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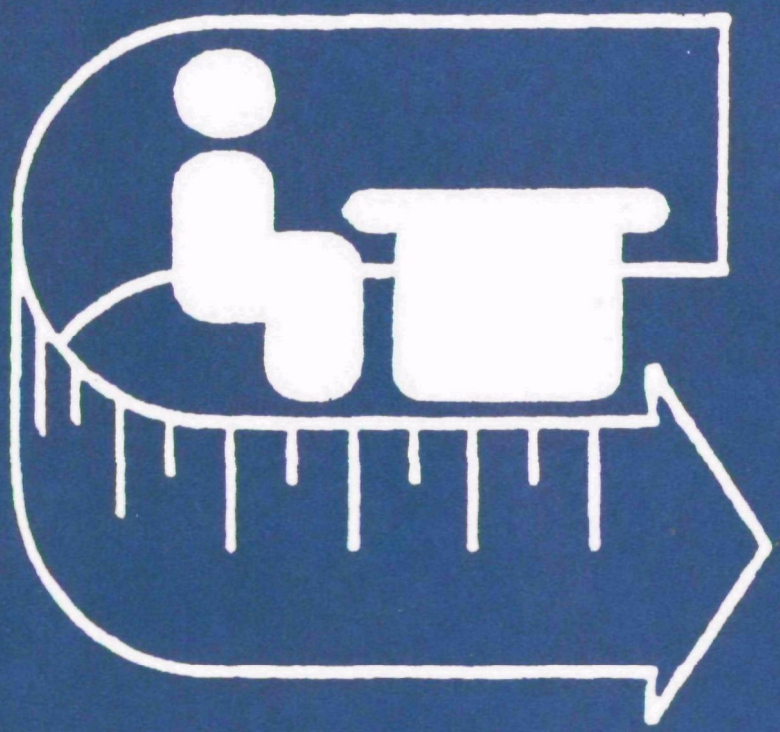
Multivariate Statistical Analysis Of Health, Comfort And Odor Perceptions As Related To Personal And Workplace Characteristics

Volume 4



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Indoor Air Quality and Work Environment Study:

EPA Headquarters Buildings

Volume IV

MULTIVARIATE STATISTICAL ANALYSIS OF HEALTH, COMFORT, AND ODOR PERCEPTIONS AS RELATED TO PERSONAL AND WORKPLACE CHARACTERISTICS

Atmospheric Research and Exposure Assessment Laboratory

US Environmental Protection Agency

Research Triangle Park, North Carolina 27711

JUNE 1991

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This study of indoor air quality and work environment was conducted by three technical teams representing multiple organizations. It was jointly developed and carried out at EPA headquarters and the Library of Congress Madison Building under the auspices of these teams working independently of both management and unions at both EPA and the Library of Congress.

Overall project coordination was provided by two technical team leaders: Kevin Teichman at EPA and Lawrence Fine at NIOSH.

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EXECUTIVE SUMMARY

This volume presents the results of a multivariate statistical analysis of a questionnaire administered in February-March of 1989 to 3955 EPA employees working in three buildings in the Washington, DC area. Three earlier volumes in this series have been released. Volume I describes the development of the questionnaire and presents the descriptive results, but without interpretation or statistical analysis. Volumes II and III deal with a component of the study involving indoor air quality measurements and a supplementary questionnaire administered to a subset of employees working near the monitoring locations. This report presents a detailed statistical analysis of the employee survey questionnaire described in Volume I, together with additional data collected on ventilation and carpet installation; it does not deal with the supplementary questionnaire or the environmental monitoring results.

OBJECTIVES

The main goal of this analysis was to identify the personal or workplace characteristics associated with employees' health and comfort. If such characteristics can be identified, steps can be taken to provide better working conditions and possibly improve health and productivity.

Personal characteristics such as age, sex, job category, and pay grade may affect health. Also, "psychosocial" factors such as stress can impact health. Therefore, a set of 25 personal characteristics, including seven psychosocial variables, was included in the analysis.

A large number of workplace characteristics could affect health and comfort, including ventilation, temperature, humidity, dust, noise, crowding, maintenance, etc. A total of 29 workplace characteristics were included.

Finally, there was concern that some areas within buildings might have higher symptom rates than other areas. Therefore, several additional analyses were conducted to determine whether any spatial variation not explained by other factors was occurring. This analysis included an additional set of 66 variables describing the locations served by different air handling units, and five variables describing areas where the new carpet had been installed.

STATISTICAL METHODS

Multiple regression analysis was used to investigate the effects of personal and workplace factors on reported health, comfort, and odor concerns occurring during the year prior to administering the questionnaire. Multiple regression can be used to analyze the effects of a large number of factors simultaneously, and determine which of these factors have the strongest association with the health effect or other variable of interest.

Most of the data used in the regressions were derived from the questionnaire, which contained 68 questions and required about 30 minutes to complete. The complete questionnaire is reproduced in Appendix A. Some additional data were collected from EPA payroll and telephone directory files, engineering records on air handling units, and management records on the installation of new carpet during the period 1987-88.

To reduce the large number of questions on health symptoms, comfort concerns, and odors to a manageable number of factors, a principal components analysis (PCA) was first carried out. This type of analysis can be used to combine separate variables into a single factor without losing too much information. The PCA reduced the 32 health symptoms to 12 factors. In most cases, separate symptoms dealing with a single body organ or system formed a single factor. For example, four questions on eye irritation (dry eyes, sore eyes, burning eyes, and blurry vision) formed one factor. In a similar fashion, 10 questions on indoor air quality were reduced to four factors, and 15 questions on odors were reduced to six factors.

These 22 health, comfort, and odor factors, defined in Table ES-1, became the dependent variables used in all regressions. To avoid repeating all the symptoms contained in a factor, we refer to the factor by a short phrase such as "chest problems," which stands for the three health symptoms "wheezing," "shortness of breath," and "chest tightness."

The independent variables included the 25 personal and 29 workplace factors that were identified from the first questionnaire. Additional independent variables included new carpet and ventilation. Because of the reactions of many employees to the installation of new carpet in 1987-88, offices and corridors with new carpet were identified and included as a possible explanatory variable. Two measures of spatial variation were

employed: a "coarse-grained" location variable consisting of the eight building "sectors" defined in Volume I (the East and West Towers, the second and third floors of Waterside Mall, its Northeast and Southeast extensions, Crystal Mall and the Fairchild building); and a "fine-grained" variable consisting of 66 distinct areas within the three buildings. These areas were characterized by the unique air handling unit (AHU) serving the area, or if an AHU served areas on different floors, by the combination of the floor and AHU.

Three sets of linear regressions were then run on each of the 22 health, comfort, and odor factors. The first set was designed to test for differences between the three buildings, or between the eight sectors. The second set of linear regressions tested for differences among the 66 areas. The third set of regressions tested for an effect of the estimated supply airflow associated with each AHU.

All three sets of regressions also included all of the other personal and workplace characteristics. Some characteristics were significantly associated with health symptoms in all three of the regressions, indicating that no matter what measure of spatial variation or building ventilation was used, these characteristics remained important.

Following the three sets of linear regressions, a final set of logistic regressions was carried out. Logistic regressions are often used to determine the increased risk associated with each factor of significance.

All the regressions were run separately for men and women to minimize the gender-related interactions among certain variables that could otherwise complicate the interpretation of the regressions. For example, women employees had less formal education, received less pay, had fewer private offices, and reported more health symptoms than men. Analyzing the genders separately eliminates these gender-related interactions and makes interpretation of the results clearer. However, one drawback of the separate analyses is that the relative risks for men and women cannot be calculated.

All regressions on health symptoms were run both with and without the comfort and odor factors as independent variables. Health could be affected by indoor air quality (e.g., headaches arising from hot stuffy air), but both could be affected by other variables (e.g., both the headache and the hot stuffy air might be caused by an inoperative AHU). In many cases, the same

personal or workplace characteristics remained significant whether or not the comfort and odor variables were included.

These decisions (separate regressions by sex; including and excluding the comfort and odor variables on the 12 health factors) led to a total of 68 separate regressions within each of the three sets of linear regressions and one set of logistic regressions. Since each regression included between 20 and 136 personal and workplace characteristics, some thousands of associations were investigated. When such a large number of tests are made, some associations will appear significant even though they are due to chance alone. To reduce the number of these "false positives," we chose to consider associations significant only if there was no more than one chance in 100 ($p \leq 0.01$) that the association was due to chance. However, we have published in Appendix E of this report all the associations tested in the final logistic regressions. Thus readers may determine for themselves what associations appeared at any level of significance.

Since the three sets of linear regressions ("coarse-grained," "fine-grained," and flow rate-based) gave similar results, only the set including the "fine-grained" spatial variables was selected for comparison with the logistic regressions. These comparisons may be found in Tables 12-33 in the text; they are summarized in Tables 34 and 37 in the text.

RESULTS

Health

Of more than 100 variables tested, only 11 were associated with multiple (more than three) health factors (Table ES-2). These 11 variables included two workplace characteristics (dust and glare); three personal characteristics (sensitivity to chemical fumes, allergy to molds, lack of college education); two psychosocial factors (workload and conflicting job demands); two comfort factors (hot stuffy air and dry air); and two odor factors (the odor of fresh paint, carpet cleaning, and other chemicals; and the odor of cosmetics, body odor, and food).

Workplace Characteristics

The workplace variable that appeared most often in relation to significantly increased frequency of health symptoms was a dusty workspace. Dust was often associated with increased frequency of nasal congestion, throat symptoms, dizziness, and dry skin. Other associated symptoms included headache, chest problems, eye irritation, and fatigue.

Glare was associated with headache, eye irritation, and (particularly strongly--$p<0.0001$) with muscle aches and upper body pain.

Personal Characteristics

Persons reporting sensitivity to chemical fumes were more likely to report headache, eye irritation, throat symptoms, fatigue, difficulty concentrating, and dizziness. Other symptoms sometimes associated with sensitivity to chemical fumes were nasal congestion, chest symptoms, and bodily aches and pains. In total, sensitivity to chemical fumes was significantly related to health factors more often than any other variable: 24 of 48 regressions for women and 22 of 48 for men.

Persons reporting mold allergies had more frequent eye irritation and bodily aches and pains. Nose and throat symptoms were sometimes increased, as were headaches and fatigue (men only) and dry skin (women only).

Persons (especially women) without a college education were more likely to report chest problems, chills and fever, headaches, dizziness, and fatigue.

Psychosocial Factors

Persons with a heavy workload reported increased frequency of headaches, eye irritation, and difficulty concentrating.

Persons reporting conflicting work duties or demands were more likely to experience symptoms such as difficulty concentrating. Other symptoms included nasal congestion, chest symptoms, dizziness, chills and fever, and muscular pain.

Comfort Factors

Persons reporting hot stuffy air reported more symptoms of headache, stuffy nose, chest tightness, eye irritation, difficulty concentrating, fatigue, and dizziness.

Persons reporting dry air reported more eye, nose, and throat problems, and dry skin.

Odor Factors

Persons reporting the odor of fresh paint, carpet cleaning, and other chemicals were more likely to report headache, throat problems, chills and fever, and dizziness. Women reporting this odor were more likely to report nasal congestion, chest problems, fatigue, and difficulty concentrating.

Women reporting the odor of cosmetics, body odor, and food smells were more likely to report chills and fever, bodily aches and pains, and difficulty concentrating. Men reporting this odor were more likely to report eye irritation.

Comfort and Odor

Four regressions (linear/logistic; male/female) were run on each of the 10 comfort and odor factors. By far the most frequently appearing variable was dust, appearing at the 0.01 level of significance in 20 of 20 regressions for men and 15 of 20 for women. Dust was associated with all four of the comfort conditions (hot, cold, dry, or humid air) and all six of the odor factors (Table ES-3). Four other workplace variables--noise, glare, nearby water leaks, and the use of a fan--were associated with a smaller number of comfort and odor factors.

Two personal characteristics--sensitivity to chemical fumes and conflicting job demands--were also associated with multiple comfort and odor factors. Sensitivity to chemical fumes was associated particularly strongly

with odors of paint and other chemicals, printing and photocopying, and tobacco smoke. It was also associated with the odor of new carpet, but among women only. Persons reporting conflicting job demands reported being bothered by printing and photocopying odors, cosmetics and body odor, and damp, musty odors.

Ventilation

Several efforts were made to relate ventilation characteristics to health and comfort. Supply airflow rates were measured for about 30 of 50 AHUs. (Supply air is the total air supplied to building occupants by the ventilation system, consisting of the sum of the fresh outdoor air and recirculated air.) Concurrent temperature measurements of the supply air, outdoor air, and recirculated air allowed the outdoor airflow rates to be estimated for these 30 AHUs. However, the missing data on outdoor airflow rates at the other 20 AHUs made it impossible to test for the effect of fresh airflow on health and comfort symptoms.

As a backup calculation, the measured supply airflow rates for most of the AHUs were supplemented with the estimated supply airflow rates for the remaining AHUS. These values were calculated either from previously measured supply airflow rates or from the manufacturer's rated capacity for the supply air fans. The estimated values were then divided by the number of people served by each AHU to provide an estimated per capita supply airflow rate. This variable was then included in the third set of 68 linear regressions. No effect was found on any health, comfort, or odor factor using these estimated flows.

Spatial Variation

No effect on health was noted for any of the "coarse-grained" location variables; that is, neither the building nor any of the large "sectors" within a building (e.g., East or West Towers, Southeast Mall) had any consistent association with either increased or decreased frequency of any of the 12 health factors investigated. Among the 66 "fine-grained" locations, only two appeared to be related to increased frequency of some symptoms: the Library area of the mall (AHU 21), associated (among men only) with flu-like symptoms (chills, fever, muscle/joint aches and pains); and the part of the 2800

corridor of Waterside Mall served by AHU 16, associated (again among men only) with complaints of eye irritation.

However, certain comfort concerns and odors were affected by particular locations. The Southwest Mall reported significantly higher frequency of odors of paint and other chemicals, engine exhaust and musty/damp odors. Tobacco smoke odors were reported on the second and third floors of the West Tower. Reports of cold drafty air were elevated among people served by AHU 14 on the second floor of Waterside Mall, and reports of dry air were elevated among people served by AHU 16 on that floor. Reports of humid air were elevated in the Library area (served by AHU 21) of Waterside Mall. Workers in the garage and lower garage areas (AHU G&LG) reported being bothered by odors of photocopying and printing processes; this area includes the EPA print shop.

Carpet

Persons in areas where the new carpet had been installed about a year before the survey reported increased frequency of throat symptoms (sore throat, dry throat, hoarseness). An effect on dizziness was also noted, but only for men in some regressions.

DISCUSSION

Methodology

This is the first large-scale building study to employ an objective measure (PCA) to assess the way in which health symptoms cluster together. Previous studies have subjectively grouped symptoms into rather large clusters, such as a "mucous membrane" category involving eye, nose, and throat symptoms. The more objective PCA employed in this study indicated that each of the 12 health factors identified in this study had a somewhat different set of associated personal and workplace characteristics (see Tables 12-23 in the text). If any of the 12 health factors had been further combined, some of the associations may not have been observed, although associations common to the combined factors would still be observable.

Thus an important feature of the study has been the objective identification of health symptom clusters. These findings should be tested in future studies to determine whether these clusters of symptoms have broad validity.

Another important feature of this study was the fact that it attempted a census (rather than a sample) of all EPA employees at the three buildings. Even though the census was not complete, the 80% coverage allowed an investigation of spatial variation within the buildings, including the effects of ventilation and carpet installation. Although some preceding studies, such as the Danish Town Hall Study (Skov *et al.*, 1989) attempted a census, this is the first study to attempt an extensive spatial analysis within buildings.

Symptom Prevalence

We have been unable to locate baseline statistics on the prevalence of acute symptoms in a working population in non-problem buildings. The closest substitute we have found is several studies of acute symptoms in healthy urban populations. Frequencies of nine symptoms among the EPA employees appeared elevated by factors of 3-12 over the rates reported in these studies. Although we recognize that these comparisons are not exact (the earlier study populations included children and other persons not in the work force; our results were for a single week in winter, when rates of respiratory disease are typically twice as high as in spring and summer), we conclude, as did the

authors of the earlier studies, that the burden of minor acute symptoms is high. For example, about a quarter of a million headaches per year could be calculated among the 5000 EPA employees. Headaches were identified by the respondents as the main cause of time lost from work. Allowing a few minutes of lost productivity per headache results in extensive productivity losses due to this single symptom.

Workplace Characteristics

Dust was identified as the characteristic contributing most powerfully to a wide variety of health, comfort, and odor concerns. Dust has previously been identified as a proximate cause of health problems in offices or schools. The primary cause, presently unknown, could be physical irritation, allergens or endotoxins. The Danish Town Hall Study found that measured dust and surrogates for dust (fabric-covered surfaces and shelf space) were among the most highly correlated variables with reported health symptoms (Skov et al., 1990; Gravesen et al., 1990). Another study found that intensive cleaning of carpets and wet dusting reduced health symptoms in an office building for at least the following two months (Norbäck and Torgen, 1989).

The problem of dust may be more extreme at Waterside Mall than at the other two EPA buildings. A substantially higher percentage of people reported dusty conditions at the Waterside Mall building (24% compared to 16% and 12% at the other two buildings). Also, a much higher percentage of employees at Waterside Mall than at the other two buildings brought up problems of maintenance (including lack of dusting or vacuuming, presence of vermin, etc.) as the first item they mentioned on the essay question (EPA, 1989, p. 5-43).

Dust was also the single strongest variable affecting comfort and odor factors. Since odors may be carried by particles, or by gases associated with particle emissions, as in tobacco smoke, printing processes, painting, etc., the observed direct relationships of odors with dust may have a physical explanation.

Glare was the other workplace variable affecting a number of health factors. The influence of glare on headache and eye irritation is understandable. However, the strongest effect of glare was on muscle pain, including neck and shoulder pain. This may be explained if people working

with computers and word processors adopt and maintain uncomfortable positions to minimize the effects of glare.

Noise was associated with several comfort and odor factors, including particularly cold drafty air.

Water leaks near the respondents' office area were associated with increased reports of damp and musty odors. Water leaks were also associated with reports of unusual fatigue and difficulty concentrating (men only). These findings support the possibility that molds are implicated in some health symptoms, consistent with the finding that allergies to molds were broadly associated with a number of symptoms.

Although new carpet showed few relationships with health symptoms, it is of interest due to the widespread reports of health problems following installation in 1987-88. People in areas where the new carpet was installed reported higher frequencies of throat symptoms (sore throat, dry throat, hoarseness). Since the period of recall was one year, which extended back to the time of installation, the question of whether the respondents were still experiencing these symptoms, or whether they had simply experienced them earlier and were now recovered, could not be resolved. (Analysis of the "last week" question could resolve this point.) Nonetheless, this finding provides some support for the hypothesis that carpet installation can result in these symptoms.

The finding that spatial location had no discernible effect on health does not mean that there were no differences in frequency of health symptoms among buildings or locations within buildings, but only that such differences could be largely explained by other, possibly more directly related, variables. For example, since dusty offices were more prevalent in the Waterside Mall building than in the other buildings, the frequency of those health symptoms significantly related to dust would be expected to be higher at Waterside.

The finding that ventilation capacity and AHUs also had no discernible effect on health symptoms should also be interpreted with caution. It is likely that other variables, more directly related to health problems, have captured whatever variability was associated with the AHUs. For example, hot stuffy air was associated with a number of health symptoms. Hot stuffy air is

likely to have been associated with certain AHUs as well, although this analysis has not been carried out.

Personal Characteristics

The variable with the most widespread influence on health was sensitivity to chemical fumes. The questions used to define this factor included a list of possible sources of irritation (e.g., tobacco smoke, fumes from new carpets, paint, etc.) and a question on whether the respondent considered herself or himself "especially sensitive" to any of these chemical mixtures. About a third of the respondents (29-32%) at each building answered "Yes." Women were more likely to report sensitivity to chemical fumes than men (37% vs. 25%).

The hypothesis that Waterside Mall employees would be more likely to report sensitivity to chemical fumes, either because they had been physically sensitized by the carpet installation or because they were influenced by the extreme publicity and/or by fellow workers' complaints, was not confirmed (Waterside Mall 32%, Crystal Mall 32%, and Fairchild 29%).

Sensitivity to chemical fumes was also significantly related to reports of odors, particularly odors of paint and other chemicals, tobacco smoke, and photocopier and printing processes. This is consistent with anecdotal reports of severe reactions to paint, cigarette smoke, and other odorous products.

Several psychosocial variables were associated with health symptoms, and also with comfort and odor concerns. The most commonly occurring psychosocial variable was a measure of conflicting job duties or demands on employees by their supervisors or peers. This variable was associated with difficulty concentrating, bodily aches and pains, chills, and nasal and chest symptoms, as well as many odors. Other important psychosocial variables were workload, associated with eye irritation and difficulty concentrating, and job dissatisfaction, associated with fatigue and difficulty concentrating. Since all of the three most important psychosocial factors affected only about half of the health symptoms, it appears that the bulk of the reported health problems at the EPA buildings cannot be attributed to psychological factors alone.

The importance of mold allergies for a number of health symptoms indicates that molds may play a part in the reported health symptoms at the

EPA buildings. Molds and dustiness may both be results of inadequate maintenance.

Comfort and odor factors

Reports of dry air and hot, stuffy air were often associated with health symptoms. The reports of dry air were supported by the inspections of the AHUs, which found no AHU with an operable humidifier. The measured indoor relative humidities averaged about 23%, which is below recommended standards. However, these measurements were made during the winter and may not reflect conditions at other times.

With respect to the reports of stuffy air, however, little evidence was found of inadequate ventilation. The design capacity of the supply air fans was calculated both per capita and per unit area, and was found to be adequate for most areas in Waterside Mall. The main exception was the print shop at Waterside Mall--but this area has had a new AHU installed since the monitoring period. However, it is recognized that these calculations are incapable of determining the actual delivery of fresh outdoor air to individual employees at all locations.

The odor factor having the most significant associations with health symptoms was the factor comprised of the odors of paint, carpet cleaning, pesticides, and other chemicals such as glues and cleansers. Some of these odors are associated with maintenance activities or with renovation.

CONCLUSIONS

Analysis of the 32 health symptoms indicated that they clustered into 12 factors, largely by single body systems such as eye, nose, throat, chest, and central nervous system. This finding, if confirmed, would be useful in designing future questionnaires.

Symptom levels appeared to be elevated at all buildings compared to findings from previous studies of acute symptoms in healthy urban populations. However, statistics on symptom frequencies in adult working populations more comparable to the EPA respondents could not be located.

Major variables affecting more than three health factors included two workplace characteristics (dust and glare) and several personal characteristics (sensitivity to chemical fumes, allergy to molds, workload, and conflicting job demands). Comfort and odor factors associated with multiple health symptoms included hot stuffy air, dry air, and the odor of fresh paint and other chemicals.

RECOMMENDATIONS

The importance of dust, mold allergies, the odor of paints and other chemicals, and nearby water leaks in affecting multiple health symptoms and comfort/odor concerns points to building maintenance or renovation as a crucial factor in the problems at the EPA buildings, particularly the Waterside Mall building. One recent study indicates that intensive carpet cleaning and wet dusting can have a beneficial effect on employees' health. Another suggests that removal of carpeting improved the health of students in two Swedish schools. Therefore it is recommended that attention be given to ways of improving building maintenance, particularly to reduce dust, clutter, and conditions conducive to growth of mold. The design of new buildings should stress adequate building maintenance and reduced likelihood of dust buildup. This should include consideration of the relative advantages of carpeting and fabric-covered partitions vs. other more easily cleaned surfaces, the use of gratings or walk-off mats to reduce track-in of dust and dirt, and techniques to allow for easy replacement or cleaning and drying of water-soaked carpet. The complexity of the issue of building design and

maintenance is recognized. For example, carpets may be cleaned with chemicals whose residue has been shown to cause health problems, or they may be soaked during steam cleaning to the extent of encouraging mold growth. On the other hand, noncarpeted surfaces such as tile or linoleum may allow unacceptable noise and can be slippery following cleaning.

Some employees stated in their questionnaire responses that they had to keep unused files in their offices as a historical record. This suggests that an adequate archiving policy and provision of external storage space could reduce the level of dust and clutter. We are aware that EPA management has taken steps recently (Operation Cleanup) to reduce clutter, and we recommend continued vigilance.

Since many sources of dust are associated with essential office processes such as filing, photocopying, and the like, providing supplemental air cleaning and filtration may also be considered. Since this would also require supplemental ventilation, or at least recirculation, the same system could reduce employees' complaints of hot stuffy air. The system should include both charcoal filters for volatile organic compounds (VOCs) and high-efficiency filters to reduce fine particle accumulation. However, if persons work in proximity to common indoor sources (e.g., computers, printers) careful attention to the design of the airflow patterns would be required. Whether these systems work as advertised is not clear; adequate testing of systems should be carried out. In the case of major indoor sources such as copiers, separate ventilation systems are recommended.

A second factor of broad importance in affecting health was glare. With the increased use of computers, it appears that reducing glare has the potential of reducing complaints of headache, eye irritation, and neck and shoulder pain. Providing glare screens for all computers may be helpful, as would providing information to employees on the importance of reducing glare. An important finding of this study has been that headache is the single most common cause of absenteeism and lost work time (EPA, 1989). Thus if reducing glare resulted in reducing headache prevalence, employee absenteeism and lost work time may also decrease. Inspections of workstations to improve ergonomic design could reduce the complaints noted in this study regarding uncomfortable workstations. Such improvement of employee working conditions could also be a cost-effective means of increasing productivity.

Neither the environmental measurements nor the results of these analyses support a recommendation to replace the present air handling systems with more powerful systems. (Possible exceptions are the units in the garage and lower garage areas, the Library area, and the Southwest Mall, which were all associated with comfort or odor problems. We are aware that the garage and Library units have been replaced.) However, the findings of widespread health problems associated with complaints of hot stuffy air do support a recommendation that supplemental ventilation be supplied, particularly to locations where people are reporting problems. This additional ventilation could include additional outdoor air, or it could consist of supplemental recirculated air, preferably including filtration capable of removing both particles and VOCs. Supplying additional fresh air alone might not deal with the problem of dust buildup due to internal sources.

This study suggests that carpet installation was associated with increased symptoms of throat problems. It is not known, however, which aspect of the installation process may be implicated. One possibility is emissions of organic chemicals, either from the carpet, the carpet adhesive, or, if molding is involved, the molding itself or the molding adhesive. Another possibility is the raising of dust, molds, allergens, or endotoxins while ripping up old carpet or molding. This suggests that carpets be installed without employees present and that some sort of minimum waiting period ensue before they reenter their offices to allow dust to settle and organic chemical concentrations to decline. However, this study provides no guidance on the optimum length of the minimum waiting period. If the carpets can be aired out in the warehouses for a week or two before installation, the initial high rate of organic emissions should be greatly reduced. (We understand that EPA management has in fact adopted this procedure in recent carpet installations.)

Sensitivity to paint, carpet, adhesives, tobacco smoke, automobile exhaust, and other chemical mixtures was associated with more health symptoms than any other variable. It was also one of the strongest factors associated with headache, the major cause of time lost from work identified in the questionnaire responses. Therefore, steps to reduce the likelihood of these chemical fumes or vapors from reaching employees may improve productivity. (This is the case regardless of whether such chemical exposures have a physical or psychological effect.) Such steps include a no-smoking policy

that is adequately enforced (this was a common complaint in some essays, particularly in the Fairchild building); steps to seal off the underground garage from the work areas, through enforcement of the fire door policy and perhaps through some work on the elevator shafts and stairways; and reduction of activities such as painting, cleaning, and other maintenance or renovation work during working hours. Pollution prevention through the use of low-emitting adhesives, alternative cleansers, and other nontoxic products would reduce the indoor sources of VOCs. Since sensitivity to chemical fumes is so little understood, we recognize that further research is required. However, prudent steps to reduce chemical exposures, and to communicate with employees so they can recognize that effective actions are being taken, seem justified.

Among the psychosocial variables, the most important seemed to be conflicting job demands. This suggests that particular attention be paid to establishing clear areas of responsibility and lines of authority to reduce the likelihood for multiple, possibly contradictory, demands to be placed on employees. Other important psychosocial variables included workload and job dissatisfaction. However, job satisfaction was generally high for the employees as a whole, and many employees stated that although their workload was high, they were committed to their jobs.

In terms of future research, the questionnaire and data base collected in this study will form a major resource. The identification of clusters of health symptoms should be validated on different populations. The questionnaire should be revised according to the experience in this study and retested on small populations. Research on methods of collecting settled dust should be undertaken to allow this component to be added to future monitoring studies. Additional analysis of the most important variables (dust, hot stuffy air) could be undertaken to pinpoint those areas of the buildings with problems. An analysis of existing data to identify organizational units with psychosocial problems could be fruitful, provided problems with confidentiality can be overcome.

In summary, the findings that dust, water leaks, mold allergies, and the odor of fresh paint and chemicals are associated with health and comfort factors suggest that improved building operation and maintenance procedures are needed. The finding that glare is associated with increased incidence of headache, the leading cause of employee absenteeism and loss of work time, as

well as with bodily aches and pains, suggests that reduction of glare could improve employee productivity. The finding that hot, stuffy air and dry air are also associated with many health problems suggests that increased effort in providing stable temperature regimes, improved airflow, and relative humidities in the approved range would also be desirable. The finding that sensitivity to a variety of chemical mixtures is associated with many health symptoms indicates that reduction of chemical exposures may be indicated through enforcement of smoking policies; controlled use of paints, glues, and cleansers during non-working hours; airing out carpets before installation and providing a minimum waiting period before reentry; and sealing off pathways for auto exhaust to reach the workspace. For maximum effectiveness, any such actions should be clearly communicated to employees. The finding that several psychosocial variables (particularly conflicting job demands) contribute to acute symptoms suggests that increased attention should be paid to defining job duties and responsibilities to reduce the stresses due to conflicting job demands.

Table ES-1. DEPENDENT VARIABLES IDENTIFIED BY PRINCIPAL COMPONENTS ANALYSIS AND USED IN ALL REGRESSIONS

HEALTH SYMPTOMS

1. headache; nausea
2. stuffy nose/sinus congestion; runny nose; sneezing; cough
3. wheezing; shortness of breath; chest tightness
4. dry, itching, tearing eyes; sore eyes; burning eyes; blurry vision
5. sore throat; hoarseness; dry throat
6. sleepiness; unusual fatigue
7. chills; fever
8. aching muscles; back pain; shoulder/neck pain; hand/wrist pain
9. difficulty concentrating; difficulty remembering; tension; depression
10. dizziness
11. dry itchy skin
12. problems with contact lenses

COMFORT CONCERNS

1. air too hot; air too stuffy; too little air movement
2. air too dry
3. air too cold; too much air movement
4. air too humid

ODORS

1. fresh paint; carpet cleaning; pesticides; chemicals
2. cosmetics; food; body odor
3. photocopier; printing process
4. new carpet; new drapes
5. musty/damp odor; fishy smells; engine exhaust
6. tobacco smoke

Table ES-2. VARIABLES ASSOCIATED[a] WITH AT LEAST FOUR OF THE 12 HEALTH FACTORS

Variable	N	Health Factors Significantly Associated
Workplace Characteristics		
Dust	11	headache; nasal, chest, eye, throat symptoms; fatigue; chills; difficulty concentrating[b]; dizziness; dry skin; contact lens problems
Glare	5	headache; eye symptoms; fatigue; difficulty concentrating; pain[c]
Personal Characteristics		
Sensitivity to Chemicals	9	headache; nasal, chest, eye, throat symptoms; fatigue; pain; difficulty concentrating; dizziness
Mold Allergies	7	headache; nasal, eye, throat symptoms; fatigue; pain; dry skin
No College	5	headache, chest symptoms, fatigue, chills and fever, dizziness
Psychosocial Characteristics		
Conflicting Demands	6	nasal, chest symptoms; chills and fever, pain, difficulty concentrating, dizziness
Workload	5	headache, eye symptoms, pain, difficulty concentrating, dizziness
Comfort and Odor Characteristics[d]		
Odor of Paint, Chemicals	8	headache; nasal, chest, throat symptoms; fatigue; chills; difficulty concentrating; dizziness
Hot Stuffy Air	7	headache; nasal, eye, chest symptoms; fatigue; difficulty concentrating; dizziness
Dry Air	4	nasal, eye, throat symptoms; dry skin
Odor of Cosmetics	4	eye symptoms, chills, pain, difficulty concentrating

[a] Significant at $p < 0.01$ in at least two (of eight) regressions
[b] Includes difficulty concentrating/remembering, depression, tension
[c] Includes aching muscles, back pain, shoulder/neck pain, hand/wrist pain
[d] Significant at $p < 0.01$ in at least two (of four) regressions

Table ES-3. VARIABLES SHOWING SIGNIFICANT[a] ASSOCIATIONS WITH AT LEAST THREE OF THE 10 COMFORT AND ODOR FACTORS

Variable	N	Odor and Comfort Factors Significantly Associated
Workplace Characteristics		
Dust	10	all four comfort concerns and all six odor factors
Glare	5	hot air, dry air, odors of paint, cosmetics, dampness
Noise	5	hot air, dry air, cold air, odors of paint, cosmetics
Use Fan	4	hot air, humid air, cold air [-], odor of cosmetics
Water Leaks	3	odors of dampness, cosmetics, tobacco smoke
Personal Characteristics		
Conflicting Demands	6	dry air, cold air, odors of cosmetics, photocopying, dampness, tobacco smoke
Chemical Sensitivity	5	humid air, odors of paint, photocopying, new carpet, tobacco smoke

[a] Significant at $p < 0.01$ in at least two (of four) regressions

1. INTRODUCTION

In March of 1989, a study of indoor air quality was carried out in three buildings occupied by the US Environmental Protection Agency at Washington, DC. A questionnaire was distributed to all 4,900 employees. The questionnaire contained 68 questions on health and comfort concerns, workplace conditions, and personal characteristics of the respondents. Nearly 4000 employees answered the questionnaire, for an 80% response rate. A few weeks later, environmental measurements were taken in the buildings, and a supplemental questionnaire was administered to a subset of about 500 employees who worked in the areas monitored.

Three EPA reports have been published on this study. Volume I (EPA, 1989) describes the survey results. Volume II (EPA, 1990a) summarizes the results of the environmental monitoring. Volume III (EPA, 1990b) analyzes the relationships between the environmental monitoring results and the responses to the supplemental questionnaire.

This report is a statistical analysis of the responses to the first questionnaire. It covers most of the questionnaire material, including most of the health symptoms, comfort concerns, and personal and workplace characteristics. It includes none of the environmental measurements nor any of the responses to the supplementary questionnaire.

1.1 Objectives

The fundamental goal of the analysis was to determine relationships between employee-reported health symptoms and comfort concerns and personal and workplace characteristics. If such relationships can be established, it may be possible to improve the relevant working conditions and thereby reduce employee concerns, sickness and absenteeism. Improved working conditions may also result in increased productivity.

Several previous large-scale studies of office buildings (Skov and Valbjorn, 1987; Skov *et al.*, 1989, 1990; Wilson and Hedge, 1987; Zweers *et al.*, 1990) have tentatively identified some personal and workplace characteristics that may be associated with health symptoms. For example, in all of these studies, women reported higher symptom rates than men, although

the root cause remains unknown. However, no other variable out of the many variables tested in these studies was consistently identified in all studies as being related to health or comfort. Also, none of the previous studies examined the spatial variation in health symptoms within a single building; such variation might be caused by differences in ventilation or areas with new carpet, water damage, or other possible localized sources of problems.

Therefore, the present study was designed to test the widest possible number of health symptoms, comfort concerns, odors, workplace characteristics, personal factors, and spatial variables that might affect employees. A detailed questionnaire was developed that took approximately 30-45 minutes to complete. Additional data were collected on building ventilation characteristics, employee density, and locations where new carpet had been installed.

The study was designed to test a large number of hypotheses. Some of the major objectives were as follows:

1) Determine which health symptoms are most closely correlated with other health symptoms. Identifying symptoms that "cluster" together, perhaps because of the same or similar causes, would allow a smaller number of health symptoms to be included on future questionnaires.
2) Determine which workplace characteristics affect health and comfort. This would indicate which improvements in working conditions should be targeted as having the greatest likelihood for improving employee well-being. Some of these workplace characteristics were of great interest to employees and management, including ventilation and new carpets:
   - 2a) Determine the effect of ventilation on health and comfort. Complaints of hot, stuffy, and dry air have been common, but the effect of these ventilation conditions on health is unknown.
   - 2b) Determine which symptoms may be related to the installation of new carpet. The carpet installation of 1987-88 was associated with an outbreak of symptoms and employee concerns. The statistical analysis would help determine which symptoms, if any, were elevated among employees in the newly carpeted areas.
3) Determine which personal and psychological characteristics affect health and comfort. This objective could identify areas such as job satisfaction or workload that could be marked for improvement.

Most of the information used was obtained from the questionnaires. Thus the personal and workplace characteristics, like the health symptoms and comfort concerns, are subjective; no independent confirmation of these characteristics has been made, with the exception of the newly carpeted areas, for which management records were used.

To avoid awkwardness, we use terms like "dust" or "glare" as shorthand for the more precise "office was reported dusty during last year" or "reported being bothered by glare." We also use the terms "sensitivity to chemical fumes" or "sensitivity to chemicals" to refer to a specific set of questions on our questionnaire; these terms should not be taken to refer to the syndrome known as "Multiple Chemical Sensitivity," nor should their use be taken to indicate acceptance of the cause-effect relationship implied. Readers with questions regarding the precise meaning of a variable may look up the exact wording of the question in the original questionnaire (Appendix A).

1.2 Description of Buildings

The main EPA Headquarters building, with about 4000 employees, is located in Southwest Washington, DC and is known as Waterside Mall. The remaining two buildings, each with about 500 employees, are known as Crystal Mall and the Fairchild Building. Crystal Mall is located in Crystal City, VA., just across the Potomac River from Washington. Fairchild is located a few blocks from Waterside Mall, on South Capitol St.

Waterside Mall was originally constructed in 1970; EPA took occupancy in 1971. Two 12-story buildings (the East and West Towers) are connected by a central three-story mall. The ground floor of the mall is commercial space housing restaurants and shops. Although the second floor of the mall was also designed as commercial space, with 10 to 12-foot ceilings finished to 8-feet, it was transformed into office space soon after the building was built. The third floor of the mall and the towers were designed for standard offices. Over the years, additions have been made to the building. The Southeast Mall was built in the late 1970s, and the west side of the Mall, consisting of three floors and a basement, was built in 1971. The Northeast Mall, five floors and two basement floors, was occupied by EPA in 1984. Thus the Waterside Mall complex comprises at least three separate buildings (the two

Towers and the Mall), with several additional architecturally distinct areas.

Crystal Mall is a 12-story office building constructed about 1970 in Crystal City, VA. EPA leases five floors housing about 500 workers. The Fairchild Building is an eight-story structure that was built in the late 1970s. EPA has leased five floors since 1980, again for about 500 employees.

For the last few years, including the period of recall on the questionnaire, all EPA Headquarters buildings have had a smoking policy, with smoking restricted to outdoors and designated rest rooms.

1.3 Questionnaire Design

A new questionnaire was designed for this study by research scientists from EPA, from the National Institute of Occupational Safety and Health (NIOSH), and from Yale University/Pierce Foundation. The group included environmental scientists, statisticians, survey design specialists, physicians, epidemiologists, industrial hygienists, and specialists in measuring environmental chemicals, bioaerosols, and building-related parameters such as air exchange rates. Existing questionnaires were reviewed, including questionnaires for medical conditions, psychosocial variables, and previous indoor air quality investigations. When possible, standardized questions from these questionnaires were used. In some cases, new questions were added. The questionnaire went through a number of drafts over a period of several months, and was pretested twice before the final version was completed. The resulting questionnaire (Appendix A) includes 68 questions (some with multiple parts) addressing health, comfort concerns, odors, and personal and workplace characteristics. For a detailed discussion of the questionnaire design process, see Volume I (EPA 1989).

Other reports on the questionnaire design and results from both the EPA buildings and the associated study in the Madison Building, Library of Congress (LOC), are contained in Fidler et al. (1990), Leaderer et al. (1990), Nelson et al. (1990), Hall et al. (1990), and Hurrell et al. (1990). Reports on monitoring results in the EPA and LOC buildings are contained in Crandall et al. (1990), Persily and Dols (1990), and Selfridge et al. (1990).

2. DATA DESCRIPTION

An early decision was made to have separate statistical models for men and women, based on consistent findings from previous studies that women report symptoms at a higher rate than men. Accordingly, the symptom frequencies are presented separately for men and women for the 32 health symptoms (Table 1).

About 3900 responses were available, divided almost evenly among men (1900) and women (2000). The symptoms that occurred "often" or "always" in the previous year at the highest rates were sinus congestion (females 36%, males 26%); headache (28%, 13%); fatigue (27%, 13%); dry skin (27%, 16%); and eye irritation (26%, 15%).

Personal and workplace characteristics showed differences among male and female respondents (Table 2). Women were younger and less well educated than men: 24% of women were under 30 compared to only 8% of men; more than 90% of the men had college degrees, but only half of the women did. Pay grades followed suit, with three-quarters of the men in the highest pay grade (GS 13 and above), but only a third of the women. More women than men smoked tobacco--18% compared to 12%.

Medical conditions showed similar rates among men and women--rates for asthma, eczema, and allergies to dust, molds, animals, and pollen were within a few percent for both sexes. The reported asthma rates of 9% for men and women more than doubled the nationwide rates of 3% for men and 4% for women in 1988 (NCHS, 1989). About 37% of women considered themselves unusually sensitive to certain chemical fumes or vapors, as compared to 25% of men.

Seven measures of stress were evaluated. Men and women scored similarly on most measures, including workload, job satisfaction, and conflicting job demands. However, women were about twice as likely as men to report external (not job-related) stress factors, such as caring for a family member. Nearly twice as many women as men lived alone (25% vs. 15%) while more than twice as many men as women (26% vs. 12%) described themselves as living with others and being the sole provider.

About four of five men had an enclosed office, but only half of the women did. About 40% of women shared their workspace with two or more

persons, compared to 14% of men. More men reported a window in or near their workspace (49% vs. 38% of women).

Women worked more hours at computers than men: 27% of the women spent more than four hours a day on the computer but only 15% of the men. Women also reported being bothered by glare more than men: 53% vs. 42%. Women also worked more often with chemical-containing office products such as adhesives and whiteout: 24% worked one or more hours per day with such chemical mixtures compared to only 11% of men. Three times as many women as men (15% vs. 5%) reported working more than one hour at a copy machine.

Men and women had equal levels of complaint about noise, with more than half of each finding their work environment too noisy. Women complained of dusty working conditions more frequently than men (56% compared to 40%).

3. DATA PREPARATION

The variables used in the analysis are listed in Table 3, together with the identification of the questions from which they were constructed. Some of the questions on the questionnaire were not used in the analysis. These questions, and the reasons for dropping them from the analysis, are shown in Table 4.

Other questions were either accepted as is, or were combined or otherwise recoded in some way. Coding of many binary questions followed standard conventions ("No" = 0, "Yes" = 1). Decisions on coding the remaining questions are explained below.

3.1 Health, Comfort, and Odor Variables

The questions on health symptoms had two parts, one dealing with how often the symptom occurred during the previous year ("never," "rarely," "sometimes," "often," or "always") and the other with how many days it occurred last week. It was decided to analyze the "last year" question but not the "last week" question, since the latter might not be representative of typical conditions. Another reason was that many of the other questions on the questionnaire covered lengthy periods. For example, people were asked if new carpet, new furniture, etc., had been installed within the past 6 months or one year. These questions might have to be omitted in analyzing the "last week" question. Finally, analyzing the "last week" question would have doubled the number of computer analyses, which was not feasible economically. Nonetheless, we recognize that there are certain advantages to analyzing the "last week" question (responses are apt to be more accurate; the "number of days" response lends itself better to quantitative analysis). Also, running the "last week" analyses could serve as a check on the stability of the conclusions reached from analyzing the "last year" questions.

A final question was "Does the symptom usually change when not at work?" with three possible responses: "gets worse; stays same; gets better." Responses of "gets better" would normally be considered to be work-related. However, some building-related symptoms may get worse after leaving work (e.g., muscle and back pains), others may stay the same for long periods of

time (e.g., dry skin), and some non-building-related symptoms may improve after leaving work because of natural causes (e.g., a headache that begins in the morning before coming to work and gets better after leaving work). All of these situations would lead to misclassification. Also, since this question was placed immediately after the "last week" question, the possibility exists that some respondents interpreted the question as referring to last week rather than last year, as intended. For these reasons, this question was not used in this analysis.

Some previous studies have analyzed only symptoms that were thought to be work-related, using questions similar to those discussed above to separate work-related from non-work-related symptoms. Other studies, like this one, have analyzed all symptoms without regard for whether they are work-related. An interesting contribution to future studies of this sort would be to repeat the analysis on only the work-related symptoms. If the two analyses are fundamentally similar, identifying work-related symptoms may be unnecessary.

Comfort questions were also in two parts, "last year" and "last week", each with identical 5-point scales ranging from "never" to "always." Odor questions dealt only with odors noticed at the workstation during the last year, using the same five-point scale.

3.2 Personal and Workstation Characteristics

Initially, two age variables were used: age and $(\text{age})^2$, to allow for nonlinear effects. After determining that these variables were collinear, they were replaced in all later analyses by a three-way categorization: <30, 30-39, 40+. These categories have been used by other investigators (Wilson and Hedge 1987, Skov and Valbjorn 1987), who found some effects related to age.

Three questions on the comfort of the chair or desk at the workstation and the adjustability of the chair were combined into one discomfort index.

Three pay grade categories were created: < GS9, GS9-GS12, > GS12.

The original 3-level question on smoking (none, light, heavy) was recoded into a binary variable (smokers = 0, nonsmokers = 1) because of the small size of the smoking group (12% of men, 18% of women).

Three types of workspace were considered, based on answers to Question I.1a: enclosed offices, cubicles with half-height partitions, and open areas. Three types of space sharing were also considered, based on responses to Question I.1b: single occupant, sharing with one other person, and sharing with two or more persons. These variables were kept separate for the initial multiple least-squares regressions, but for the final logistic regressions, they were combined. This was done because it was felt that an occupant of a private office might have different characteristics from an occupant of a cubicle, although both would respond that they did not share their workstation with anyone else. Thus the three types of space were crossed with the three types of space sharing to form nine "cells." These nine cells were then combined into three categories. The first category consisted of persons in a private office. The second category was made up of two cells: persons who shared an enclosed office with just one other person, and persons in private cubicles with half-height partitions. The last category consisted of the remaining six cells: persons sharing an office with two or more workers (one cell), persons sharing cubicles with one or more others (two cells), and persons in open areas (three cells). Two binary variables were created from the three categories.

Question I.7 on bookcases, desks, and other items in the workstation was recoded into several variables. One was intended to approximate a "shelf space" variable, of the type developed in the Danish Town Hall study (Skov and Valbjorn, 1987), and hypothesized to be a measure of the total dust-catching area in the workplace. This variable was the sum of the positive responses to questions on the presence of a desk, bookcases, file cabinets, and other furniture. Another variable, intended to test for possible effects of chemicals emitted by wood products (e.g. formaldehyde or terpenes such as α-pinene), was the sum of positive responses to questions on wood desks, bookcases, and furniture.

3.3 Ventilation, Spatial, and New Carpet Variables

Data on air handling units (AHUs), the locations they serve, and the areas with new carpet of the type associated with EPA employee health and comfort concerns were acquired and added to the data base for analysis. This

allowed us to test for the possibility that the ventilation system or installation of new carpet could affect health, comfort, or odor perceptions.

3.3.1 Ventilation

The most desirable information on ventilation would be actual long-term continuous measurement of outdoor airflow rates. This information could then be combined with employee densities to calculate a per capita outdoor airflow rate (in cubic feet per minute per person, or cfmp), which could be compared directly to the recommended flow rates contained in ventilation standards such as Standard 62-89 of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

However, this ideal situation was not possible in this study. A year-long monitoring effort, preceded by an extended study design, with appropriate financial resources, was mounted to provide this information for the associated Library of Congress study, but there was no time to develop the same program for the EPA buildings. Nonetheless, some useful information was collected on the ventilation system at the EPA buildings.

Approximately 50 large AHUs bringing in outside air were identified in the Waterside Mall building (Table 5). Additional units were identified in the Crystal Mall and Fairchild buildings, but because information was lacking about the location of the respondents' workplaces in the specific areas served by each unit, the AHUs in these two buildings were treated as a single unit in each building. An additional 50 or so small air conditioners were identified in the Waterside Mall building; however, since the completeness of this data base was questionable, and since these units did not affect the air exchange rate, they were not considered further. Appendix B provides a detailed discussion of the identification process and sources of information for ventilation data.

For the following discussion, several terms need to be defined. "Supply air" is the air supplied to building inhabitants through the ventilation ducts. It includes both outdoor air and recirculated air. "Design flow rate" is the flow rate, in cubic feet per minute (cfm), that the supply air fans are theoretically capable of maintaining.

The supply airflow rate was estimated for each AHU. For about 30 of the AHUs, the actual supply airflow rate was measured during the monitoring period in March of 1989. The outdoor airflow rate for each of these AHUs was calculated by measuring temperature differences between supply air, outdoor air, and recirculated air. These measured outdoor airflow rates could have been used to calculate an average per capita outdoor airflow rate for these locations only, but the results would refer only to the short period when the measurement occurred. Also, these values would have applied to only about half the EPA employees. For these reasons, the outdoor airflow rates were not used in the statistical analysis.

For two additional AHUs in the East Tower, a 1986 "air balancing" report provided a measured supply airflow rate. For the remaining 18 or so AHUs, only the design flow rates were available. Good agreement (generally within 15%) was noted between the design and measured supply airflow rates of most of the AHUs, both in the 1986 and 1989 measurements. Therefore it is expected that the use of the design flow rates rather than measured flow rates for these remaining AHUs did not introduce major errors.

By summing up either the measured or design flow rates within a given building or sector of a building, and dividing by the area, a supply airflow rate per unit area (cfm/ft^2) was estimated (Appendix B). The resulting values could then be compared to a typical design value of one cfm/ft^2.

To obtain an estimated per capita supply airflow rate (cfm per person), the computerized EPA directory for the period of the survey (February-March 1989) was employed to determine the number of persons in each office served by a particular AHU. This <u>supply</u> airflow rate is not to be confused with the <u>outdoor</u> airflow rate referred to in ASHRAE Standard 62-89.

The AHUs in the East and West Towers of Waterside, and in the Crystal and Fairchild buildings, serve portions of all floors in each building. Thus, the per capita supply airflow rate of these AHUs could be estimated by floor (Table 6). The frequency distribution of estimated per capita supply airflow rates for the EPA employees is shown in Figure 1.

The above information was used to determine locations with relatively high or low per capita supply airflow rates. It was also used to determine if any AHUs were associated with health symptoms or comfort concerns, and if such associations were a function of the supply airflow rate. (For example, if

some air handling systems were actually sources of dust, mold, or other allergens, symptoms might increase with supply airflow rate.)

3.3.2 Spatial Variables

A question of interest is not only whether some entire buildings have health or comfort problems that are significantly different from other buildings, but also whether areas within buildings might also show significant differences. Volumes I-III employed an a priori categorization into eight "sectors" based on architecture and time of construction. These "sectors" consisted of the Crystal Mall building, the Fairchild Building, the East and West Towers of Waterside Mall, and four portions of the central mall: the second floor and third floor, and the Northeast Mall and Southeast Mall. (At times, the small Southwest Mall was considered to be a separate sector; at other times, this was considered part of the second floor of the Mall.) In this analysis, we added a ninth "sector": the garage and lower garage areas of Waterside Mall. These nine sectors, most having several hundred employees, formed the "coarse-grained" location variables that were tested for differences in employee health, comfort, and odor concerns.

However, we also wished to test for the possibility that smaller spatial units might display significantly different symptom prevalence rates. Since the AHUs tile the work areas in the central mall, and since most of them serve 20 or more respondents of each sex, they were selected as the "fine-grained" spatial variables. (One exception is the eight small AHUs [A-H] on the second floor of the mall; these were combined into two groups.) However, in the Crystal and Fairchild buildings, and in the West and East Towers, the AHUs serve vertical slices of each building. Employing the AHUs as a spatial unit in these areas could make it impossible to detect problems occurring on a single floor. Therefore the AHUs in these four areas were subdivided by floor. Because the number of respondents in the West and East Towers was too small to allow individual floors to be included, adjoining floors were grouped into two- or three-floor units (four-floor units for the "peripheral" AHUs).

The result was a set of 66 variables that served both as a measure of spatial variation and an indicator of the AHU associated with each space. These variables could then be used to test the hypothesis that AHUs or other

spatially varying factors could be associated with variation in health, comfort, or odor responses.

3.3.3 New Carpet

In late 1987 and early 1988, about 27,000 yards of carpet (covering roughly a third of the available floor space) were laid in two of the three EPA buildings; only Crystal Mall received no new carpet. Health symptoms were reported by about 100 employees shortly after installation. One hypothesis was that offgassing from the carpet, the adhesive, or other operations associated with the installation process could be involved. Although the questionnaire was administered about a year after the installation, it was thought desirable to test whether persons in the newly carpeted areas showed any higher symptom prevalence or comfort concerns than other respondents.

Two types of carpet were employed, one for offices and one for corridors. About 17,000 yards were glued down, and the remaining 10,000 were tacked down. Reasoning that carpet in one's office would be more likely to affect one than carpet in a nearby corridor, and that carpet adhesive could have something to do with the outbreak, we created a total of five variables: no new carpet; glued down carpet in corridors on the same floor as the respondent; glued down carpet in the respondent's office; tacked down carpet in same-floor corridors; and tacked down carpet in the office. The total number of persons located in offices or on floors with the new carpet was 2034, (about half of all respondents). This is somewhat more than the fraction of area taken up by the new carpet (about a third) but because of including all persons on floors where the carpet was installed only in corridors, a somewhat larger fraction would be expected.

4. METHODS OF ANALYSIS

The basic hypothesis of this study is that health, comfort, and odors may depend on parameters associated with the person, the building, or the individual workstation. Thus a multivariate method of analysis was employed to test all these possibilities simultaneously.

4.1 Principal Components Analysis

The first step of the multivariate analysis was to examine the relationships among the many health, comfort, odor, and psychosocial questions to reduce them, if possible, to a smaller number of factors that would account for most of the observed variance. Principal components analyses (PCA) were performed separately on these four groups of questions.

4.2 Linear Regressions

The health, comfort, and odor factors identified by PCA became the dependent variables in all three sets of linear regressions. Independent variables were selected from the personal and workplace characteristics, location, airflow, and new carpet variables. Once the independent variables had been selected for each set of linear regressions, regression diagnostics were performed using the SAS routine COLLIN (SAS users' manual, 1989) to test for collinearity and matrix singularities.

A core set of independent variables in all linear regressions was the 54 personal and workplace characteristics (except for some minor changes based on results from the COLLIN analyses of each set of regressions). Other independent variables on location, airflow, and new carpet areas were used in one or two of the three sets of regressions according to the hypothesis being tested.

Since our results and those of previous studies have shown considerable differences among men and women in symptom prevalence, and since many variables (e.g., pay grade, type of work, workstation environment) are related to gender, separate regressions were run for each sex. This has the effect of accounting for gender-related interactions without specifically including interaction variables.

Although perceptions of comfort and odor may be considered as dependent variables, affected by personal or workplace characteristics, they may also act as independent variables, having an effect on health. (It is also possible that the relationship is reversed--that the state of one's health affects one's perception of comfort.) Therefore, in order to test this potential association of comfort and odor with health, an additional set of regressions was run on the health factors only, again separately by sex, with the comfort and odor variables augmenting the other independent variables.

4.2.1 First Set of Linear Regressions

The initial set of linear least-squares multiple regressions was aimed at testing whether there were differences between buildings, or between building sectors. Each regression included eight building sector variables and 55 personal and workplace variables.

4.2.2 Second Set of Linear Regressions

The second set of linear regressions was designed primarily to test the hypotheses that AHUs or recently carpeted areas might be associated with increased prevalence of health, comfort, or odor complaints. Also, since the AHUs corresponded, for the most part, to distinct contiguous areas, these regressions were able to test whether individual locations (on a finer-grained scale than the building sectors used in the preliminary set of regressions) were associated with increased reports of health, comfort, or odor problems.

Thus the 66 AHU/floor variables replaced the eight building sector variables, and four variables representing the carpeted areas were added. All other variables remained in the regressions. Thus the second set of regressions, besides testing these new hypotheses, provided a test of the stability of the previous findings. If most of the previously identified variables continued to be significant, it would be evidence that the models are stable.

4.2.3 Third Set of Linear Regressions

To test whether the estimated supply airflow rates of the AHUs had any effect on health, comfort, or odors, a third set of linear regressions was carried out. These regressions replaced the 66 AHU/floor variables with a

single continuous variable reflecting the estimated per capita supply airflow rate in cubic feet per minute per person. (To test for nonlinear effects, the square of the flow rate was also included as a variable.)

4.3 Logistic Regressions

A set of logistic regressions was carried out to estimate the magnitude of the effects on health and comfort of personal and workplace characteristics. For these logistic regressions, all of the health, comfort, and odor factors were reduced to binary variables. That is, people were classed into two groups: those who reported the factor sufficiently often (according to some criterion) and those who did not. Then the relative risk of falling into the "positive" group can be calculated for each personal or workplace characteristic.

Since different criteria could be used to classify a symptom as positive, a second set of logistic regressions was carried out to test the effect of different classification criteria on the results.

Thus a total of five sets of regressions were carried out: three sets of linear multiple regressions and two sets of logistic regressions. The relationships between these regressions are shown in Figure 2.

5. RESULTS

5.1 Principal Components Analysis

The first PCA analysis identified nine principal factors among the 31 health symptoms experienced over the past year (Table 7). Twenty-nine of the 31 symptoms could be assigned to one of these factors on the basis of a loading greater than 0.5. The two remaining symptoms (dizziness and dry skin) had low loadings on all nine factors. One symptom--problems with contact lenses--applied only to a subset of respondents and therefore could not be included in the PCA. Thus a total of 12 health factors were identified from the original 32 health questions. The analysis was repeated for the "last week" questions on health with essentially the same results.

In a similar manner, a total of four comfort factors were isolated from the original 10 questions on comfort (Table 8), and six odor factors were isolated from the original 15 questions on odors (Table 9).

The fourth PCA was performed on a set of 22 psychosocial questions (Part IV of the questionnaire). These questions had been drawn from a larger set of previously validated questions on job satisfaction, workload, conflicting job demands, etc. (Hurrell et al., 1990). Another set of questions was added on such external factors as child care responsibilities, caring for an elderly or disabled person, volunteer activities, etc., to provide a measure of external stress. These questions arose from previous investigations by NIOSH but have not been formally validated. The PCA analysis confirmed that the questions in each of the seven psychosocial factors were closely related and represented relatively independent (uncorrelated) factors (Table 10).

The methods and results of the principal components analyses are described more fully in Appendix C.

An index was created for each of the 12 health, four comfort, and six odor factors by summing the responses for each of the questions comprising the factor. Responses of "never" or "rarely" were assigned a value of 0, "sometimes" 1, "often" 2, and "always" 3. Thus each index extended from 0 to values of 3, 6, 9, 12, or 15 depending on how many questions were combined to form the factor. The number of males and females associated with each level of the health, comfort, and odor indices is displayed in Appendix D.

Females reported higher symptom frequencies on all 12 health factors. Females also reported more discomfort on all four comfort conditions, finding the air to be hotter, colder, drier, and more humid than men.

On the other hand, for four of the six odor factors, the complaint rates were similar for men and women. Men were almost as likely as women to report odors from copying machines, carpets, musty or damp smells, and tobacco smoke. Women were more likely to report odors of new paint or other chemicals, and cosmetics.

5.2 Linear Regressions

These 22 health, comfort, and odor indices were used as the dependent variables for all three sets of linear regressions. An additional 12 regressions in each set were run on the health indices using the comfort and odor indices as independent variables, as described above. Since all regressions were run separately by gender, a total of (22 + 12) X 2 = 68 regressions were run in each of the three sets of linear regressions.

In the first set of linear regressions, a number of personal and workplace characteristics were significantly associated with health, comfort, or odor concerns. Most of these associations continued to be significant in the second and third set of linear regressions, and also in the logistic regressions. Therefore we have chosen to present the results from only one of the three sets of linear regressions (the set employing the AHU/floor and new carpet variables) together with the results from the first set of logistic regressions.

5.3 Logistic Regressions

The 22 health, comfort, and odor factors were again employed as dependent variables in the logistic regressions. Since these factors were represented as multilevel indices in the linear regressions, they had to be transformed to binary variables for the logistic regressions. Thus a choice was necessary regarding what level of each index to consider the dividing line between those who exhibited the symptom sufficiently often and those who did not. For certain of the rarer symptoms, too stringent a definition would lead to too small a number of persons with the symptom to allow effective statistical analysis. Therefore, it was decided to "cut" each index at the

point that would allow at least 4-5% of the male or female population to be classified as exhibiting the given set of symptoms. Since men reported lower symptom prevalence than women, the possibility of separate "cutpoints" for men and women was considered; however, it was decided to keep the same cutpoints for both men and women. The number of men and women assigned to each level of the 22 binary dependent variables is shown in Table 11.

Since the cuts are made on an index that includes four possible levels for each answer, it is not possible to unambiguously interpret a given index level as representing, say, a "sometimes" or "often" response. For example, on a four-question index, a score of "4" could be made by answering "always" to one question, "sometimes" to another, and "rarely or never" to the remaining two. However, the same score could be achieved by answering "sometimes" to all four questions, or "often" to just two questions. Since previous studies have used a different system to judge the intensity of the response, (i.e., requiring at least an "often" or "always" response to at least one symptom among the multiple-symptom complex), we reran a set of logistic regressions for the "eye irritation" factor using this selection criterion.

The complete results of the logistic regressions, including the odds ratios and their 99% confidence limits, are provided in Appendices E and F. (The 68 tables of Appendix E refer to the 68 logistic regressions using the "index cutpoint" criterion described above; the four tables in Appendix F correspond to the four regressions on the eye irritation factor using the "often or always" criterion.)

In general, the magnitudes of the odds ratios for variables significantly associated with health outcomes were less than 2. That is, few variables were strong enough to cause a doubling of the risk of any health outcome. Exceptions included doctor-diagnosed asthma, associated with a 3- to 4-fold increase in the risk of having chest-related problems; eczema, which increased dry skin reports by factors of 2.5-5; and wearing contact lenses, which increased the risk of reporting eye irritation by factors of 2.2-2.3.

5.4 Comparison of Linear and Logistic Results

The second set of linear regressions included 44 regressions with 126 variables, and 24 regressions with 136 variables. Thus 8,808 separate tests of significance were performed. The logistic regressions added more than 1,000 additional tests. Whenever so many tests are performed, some associations will appear by chance to be significant ("false positives"). To reduce the number of "false positives," we considered variables significant only if the likelihood of an association appearing by chance was less than 1% ($p < 0.01$). (The use of the more common value of $p < 0.05$ could lead to an unacceptably large number of "false positive" findings. For example, if no true associations existed, and all variables in the second set of regressions were unrelated, the expected number of "false positive" findings at the 0.05 level would be 440.) Even at the 0.01 level, as many as 88 false positives would be expected.

The results of the second set of linear regressions and the set of logistic regressions are compared in Tables 12-33. All variables that appeared at least once at the $p < 0.01$ level of significance are listed in these tables. Those with the largest number of significant associations are briefly discussed below.

5.4.1 Health Factors

5.4.1.1 Headache and Nausea

Sensitivity to chemical fumes appeared at a significant level in all eight possible regressions (Table 12). Workload was significant in six of eight regressions, but not for females in the logistic regressions. Glare was always significant for females but rarely for males. Dust and noise were often significant in the models without comfort and odor, but did not retain their significance in the models including these variables as explanatory variables. Allergies to molds were significant for men only. Among the comfort variables, hot stuffy air appeared at the $p < 0.001$ level in all four possible regressions. The odor of paint and carpet cleaning was also significant in three of four regressions.

5.4.1.2 Stuffy Nose, Runny Nose, Sneezing, Cough

Dust and allergies to dust were often significant, with mold allergies appearing slightly less often (Table 13). Allergies to pollen were significant for females only. Hot stuffy air was also significant. Women younger than 30 reported significantly fewer nasal symptoms than those older than 30.

5.4.1.3 Wheezing, Shortness of Breath, Chest Tightness

Pre-existing asthma had by far the most predictive power for these symptoms (Table 14). Dust was significant in several regressions, but became less so in the regressions including the comfort and odor variables. Females who were sole providers, reported conflicting job demands, and had no college degree were also likely to have a higher prevalence of chest symptoms. Among comfort and odor variables, only hot stuffy air was significant for both sexes, although the odor of fresh paint and carpet cleaning was highly significant for females.

5.4.1.4 Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision

A heavy workload and wearing contact lenses to work were significant in all regressions (Table 15). Sensitivity to chemical fumes, glare, and mold allergies were also significant in most regressions, although the latter two were not significant for males in the logistic regressions. Among the comfort complaints, hot stuffy air and dry air were often associated with these eye irritation symptoms. Odors from photocopying processes were also significantly associated with eye symptoms.

5.4.1.5 Sore Throat, Hoarseness, Dry Throat

Sensitivity to chemical fumes, the presence of tacked down new carpet in offices, dusty offices, and mold allergies were significantly associated with throat symptoms in many of the regressions that excluded the comfort variables (Table 16); however, all these variables lost explanatory power when the comfort variables were added to the regressions. Dry air was very strongly associated ($p < 0.001$) with throat symptoms. The smell of fresh paint was also related to these complaints.

5.4.1.6 Sleepiness, Unusual Fatigue

Dissatisfaction with the job and sensitivity to chemical fumes were sometimes associated with fatigue and sleepiness (Table 17). Hot stuffy air was strongly associated with these symptoms.

5.4.1.7 Chills and Fever

Women without college degrees were more likely to report these flu-like symptoms (Table 18). Persons with these complaints were more likely to use portable heaters. Cold air was significant in all regressions. The odor of paint was significant in three of four regressions.

5.4.1.8 Aching Muscles or Joints, Pain in Back, Shoulder, Neck, Wrists

Glare entered at the 0.001 level in all eight regressions (Table 19). Mold allergies also appeared often. An uncomfortable workstation was significant in many cases. Females under 30 and those in the highest pay bracket were significantly less likely to report these symptoms. The odor of cosmetics/body odor was associated with increased frequency of symptoms.

5.4.1.9 Difficulty Concentrating, Remembering; Depression, Tension

A heavy workload and dissatisfaction with the job were the main variables associated with these psychological and neurological symptoms (Table 20). Other important psychosocial variables included measures of conflicting job demands and role ambiguity. Sensitivity to chemical fumes was often significantly related to these symptoms. Hot stuffy air was also often significant. Females reporting odors of paint/carpet cleaning and cosmetics/body odor had higher frequencies of symptoms.

5.4.1.10 Dizziness, Light-Headedness

Sensitivity to chemical fumes was the variable most commonly associated with this symptom (Table 21). Among females, a dusty office and a heavy workload were significant. Males working in areas with new carpet laid in the last year (both self-reported and as appearing in the building records) showed significantly increased prevalence rates in the linear regressions but not in the logistic regressions. Hot stuffy air was a significant variable in the

logistic regressions but not in the linear regressions. The odor of paint and carpet cleaning was a significant factor for both men and women.

5.4.1.11 Dry, Itchy Skin

Pre-existing eczema was the most significant variable in all eight regressions (Table 22). Dust was often significant, as was dry air. Females using portable heaters reported dry skin more often.

5.4.1.12 Problems with Contact Lenses

Few variables were consistently associated with contact lens problems (Table 23). This is partly due to omitting some variables by error in the second set of logistic regressions. Dissatisfaction with the job sometimes appeared significant. Among males, a long time at the workstation was sometimes associated with increased problems. Among females, dust and dust allergies were sometimes significant.

5.4.2 Comfort Factors

5.4.2.1 Hot Stuffy Air

Dust and use of a fan were strongly associated with complaints of hot stuffy air (Table 24). Many other variables were associated with this complaint, including lighting problems and a heavy workload. Lack of a window was significant for males only.

5.4.2.2 Dry Air

Dust, noise, and an uncomfortable workstation were significantly associated with reports of dry air (Table 25). AHU 16, on the second floor of the mall, was also associated with dry air.

5.4.2.3 Cold Drafty Air

Noise and the use of a portable heater were reported more often in areas with cold drafty air; use of a fan was significantly less likely in such areas (Table 26). Respondents at the Crystal Mall and Fairchild buildings reported cold drafty air consistently less often, whereas several areas in the Waterside Mall building (e.g., the AHU 14 area on the second floor) reported cold air significantly more often.

5.4.2.4 Humid Air

Dust, the use of a fan, and the lowest pay grade (<GS9) were significantly associated with complaints of humid air (Table 27). AHU 21 in the Library area of the mall was also associated with significantly higher rates of complaint.

5.4.3 Odor Factors

5.4.3.1 Odor of Paint and Carpet Cleaning

Recently painted walls, use of chemicals at the workstation, dust, and sensitivity to chemical fumes were significant variables in all regressions (Table 28). Southwest Mall employees reported these odors more often.

5.4.3.2 Odor of Cosmetics, Body Odor, Food

The conflicting job demands index and dusty offices were significant in most regressions (Table 29). Persons at the highest pay grade (>GS-12) were less likely to report these odors.

5.4.3.3 Odor from Photocopies, Printing Processes

The presence of a photocopier was the strongest variable associated with the odor of photocopies (Table 30). Dust and conflicting job demands were also significant. Sensitivity to chemical fumes was significant for women, less so for men.

5.4.3.4 Odor from New Carpet or Drapes

The presence of new carpet in the office was significantly related to reports of new carpet odor (Table 31). Dust was also significant in most regressions.

5.4.3.5 Musty/Damp Odor, Engine Exhaust

Dust was significant in all regressions (Table 32), as was location in the Southwest Mall (AHUs 15 and SW-2). The presence of nearby water leaks was significant in three of four regressions. The conflicting job demands index was also significant. For females, mold allergies were significantly related to reports of musty/damp odors.

5.4.3.6 Tobacco Smoke

Sensitivity to chemical fumes and location on the lower floors of the West Tower, the Northeast Mall, the eleventh floor of Crystal Mall, and the garage locations of Waterside Mall were significantly related to tobacco smoke odors (Table 33). These odors were also associated with dusty offices.

6. DISCUSSION

6.1 Limitations of This Study

As with all attempts to complete a census, nonresponse may cause a bias. Although the response rate was high, and was quite comparable to previous large-scale building studies, 19% of EPA employees did not complete the questionnaire. It may be argued that these people had fewer health problems and therefore felt no need to complete the questionnaire. On the other hand, nonresponse was highest (38%) among low-paid wage-grade employees (EPA, 1989). If these employees have somewhat higher frequencies of health problems, as indicated in nationwide statistics, the resulting bias would be in the opposite direction.

Employees were asked to characterize the frequency of their health symptoms over the past year by using somewhat vague terms such as "rarely" or "sometimes." Relying on memory over a full year is risky, and the vagueness of the descriptive terms invites misclassification. The most likely result of these basic limitations is to make it more difficult to detect associations between health effects and the workplace.

An attempt was also made to identify work-related symptoms, by asking if the symptom "gets better when not at work." As previously discussed, some work-related symptoms such as muscle pain may get worse on leaving work, whereas some non-work-related symptoms, such as a morning headache, may get better on leaving work; therefore this question was not used in the analysis. To the extent that this decision jumbled together work-related and non-work-related symptoms, it also makes it more difficult to detect associations with the workplace.

All employee responses were subjective. None of the health symptoms or descriptions of workplace characteristics were verified, with the exception of the locations of the new carpet and AHUs. This means that all associations, even those that are highly significant, must be considered tentative; they are relations between <u>perceptions</u> of health and <u>perceptions</u> of the workplace. However, the large number of responses required to create a significant association means that the perceptions are at least widely shared, and may therefore have a core of truth. Also, the consistency of relationships across

different regressions, and the verification of expected relationships (e.g. asthma was associated with wheezing; new carpet odors were reported most often in areas with new carpet) provide additional support for the reliability of the questionnaire responses.

However, consistency of response does not guarantee freedom from bias. It is likely that persons suffering symptoms will search their environment for a cause, and may therefore be more likely to observe and report workplace problems. This "wish bias" (Wynder et al., 1990) could result in an apparent but false relationship between symptoms and one or more workplace characteristics. Since we did not verify reported workplace characteristics such as dust and glare, we cannot rule out this possibility. On the other hand, these findings may be testable: areas reported as dusty could be investigated and compared to other areas, assuming no changes since the questionnaire was administered. Also, some results, such as the importance of workplace dust, have been established in previous studies (Skov et al., 1990) on the basis of objective measurements.

A related methodological limitation is the difficulty of distinguishing physical/chemical/biological causes from psychological/social ones, when the investigator is forced to depend on self-reported symptoms and unverified perceptions of workplace conditions. For example, more symptoms may be reported under conditions of intense stress and publicity, such as surrounded the carpet installation at Waterside Mall. This phenomenon has been referred to by some as Mass Psychogenic Illness, or MPI (Hall and Johnson, 1989). We attempted to deal with this phenomenon in several ways. First, we included a set of psychosocial indicators to identify job stresses such as heavy workloads and conflicting duties. These indicators were allowed to compete with other personal and workplace characteristics in determining the potential causes of health symptoms. Secondly, we included several buildings that were not affected by the carpet incident (Fairchild received no new carpet, and the Library of Congress Madison building was also unaffected by this incident). Comparison of symptom frequencies at these buildings would allow the MPI hypothesis to be tested. Thirdly, since the concept of chemical sensitivity is thought by some to have a strong psychological component, we asked people in all four buildings if they believed they were especially sensitive to carpet fumes and other chemical mixtures. If the carpet installation process

had caused either a chemical or a purely psychological sensitivity, the frequency of persons reporting sensitivity should have been elevated in Waterside Mall and perhaps Crystal Mall compared to the Fairchild and Library of Congress buildings.

6.2 Relationships among the Health Symptoms

The PCA for the 32 health symptoms showed that they clustered into a smaller number of factors that could generally be associated with a particular bodily system such as eyes, nose, throat, central nervous system, muscular system, etc. That is, individual symptoms that might appear to be quite different (runny nose vs. sinus congestion; back pain vs. neck pain) tended to vary in a similar manner if they referred to the same bodily system. If this observation is correct, it implies that future questionnaires could be simplified by asking just one question on each of these health factors, instead of three or four. However, it should be noted that the questions were ordered on the questionnaire by body systems (all eye symptoms followed by all throat symptoms, etc.). This leaves open the possibility that respondents answered what they perceived to be similar questions in a consistent way, possibly creating a bias. A kind of inertia may set in as one goes down the page, such that answering "sometimes" to a question on sore throat makes it more likely that the same answer will be provided to the following questions on hoarseness and dry throat. For example, this may be the reason that headache and nausea, two symptoms not necessarily strongly related, formed a factor on the PCA--they were listed in first and second position.

To our knowledge, this is the first time that PCA has been employed in large-scale studies of Sick Building Syndrome. The results obtained here indicate that previous subjective groupings of symptoms such as "mucous membrane" or "indoor air quality" symptoms may include some symptoms from different groups, which may have different causes. For example, "mucous membrane" symptoms might include eye, nose, and throat symptoms; yet these systems were quite separate in the PCA. Grouping such symptoms could make it more difficult to identify potential causes affecting only one or two of the symptoms in the group.

6.3 Agreement among the Regression Analyses

All three sets of linear regressions displayed excellent agreement regarding the variables that were significant for both men and women. Of 57 associations that achieved the $p < 0.01$ level of significance for both men and women in the first set of linear regressions, 49 (>80%) achieved the same level in the second set of linear regressions. This is evidence that the replacement of the eight building sectors by 66 AHU-based spatial variables and five carpet variables did not adversely affect the stability of the relationships between the most powerful explanatory variables and the health, comfort, and odor factors. When all 66 AHU-based location variables were replaced by a single continuous variable--estimated supply airflow of the AHUs--once again most of the significant variables in the first two regressions continued to be significant.

The logistic regressions confirmed the general level of stability displayed by the three preliminary linear regressions. Again most of the associations (>60%) occurring at the $p < 0.01$ level for both men and women in the linear regressions remained so in the logistic regressions.

As measures of goodness of fit, the linear regressions typically accounted for about 15-25% of the total variation ($R^2 = 0.15$-0.25). The logistic regressions generally resulted in a 70-80% chance of ordering any pair of respondents correctly with respect to their probability of experiencing symptoms (concordance ratio = 0.7-0.8). Both of these goodness-of-fit measures indicate moderate success in predicting which groups of respondents are more likely to suffer health symptoms, given their personal and workplace characteristics.

6.4 Variables Associated with Multiple Health Factors

The results of the second set of linear regressions and the logistic regressions on the 12 health factors (Tables 12-23) are summarized in Table 34. A total of 96 regressions were performed, 48 for each sex. Thus any personal, workplace, or location variable could appear a maximum of 96 times. (Since the comfort and odor variables were included in half of the regressions, they can appear only 48 times.) The total number of times a

variable appears at the $p < 0.01$ level of significance is provided for each sex separately in the last two columns. Sensitivity to chemical fumes was significantly related to health factors more often than any other variable: in 24 of 48 regressions for women, and 22 of 48 for men. A dusty office was the second most frequently significant variable, with 24 of 48 regressions for women and 16 of 48 for men. Among the comfort and odor variables, hot stuffy air was significant in nearly half of all possible regressions: 10 of 24 for women and 13 of 24 for men. The odor of paint and chemicals was significant in 17 of 24 regressions for women but only 4 of 24 for men.

However, even at the $p < 0.01$ level, we might expect as many as 100 false positive findings, since we performed more than 10,000 tests of significance in the 96 regressions. To reduce the chances for a false positive, in the following discussion we shall require that a variable reach the 0.01 level of significance for at least <u>two</u> of the eight possible regressions run on any given health factor. It can be shown that this is equivalent to accepting about three false positives out of every hundred associations that meet the criterion. We can then rank the variables by how many different health factors they are associated with.

Using this criterion, three classes of variables may be differentiated: those that are significantly associated (in at least two of eight regressions) with multiple (more than three) health factors, those associated with just two or three health factors, and those associated with only one health factor. These rankings are summarized in Tables 35 and 36.

Although up to 136 individual variables were considered in these analyses, only about 11 turned out to be consistently associated with increased prevalence of at least four of the 12 health factors (Table 35). The 11 variables include two workplace characteristics (dust and glare); three personal characteristics (sensitivity to chemical fumes, mold allergies, lack of college education); two psychosocial factors (workload and conflicting job demands); two comfort factors (hot stuffy air and dry air); and two odor factors (the odor of fresh paint, carpet cleaning, and other chemicals; and the odor of cosmetics, body odor, and foods).

6.4.1 Workplace Characteristics.

6.4.1.1 Dust.

The workplace variable that appeared most often in relation to significantly increased frequency of health symptoms was a dusty workspace. Dust was significantly associated (at the $p < 0.01$ level for two or more regressions) with 11 of the 12 health symptom complexes, missing only the muscle and back pain syndrome (Table 35).

Since airborne particles were uniformly low throughout all buildings (EPA, 1990a), it may appear contradictory that reports of dusty offices are so strongly associated with health, comfort, and odor concerns. However, the airborne particles measured were small particles of the type that can pass through the nasal barriers and can exacerbate chronic respiratory problems such as bronchitis and emphysema; visible dust on surfaces includes larger particles and fibers that have been associated with acute upper respiratory (eye, nose, throat) symptoms of the type reported. No measurements were made of the amounts of carpet dust or settled dust on surfaces in the buildings.

Previous studies have also indicated the importance of dust in health complaints. The Danish Town Hall Study (Skov and Valbjorn, 1987; Skov et al., 1989) measured shelf space and fabric-covered surfaces, both measures of available area for dust to collect, and found them to be the two variables most highly correlated with health symptoms. These investigators also measured settled dust in offices and found that it was significantly related to health complaints (Skov et al., 1990). Dust may contain pollen, mite feces, or other allergens, leading to such health symptoms as headache, stuffy or runny nose, irritated eyes, and dry throat (Gravesen et al., 1990). In the EPA study, all four of these symptoms showed a significant association with reported dustiness of EPA workstations.

In this study, several questions were designed to test the possibility that increased dust could lead to increased health problems. One question concerned the number of desks, bookcases, and file cabinets in the workstation; this was an attempt to estimate the "shelf factor," or the amount of dust-gathering area in the workstation. Other questions concerned the "fleece factor": the presence of carpet, drapes, and fabric-covered partitions as possible dust-catchers. One question was simply the direct question of how often the workplace seemed too dusty. The first question (on

the "shelf factor") never appeared at the $p < 0.01$ level of significance. The second group of questions (on the "fleece factor") also failed to be significant for any health symptom. (One of these questions, on carpet, was not employed in the regression because of too little variability: 96% of respondents reported carpeting at their workstations.) Thus it appears that in this study the direct question on how often the workstation is dusty is superior to the indirect questions on the amount of shelf space or fabric-covered area. Also, the measurements of the fabric-covered and shelf areas in the Danish study are likely to be more accurate than the subjective estimates of employees.

6.4.1.2 Glare.

Glare was significantly associated with headache, eye irritation, fatigue, muscle pain, and difficulty concentrating (Table 35). By far the strongest effect was on bodily aches and pains, including head, shoulder, and neck pain. This may be due to maintaining a cramped or uncomfortable position in order to avoid glare. This explanation would also account for the increased reports of fatigue among workers bothered by glare.

The association of glare with headache, eye irritation and difficulty concentrating seems logical. Since headache was the single most important cause of lost work time (EPA, 1989), the relationship of glare to headache may be an important economic factor; reducing glare could improve productivity by reducing lost work time.

6.4.2 Personal Characteristics

6.4.2.1 Sensitivity to Chemical Fumes

Although sensitivity to chemicals is a little-understood and controversial area, it was felt to be an interesting area of inquiry. Therefore a question was included that asked "Do you consider yourself especially sensitive to [tobacco smoke, fumes from copying machines, printing processes, chemicals such as adhesives and cleansers, pesticides, new carpeting, drapes, paint, and carpet cleaning]?" Little information exists on the percentage of persons who consider themselves sensitive to chemicals; this question would provide such data for the study population. Also, little is known about the "epidemic" effect of publicity in possibly raising the

prevalence of complaints among nearby workers. Since the Waterside Mall building had experienced a recent highly publicized incident of worker illnesses following carpet installation, the hypothesis was made that the prevalence of sensitivity to chemical vapors at WSM might be higher than at, say, the Fairchild building, where no carpet had been laid. This would be the case whether there was a true chemical/biological effect or a purely psychological effect. In fact, little difference was shown among the three buildings in the prevalence of persons reporting unusual sensitivity to chemical fumes: 32% at both Waterside and Crystal, 29% at Fairchild. As a further test of this hypothesis, the same question was asked of the 2000-odd workers at the Library of Congress Madison building; 33% reported chemical sensitivity. Thus, the absolute prevalence appears to be rather high (nearly a third of all respondents), and the number of persons considering themselves unusually sensitive to chemicals appears to have been unaffected by either the carpet installation itself or the ensuing publicity related to fellow workers' complaints. (It is recognized that this analysis did not include the most seriously affected workers--those working in the alternative workspaces. Also, the question as asked could not distinguish the relative severity of responses or the number of chemical mixtures associated with increased sensitivity.)

The question on sensitivity to chemical fumes was the most commonly appearing indicator of increased prevalence of health complaints. Nine of the 12 health factors were significantly associated with sensitivity to chemical fumes in at least two of eight regressions: headache; eye, nose, throat, and chest symptoms; fatigue; muscle pain; dizziness; and difficulty concentrating and other central nervous system complaints (Table 35). All of these symptoms have been linked to Sick Building Syndrome (Molhave 1987), which some investigators have hypothesized may be closely related to chemical sensitivity (Ashford and Miller, 1990).

6.4.2.2 Mold allergies

Four types of allergies were recorded (mold, dust, animals, pollen), but only the mold allergies were repeatedly associated with health symptoms. Mold allergies were significantly associated (in at least two of eight regressions) with eye, nose, and throat symptoms; muscle pain; headache; fatigue; and dry

skin (Table 35). The number of significant associations involving mold allergies could be an important clue with respect to health symptoms and building conditions. Several recent studies have reported increased health problems in homes, hospitals, and other buildings with mold or moisture problems (Morey and Williams, 1990; Kalliokoski et al., 1990). If dusty working conditions provide a growth habitat for mold, the appearance of both these variables as important explanatory factors might be expected. The very low measured relative humidities may argue against this interpretation; however, these measurements were made during the winter, when low indoor humidities are expected. High humidities may be encountered during other seasons. Also, a number of cases of water leaks, toilet overflow, water-stained carpet and damp ceilings were reported in the essay section of the questionnaire; therefore the conditions for mold growth may exist in some areas.

6.4.2.3 Education

Persons--particularly women--with higher education reported fewer health problems. Both men and women with college educations reported fewer chest problems and flu-like (chills and fever) symptoms. Women with college degrees reported fewer headaches, less fatigue, and less dizziness. This finding is in general agreement with observed lifestyles of less educated and lower-paid people (more smoking, lower nutrition, lower quality medical care) that may lead to their higher prevalence of health problems (NCHS, 1989).

6.4.3 Psychosocial factors

6.4.3.1 Workload

Persons reporting a heavy workload were more likely to report headache, eye irritation, and the group of symptoms comprised of difficulty remembering, difficulty concentrating, depression, and tension. These are the symptoms that one would expect to be related to working hard or in a concentrated fashion under tight time schedules.

6.4.3.2 Conflicting Job Demands

Persons reporting conflicting demands were more likely to suffer from nasal symptoms, chills and fever, and the psychological/neurological symptoms

including tension, depression, difficulty concentrating, and difficulty remembering.

6.4.4 Comfort Conditions

6.4.4.1 Hot Stuffy Air

Perceptions of hot or stuffy air were associated with more health factors than any other comfort or odor concern. Many people complained of this condition, particularly in the essay section of the questionnaire; it was associated with increased incidence of headache, stuffy nose, eye irritation, chest tightness, fatigue, difficulty concentrating, and dizziness (Table 35). Although the room temperature and airflow measurements during the one-week monitoring period in winter showed generally moderate temperatures and adequate airflow, the log of building complaints shows that measured temperatures have been high in some locations, and complaints of reduced airflow have occurred in some areas.

Some locations in Waterside Mall had fewer complaints of hot stuffy air; these included the Northeast Mall and the East and West Towers. These locations had the highest estimated supply airflow rates per unit area.

6.4.4.2 Dry air

Perceptions of dry air were associated with increased reports of stuffy nose, eye irritation, sore throat, and dry skin. Measured humidity levels were indeed very low (about 25% relative humidity), and no AHUs were found in Waterside Mall with operating humidifiers. However, the measurements were made in the winter and it is not known whether humidity levels remain low all year round.

6.4.4.3 Gender Differences in Perception of Comfort

As mentioned above, women reported more comfort problems than men, finding the air to be hotter, colder, drier, <u>and</u> more humid. Since women may wear lighter clothes than men, they might perceive the same air temperatures as colder; but since they do more work with copy machines, printers, and other local heat sources, they could also be exposed to higher localized temperatures during part of the day. The influence of psychological pressures associated with lower pay and worse working conditions could also influence

perceptions of comfort. It may also be that a cultural factor inhibits men from expressing discomfort.

6.4.5 Odor

6.4.5.1 Odor of Fresh Paint, Carpet Cleaning, and Other Chemicals

This odor factor was significantly associated with a number of health symptoms: headache, stuffy nose, chest tightness, sore throat, fatigue, chills and fever, difficulty remembering or concentrating, and dizziness (Table 35). Most of these odors are associated with maintenance activities or with renovation (painting, installing new carpet, etc.).

6.4.5.2 Odor of Cosmetics, Body Odor, and Non-Fish Food Odors

This odor factor was associated with eye irritation, chills and fever, muscle pain, and the factor including symptoms of depression, tension, difficulty concentrating, and difficulty remembering. These associations, based on all EPA respondents, include some of the same symptoms mentioned in the medical literature and in the essay question by persons reporting strong reactions to perfumes, colognes, and other cosmetics.

6.5 Variables Associated with Two or Three Health Factors

In addition to the 11 variables affecting multiple health symptoms described above, another dozen or so variables were associated with just two or three health symptoms (Table 36). These include several personal/medical characteristics (allergies to dust, under 30 years old, and wearing glasses); two psychosocial factors (job satisfaction, sole provider for a family); seven additional workplace variables (noise, use of a portable heater, window visible from office area, walls recently painted, water leaks near workspace, hours at work, and new carpet); one location variable (AHU 21 in the Library area of Waterside Mall); and one comfort factor (cold drafty air).

6.5.1 Personal/Medical Characteristics

Dust allergies were strongly associated with stuffy nose and occasionally associated with problems with contact lenses (Table 36). Wearing glasses was occasionally associated with eye and nose irritation. Women under

30 were less likely to report nasal symptoms and muscular aches and back pain. This was the only observed effect of age, which indicates that age was not a very important factor in most of the targeted health symptoms for this population of office workers.

6.5.2 Psychological/social factors.

Dissatisfaction with the job was very strongly associated with the group of symptoms comprised of difficulty concentrating, depression, and tension (Table 36). It was also associated with fatigue, mainly among women. Women who were sole providers for their families reported higher frequencies of chest and throat symptoms and chills and fever.

6.5.3 Workplace Variables

Noise was associated with headache, muscle pain, and difficulty concentrating (Table 36). Lack of a window was associated (among men only) with eye and throat irritation and fatigue. Use of a portable heater was associated with chills and fever and dry skin. Water leaks were associated with tiredness and the factor including difficulty concentrating, depression, and tension. Persons with recently-painted walls reported more chest symptoms and eye irritation. Long hours at work were associated with contact lens problems and flu-like symptoms. Tacked-down new carpet in hallways was associated with dizziness.

6.5.4 Location Variable

The only location variable associated with more than one health symptom was AHU 21 in the Library area of Waterside Mall. Men in this area reported higher frequency of flu-like symptoms (chills and fever, muscle/joint aches and upper-body pains).

6.5.5 Comfort Factor

Cold, drafty air was associated with nasal congestion, throat symptoms, and chills and fever.

6.6 Variables Associated with a Single Health Factor

An additional 14 variables were associated ($p < 0.01$ in at least two regressions) with a single health symptom (Table 36): pre-existing asthma (chest symptoms); eczema (dry skin); allergy to pollen (nasal symptoms); uncomfortable workstation, lights too dim, and living alone (aching muscles/upper body pain); wearing contact lenses, hours at computer, and odor of photocopying (eye irritation); odor of new carpets (headache); new carpet tacked down in office (throat symptoms); role ambiguity (central nervous system symptoms); and external stress (fatigue). One location variable (AHU 16 on the second floor of the mall) was associated with eye symptoms among men only.

6.7 Possible Gender-Related Variables

A few variables appeared significant primarily for one gender.

6.7.1 Females

The odor of paint and other chemicals was much more likely to be significantly associated with women's health symptoms than with men's (17 significant associations for women compared to four for men--Table 34). Several factors may contribute to this result. More women than men reported working with chemicals (24% vs. 11%). Also, more women had their workstations in open areas where chemicals are more likely to be used (40% vs. 14% for men), whereas more men were in private offices where the levels would be lower than near the sources (46% vs. 21% for women).

Women with college degrees reported fewer headaches, fatigue, dizziness, chills and fever, and chest symptoms than other women. Since only 6% of males lacked college degrees, the number may have been too small to allow detection of differences in symptom prevalence among men.

Young women (under 30) were less likely to report muscular aches and upper-body pains than older women. Since 24% of females but only 8% of males were under 30, again the numbers of males involved may have been too small to detect symptom prevalence differences. Males of any age reported fewer muscular aches and pains than females; the number of males reporting the five

pain-related symptoms as occurring "often" or "always" in the previous year was about half the number of females.

Women reporting that they were the sole providers for their family were more likely to report throat and chest problems as well as chills and fever. Many more men reported being sole providers (26% vs 12% of women); however, since this is a more customary situation in society, and since men in general earn more than women, there may be fewer stresses involved for males.

Women working in EPA's garage and lower-garage level offices were more likely to report chest symptoms and muscle pain than women in other locations. These areas include the print shop and the maintenance and supplies areas, which may involve more physical labor than in other areas. They may also have more chemicals in use or in storage, and more exposure to automobile exhaust.

Women reporting recent repainting of nearby walls were more likely than men to report chest and eye symptoms.

6.7.2 Males

Lack of a window was a contributing factor to higher rates of eye and throat symptoms and feelings of fatigue among men. Somewhat fewer women than men had access to a window (38% to 49%), but this difference is too small to explain why women were not affected by this variable.

Men working near the EPA Library (AHU 21 on the second floor of the mall) reported increased rates of flu-like symptoms (muscle aches/upper-body pains and chills and fever). This area was also associated with increased reports of damp or musty odors. Roof leaks were noted in this area, and biological sampling carried out by EPA management confirmed higher levels of biological contamination (J. Davidson, personal communication). This AHU has been replaced.

The odor of new carpets was associated with headache, chest and throat symptoms, fatigue, dizziness, and dry skin among men but not among women.

Water leaks near the workstation were associated (among men but not women) with feelings of fatigue and the central nervous system (CNS) symptoms of depression, tension, and difficulty concentrating/remembering. About the same number of men as women (13% vs. 12%) reported water leaks occurring in the previous year; thus the reason for an association with men but not with women is not due to sample size.

6.8 Variables Associated with Multiple Comfort and Odor Factors

A summary of the variables significantly associated with comfort and odor concerns (Tables 24-33) is provided in Table 37. The most frequently appearing variable was dust, appearing at the 0.01 level of significance in 15 of 20 regressions for females, and 20 of 20 for males.

Again requiring that a variable be significant in at least two of the possible regressions (to avoid false positives), we can group variables by whether they affect multiple comfort/odor factors or only one or two.

Dust was by far the factor most broadly associated with comfort and odor factors. By the criterion above, it was significantly associated with all 10 factors. In most of the cases involving odors, the reason for the association appears evident: tobacco smoke, photocopying and printing processes, and diesel fumes are themselves sources of dust particles, and fresh paint is often associated with dust-raising renovation. Dusty offices were also associated with conditions of hot stuffy air, dry air, and cold drafty air.

Other workplace characteristics often associated with comfort and odor concerns were noise, glare, nearby water leaks, and the use of a fan (Table 38). Noise was strongly associated with cold drafty air, which may sometimes be associated with renovation. Glare was associated with hot stuffy air. Water leaks were associated with musty or damp odors and with odors of cosmetics and tobacco smoke. (Since smoking is allowed only in some rest rooms, and since cosmetics are often applied in rest rooms, the association of these odors with water leaks may be expected.) Fans were employed more often when the air was hot, stuffy and humid, and less often under cold, drafty conditions.

Two personal characteristics were often associated with odor concerns, but seldom with comfort concerns. Sensitivity to chemical fumes was related to increased reports of odors of paint and other chemicals, photocopying and printing process fumes, and tobacco smoke (Table 38). Persons reporting conflicting job demands were more likely to report odors of cosmetics and body odor, photocopier and printing process odors, and musty or damp odors.

Two contiguous spatial locations were associated with multiple comfort or odor concerns. The Southwest Mall (AHU 15 and SW-2) showed significantly increased reports of cold air, odors of paint and other chemicals, and the

odor factor including damp or musty smells and engine exhaust. An adjacent area on the second floor of the mall (AHU 16) was also associated with cold air, dry air, and the damp/musty/engine exhaust odors.

6.9 Variables Associated with One or Two Comfort/Odor Factors

With the exception of the variables discussed above, most of the remaining variables associated with comfort and odor were quite specific, often appearing with only one comfort or odor condition (Table 39). For example, in all four sets of regressions, heater use was associated with cold drafty air. The presence of new drapes and carpets was associated with the odor of new drapes and carpets, as was the presence in the respondents' offices of tacked-down new carpet. The presence of a copy machine was associated with the odor of photocopying processes. Similarly, recently painted walls were associated with the odor of paint, and the use of chemicals at the workspace was associated with the odor of paint and other chemicals.

Although all of the above associations may sound rather unsurprising, if not excruciatingly obvious, they are an important indication that the questionnaire is sound and that the answers to these questions may be relied upon. That is, since these responses display the expected relationships with comfort and odor prevalence, they indicate that other observed relationships based on the questionnaire responses may be trustworthy.

Seven other variables were associated with just one or two comfort or odor conditions. Low pay was associated with reports of humid air. An uncomfortable workstation was associated with reports of dry air. Complaints of dim lighting were associated with reports of hot stuffy air and dry air. A private office, no access to a window, and a heavy workload were all associated with increased reports of hot stuffy air. Mold allergies were associated with reports of damp, musty odors.

6.10 Effect of Location

6.10.1 Effect of location on health

The main goal of the first set of linear regressions was to determine whether buildings and/or building sectors differed in the prevalence of

health, comfort and odor reports. The results showed few differences between buildings or building sectors. None of the 12 health factors showed a significant relationship with any building or building sector.

The second set of regressions, employing a finer-grained measure of spatial variation (the areas served by the AHUs), confirmed the general lack of a "spatial effect" on health symptoms and extended this finding to apply to AHUs as well: few individual AHUs (or the spaces they serve) were associated with increased reports of health symptoms at the 0.01 level of significance. The small number of associations noted were significant for one sex but not the other. In view of the large number of spatial variables (66) tested in 12 sets of four regressions (male/female; with/without comfort and odor variables), most of these associations may be due to chance. To reduce the possibility of reporting chance associations, only those that were significant at $p < 0.01$ for at least two of the four regressions are discussed below.

Men in the Library area (AHU 21) had significantly elevated frequency of flu-like symptoms, including chills and fever as well as aching muscles and joints and upper body pain. (This AHU was replaced shortly after the survey.) Men on a portion of the third floor of the Mall (AHU 9) also had higher frequency of aching muscles/upper body pain.

Women in the garage areas (AHUs G,LG) showed higher rates of chest symptoms. Women in the Southeast Mall (AHU SE 2-1, 2-2) reported higher frequencies of difficulty concentrating and dizziness. Women on the lower floors of the West Tower (AHU WT FL1-3) and the 8th and 9th floors of the East Tower (AHU ET1 FL 8-9) reported higher rates of dry skin complaints.

Some locations were associated with significantly <u>reduced</u> rates of health symptoms. Men on the lowest floor of the Northeast Mall (AHU NEG-1,2) and women on the next higher floor (AHU NEG-4) reported significantly fewer throat symptoms than in other areas. Women in Crystal Mall showed lower frequency of chills and fever.

The logistic regressions confirmed the general lack of a building effect on health variables, with the possible exception of AHU 16 on the second floor of the mall, which was associated with increased levels of eye irritation.

The lack of a "building effect" on health symptoms does not necessarily mean that there are no differences in health symptom prevalence rates among buildings. For example, one of the most important variables associated with

health complaints was dust. People who reported that their workstation was too dusty were significantly more likely to have headaches, nasal problems, cough, eye irritation, and sore or dry throat. These people were more heavily concentrated in WSM than in the other two buildings; 24% of WSM respondents reported that their workstation was often or always too dusty, compared to 16% at Crystal and only 12% at Fairchild. Since dust was separately included as a variable, the "building" variable did not reflect this difference in dustiness; rather, the building variable includes only whatever differences remain after all other specific variables (which may differ between buildings) are accounted for. Therefore, the fact that little or no "building effect" was observed means that no remaining difference between buildings (after removing the differences due to the specific variables included in the regression) was strong enough to account for variations in health symptom prevalence.

Similarly, the lack of any consistent association of the AHUs with health symptoms should not be interpreted to mean that ventilation had no effect on health; in fact, some of the ventilation-related comfort variables (hot stuffy air, dry air) had extensive associations with health symptoms.

To summarize, our finding of little or no residual effect of location implies that most or all of the spatial variability was captured by the other existing variables in our model. Thus we need not look for additional causes of spatial variability. Instead, we can analyze the spatial variability associated with certain important variables (e.g., dust, sensitivity to chemical fumes, hot stuffy air) to identify locations in possible need of corrective action.

6.10.2 Effect on Comfort and Odor

In the first regression, which included the "coarse-grained" building and building sector variables, a clear "building effect" was observed for one comfort and two odor factors. The Waterside Mall building was significantly more likely to be associated with complaints of cold drafty air than the other two buildings. Also, the second floor at Waterside was significantly more likely to be associated with the odor complex including musty/damp, fishy, or engine exhaust odors. (This floor had a much higher complaint rate for engine exhaust odors than any other sector.) Finally, the building sector including

the two office areas on the garage and lower garage levels of Waterside Mall were more likely to be associated with reports of printing or photocopying odors.

In the second regression, which employed the "fine-grained" AHU/floor combinations, certain AHUs (or factors associated with the spaces they serve) were strongly associated with comfort and odor factors. These included two AHUs on the Southwest Mall (increased reports of paint and other chemical odors, together with damp/musty and engine exhaust odors), and some serving the second floor of the mall (complaints of dry air and/or musty/damp odors from AHUs 2 and 16). Cold air complaints were significantly increased in some of the Waterside Mall areas (e.g. AHU 14 on the second floor of the mall), and significantly decreased in the Crystal Mall building. This agrees with the respondents' essays, which included many complaints of cold air at Waterside Mall and hot stuffy air at Crystal Mall. Printing process odors were evident in the print shop location (G1). Odors of tobacco smoke were associated with the first floors of the West Tower (AHU WT1 FL 1-3) and the basement level of the Northeast Mall (NEG-1,2). The Library area of Waterside Mall (AHU 21) was associated with reports of humid air. Many of these building effects on comfort and odor factors were also confirmed by the logistic regressions.

6.11 Effect of New Carpet

Although new carpet showed only a few strong associations with health symptoms, it is discussed here because of the intense interest in the carpet situation at Waterside Mall. The new carpet variable was the only one for which objective data existed to check against the questionnaire responses. Evidence that the areas with new carpet had been reasonably well identified was provided by the very high correlation of the associated variables (new carpet, tacked or glued, in offices or in nearby corridors) with reported presence and odor of new carpet.

The two health factors that were most closely associated with new carpet were throat symptoms and dizziness. Both men and women in offices that had received the new carpet (tacked-down) reported higher prevalence of throat problems in the past year, significant at the 0.01 level in three of eight

possible regressions, and at the 0.05 level in an additional three regressions. Complaints of dizziness or light-headedness were also elevated (among men only) in areas with new tacked-down carpet in nearby hallways. In addition, one other health factor (headache and nausea) was associated with the odor of new carpets (males only).

Since the period of recall for the health symptoms was one year, and since the carpet had been installed roughly one year before, it is not known which of the respondents, if any, were still experiencing symptoms; however, these results provide some support for relating some health symptoms--most likely throat symptoms--to areas with the new carpet.

Another study (Norbäck and Torgen, 1989) also noted a significant effect of carpet on dry throat and sore throat complaints, as well as eye irritation and headache. Workers in two schools with wall-to-wall carpets had 2-3 times the prevalence of these complaints as workers in four schools without carpets. Since the carpets were 8-10 years old and were never cleaned with chemicals or dry shampoo, emissions of VOCs were unlikely to be the cause of the complaints. Also, since the area in question has low humidity for several months each winter, mites and mite allergens were also ruled out. The author concluded that dust accumulation on the carpets was the most likely cause of the association (Norbäck, 1990).

6.12 Variables with Little Effect on Health, Comfort, or Odor

Many personal and workplace characteristics showed little or no effect on the reported health symptoms and comfort/odor concerns. For example, as discussed above, little spatial variability was noted for any health symptom. Neither the coarse-grained spatial variables (buildings or building sectors) nor the fine-grained variables (AHU by floor) showed consistent associations with any health symptom, with the exceptions mentioned above. Smoking status, type of office, time working at a copying machine, presence of new furniture, airflow capacity, certain psychosocial indices, several comfort/odor factors, and several other variables that have been suspected to be associated with health symptoms seldom showed significant associations. Table 40 summarizes the variables that showed few or no associations with health, comfort, or odor factors. Some are discussed further below.

Five questions concerned the presence of laser printers and copy machines and the number of hours spent at the workstation or working with computers/word processors and copy machines. None of these variables had much effect on health symptoms. Time at the workstation was associated with chills and fever and with contact lens problems, but only for men, while time in front of a computer was associated with eye and nasal irritation, but only for women. Fewer men than women worked 5 hours or longer near computers (298 men compared to 551 women).

Several questions dealt with office surroundings, such as presence of fabric-covered partitions, live plants, and new carpet, drapes, furniture or equipment. Two additional variables, "shelf space" and wood surfaces, were created from these questions. None of these variables except the new carpet were associated with health symptoms.

Two questions concerned recently painted or recently rearranged walls. Neither variable had much effect on health symptoms, although the recently painted walls variable was sometimes (females only) associated strongly with eye and chest symptoms.

Two of the seven psychosocial indices used in this study (conflicting job demands and workload) showed multiple significant associations with health symptoms. Several other variables (job satisfaction, external stress, and role ambiguity) were associated with one or two symptoms. However, two other variables (job control and utilization of skills) had little effect.

Although allergies to molds, dust, and pollen were important explanatory variables for some symptoms, allergies to animals or to other allergens were not associated with any health symptom.

Age was not often an important explanatory variable. When it did appear, it was for women only: women under 30 had fewer nasal symptoms and muscular aches and pains.

Pay grade was seldom important as an explanatory variable. Females in the highest pay grade reported significantly fewer muscle and back pains; females in the medium pay grade (GS9-12) reported dry skin more often.

In the first two sets of linear regressions, separate variables were included for the type of office and the number of persons sharing the office. For the final logistic regression, these variables were combined into one

variable with three levels: private offices, private cubicles or offices with exactly two people, and all other combinations. No matter which set of variables was employed, the type of office and space sharing had little effect on health symptoms. One exception was fatigue (among men only), which was increased in open areas or offices with two or more workers.

Two variables were created to describe respondents' living conditions: living alone and living with others as sole provider. Neither variable provided much explanatory power for health or comfort symptoms. Living alone was associated with increased reports of muscle aches and pains among men only, while being the sole provider was associated with increased rates of chest, throat, and flu-like symptoms among women only.

Smoking status was not associated with any of the health or comfort symptoms.

6.13 Comparison with Other Studies.

The normal prevalence of the 32 target symptoms is not well known. For example, the annual Health Interview Survey carried out by the National Center for Health Statistics (NCHS) includes only a few of the symptoms (dry skin, fever, "frequent" headaches) used in our questionnaire, and prevalence rates are reported only for those symptoms that receive medical attention or restrict activity (NCHS, 1988). Thus it is not possible to compare NCHS data with data from this study.

6.13.1 Family-Based Studies.

One study (Lebowitz et al., 1972a) followed 418 families in Manhattan for several years, collecting weekly reports on 14 symptoms experienced by all members of the family over the previous week. Nine of the symptoms were similar to those in this study. These nine symptoms were reported 3-12 times more often by EPA workers than by the Manhattan subjects (Table 41).

The reasons for these large differences are unclear. In the Manhattan study, information was supplied by one person (the mother in 85% of cases) for all other family members; this could lead to underreporting of certain less noticeable symptoms (such as headache, eye irritation, and aching muscles, the three symptoms with the greatest differences) in other family members.

However, other studies with different methodologies resulted in prevalence estimates similar to those of Lebowitz (Buck, 1956; Dingle 1964). Also, these family studies included children, who typically suffer higher rates of minor upper respiratory symptoms, and persons not in the work force, who are also generally considered to be at a lower level of health. These factors would tend to increase the prevalence of most of these symptoms in families compared to a working population. Since our study took place in a week in the winter, when respiratory infections are about twice as common as in spring or summer (NCHS, 1988), it is likely that the respiratory symptoms were more frequent than in a typical week; however, this factor of 2 would not explain the much larger factors of 3-12 observed, nor would this explain the differences in the non-respiratory symptoms.

Lebowitz concluded that his study had found "a remarkably high burden of illness in a healthy urban population--in fact, far more than normally imagined" (Lebowitz et al., 1972b). Since the rates in the EPA employee population appear to be several times those found by Lebowitz, it may be that EPA employees also are carrying a heavy burden of minor illnesses. For example, about half of EPA employees reported a headache the previous week with an average duration of 2.0 days. This corresponds to about 5000 headaches per week among the 5000 employees, or a quarter of a million headaches per year. If each headache results in a few minutes of lowered productivity, the total time lost would be several man-years. About 15% of EPA employees reported leaving work early or not coming in due to headache (EPA, 1989). Some other symptoms, such as sinus congestion, were even more common than headache. About 5% of employees reported losing work time due to this symptom (EPA, 1989).

6.13.2 Large Building Studies

Three other studies have administered questionnaires to several thousand office workers in an attempt to learn more about building-related health complaints. These studies have taken place in Great Britain (Wilson and Hedge, 1987), Denmark (Skov and Valbjorn, 1987; Skov et al., 1989, 1990) and the Netherlands (Zweers et al., 1990; Preller, et al., 1990). All three of those studies involved a large number of buildings (28 to 61), whereas the present study included only a small number of buildings (3). Thus these

investigators were able to compare, for example, buildings with natural ventilation to those with mechanical ventilation, and buildings with spray humidification to those with steam humidification, comparisons which our study is unable to make. On the other hand, since our study involved a census rather than a sample of employees, we were able to carry out a spatial analysis of our buildings. (The Danish investigators also carried out a census of 4369 employees in 28 buildings, but did not analyze spatial variation within the buildings.) We were also able to test the effect of all air handling systems employed in the buildings as well as the effect of new carpet installed in two of the buildings in the previous year.

Most of the personal characteristics and work environment variables measured in the previous studies were also measured in this study, allowing multiple comparisons to be made among the four studies. The basic characteristics of the four studies are listed in Table 42.

Many of the health symptoms included in the questionnaire were similar from one study to the next; however, the wording of the questions was different. For example, all four studies attempted to deal with the frequency of symptoms and whether they were "work-related." However, all four had different definitions both of frequency and of what constituted a work-related symptom. Wilson and Hedge asked respondents if they had experienced any of a set of 10 symptoms "on two or more occasions in the previous year," and if the symptoms were better on days spent away from the building they worked in. Skov and Valbjorn asked if a set of 12 symptoms occurred "several times a week or more" and if the symptoms improved on weekends, holidays, and vacations. Zweers et al. and Preller et al. asked if any of 18 symptoms occurred "daily or weekly in the past 12 months and if improvement was noted when away from work." The EPA study asked if any of a set of 32 symptoms occurred "never, rarely, sometimes, often, or always" in the past year, and if they "usually got better" on leaving work; a second EPA category asked if the symptom occurred last week, and if so, on how many days. As can be seen, the minimum criterion for a "positive" response varied from 2 days per year in the British study to about 100 days per year in the Danish study. We attempted a direct comparison of symptom frequencies in these studies but were unable to overcome these fundamental differences in definition.

6.13.2.1 Grouping of Symptoms

In all the studies, symptoms were grouped for analysis. In one paper based on the British study (Raw et al., 1990), only the number of positive symptoms was used as the dependent variable. In the Danish study, two groupings were used: mucous membrane (eye, nose, throat) complaints and "general" symptoms (headache, fatigue, etc.). The Netherlands investigators grouped 17 symptoms into five factors.

Of the four studies, apparently only one (the present study) used an objective method of grouping health symptoms. As described above, a PCA on the original 32 health symptoms identified nine factors. Three additional symptoms (dizziness, dry or itchy skin, problems with contact lenses) were also analyzed. The nine factors and three individual symptoms are listed here for comparison with those in the European studies:

1. Headache and nausea
2. Nasal (runny nose, stuffy nose/sinus congestion, sneezing, cough)
3. Chest (wheezing, shortness of breath, chest tightness)
4. Eyes (dry itching or tearing eyes, sore eyes, blurry vision, burning eyes)
5. Throat (sore throat, hoarseness, dry throat)
6. Fatigue (unusual fatigue or tiredness, sleepiness or drowsiness)
7. Chills and fever
8. Muscle pain (aching muscles or joints, pain or stiffness in upper back, pain or stiffness in lower back, pain or numbness in shoulder/neck, pain or numbness in hands or wrists)
9. Neurological (difficulty remembering or concentrating, feeling depressed, tension or nervousness)
10. Dizziness
11. Dry skin
12. Problems with contact lenses

For comparison, the five symptom groupings in the Netherlands study were as follows:

1. Neurological (fatigue, headache, heavy feeling in the head, listlessness, dizziness, problems with concentration, forgetfulness, irritability)

2. Skin (dry skin, skin rash, itchy or prickly skin)
3. Eyes (weary eyes, itchy, prickly, or watering eyes)
4. Nose/throat (blocked or runny nose, dry throat, sore throat)
5. Fever [sic; more appropriately, flu-like] (shivery, muscle or joint pain)

Thus the Netherlands classifications mix some categories found to be separate in the US analysis. For example, the Netherlands "neurological" category includes symptoms from four different US categories--headache, dizziness, fatigue, and problems with concentration and forgetfulness. Also the Netherlands study combines nose and throat symptoms, which were found to be separate factors in the US study.

The Danish study identified two symptom groupings:

1. Mucosal irritation (at least one work-related symptom of irritation/dryness of the mucous membrane of the eyes, nose, or throat);
2. General symptoms (at least one work-related symptom of headache, abnormal fatigue, or malaise).

Again, the Danish classification, like that of the Netherlands study, lumps categories found to behave as separate factors in this study. Because of these differences in grouping symptoms, comparisons of significant factors across studies may be flawed. Nevertheless, a list of variables found to be significant (and those tested and found not significant) in the studies is included in Table 43.

In the present study, we have chosen to require a significance level of $p < 0.01$, because of the large number of tests being made. The three other studies chose significance levels of 0.05. Since those studies also made multiple comparisons, they may be expected to include a larger number of false positive findings.

6.13.2.2 Comparison of Findings

In view of the different definitions of health symptoms, and the different ways of grouping those symptoms for analysis, the findings of the

studies may be expected to differ somewhat. However, if certain findings are common to most or all studies, they may be viewed as having some substantiation.

The only finding that was common to all three European studies was the increased symptom rates reported by females. This increased frequency was also noted in our study, but we made no formal tests to determine its significance. This was because we believe that many factors interact with gender (education, pay grade, type of workstation, number of persons sharing workspace, etc.) and would have to be accounted for in a multivariate model. By running separate models for men and women, we allowed for all such interactions, at the cost of being able to calculate the odds ratio between men and women.

A major explanatory variable isolated in both the Danish (Skov et al., 1990; Gravesen et al., 1990) and our studies was dust. The likely reasons for the importance of dust as a reservoir of allergens have been discussed above.

A few factors found significant in two of the three European studies were also significant in the U.S. study. These included dissatisfaction with the job and pre-existing allergies.

Some of the variables that we found to be highly significant were not examined, or were examined in a less specific manner, in some of the other studies. These include perceptions of dust and glare at the workstation, allergies to molds, and sensitivity to chemical fumes. Other variables that we found significant, such as the presence of new carpet, were not tested for in the other studies.

Some factors that were found significant in some of the other studies failed to reach significance in this study. For example, the type of workstation and number of people sharing a room (an important factor in the British study) seldom had any effect on health symptoms. Time spent at a photocopier or in front of a video display terminal (important in the Danish and Netherlands studies) also had little effect. The "shelf factor" found important in the Danish study was not significant in this study. (However, the Danish study actually measured the shelf factor, whereas our study depended on subjective estimates; also, our inclusion of a direct question on the presence of dust may have supplanted the more indirect measure represented by the shelf factor.) Similarly, the "fleece factor" found important in the

Danish study was not significant in this one, although again the Danish study included objective measurements. Also, carpet is an important contributor to the fleece factor, but 96% of the EPA floor area was carpeted, which reduces the possible variation. The somewhat irregular age effects noted in other studies, with younger and middle-aged workers sometimes reporting higher symptom prevalence than older workers, were not replicated in this study; for the few times age was important, younger workers showed lower prevalence. Being a smoker had no effect on health symptoms in our study, although both the Danish and Netherlands studies noted an effect. (The prevalence of smoking in this study may have been lower than in the European studies; also all buildings in this study had no-smoking policies in effect in the work areas.)

7. CONCLUSIONS

This study has allowed testing a number of hypotheses regarding the association of personal and workplace characteristics with perceptions of health, comfort, and odor. A new questionnaire included many variables that have been tested in previous studies, but also included a number of new variables tested here for the first time. The effects of location within the building were tested as a possible factor of importance for the first time. Information was also obtained on the locations where carpet had been installed in the previous year, to test the hypothesis that carpet installation might have health effects. The many AHUs in the buildings were mapped out and every person was associated with an AHU. This made it possible to carry out a valid multivariate statistical test of the hypothesis that AHUs, or the spaces served by them, might be associated with health, comfort, or odor. Conclusions regarding the methodology and the questionnaire will be discussed first, followed by conclusions on health and comfort effects.

7.1 Methodology

The original 32 health symptoms were reduced to 12 factors using an objective statistical method: PCA. These factors were often different from those used in previous studies, which have apparently used subjective groupings of symptoms. For example, some studies have grouped eye, nose, and throat symptoms into a mucous membrane category; however, the PCA showed clearly that these three types of symptoms were separate, at least for the EPA employee population. Some studies have grouped headache, fatigue, and difficulty concentrating or remembering into one syndrome; however, these symptoms were also members of three different classes, at least for the EPA employees. Our logistic regressions have also indicated that each of the health and comfort factors identified by PCA had a different set of potentially causative personal and workplace characteristics. This suggests that regression analyses that lump symptoms from different classes have the potential for missing significant associations due to misclassification.

Since the original PCA was carried out on the health symptoms occurring "last year," the analysis was repeated on the questions referring to "last

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week" to determine whether the factors identified would remain the same. The same factors were identified. It remains possible that these factors were influenced by the ordering of the health symptoms on the page of the questionnaire. Although the symptoms were not grouped or otherwise labelled on the questionnaire, they were ordered by body system; that is, most of the eye symptoms were in proximity to each other, followed by the nasal symptoms, etc. With some noteworthy exceptions, the PCA factors were very similar to the a priori ordering. A future study in which questions are randomly ordered on the questionnaire would be definitive in determining whether the factors found by the PCA are robust.

PCA analyses were also carried out on 10 comfort questions, 15 odor questions, and 24 "psychosocial" questions. In the case of the psychosocial factors, the questions on the questionnaire were shortened versions of extensively tested groups of questions on five or six psychosocial factors, such as job satisfaction and conflicting job demands. The PCA analysis confirmed that the shortened set of questions constituting each of the psychosocial factors was self-consistent and that each factor was independent of the others.

7.2 Health Symptom Frequencies

Attempts to compare symptom frequencies in this study to those observed in other studies of workplace populations proved fruitless because of different definitions of symptoms. However, a comparison to an earlier study of a healthy urban population showed that EPA employees reported higher frequencies of all nine of the symptoms common to both studies.

7.3 Health and Comfort Effects

The workplace variable associated with the largest number of health and comfort factors was dust. Dust may provide a reservoir of allergens causing mucous membrane irritation, as indicated by several recent studies. Related variables were allergies to mold and to dust, strongly associated with some of the same symptoms. Such allergies may be exacerbated by working in dusty

conditions. About 24% of Waterside Mall workers reported dusty workspaces, compared to 16% of Crystal Mall and 12% of Fairchild building employees.

Nearly a third of people at all three buildings reported that they were unusually sensitive to a variety of chemical vapors. Such persons were significantly more likely to report health symptoms and odors. Women were more likely than men to report sensitivity to chemical fumes (37% vs. 25%), but the number of associations of this variable with health symptoms and odor problems was about the same in both sexes.

Glare at the workspace was strongly associated with several health symptoms, including eye strain and upper body pain. (The latter may be related to maintaining uncomfortable posture for long periods of time in order to reduce or avoid glare.)

Among the comfort concerns, complaints of hot, stuffy air were most likely to be associated with a large number of different health symptoms. Dry air was also an important variable in many symptoms. Cold air and humid air were seldom related to health symptoms.

Among the six classes of odors, the odor of paint, carpet cleaning, and other chemicals was most likely to be associated with health symptoms. Odors from cosmetics and food were also associated with a number of health symptoms. The odor of new carpets and drapes was associated with headache. Musty or damp odors were associated with flu-like symptoms (chills, fever, and muscle and joint pain). The odor of photocopying processes was seldom associated with health symptoms. The odor of tobacco smoke was also seldom associated with any health symptom. Smoking is restricted in all three buildings, and nicotine measurements showed little indication of cigarette smoke in the 50 locations measured.

Two psychosocial factors were often significantly related to health symptoms, particularly the cluster of symptoms including difficulty concentrating, tension, and depression. These factors were workload and conflicting job demands. Three other psychosocial factors (job satisfaction, role ambiguity, external stress) were related to one or two health symptoms. Two remaining psychosocial factors (job control, utilization of abilities) seldom appeared significant.

Persons in areas where new carpet had been installed in the last year were more likely to report sore throat, dry throat, and hoarseness. Dizziness

was also increased among men in these areas. Men reporting odors of new carpet were also more likely to report these and other health symptoms. Although none of these findings were individually incontrovertible, taken as a whole they suggest that carpet or the carpet installation process (ripping up old carpet and molding, which would increase dust levels; applying carpet and molding adhesives, which would increase VOC levels; and installing new carpet and molding) can be associated with certain health effects among a substantial number of employees. (These effects are not limited to a small sensitive group, since those workers who had reacted strongly and were working at alternative workplaces were not included in this statistical analysis.)

Most of the variables described above were about equally important among men and women. Some variables were stronger in one sex than in another. Among women, conflicting job demands, lack of formal education, time at a VDT, the odor of paint and other chemicals, and being the sole provider were important indicators for some health symptoms. Young women reported significantly fewer nasal symptoms and bodily aches and pains. Among men, access to a window was a significant (protective) variable for three health factors (fatigue, eye and throat symptoms). Time at the workstation, working in the EPA Library area, and the odor of new carpets was also related to several health symptoms among men.

After accounting for the effect of confounding variables, neither buildings nor building sectors were consistently associated with increased prevalence of any health symptom. Thus the slightly but consistently elevated rates for certain buildings or building sectors reported in Volume I (EPA, 1989) are due to variations in the explanatory or confounding variables. For example, the somewhat lower health symptom prevalence rates reported in the Crystal building are due in part to the higher percentage of male workers at Crystal (57% compared to 43% at Waterside): males reported consistently lower rates than women for all health factors.

Similarly, after accounting for specific variables that vary spatially (e.g. hot stuffy air), few of the 66 areas identified by their unique AHU/floor combinations could be associated with health symptoms. The main exceptions were the Library area of Waterside Mall (AHU 21), associated with increased reports among men of chills and fever and muscular aches/upper body pain; and AHU 16 on the second floor of the mall, associated with eye

symptoms, again among men only. Other areas occasionally associated with health complaints were the garage and lower garage areas of Waterside Mall (AHU G & LG), and the Southwest Mall and one nearby location (AHU 14).

On the other hand, certain buildings, sectors, and locations were strongly associated with some of the comfort and odor variables. For example, the Waterside building was associated with more complaints of cold drafty air than either of the other buildings; the print shop in Waterside was associated with more reports of photocopying and printing process odors than other areas.

Although previous studies have found that the type of office and number of persons in an office are associated with symptoms, this study found few such associations.

Our attempt to include questions that would represent a "shelf factor" and "fleece factor", found to be important in the Danish Town Hall Study (Skov and Valbjorn, 1987) was ineffective in producing relationships with health or comfort symptoms. Since these factors may be surrogates for dustiness, it appears that measuring settled dust or asking a direct question on dustiness of the workplace may be more effective than indirect efforts to estimate the amount of dust-catching surface.

In previous studies, age has often been found to be a factor related to health symptoms. However, in this study it never appeared for men, and infrequently for women. When it did, the direction of the effect was different than in previous studies: women under 30 had significantly fewer nasal symptoms and bodily aches and pains.

Unlike observations in some other studies, pay grade was rarely found to be a significant health factor. Smoking status also did not appear to be an important factor in this population, although smoking rates were very low.

8. RECOMMENDATIONS

The following recommendations are offered for improving working conditions and for planning future research.

8.1 Improving Working Conditions

The major variable affecting a wide variety of health, comfort, and odor responses was dust. Dusty working conditions were significantly associated with increased prevalence of nose and throat irritation, chest tightness, fatigue, dizziness, and dry skin among both men and women. Dusty, dirty, cluttered working conditions and lack of regular cleaning and vacuuming were also identified as major problems in a large number of the essay responses (Selfridge, 1991) for the Waterside Mall building.

Therefore, the main practical recommendation arising from this study is to reduce dust in the workplace. One way to do this would be by designing workplaces to be as dust-free as possible. Replacing open files and bookcases with the type with retractable shelves might reduce opportunities for dust, dirt and clutter to collect. Providing storage areas separate from workstations would reduce dust and clutter near the workers. A public information campaign informing workers that dusty conditions may be affecting their health and providing helpful hints on reducing dust and clutter may be useful. In terms of designing future buildings, a design inhibiting possibilities for dust to collect and allowing easy maintenance of workstations is indicated. (One of the many ways to reduce dust accumulation is by using a "walk-off" grating or carpeted strip leading from the lobby doorway to the stairs or elevators, that serves as a trap to remove dirt from shoes. Studies in Germany (Deutsches Teppich-Forschungsinstitut, 1983) have indicated that such walk-off zones can reduce the daily accumulation of dirt in the workplace by a factor of 2-3, and can reduce the required frequency of cleaning or shampooing in the workplace by the same factor.)

A second way to reduce dust is by improved maintenance. Some respondents mentioned the fact that security regulations based on protecting confidential business information have made it almost impossible to vacuum certain areas of Waterside Mall; attention to overcoming these problems

without compromising security may be required. However, conventional vacuum cleaners are least efficient for the particle sizes (<2 μm) of greatest allergenic or asthmatic potential (Godish, 1989). Vacuuming may well raise the airborne levels of these particles for hours following the operation. Vacuuming after work hours would allow time for airborne particles to settle. Vacuums with high efficiency (HEPA) filters may collect dust more efficiently.

An alternative to vacuuming is shampooing or steam cleaning of carpets. Leinster et al. (1990) demonstrated reduced prevalence of dry eyes, stuffy nose, dry throat, lethargy, and dry skin among employees for two months following steam cleaning of carpets, wet cleaning of hard surfaces, and HEPA vacuuming of carpets after steam cleaning. However, care must be taken not to use too much shampoo or water; dry residues from too much shampoo have been shown to cause mucous membrane irritation (Kreiss and Hodgson, 1984), and soaked carpets would provide a mold-growth medium.

A third way to reduce dust is by filtering the air. Although outdoor air is routinely filtered, major sources of dust also occur indoors, from all the processes employed in a modern office. Systems supplying additional ventilation and filtration of office air are available commercially. Some of these systems employ HEPA filters to remove particles, charcoal filters to remove VOCs, and powerful fans (>300 cfm) to assure that most of the air in the breathing zone of workers has been cleaned (although dust generated in the vicinity of the worker may still be inhaled.) A recent test of such a system installed on two floors of an office building showed that over a two-month period both airborne and settled dust was reduced, and various health symptoms were also reduced among the employees on those floors compared to employees on two other floors (Hedge, 1991). However, additional testing is necessary to determine how well such systems perform over extended periods.

A second variable of major impact on certain health symptoms was glare. Glare was the single most significant variable in the symptoms of aching muscles and upper-body pain, and was also implicated in headache, fatigue, and eye irritation symptoms. It seems likely that some of the problems with glare have been exacerbated by the greatly increased use of computers and video display terminals. Supplying all display terminals with glare screens could be effective in reducing problems associated with glare. A "walk-through" inspection of rooms to identify and eliminate sources of glare is indicated.

The third variable widely implicated in health problems was allergy to molds. Such allergies were very strongly associated with nose and throat problems, and less strongly with eye irritation and headaches. Molds require moisture to grow, and they have been found to be plentiful in homes with high humidity, carpets that have had spills or seepage from water leaks, books and magazines, cardboard cartons, etc. The essay question in this study elicited several comments from workers regarding water leaks, overflowing restrooms, carpets that had been soaked and not removed, etc. It seems possible that such incidents may have provided the conditions for mold growth and subsequent health problems of building occupants. Again, a "walk-through" inspection for molds and replacement of carpets that have been previously soaked may be called for.

This study provided limited support for the suspicion that the carpet installation process can cause health problems. Throat symptoms (dry throat, sore throat, hoarseness) were found to be significantly associated with areas that had new carpet installed. Dizziness was also reported in areas with new carpet, but only among men. These findings suggest that carpet be installed with minimal use of adhesives and careful control of dust, at times when employees are not present, and perhaps with a waiting period before employees return.

8.2 Implications for Further Research

It appears that dust is a major factor in building-related health symptoms. However, it is not known what component of the dust may be the specific agent. Dust mites, molds, pollen, fibers, pesticides, volatile organic chemicals, roach allergens, and allergenic macromolecules have all come under suspicion. Further research to track down the specific agent seems to be indicated. Methods are needed to measure settled dust in a reproducible way and to determine the amount of settled dust that gets transferred to the eyes and nose of the affected worker. Additional comparative studies of different methods to reduce dust and their effectiveness in reducing health and comfort complaints are also desirable.

Although this study provided only limited support for the idea that carpet installation plays a role in employee health symptoms, it would appear

that further research is justified. As with dust, the precise agent is not known. It could be VOC emissions from carpet, from carpet adhesive, or from molding and molding adhesive (which is usually replaced during installation of the carpet.) VOCs at high concentrations have been found to cause throat symptoms and dizziness. Since carpet installation is sometimes associated with construction, dust or reentrainment of molds or other allergenic particles could also be involved. Research to identify compounds emitted by carpets and adhesives and the variation of their source strengths by brand and type of carpet seems indicated. Research to understand the nature of dust buildup in carpets and effectiveness of cleaning methods is also desirable.

This study was one of the first to carry out an objective analysis, using PCA, of a large number of health, comfort, odor, and psychosocial questions. The principal factors discovered in this way allowed similar questions to be grouped and a more streamlined statistical analysis to take place. However, the question of whether the factors found in this study have universal validity needs to be studied. Since the factors matched the ordering of the health questions, there is a possibility that some of the findings are artifices of the questionnaire design. A survey of a different population using the same questions in random order would clarify this question. Ultimately, the knowledge of which symptoms group together would allow a more streamlined questionnaire to be designed.

A related question concerns the design of future questionnaires for building studies. A number of questions employed in this questionnaire were highly useful; another group was not useful at all; and some questions were of marginal use. A careful examination of the effectiveness of each question needs to be carried out, with the ultimate product being a redesigned questionnaire for use in future studies. This process may benefit from being linked with ongoing efforts by the American Society for Testing and Materials to create a standardized questionnaire (Hedge, 1990).

The data collected in this study will be a rich source of future studies. Many analyses were suggested during this study that could not be carried out. One of the most important future research opportunities would be to repeat the analysis using only work-related symptoms. A comparison of the two approaches could have considerable impact on future studies. For example, if the basic findings remain unchanged, it could indicate that future studies

need not attempt to determine work-related symptoms. Since most previous studies have attempted to look at work-related symptoms, but have used somewhat different definitions, this would provide a point of comparison between all such studies, as well as those studies that did not use a "work-related" criterion. Conversely, if large differences are found between the regression results for work-related and non-work-related symptoms, it would indicate that more attention needs to be paid to achieving useful and comparable definitions of what constitutes a work-related symptom.

A second potentially fruitful area of additional statistical analysis would be the "last week" questions for health and comfort conditions. Since people's memory over seven days is far better than over a year, more accurate indications of prevalence rates could be obtained. Also, with respect to the specific question of whether persons in the newly carpeted areas have experienced some long-lasting effect on health, a comparison of their most recent health symptoms to those of persons in other areas would show whether they are still experiencing elevated rates.

A third analysis could concentrate on the spatial variation of the variables significantly associated with health: dust, hot stuffy air, sensitivity to chemical fumes, and a few others. This could assist in identifying locations where corrective action might have the greatest effect.

A fourth analysis on psychological and organizational factors may also be useful. Confidentiality provisions required that all administrative identifiers be removed before analysis; however, if some way were found to allow organizational analysis without violating these provisions, it might be possible to identify organizational components where an opportunity for improving employee well-being and productivity exists.

Future studies to verify the relationships identified in this study would be desirable. For example, the effect of dust on office workers could be studied by making objective measurements of productivity before and after initiating various dust-control measures (supplemental filtered ventilation, improved cleaning procedures, etc.).

9. REFERENCES

Ashford, N. and Miller, C., Chemical Exposures: Low Levels and High Stakes, Van Nostrand Reinhold, New York, NY, 1991.

Buck, C., "Acute Upper Respiratory Infections in Families," Amer. J. Hygiene 63:1, 1956.

Crandall, M.S., Highsmith, R., Gorman, R., and Wallace, L., "Library of Congress and U.S. EPA Indoor Air Quality and Work Environment Study: Environmental Survey Results," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 597-602, 1990.

Deutsches Teppich-Forschungsinstitut e. V., "Concerning the Effectiveness of Clean-off Zones", Test Report No. 83 037, Tufton B.V. Textielfabriek KS Aachen, Germany, 7 July 1983.

Dingle, J.H., Badger, G.F., and Jordan, W.S., Illness in the Home, Western Reserve Univ. Press, Cleveland, 1964.

EPA, Indoor Air Quality and Work Environment Survey: EPA Headquarters Buildings, Volume I: Employee Survey, US Environmental Protection Agency, Washington, DC, 1989.

EPA, Indoor Air Quality and Work Environment Survey: EPA Headquarters Building, Volume II: Results of Indoor Air Environmental Monitoring Study, US Environmental Protection Agency, Washington, DC, 1990a.

EPA, Indoor Air Quality and Work Environment Survey: EPA Headquarters Buildings, Volume III: Relating Employee Responses to the Follow-Up Questionnaire with Environmental Measurements of Indoor Air Quality, US Environmental Protection Agency, Washington, DC, 1990b.

Fidler, A.T., Wilcox, T.G., and Hornung, R.W., "Library of Congress Indoor Air Quality and Work Environment Study: Health Symptoms and Comfort Concerns," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990. Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 603-608, 1990.

Godish, T., Indoor Air Pollution Control, Lewis Publishers, Chelsea, MI, 1989.

Gravesen, S., Skov, P., Valbjorn, O., and Lowenstein, H., "The Role of Potential Immunogenic Components of Dust (MOD) in the Sick Building Syndrome" in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990. Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 1, p. 9-13, 1990.

Hall, E.M. and Johnson, J.V., "A Case Study of Stress and Mass Psychogenic Illness in Industrial Workers," J. Occup. Med. 31:243-50, 1989.

Hall, H.I., Leaderer, B.P., Cain, W.S., Selfridge, O.J., Fidler, A.T., and Wilcox, T., "Subjective and Physical Correlates of Irritation from the Library of Congress/EPA Indoor Air and Work Environment Study," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990. Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 641-646, 1990.

Hedge, A., "Effect of filtering breathing-zone air in reducing Sick Building Syndrome complaints," press announcement, Centercore, Inc., Plainfield, NJ, 1991.

Hedge, A., "Questionnaire Design Guidelines for Investigations of 'Sick' Buildings" in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990. Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 1, p. 605-610, 1990.

Hosmer, D. and Lemeshow, S., Applied Logistic Regression, Wiley, New York, 1989.

Hurrell, J.J., Sauter, S.L., Fidler, A.T., Wilcox, T.G., and Hornung, R.W., "Job Stress Issues in the Library of Congress/EPA Headquarters Indoor Air Quality and Work Environment Study," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 647-652, 1990.

Kalliokoski, P., Reponen, T., Nevalainen, A., and Katila, M.L., "Improper Use of Ventilation May Cause Severe Health Hazards in Hospitals," in Walkinshaw, D., (ed) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990. Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 523-28, 1990.

Kreiss, K. and Hodgson, M., "Building-Associated Epidemics," Chapter 6 in Walsh, P., Dudney, C., and Copenhaver, E. (eds.) Indoor Air Quality, CRC Press, Boca Raton, FL, 1984.

Leaderer, B., Wilcox, T., Fidler, A. Selfridge, J., Hurrell, J. Kollander, M., Clickner, R., Fine, L., and Teichman, K., "Protocol for a Comprehensive Investigation of Building Related Complaints," in Walkinshaw, D., (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 609-614, 1990.

Lebowitz, M.D., Cassell, E., and McCarroll, J., "Health and the Urban Environment. XI. The Incidence and Burden of Minor Illness in a Healthy Population: Methods, Symptoms, Incidence" Amer. Rev. Resp. Dis., 105:824-34, 1972a.

Lebowitz, M.D., Cassell, E. and McCarroll, J., "Health and the Urban Environment. XII. The Incidence and Burden of Minor Illness in a Healthy Population: Duration, Severity, and Burden" Amer. Rev. Resp. Dis. 105:835-41, 1972b.

Leinster, P. Raw, G., Thomson, N., Leaman, A. and Whitehead, C., "A Modular Longitudinal Approach to the Investigation of Sick Building Syndrome," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate; Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 1, p. 287-292, 1990.

Mølhave, L. (1987) "The Sick Buildings--A Sub-Population among the Problem Buildings?" in Seifert, B., (ed.), Indoor Air '87: Proceedings of the 4th International Conference on Indoor Air Quality and Climate, Institute of Air, Water, and Soil Hygiene, Berlin, Germany, Vol. 2, p. 469-474, 1987.

Morey, P. and Williams, C., "Porous Insulation in Buildings: A Potential Source of Microorganisms," in Walkinshaw, D. (ed) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate; Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 529-534, 1990.

NCHS, Current Estimates from the National Health Interview Survey for 1987, National Center for Health Statistics, Hyattsville, MD, 1988.

NCHS, Current Estimates from the National Health Interview Survey for 1988. National Center for Health Statistics, Hyattsville, MD, 1989.

Nelson, C.J., Leaderer, B. P., Teichman, K., Wallace, L., Kollander, M., and Clickner, R.P., "Environmental Protection Agency Indoor Air Quality and Work Environment Study: Health Symptoms and Comfort Concerns," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate; Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 615-620, 1990.

Norbäck, D. and Torgen, M., "A Longitudinal Study Relating Carpeting with Sick Building Syndrome," Environ. Int. 15:129-135, 1989.

Norbäck, D., "Environmental Exposures and Personal Factors Related to Sick Building Syndrome", Ph.D. dissertation, Uppsala University, Sweden, 1990.

Persily, A. and Dols, W.S., "Ventilation and Air Quality Investigations of the Madison Building: Preliminary Results," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4 p. 621-626, 1990.

Preller, L., Zweers, T., Brunekreef, B. and Boleij, J., "Sick Leave Due to Work-Related Health Complaints Among Office Workers in the Netherlands," in Walkinshaw, D. (ed) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 1, p. 227-230, 1990.

Raw, G., Roys, M., and Leaman, A., "Further Findings from the Office Environment Survey: Productivity," in Walkinshaw, D. (ed) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 1 p. 231-236, 1990.

SAS, Statistical Applications Manual, SAS Institute, Cary, NC, 1989.

Selfridge, O.J., Berglund, L.G., and Leaderer, B.P., "Thermal Comfort Dissatisfaction Responses in the Library of Congress and Environmental Protection Agency Indoor Air Quality and Work Environment Study," in Walkinshaw, D. (ed.) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 4, p. 665-670, 1990.

Selfridge, O.J., Summary of Responses to the Essay Question of the Employee Survey Questionnaire, Supplement to Volume I of the Indoor Air Quality and Work Environment Study: EPA Headquarters Buildings, EPA, Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, NC, 1991.

Skov, P. and Valbjorn, O., "The 'Sick' Building Syndrome in the Office Environment: The Danish Town Hall Study" in Seifert, B. (ed). Indoor Air '87: Proceedings of the 4th International Conference on Indoor Air Quality and Climate, Institute of Air, Water, and Soil Hygiene, Berlin, Germany, 1987.

Skov, P., Valbjorn, O., Pedersen, B.V., and the Danish Indoor Climate Study Group, "Influence of Personal Characteristics, Job-related Factors, and Psychosocial Factors on the Sick Building Syndrome," Scand. J. Work Environ Health 15:286-295, 1989.

Skov, P., Valbjorn, O., Pedersen, B.V., and the Danish Indoor Climate Study Group, "Influence of Indoor Climate on the Sick Building Syndrome in an Office Environment," Scand. J. Work Environ. Health 16:363-71, 1990.

Wilson, S. and Hedge, A., The Office Environmental Survey: A Study of Building Sickness, Building Use Studies, Ltd., London, England, 1987.

Wynder, E.L., Higgins, I.T., and Harris, R.E., "The Wish Bias," J. Clin. Epidemiol. 43:619-21, 1990.

Zweers, T, Preller, L., Brunekreef, B., and Boleij, J., "Relationships Between Health and Indoor Climate Complaints and Building Workplace, Job and Personal Characteristics," in Walkinshaw, D. (ed) Indoor Air '90: Proceedings of the 5th International Conference on Indoor Air Quality and Climate: Toronto, Canada, 29 July - 3 August 1990, Canada Mortgage and Housing Association, Ottawa, Canada. Vol. 1, p. 495-500, 1990.

Table 1. FREQUENCIES BY GENDER FOR HEALTH SYMPTOMS EXPERIENCED LAST YEAR

			Percent of Respondents Who Experienced Symptom Last Year:				
Health Symptom	Sex	N	Never	Rarely	Sometimes	Often	Always
Headache	M	1901	13	37	38	12	1
	F	2031	7	21	44	25	3
Nausea	M	1891	60	30	8	1	0
	F	2015	48	32	17	3	0
Runny nose	M	1891	15	34	37	12	1
	F	2015	15	27	37	16	5
Stuffy nose/sinus congestion	M	1892	12	25	37	21	5
	F	2023	12	19	33	27	9
Sneezing	M	1892	14	41	37	7	1
	F	2020	14	31	41	12	2
Cough	M	1892	20	47	28	5	1
	F	2024	18	37	34	9	2
Wheezing or whistling in chest	M	1886	68	23	7	2	0
	F	2020	68	20	9	2	1
Shortness of breath	M	1890	69	20	8	2	0
	F	2021	61	21	13	4	1
Chest tightness	M	1885	71	19	8	2	0
	F	2020	67	18	11	3	0
Dry, itchy, or tearing eyes	M	1895	32	24	29	13	2
	F	2021	25	18	31	21	5
Sore/strained eyes	M	1889	26	26	32	13	2
	F	2021	25	18	33	20	5
Blurry, double vision	M	1889	67	19	10	3	1
	F	2019	56	19	17	7	2
Burning eyes	M	1892	46	24	21	8	1
	F	2020	37	21	26	12	4
Sore throat	M	1889	26	44	25	5	0
	F	2024	27	35	30	8	1

(continued)

Table 1 (continued)

Health Symptom	Sex	N	Percent of Respondents Who Experienced Symptom Last Year: Never	Rarely	Sometimes	Often	Always
Hoarseness	M	1889	50	34	12	3	1
	F	2020	45	30	19	4	1
Dry throat	M	1885	35	33	23	8	1
	F	2022	29	26	27	13	4
Unusual fatigue or tiredness	M	1895	28	29	30	11	2
	F	2022	18	20	35	21	6
Sleepiness or drowsiness	M	1892	16	28	40	13	2
	F	2024	15	21	40	19	5
Chills	M	1893	56	30	12	2	0
	F	2027	45	26	22	6	2
Fever	M	1891	53	40	6	1	0
	F	2024	57	33	10	1	0
Aching muscles or joints	M	1893	42	32	20	5	1
	F	2026	39	24	24	10	3
Problems w/contact lenses	M	1856	84	6	6	3	2
	F	1999	76	5	9	7	4
Difficulty remembering things	M	1893	52	23	21	3	1
	F	2018	45	24	23	6	2
Dizziness/light headedness	M	1892	59	27	12	2	0
	F	2020	47	25	22	5	1
Feeling depressed	M	1895	39	32	23	5	1
	F	2020	32	29	28	9	2
Tension or nervousness	M	1891	27	29	33	9	1
	F	2020	27	23	35	13	2
Difficulty concentrating	M	1895	30	31	31	7	1
	F	2014	30	26	33	9	2
Dry or itchy skin	M	1889	41	20	23	12	4
	F	2019	31	17	26	18	9

(continued)

Table 1 (continued)

Health Symptom	Sex	N	Percent of Respondents Who Experienced Symptom Last Year: Never	Rarely	Sometimes	Often	Always
Pain or stiffness in upper back	M	1891	52	25	17	6	1
	F	2021	43	19	24	11	3
Pain or stiffness in lower back	M	1891	41	25	24	8	2
	F	2018	39	20	27	10	4
Pain or numbness in hands or wrists	M	1889	72	17	8	3	1
	F	2019	63	16	14	6	2
Pain or numbness in shoulder/neck	M	1892	58	20	16	6	1
	F	2021	48	18	21	11	3

Table 2. PERSONAL AND WORKSPACE CHARACTERISTICS, BY GENDER (%)

Characteristics		Female	Male
Personal			
Age:	< 30	24	8
	30-40	40	37
	>40	36	55
Pay grade:	< GS 9	35	6
	GS 9-12	30	18
	> GS 12	35	76
College degree		52	94
Smoke		18	12
Wear glasses		56	65
Wear contact lens		23	16
Allergies:	Dust	46	41
	Molds	30	30
	Pollen	39	46
	Animals	17	17
Asthma		9	9
Eczema		8	8
Live alone		25	15
Live w/others--sole provider		12	26
Use regularly:	Fan	44	37
	Heater	22	9
	Desk lamp	43	36
Worked at copier:	None	14	22
	<1 hour	71	73
	>1 hour	15	5
Worked at computer:	None	13	19
	<1 hour	17	21
	>1 hour	70	60
Worked with chemicals		24	11
Especially sensitive to chemical fumes		37	25

(continued)

Table 2 (Continued)

Characteristics	Female	Male
Workspace		
Private office	21	46
Private cubicle or share with one person	39	40
Open area or shared with two or more	40	14
Too dusty	56	40
Too much glare	53	42
Too noisy	55	55
Too dark	7	5
New carpet in office within past year		
Respondents	17	17
Building records	17	16
New carpet in corridors (building records)		
Glued down	31	30
Tacked down	8	8
Near:		
Fabric-covered partitions	45	44
Laser printer	41	29
Photocopier	15	11
Live plants	53	39
Window visible	38	49
New furniture in past year	44	37
New equipment in past year	64	59
Walls recently painted	22	19
Walls recently rearranged	20	16
Water leaks last year	12	13

Table 3. INDEPENDENT VARIABLE DEFINITIONS AND SOURCE[a] OF INFORMATION

Personal Characteristics	
JOB SATISFACTION	index of job satisfaction from IV.1
CONFLICTING JOB DEMANDS	index of conflicting demands from IV.4
JOB CONTROL	index of control over work from IV.5
WORKLOAD	index of workload from IV.6.a-d
UTILIZE SKILLS	index of skill utilization from IV.6e-g
ROLE AMBIGUITY	index of job definition from IV.6.h-k
(Above six "psychosocial" variables constructed according to principal components analysis of Part IV of the main questionnaire)	
MEDIUM PAY	pay grades GS9-12 from EPA personnel records
HIGH PAY	pay grades GS13 and above from personnel records
EXTERNAL STRESS	index of family or home stress from IV.7
CONTACT LENS	wears contact lenses at work from II.1.b
GLASSES	wears glasses at work from II.2
ASTHMA	doctor-diagnosed asthma from II.16.a
COLLEGE GRAD	college graduate from V.3
ALLERGIC TO PLANTS	allergic to pollen or plants from II.18.a
ALLERGIC TO ANIMALS	allergic to animals from II.18.b
ALLERGIC TO DUST	allergic to dust from II.18.c
ALLERGIC TO MOLDS	allergic to molds from II.18.d
ALLERGIC: OTHER	allergic to other allergens from II.18.e
CHEM SENSITIVITY	sensitive to chemical fumes from II.20
ECZEMA	doctor-diagnosed eczema from II.14
LIVE ALONE	living alone from V.2

(continued)

Table 3 (Continued)

SOLE PROVIDER	living with others and sole provider from V.2
NOSMOKE	current nonsmoker from II.3
LESS THAN 30	under 30 years of age from II.21
OVER 40	over 40 years of age from II.21

(Reference variable for above two groups are people between the ages of 30 and 40 inclusive)

Workstation Characteristics

HOURS AT WORK	hours spent per day at workstation from I.4.b
SHELF INDEX	surface area index of office furnishings from I.7: sum of "yes" responses of items I.7.a-g (metal desk, wood desk, metal bookshelves, wood bookshelves, file cabinets, other metal furniture, other wood furniture)
WOOD INDEX	wood present in office furnishings from I.7: sum of "yes" responses of items I.7.b, I.7.d, and I.7.g(wood desk, wood bookshelves, and other wood furniture)
FABRIC PARTITIONS	presence of fabric-covered partitions from I.7.h
LASER PRINTER	presence of laser printer from I.7.j
PHOTOCOPIER NEAR	presence of photocopy machine from I.7.k
PLANTS NEARBY	presence of live plants from I.7.l
HOURS AT VDT	hours at work on computer or word processor from I.9.a
1 HOUR AT COPIER	one hour of work on copying machine from I.9.b
>1 HOUR AT COPIER	over one hour of work on copying machine from I.9.a.

(No work on copying machine was the reference group)

USED CHEMICALS	used chemicals from I.9.e
USE FAN	regular use of portable fan from I.10.a
USE HEATER	regular use of portable heater from I.10.c
USE LAMP	regular use of desk lamp from I.10.d

(continued)

Table 3 (Continued)

NEW CARPET/DRAPES	presence of new drapes or new carpets from I.11.a-b (sum of the two items)
NEW FURNITURE	presence of new furniture from I.11.c
NEW EQUIPMENT	presence of new equipment from I.11.d
WALLS PAINTED	walls recently painted from I.11.e
WALLS REARRANGED	walls recently rearranged from I.11.f
WATER LEAKS NEAR	water leaks in the last year from I.12
WINDOW NEARBY	presence of outside window from III.6
LIGHTS TOO DIM	lights too dim from III.4
GLARE	experience reflection or glare at workstation from III.5.a. (1 if sometimes, often, or always, else 0)
NOISE	work environment too noisy from III.1.k.1. (1 if sometimes, often, or always, otherwise 0)
DUST	work environment too dusty from III.1.m.1. (1 if sometimes, often, or always, otherwise 0)
UNCOMNDX	an index of workstation uncomfortableness ranging from 0 to 4 formed by combining responses from III.7.a and III.7.b
OWNRMPVT	a binary variable indicating private office from I.1.a and I.1.b
RMGTICUB	a binary variable indicating either the sharing of an enclosed office with just one other person or working in a private cubicle with half-height partitions from I.1.a. and I.1.b. The remaining work space/space sharing configurations served as the reference group.
CAPACITY	a continuous variable associating a maximum per capita airflow capacity (cfmp) with each person based on the measured or rated airflow capacity of a given air handling unit (AHU) and the number of persons served by that AHU. Used only in third linear regression.

(continued)

Table 3 (Continued)

New Carpet Variables

The following four variables were constructed from information in a memorandum from EPA management to EPA unions identifying the areas where new carpet was installed in the winter of 1987-88.

GDOFFICE	a binary (0,1) variable indicating the presence of recent glued down carpet in the respondent's office
GDCORRID	a binary variable indicating the presence of recent glued down carpet in respondent's corridor (GDOFFICE took precedence over GDCORRID)
TSOFFICE	a binary variable indicating the presence of recent tacked down carpet in the respondent's office
TSCORRID	a binary variable indicating the presence of recent tacked down carpet in the respondent's corridor (TSOFFICE took precedence over TSCORRID). No recent carpet installation was the reference group.

Location Variables

L - a set of 8 variables representing two buildings and seven "sectors" in the Waterside Mall building. (L1-L8: Crystal Mall building, Fairchild building, six sectors in Waterside Mall including East and West Towers, Northeast and Southeast Mall, 2nd and 3rd floors of the Mall). This "coarse-grained" spatial variable used only in first linear regression.

AHU - a set of 66 indicator variables representing the particular air handling unit serving a respondent. In the case of air handling units serving several floors, an additional subdivision was created identifying the floor of the respondent. This set of "fine-grained" spatial variables used in second linear regression and in all logistic regressions.

[a] For most variables, the source of information was the questionnaire. The exact wording of the question may be determined by consulting Appendix A. Questions are identified by Roman numeral for Parts I-V of questionnaire; Arabic numeral for question number; small letter(s) for subpart(s) of question. Example: IV.1.a-d - Part IV, question 1, subparts a through d.

For the remaining variables, the main sources of information were EPA personnel records (payroll and directory information) and management-union records on locations of air handling units and new carpet installation.

Table 4. QUESTIONS THAT WERE NOT INCLUDED IN THE ANALYSIS OF THE FIRST QUESTIONNAIRE

QUESTION	REASON FOR NOT INCLUDING
PART I	
2. years of service with EPA	May not have been in same building
3b. hours per week in building	Little variation
5. days in building last week	Not related to last year symptoms
6. time of arrival at work	Little relation to health
8. carpeting on floor of workstation	97% had carpeting--no variation
PART II	
4. smoke tobacco at workstation	No variation--smoking not allowed
5. smoke elsewhere at work	Almost no variation
8. reduced ability to work	Could be dependent variable
9. stayed home or left home early	Could be dependent variable
10. seasons most bothered	Not clear how to include in analysis
11a. associate symptoms with work	Not clear how to use in analysis
11b. symptoms changed over past year	Cannot use in regression analysis
12. wheeze, cough, SOB, fever, chills	Unexpectedly high prevalence rate--unusable
13. chest illnesses: missed work	Could be a dependent variable
15. wheezing episodes without fever	Low prevalence rate

(continued)

Table 4. (continued) QUESTIONS NOT INCLUDED IN THE ANALYSIS OF THE FIRST QUESTIONNAIRE

QUESTION	REASON FOR NOT INCLUDING
17. frequency of infections	Could be a dependent variable
19. sources of eye, nose, throat irritation	Could be a dependent variable
23-31. gynecological questions	Requires separate analysis
PART III	
1.1. too quiet	Few positive responses
3. seasons you would like to adjust physical conditions near workstation	Cannot use in regression analysis
9a. times per week went outdoors	May be a dependent variable
9b. primarily to get fresh air	Modifies 9a.
10. satisfaction with physical conditions at workstation last week	Not useful in last year analysis
11. satisfaction with overall conditions at workstation last year	Could be dependent variable
12. has environment improved in last year	Could be dependent variable
13. does environment improve during the day	Not clear how to interpret
PART V	
1. day of week survey completed	No relation to symptoms
5. room number; phone number	Violates confidentiality
6. essay question	Not analyzable by regression

Table 5. AIR HANDLING UNITS AT WATERSIDE MALL, AREAS SERVED, AND MEASURED OR ESTIMATED SUPPLY AIR FLOW RATE CAPACITIES IN CUBIC FEET PER MINUTE (CFM)

No.	ID	Service Area Sector	Floor	Sample Room	Supply Air Capacity[a] (CFM)	(Tons)	Occupants	CFM/Occ.
1	1	M3	3	3402	15809		108	146
2	4	M3	3	3234	16105		85	189
3	5	M3	3	3201	9636		142	68
4	6	M3	3	3002	28440		139	205
5	8	M3	3	3702A	11329		60	189
6	9	M3	3	3702C	17635		73	242
7	12	M3	3	3600	11422		57	200
8	13	M3	3	3100	12036		59	204
9	2	M2	2	2107	10095		31	326
10	3	M2	2	2501	12566		24	524
11	10	M2	2	2701	7644		26	294
12	14	M2	2	2102	10282		109	94
13	16	M2	2	2817	10780		68	159
14	18	M2	2	2821	14400		92	157
15	19	M2	2	2603	7562		19	398
16	20	M2	2	2632	8921		32	279
17	21	M2	2	2902	15574		49	318
18	A	M2	2	2411	2100[b]		7	300
19	B	M2	2	2123	2255		8[c]	282
20	C	M2	2	2322	2100[b]		14[c]	150
21	D	M2	2	2517	2100[b]		3	700
22	E	M2	2	2435	3285		24	137
23	F	M2	2	2522	?		0	---
24	G	M2	2	2615	1650		9[c]	183
25	H	M2	2	2612	1300		12[c]	108
26	15	SW,M2	2	2	27868		114	244
27	SW-2	SW	2	256	6038	15	8	755

Table 5.(cont.) AIR HANDLING UNITS AT WATERSIDE MALL, AREAS SERVED, AND SUPPLY AIR FLOW RATE CAPACITIES IN CUBIC FEET PER MINUTE (CFM)

No.	ID	Service Area Sector	Fl	Sample Room	Supply Air Capacity (CFM)	(Tons)	Occupants	CFM/Occ.
28	SE2-1	SE	2	214	25325	85	197	129
29	SE2-2	SE	2	256	3605	10	30	120
30	SE3-1	SE	3	300	10665	45	85	125
31	SE3-2	SE	3	312	12700	45	83	153
32	NEG-1	NE	B	1	12800	40	11	1160
33	NEG-2	NE	B	15	12800	40	46	278
34	NEG-3	NE	G	4	16000	50	38	421
35	NEG-4	NE	G	13	8000	25	49	163
36	NE1	NE	1	102	20800	65	160	130
37	NE2	NE	2	202	20800	65	192	108
38	NE3-1	NE	3	300	16000	50	58	276
39	NE3-2	NE	3	308	16000	50	84	190
40	LG-1	MLG	LG	LG100	8000	25	66	121
41	G-1[d]	MG	G	G100	9600	30	133	72
42	ETB	ET	B	55	7219		38	190

[a] Supply air capacities in CFM for 31 AHUs provided from measurements in March, 1989; design capacities for remainder (in tons) are based on information from M. Shamus, EPA. Translation from tons to CFM for AHUs # 32-42 is calculated as one ton = 320 CFM.

[b] These capacities calculated by averaging the capacities of units B,D,G, and H.

[c] Number of people returning questionnaires, when this number is larger than the number given by the EPA Directory.

[d] The sum of two air handling units, each of 15-ton capacity.

Table 6. ESTIMATED SUPPLY AIR FLOW RATES AND NUMBER OF OCCUPANTS SERVED BY AIR HANDLING UNITS ON EACH FLOOR OF THE TOWERS, FAIRCHILD, AND CRYSTAL MALI

	Number of Occupants on Each Floor						Measured Supply Air Capacities (cfm)	
	East Tower			West Tower				
Fl.	ET1	ET2	ET3	WT1	WT2	WT3	ET1	ET2
1	14	30	---	---	---	---	5000	4750
2	30	36	---	20	27	---	5890	5090
3	52	37	---	27	35	---	7670	6855
4	40	30	19	39	33	14	4630	4213*
5	38	24	32	38	34	25	4540	4131*
6	28	19	30	20	42	41	4320	3931*
7	41	29	40	33	41	33	4840	4404*
8	35	42	17	23	33	26	4290	3904*
9	17	30	49	25	42	17	4360	3968*
10	30	18	32	34	37	5	4690	4268*
11	31	35	27	23	30	4	4100	3870
12	15	12	19	16	18	0	4380	3890
Tot	367	342	265	298	370	165	58710	53470

Supply Air Flow Rates by Floor (cfm) Estimated from Design Capacities for West Tower, East Tower-3, and Fairchild and Crystal Mall Air Handling Units:

WT1	6564 (1-12)	WT2	5062 (1-12)	WT3	4121 (4-11)
ET3	3002 (4-11)	CM	17812 (2-11)	FC	12645 (1-8)

Estimated Per Capita Supply Air Flow Rates (cfmp):

Fl.	ET1	ET2	ET3	WT1	WT2	WT3
1	357	158	---	---	---	---
2	196	141	---	328	187	---
3	148	185	---	274	145	---
4	116	140	158	168	153	294
5	119	172	94	173	149	165
6	154	207	100	328	120	100
7	118	152	75	199	123	125
8	123	93	176	285	153	159
9	256	132	61	263	121	242
10	156	237	94	193	137	824
11	132	111	111	285	169	999
12	292	324	158	410	281	---

Crystal (CM-2)		
Floor	No. Occ.	Per Capita Flow Rate
2	115	155
7	128	139
8	138	129
10	127	140
11	94	189

Fairchild (FC)		
2	106	127
3	116	116
5	106*	113
6	83	163
7	105	128
8	123	110

* Calculated values

Table 7. PRINCIPAL COMPONENTS ANALYSIS OF HEALTH SYMPTOMS

FACTOR	(PERCENT OF VARIANCE EXPLAINED)	HEALTH SYMPTOM INCLUDED[a] IN FACTOR	QUESTION NUMBER[b]
PAIN	(9.9)	aching muscles or joints	u
		upper back pain or stiffness	cc
		lower back pain or stiffness	dd
		shoulder/neck pain or numbness	ee
		hand/wrist pain or numbness	ff
CENTRAL NERVOUS SYSTEM (CNS)	(9.8)	difficulty remembering	w
		feeling depressed	y
		tension or nervousness	z
		difficulty concentrating	aa
EYES	(8.9)	dry, itching, or tearing eyes	j
		sore/strained eyes	k
		blurry/double vision	l
		burning eyes	m
NOSE	(8.2)	runny nose	c
		stuffy nose/sinus congestion	d
		sneezing	e
		cough	f
CHEST	(7.7)	wheezing	g
		shortness of breath	h
		chest tightness	i
THROAT	(7.0)	sore throat	n
		hoarseness	o
		dry throat	p
FLU	(5.6)	chills	s
		fever	t
FATIGUE	(4.8)	unusual fatigue or tiredness	q
		sleepiness or drowsiness	r
HEADACHE	(4.3)	headache	a
		nausea	b
DIZZY	(not selected)	dizziness	x
DRY SKIN	(not selected)	dry skin	bb
CONTACTS	(not included)	problems with contact lenses	v

[a] Factor loading > 0.5
[b] Part II, Question 7, symptoms experienced "last year" in building

Table 8. PRINCIPAL COMPONENTS ANALYSIS OF COMFORT CONCERNS

FACTOR (PERCENT OF VARIANCE EXPLAINED)		COMFORT CONCERN INCLUDED[a] IN FACTOR	QUESTION NUMBER[b]
HOT STUFFY AIR	(28)	too little air movement	b
		want to adjust air movement	c
		too hot	d
		want to adjust temperature	f
		too stuffy	j
DRY AIR	(20)	too dry	h
		want to adjust humidity	i
COLD DRAFTY AIR	(16)	too much air movement	a
		too cold	e
HUMID AIR	(10)	too humid	g

[a] Factor loading > 0.5
[b] From Part III, Question 1, conditions during last year

Table 9. PRINCIPAL COMPONENTS ANALYSIS OF ODORS

FACTOR (PERCENT OF VARIANCE EXPLAINED)		ODOR INCLUDED[a] IN FACTOR	QUESTION NUMBER[b]
PAINT	(15)	chemicals (glue, cleansers...)	l
		pesticides	m
		cleaning of carpets, drapes...	n
		paint	o
COSMETICS	(13)	body odor	a
		cosmetics (perfume, after-shave..)	b
		food smells (not including fish)	e
COPIER	(12)	photocopying machine	j
		printing press, binding	k
CARPET	(12)	new carpet	g
		new drapes or curtains	h
MUSTY	(10)	fishy smells	d
		musty or damp basement smells	f
		diesel or engine exhaust	i
SMOKE	(6.7)	tobacco smoke	c

[a] Factor loading > 0.5
[b] From Part III, Question 2, odors during last year at workstation

Table 10. PRINCIPAL COMPONENTS ANALYSIS OF PSYCHOSOCIAL VARIABLES

FACTOR (PERCENT OF VARIANCE EXPLAINED)	PSYCHOSOCIAL VARIABLE INCLUDED[a] IN FACTOR	QUESTION NUMBER[b]
ROLE AMBIGUITY (13)	clear on job responsibility	6h
	can predict others' expectations	6i
	work objectives well defined	6j
	clear about others' expectations	6k
WORKLOAD (13)	must work very fast	6a
	must work very hard	6b
	little time to get things done	6c
	a great deal to be done	6d
JOB SATISFACTION (11)	satisfied with job	1a
	would take same job if offered	1b
	would take same job over any other	1c
	would recommend job to friend	1d
JOB CONTROL (9.3)	influence over amount of work	5a
	influence over materials needed	5b
	influence on policy, procedures	5c
	influence on work environment	5d
CONFLICTING DEMANDS (8.9)	bosses request conflicting tasks	4a
	others request conflicting tasks	4b
	requests conflict with work	4c
UNDERUTILIZATION OF SKILLS (8.5)	can use skills from school	6e
	can do things one does best	6f
	can use skills from experience	6g
SALARY SATISFACTION[c] (6.1)	satisfied with salary	2
	satisfied with oppor. to advance	3

[a] Factor loading >0.5
[b] From Part IV, Questions 1-6
[c] This factor not used in analysis

Table 11. NUMBER OF RESPONDENTS ASSIGNED TO EACH CELL IN THE BINARY VARIABLES CREATED FOR THE LOGISTIC ANALYSIS

Dependent Variable	Females		Males	
	no	yes	no	yes
HEALTH SYMPTOMS				
headache and nausea	1273	742	1568	322
stuffy nose/sinus congestion, runny nose	1447	558	1553	324
wheezing, shortness of breath	1704	308	1713	169
dry, itching, tearing eyes	1553	456	1648	232
sore throat, hoarseness, dry throat	1530	489	1604	276
sleepiness, unusual fatigue	1648	372	1705	183
chills and fever	1370	653	1580	308
aching muscles, back pain, neck pain	1609	399	1687	194
difficulty concentrating, depression, tension	1508	497	1544	337
dizziness	1449	571	1625	267
dry itchy skin	1487	532	1585	304
problems with contact lenses	301	176	225	80
COMFORT CONCERNS				
hot stuffy air	1291	611	1396	443
dry air	1225	709	1384	479
cold drafty air	1048	896	1295	578
humid air	1360	597	1452	414
ODORS				
fresh paint, carpet cleaning, other chemicals	1350	614	1471	381
cosmetics, food, body odor	1478	491	1626	248
photocopies, printing process	1758	220	1713	168
new carpet or drapes	1640	336	1564	312
musty/damp odor, engine exhaust, fishy smell	1498	480	1472	400
tobacco smoke	1687	303	1646	237

Tables 12-33. RESULTS OF LINEAR AND LOGISTIC REGRESSIONS

The following tables present the results of the second set of linear regressions side by side with the results of the logistic regressions. In both sets of regressions, the dependent variables were 12 health factors, 4 comfort factors, and 6 odor factors. Thus there are 22 tables in all.

For the linear regressions, the independent variables included 56 questionnaire items dealing with personal and workspace characteristics, 66 variables representing air handling units or other spatial variables such as floor within a building or tower, and four variables representing the carpet installed the previous year--a total of 126 independent variables. The 10 comfort and odor variables were added to these 126 independent variables in a separate set of regressions carried out on the 12 health factors. Both sets were run for males and females separately.

For the logistic regressions, only those variables that had appeared at the 0.05 level of significance in the linear regressions were included in the model. Thus instead of 126 or 136 independent variables, most of the logistic regressions included between 20 and 40 independent variables. The identical procedure of running separate regressions by gender and including or excluding the comfort and odor factors as independent variables for the 12 health factors was followed.

Thus for each of the 12 health factors, 8 separate regressions were run (linear/logistic, male/female, with/without the comfort and odor factors as independent variables). For each of the 10 comfort and odor factors considered as dependent variables, 4 regressions (linear/logistic, male/female) were run.

All independent variables that appeared at the 0.001 level of significance for at least one regression are listed with a "+++" or "---" sign, depending on the direction of the effect. If the level of significance was between 0.001 and 0.01, the variables are marked with "++" or "--". If any of these variables appeared in any other regression at a significance level between 0.05 and 0.01, it was marked with a single "+" or "-".

For each health symptom, the personal and workplace variables have been presented first, followed by the comfort and odor variables (the latter appeared in only half of the regressions). For those interested in the

effects of the spatial variables, the air handling unit (AHU) variables have been separated from the other workplace variables.

To make it easier to identify the most important explanatory factors, those with the largest number of significant associations are listed first.

Table 12. HEADACHE AND NAUSEA

VARIABLE	COMFORT AND ODOR VARIABLES EXCLUDED				COMFORT AND ODOR VARIABLES INCLUDED			
	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
SENSITIVE TO CHEMICALS	+++	+++	+++	+++	+++	++	++	++
WORKLOAD	++		+++	+++	++		++	++
GLARE	+++	+++	++		++	+		
MOLD ALLERGIES			++	++			+	++
DUST	++	+	++	++				
NOISE		++	+++	++			+	
EDUCATION	---	-			---	-		
EXTERNAL STRESS	++	+			+			
NONSMOKER	++	+					+	
ROLE AMBIGUITY			++	+			+	
AHU WT1FL67	--	-			-			
AHU CM7							+	++
AHU ET1FL67							+	++
Comfort and Odor Variables								
HOT, STUFFY AIR					+++	+++	+++	+++
DRY AIR					+		+	++
ODOR OF PAINTS, CARPET CLEANING					+++	++	+	++
ODOR OF NEW CARPETS							++	++

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 13. STUFFY NOSE/SINUS CONGESTION, RUNNY NOSE, SNEEZING, COUGH

	COMFORT AND ODOR VARIABLES EXCLUDED				INCLUDED			
VARIABLE	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
ALLERGY TO DUST	+++	+++	+++	+++	+++	+++	++	+++
DUST	+++	+++	+++	+++	++	+	+++	+++
ALLERGY TO MOLDS	++	+	+++	+	+		+++	+
ALLERGY TO POLLEN	++	++			++	+++		
LESS THAN 30	---	---			--	--		
CONFLICTING DEMANDS	+++	++	++	+		NI	+	NI
GLASSES	++	NI		NI	++	++		
HOURS AT COMPUTER	++	+			+	+		
SENSITIVE TO CHEMICALS	+	++		++				
AHU 4	++	+			+	+		
AHU 13	+				++			
AHU 20					++			
Comfort and Odor Variables								
HOT STUFFY AIR					++	+	+++	+++
DRY AIR					++	+++	+	
COLD AIR					++	+++		
ODOR OF PAINT AND CARPET CLEANING					++	++		

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 14. WHEEZING, SHORTNESS OF BREATH, CHEST TIGHTNESS

	COMFORT AND ODOR VARIABLES							
	EXCLUDED				INCLUDED			
VARIABLE	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
ASTHMA	+++	+++	+++	+++	+++	+++	+++	+++
CONFLICTING DEMANDS	+++	+++			++	+++		
DUST		++	+++	+++			+	+
NO COLLEGE EDUCATION	++	+++			+	+++		
SENSITIVE TO CHEMICALS	+	+++	++	+++				
WALLS RECENTLY PAINTED	++	++			++			
SOLE PROVIDER	+	++			+	++		
AGE < 30	-	--			-			
NEW CARPET, TACKED DOWN, OFF.	+	++						
ALLERGY TO ANIMALS	+				+++			
ALLERGY TO DUST					-	--		
AHU G1LG1	++	+		NE	++			NE
AHU 16						++	+	
Comfort and Odor Variables								
HOT STUFFY AIR					+	+++	+++	+++
ODOR OF NEW CARPETS							+++	
ODOR OF PHOTOCOPIES AND PRINTING					+		++	
ODOR OF PAINT AND CARPET CLEANING					+++	+++		+
ODOR OF MUST/DAMPNESS					+			++

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 15. DRY, ITCHING OR TEARING EYES, SORE EYES, BURNING EYES, BLURRY VISION

	COMFORT AND ODOR VARIABLES							
	EXCLUDED				INCLUDED			
VARIABLE	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
CONTACTS WORN TO WORK	+++	+++	+++	+++	+++	+++	+++	+++
WORKLOAD	+++	+++	++	+++	++	++	++	++
SENSITIVE TO CHEMICALS	+++	+++	+++	+++	+++	++	+	+++
ALLERGIES TO MOLDS	+++	++	+++	+	++	++	+++	+
GLARE	+++	+++	+++		+++	+++	+	
DUST	+++	+	+++	+++				
WALLS RECENTLY PAINTED	++	+++			+	++	-	
HOURS AT COMPUTER	++	+			++	+		
GLASSES WORN TO WORK	+++				+++	+		
USE HEATER	+	++		+	+	+		
NO WINDOW			++	++				
EXTERNAL STRESS				++				
WATER LEAKS			++					
AHU 16			+	+++			++	++
Comfort and Odor Variables								
HOT STUFFY AIR					++	+++	++	+++
DRY AIR					++	+	+++	+++
ODOR OF PHOTOCOPYING					++	+++	+	++
ODOR OF COSMETICS, BODY ODOR, FOOD							++	+++

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 16. SORE THROAT, HOARSENESS, DRY THROAT

VARIABLE	COMFORT AND ODOR VARIABLES EXCLUDED				INCLUDED			
	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
SENSITIVE TO CHEMICALS	++	++	+++	++			++	+
DUST	+++	+++	+++	+++				
ALLERGIES TO MOLDS	+	++	+++	+		+	+++	+
NEW CARPET TACKED DOWN, OFF.	++	++	++	+	+		+	
NEW FURNITURE	++	++		+	+			+
NO WINDOW			++	+++			+	+
SOLE PROVIDER	+++	+			+++			
GLARE	++			+	+			
CONFLICTING DEMANDS		+++	+					
EXTERNAL STRESS			++				+	
USE FAN							--	
AHU NEG-1,2	-		---	NE			--	
AHU NEG-4	--		-		--			
AHU ET3FL8-11			--	-				
AHU SE32					+	+++		
Comfort and Odor Variables								
DRY AIR					+++	+++	+++	+++
COLD AIR					++	+++		
ODOR OF PAINT, CARPET CLEANING					+++	+++	+	+++
ODOR OF NEW CARPET							++	
ODOR OF COSMETICS, BODY ODOR								++

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 17. SLEEPINESS, UNUSUAL FATIGUE

	COMFORT AND ODOR VARIABLES							
	EXCLUDED				INCLUDED			
VARIABLE	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
JOB DISSATISFACTION	+++	+++	+	++	+++	++	+	
SENSITIVE TO CHEMICALS	+++	+++	++		++	+++	+	
DUST	++	++	+++	+				
EXTERNAL STRESS	++		++	+	+		+	+
GLARE	++	+	++	+	+			
ALLERGIES TO MOLDS			+++	+			++	
NO COLLEGE EDUCATION	+++	+			+++			
NO WINDOW			+++	+++			+	
WATER LEAKS			++	++				
PRIVATE OFFICE				---				--
PRIVATE CUBICLE OR 1 MATE				--				-
LASER PRINTER NEAR	--				-			
NOISE			++					
TOO DIM		+++						
Comfort and Odor Variables								
HOT STUFFY AIR					+++	+++	+++	+++
ODOR OF PAINT, CARPET CLEANING					++	++		
ODOR OF COSMETICS, BODY ODOR					+	+++		
ODOR OF NEW CARPET							++	+

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 18. CHILLS AND FEVER

VARIABLE	COMFORT AND ODOR VARIABLES EXCLUDED				INCLUDED			
	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
USE HEATER	++	+	+++	+++			+++	
NO COLLEGE EDUCATION	++	++		+	+	++		++
CONFLICTING DEMANDS	+++	+++		++				
HOURS AT WORK			+	++			+	++
DUST	++	+++		+				
SOLE PROVIDER	+++				+++			
GLARE			++	+		+	+	+
SENSITIVE TO CHEMICALS			++	+				
NEW CARPET	+	--						
HIGH PAY	-	--						
NOISE			+	++				
AHU 21			++				++	
AHU CM FL2	--	--			--	-		
Comfort and Odor Variables								
COLD AIR					+++	+++	+++	+++
DRY AIR							+	+++
ODOR OF PAINT, CARPET CLEANING					+++	++	+	++
ODOR OF DAMPNESS/MUSTY					+++	+	+	+
ODOR OF COSMETICS, BODY ODOR					++	++		

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 19. ACHING MUSCLES OR JOINTS, PAIN IN BACK, SHOULDER, NECK, WRISTS

	COMFORT AND ODOR VARIABLES							
	EXCLUDED				INCLUDED			
VARIABLE	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
GLARE	+++	+++	+++	+++	+++	+++	+++	+++
ALLERGIES TO MOLDS	+	++	+++	+++		++	+++	+++
UNCOMFORTABLE WORKSTATION	++	+++	++		+	+++	++	+
LESS THAN 30	--	---			--	---		
HIGH PAY	--	---			-	--		
SENSITIVE TO CHEMICALS	++	+	+	+			+	++
WORKLOAD	++	+			+	+++		
NOISE	++	+	++	+				
LIVE ALONE			+++	+			++	+
DIM LIGHT	++		+	++				
CONFLICTING DEMANDS	++	++	+					
WATER LEAKS	++				+			
DUST	++	+						
SOLE PROVIDER	++				+			
LASER PRINTER NEAR	--				-			
AHU 21			++				+++	
AHU 9			++				++	
AHU G1LG1	+++				+			
AHU FC FL6	+				++			
Comfort and Odor Variables								
COLD AIR					+	+++		
ODOR OF COSMETICS, BODY ODOR, OTHER FOOD					++	+++	+++	+
ODOR OF PAINT, CARPET CLEANING					+++	+		

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 20. DIFFICULTY CONCENTRATING, REMEMBERING; DEPRESSION, TENSION

	COMFORT AND ODOR VARIABLES EXCLUDED				INCLUDED			
VARIABLE	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
JOB DISSATISFACTION	+++	+++	+++	+++	+++	+++	+++	+++
WORKLOAD	+++	+++	++	+++	+++	+++	++	+++
CONFLICTING DEMANDS	++	+	+++	++	++	+	+++	++
SENSITIVE TO CHEMICALS	++	+++	+	++	+	+++	+	++
ROLE AMBIGUITY		+	+++	++	+	++	++	++
NOISE	++	+	+++	++	++	NI		NI
DUST	+++	+++			++	NI		NI
WATER LEAKS	+		+++	+	+		++	
GLARE	+	+	++		+	++		
LIVE ALONE			++	+			+	
USE FAN					--	-	-	-
EXTERNAL STRESS			+	++		NI	+	NI
AHU SE 2-1	+	+			++	+		
AHU ET2 FL6-7	+				++			
Comfort and Odor Variables								
HOT STUFFY AIR					++	+	+++	+++
ODOR OF COSMETICS, BODY ODOR					++	++		+
ODOR OF PAINT, CARPET CLEANING					++	++		
ODOR OF TOBACCO SMOKE					++			

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 21. DIZZINESS

VARIABLE	COMFORT AND ODOR VARIABLES EXCLUDED				COMFORT AND ODOR VARIABLES INCLUDED			
	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
SENSITIVE TO CHEMICALS	+++	+++	++	++	+++	+++		+++
DUST	+++	+++		++	+	++		
WORKLOAD	+++	++			++	+++		
NEW CARPET, GLUED DOWN, CORRIDOR			+++	+		+	++	
NEW CARPET, TACKED DOWN, CORRIDOR			+++	+			++	
NEW CARPET, TACKED DOWN, OFFICE			++			+	+	
NEW CARPET			++	+				
CONFICTING DEMANDS	+	++		++				
NO COLLEGE EDUCATION	+	+++			+	++		
GLASSES			+	+		NI	++	NI
ALLERGIES--OTHER			+	+		NI	++	NI
NO WINDOW			+	++			+	
AHU FC 8			---	-				
AHU ET2 FL 1-3			---	-			-	
AHU ET2 FL 8-9			---	-				
AHU ET3 FL 4-7			---					
AHU WT1 FL 4-5			---					
AHU WT1 FL 6-7			---	-			-	
AHU WT1 FL 10-11			---					
AHU WT2 FL 1-3			---					
AHU WT2 FL 10-11			---					
AHU WT3 FL 4-7			---	-				
AHU SE 2-1	+	++						
AHU SE 2-2	+	++			+	+		
Comfort and Odor Variables								
HOT STUFFY AIR					+	+++		+++
ODOR OF PAINT, CARPET CLEANING					+++	+++		+++
ODOR OF NEW CARPET						+	++	

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 22. DRY OR ITCHY SKIN

VARIABLE	COMFORT AND ODOR VARIABLES EXCLUDED				COMFORT AND ODOR VARIABLES INCLUDED			
	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
ECZEMA	+++	+++	+++	+++	+++	+++	+++	+++
DUST	+++	+++	+++	+++	+	+++		
USE HEATER	++	+++			++	+++		
MEDIUM PAY	+++	+			++	++		
NEW CARPET, TACKED DOWN, COR	--	--	+		-	---	+	
ALLERGY TO MOLDS	++	+++						
UNCOMFORTABLE WORKSTATION	++	+						
GLARE			+++	+		NI	+	NI
SENSITIVE TO CHEMICALS			++	+		NI	+	NI
AHU WT2 1-3	++	+	-		++	NI		NI
AHU ET1 FL 8-9	++	++	-		+	+	-	
AHU ET B			--	NE				
AHU ET3 FL 4-7			--	-				
AHU CM FL 2	-	--						
Comfort and Odor Variables								
DRY AIR					+++	+++	++	+++
ODOR OF NEW CARPET						NI	--	NI
ODOR OF TOBACCO SMOKE						---		

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 23. PROBLEMS WITH CONTACT LENSES

VARIABLE	COMFORT AND ODOR VARIABLES EXCLUDED				INCLUDED			
	FEMALE		MALE		FEMALE		MALE	
	LIN	LOG	LIN	LOG	LIN	LOG	LIN	LOG
JOB DISSATISFACTION	++		+	++		NI	+	NI
HOURS AT WORKSTATION			++	+		NI	++	NI
DUST	++	++		+				
DUST ALLERGIES	+	++			+	+++		+
USE LAMP	+	++			+	++		
JOB CONTROL						NI	--	NI
EXTERNAL STRESS			+			NI	++	NI
UNCOMFORTABLE WORKSTATION						NI	++	NI
WORKLOAD			+	++		NI	+	NI
Comfort and Odor Variables								
ODOR OF COSMETICS, BODY ODOR					+	+++		

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 24. HOT STUFFY AIR

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
USE FAN	+++	+++	+++	+++
DUST	+++	+++	+++	+++
DIM LIGHT	++	++	+++	++
GLARE	+++	++	+++	+
WORKLOAD	+	+++	++	+++
NOISE	+	+	+++	++
NO WINDOW	+		+++	+++
ENCLOSED OFFICE/PRIVATE OFFICE	++	+	++	
UNCOMFORTABLE WORKSTATION	+++		+	
ABILITIES UNDERUTILIZED	++	+		
SENSITIVE TO CHEMICALS	++	+		
MOLD ALLERGIES	+	++		
NEW CARPET TACKED DOWN, OFFICE			+++	
NEW CARPET, GLUED DOWN, CORRIDOR			++	
NEW CARPET TACKED DOWN, CORRIDOR		-	++	
MID-HEIGHT CUBICLES			++	
COPIER NEARBY			++	
AGE > 40			--	
AHU NEG-1, NEG-2	-		---	
AHU NEG-4			--	
AHU FC 8			--	
AHU ET			--	
AHU WT			--	

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 25. DRY AIR

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
DUST	+++	+++	+++	+++
UNCOMFORTABLE WORKSTATION	+++	++	++	++
NOISE	+	++	+++	++
DIM LIGHT	+	++	++	++
GLARE		+	+++	++
CONFLICTING DEMANDS			++	+++
MOLD ALLERGIES	+	++		+
PRIVATE OFFICE		+++		
AHU 16	++	++	+++	+++

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 26. COLD DRAFTY AIR

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
USE HEATER	+++	+++	+++	+++
NOISE	+++	+++	+++	+++
USE FAN	---	---	--	-
CONFLICTING DEMANDS	++	++	+	+
DUST			+++	++
WINDOW			++	+
WORKLOAD			--	
HOURS AT COMPUTER	++			
HIGH PAY	--			
AHU CM FL 2,7,8,10	--	---	-	---
AHU FC FL 7	-	---	---	NE
AHU FC FL 6	-		--	--
AHU 14	+++	++	+++	++
AHU 16			++	++
AHU 15SW2			++	++
AHU 9		++		++
AHU NE 3-2	++	+		
AHU WT1 FL 6,7,10,11	+		+	++

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 27. HUMID AIR

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
USE FAN	+++	+++	+++	+++
LOW PAY	+++	+++	++	+++
DUST	++	+++	++	+++
SENSITIVE TO CHEMICALS	++	+++		
ALLERGIES--OTHER			--	+
CONFLICTING DEMANDS	++			
NONSMOKER	-	--		
AHU 21		++	+++	++
AHU 10	++	++		
AHU 2			+++	++
AHU 20			+	++
AHU G1LG1	+++			

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 28. ODOR OF PAINT, CARPET CLEANING, OTHER CHEMICALS

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
WALLS RECENTLY PAINTED	+++	+++	+++	+++
SENSITIVE TO CHEMICALS	+++	+++	+++	+++
DUST	+++	+++	+++	+++
USED CHEMICALS AT WORKSTATION	+++	+++	++	++
NOISE		++	+	+++
GLARE			+++	+++
WALLS RECENTLY REARRANGED	++	+		
CONFLICTING DEMANDS	++		+	+
WINDOW		-	-	---
GLASSES			-	--
AHU 15 SW 2	++	+++		++
AHU ET3 FL 8-11			--	--
AHU G1LG1	+++			

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 29. ODOR OF COSMETICS. BODY ODOR, FOOD

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
CONFLICTING DEMANDS	+++	+++	+	+++
DUST		++	+++	+++
HIGH PAY		--	--	--
GLARE		+++	++	+
NOISE		+	+++	++
WATER LEAKS	+		+++	++
USE FAN	+++	++		
NO COLLEGE EDUCATION	+++	+++		
WINDOW	--			
USE LAMP			++	+
AHU CM 2,7	++	+		
AHU ETB	-		--	NE

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 30. ODOR FROM PHOTOCOPIES, PRINTING

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
PHOTOCOPIER PRESENT	+++	+++	+++	+++
DUST	++	+++	++	+++
CONFLICTING DEMANDS	+++	++	++	+++
SENSITIVE TO CHEMICALS	++	+++	++	+
PRIVATE OFFICE		--		-
WINDOW			-	--
ECZEMA	++	+		
LIVE PLANTS			++	+
GLARE			+	++
GLASSES			-	--
NONSMOKERS			-	---
WORKED > 1 HR ON PHOTOCOPIER		++		
AHU G1LG1	+++	+	+++	
AHU NEG3-4			--	NE

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 31. ODOR FROM NEW CARPET OR DRAPES

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
NEW CARPET PRESENT	+++	+++	+++	+++
NEW CARPET, TACKED DOWN, OFFICE	+++	+++	+++	+++
NEW CARPET, GLUED DOWN, OFFICE	+	++	++	+++
DUST	+	+++	+++	+++
NEW CARPET, TACKED DOWN, CORRIDOR	++		+++	+
NEW CARPET, GLUED DOWN, CORRIDOR	+		++	
WALLS RECENTLY PAINTED		+	++	++
SENSITIVE TO CHEMICALS	+++	+++		
CONFLICTING DEMANDS	++	+		
ROLE AMBIGUITY			-	--
AHU ET1 FL67	--		--	
AHU NEG-1, NEG-2	-	NE	---	--
AHU WT2 FL 6-7,10-11	--		--	
AHU ET3 FL 8-11			---	

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 32. MUSTY OR DAMP ODOR, DIESEL EXHAUST

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
DUST	+++	+++	+++	+++
WATER LEAKS	++		+++	+++
CONFLICTING DEMANDS	+++	++		+++
USE LAMP		++	+	++
GLARE		++	++	+
ALLERGIES TO MOLDS	+++	++		
UNDERUTILIZATION OF ABILITIES			+	++
NEW CARPET, TACKED DOWN, OFFICE			++	+
AHU 15 SW 2	+++	+++	+++	+++
AHU G1LG1	+++	+	+	
AHU 16		+	++	+++
AHU 2			++	++
AHU ET1 FL 10-11			--	
AHU 19,G,H			++	

LIN = Linear least-squares regression
LOG = Logistic regression
+++,--- = Significant at $p < 0.001$
++,-- = Significant at $0.001 < p < 0.01$
+,- = Significant at $0.01 < p < 0.05$
NE = Not estimated--mathematical singularity
NI = Not included

Table 33. TOBACCO SMOKE

VARIABLE	FEMALE		MALE	
	LIN	LOG	LIN	LOG
SENSITIVE TO CHEMICALS	+++	+++	+++	+++
DUST		+++	++	+++
WATER LEAKS		+++	++	+
CONFLICTING DEMANDS	+	++		++
ALLERGIES TO POLLEN	-	--		
NONSMOKER	+++			
AHU WT1 FL1-3	+++	+++	+++	+++
AHU NEG-1,2	++	+	+	++
AHU CM FL11	++		+	++
AHU G1LG1	+++	+	+	+
AHU 14	++			+
AHU CM NOFL		++	+	
AHU 13			+	++

LIN - Linear least-squares regression
LOG - Logistic regression
+++,--- - Significant at $p < 0.001$
++,-- - Significant at $0.001 < p < 0.01$
+,- - Significant at $0.01 < p < 0.05$
NE - Not estimated--mathematical singularity
NI - Not included

Table 34. VARIABLES APPEARING AT THE $p < 0.01$ SIGNIFICANCE LEVEL FOR EACH OF THE 12 HEALTH SYMPTOMS

Independent Variable	HEAD		NOSE		CHEST		EYES		THROAT		TIRED		CHILLS		ACHES		DEPRES		DIZZY		SKIN		LENS		TOTAL	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Personal/Workplace (Max = 48 + 48)																										
Personal: physical/medical																										
sensitivity to chemicals	4	4	1	1	1	2	4	3	2	3	4	1	0	1	1	1	3	2	4	3	0	1	0	0	24	22
mold allergy	0	3	1	2	0	0	4	2	1	2	0	2	0	0	2	4	0	0	0	0	2	0	0	0	10	15
dust allergy	0	0	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7	4
under 30	0	0	-4[a]	0	-1	0	0	0	0	0	0	0	0	0	-4	0	0	0	0	0	0	0	0	0	9	0
asthma	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
eczema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	4	4
contact lens worn to work	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
glasses worn at work	0	0	1	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	3
pollen allergy	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Personal: psychological/social																										
workload	2	4	0	0	0	0	4	4	0	0	0	0	0	0	2	0	4	4	4	0	0	0	0	1	16	13
conflicting demands	0	0	2	1	4	0	0	0	1	0	0	0	2	1	2	0	2	4	1	1	0	0	0	0	14	7
job dissatisfaction	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	4	4	0	0	0	0	1	1	9	6
no college education	2	0	0	0	2	1	0	0	0	0	2	0	3	1	0	0	0	0	2	0	0	0	0	0	11	2
sole provider	0	0	0	0	2	0	0	0	2	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	7	0
external stress	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	1	2	5
role ambiguity	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	1	5
hours at workstation	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	4
hours at computer	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
live alone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	2
Workplace:																										
dusty office	1	2	3	4	1	2	1	2	2	2	2	1	2	0	1	0	3	0	3	1	3	2	2	0	24	16
glare	3	1	0	0	0	0	4	1	1	0	1	1	0	1	4	4	1	1	0	0	0	1	0	0	14	10
noise	1	2	0	0	0	0	0	0	0	0	0	1	0	1	1	1	2	2	0	0	0	0	0	0	4	7
use portable heater	0	0	0	0	0	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	4	0	0	0	6	3
no window	0	0	0	0	0	0	0	2	0	2	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	7
uncomfortable workstation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	1	0	0	1	4	3
water leaks	0	0	0	0	0	0	0	1	0	0	0	2	0	0	1	0	0	2	0	0	0	0	0	0	1	5
walls recently painted	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0
new carpet, tacked down, office	0	0	0	0	1	0	0	0	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3	2
new carpet, tacked down, hallway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	-3	0	0	0	3	2
AHU 21 (Library area, WSM)	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	4
AHU 16 (2nd floor, WSM)	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
lights too dim	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	2	1
Comfort/Odor (Max = 24 + 24)																										
hot stuffy air	2	2	1	2	1	2	2	2	0	0	2	2	0	0	0	0	1	2	1	1	0	0	0	0	10	13
dry air	0	1	2	0	0	0	1	2	2	2	0	0	0	1	0	0	0	0	0	0	2	2	0	0	7	8
cold air	0	0	2	0	0	0	0	0	2	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	7	2
odor of paint, chemicals	2	1	2	0	2	0	0	0	2	1	2	0	2	1	1	0	2	0	2	1	0	0	0	0	17	4
odor of cosmetics, body, food	0	0	0	0	0	0	0	2	0	1	1	0	2	0	2	1	2	0	0	0	0	0	1	0	8	4
odor of new carpets	0	2	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	7
odor of photocopying, printing	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2

[a] Negative sign indicates significantly lower frequency of health symptoms

Table 35. VARIABLES ASSOCIATED[a] WITH AT LEAST FOUR OF THE 12 HEALTH FACTORS

Workplace Characteristics	
Dust	(headache; nasal, chest, eye, throat symptoms; fatigue; chills; difficulty concentrating[b]; dizziness; dry skin; contact lens problems)
Glare	(headache; eye symptoms; fatigue; difficulty concentrating; pain[c])
Personal Characteristics	
Chemical Sensitivity	(headache; nasal, chest, eye, throat symptoms; fatigue; pain; difficulty concentrating; dizziness)
Mold Allergies	(headache; nasal, eye, throat symptoms; fatigue; pain; dry skin)
No College	(headache, chest symptoms, fatigue, chills and fever, dizziness)
Psychosocial Characteristics	
Workload	(headache, eye symptoms, pain, difficulty concentrating, dizziness)
Conflicting Demands	(nasal, chest symptoms; chills and fever, pain, difficulty concentrating, dizziness)
Comfort and Odor Characteristics[d]	
Hot Stuffy Air	(headache; nasal, eye, chest symptoms; fatigue; difficulty concentrating; dizziness)
Dry Air	(nasal, eye, throat symptoms; dry skin)
Odor of Paint, Chemicals	(headache; nasal, chest, throat symptoms; fatigue; chills; difficulty concentrating; dizziness)
Odor of Cosmetics	(eye symptoms, chills, pain, difficulty concentrating)

[a] Significant at $p < 0.01$ in at least two (of eight) regressions
[b] Includes difficulty concentrating/remembering, depression, tension
[c] Includes aching muscles, back pain, shoulder/neck pain, hand/wrist pain
[d] Significant at $p < 0.01$ in at least two (of four) regressions

Table 36. VARIABLES ASSOCIATED[a] WITH ONE TO THREE HEALTH FACTORS

Workplace Characteristics	
Noise	(headache, pain, difficulty concentrating)
No window	(eye, throat symptoms; fatigue)
Walls painted	(chest, eye symptoms)
Water leaks	(fatigue, dificulty concentrating)
Use heater	(chills and fever, dry skin)
AHU 21 (Library area)	(chills and fever, pain)
New carpet, tacked down, hallway	(dizziness, reduced frequency of dry skin)
New carpet, tacked down, office	(throat symptoms)
Uncomfortable workstation	(pain)
Lights too dim	(pain)
AHU 16 (2nd floor Mall)	(eye symptoms)
Personal Characteristics	
Allergy to dust	(nasal symptoms, contact lens problems)
Under 30	(reduced frequency of nasal symptoms, pain)
Glasses	(nasal, eye symptoms)
Contact lenses	(eye irritation)
Asthma	(chest symptoms)
Eczema	(dry skin)
Pollen allergy	(nasal congestion)
Psychosocial Characteristics	
Job satisfaction	(fatigue, difficulty concentrating, contact lens problems)
Sole provider	(chest, throat symptoms; chills and fever)
Hours at work	(chills and fever, contact lens problems)
Hours at computer	(eye symptoms)
External stress	(fatigue)
Role ambiguity	(difficulty concentrating)
Live alone	(pain)
Comfort/Odor Conditions[d]	
Cold air	(nasal, throat symptoms; chills and fever)
Photocopy odor	(eye irritation)
New carpet odor	(headache)

[a] Significant at $p < 0.01$ in at least two (of eight) regressions
[b] Includes difficulty concentrating/remembering, depression, tension
[c] Includes aching muscles, back pain, shoulder/neck pain, hand/wrist pain
[d] Significant at $p < 0.01$ in at least two (of four) regressions

Table 37. VARIABLES APPEARING AT THE $p < 0.01$ SIGNIFICANCE LEVEL FOR EACH OF THE 10 COMFORT AND ODOR CONCERNS

	Comfort Concerns								Odors Noticed										
	HOT		DRY		COLD		HUMID		PAINT		BODY		PRINT		CARPET		DAMP		SMOKE		TOTAL	
Independent Variable	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Personal/Workplace (Max = 20 + 20)																						
Workplace:																						
dusty office	2	2	2	2	0	2	2	2	2	2	1	2	2	2	1	2	2	2	1	2	15	20
use fan	2	2	0	0	-2[a]	-1	2	2	0	0	2	0	0	0	0	0	0	0	0	0	8	5
noise	0	2	1	2	2	2	0	0	1	1	0	2	0	0	0	0	0	0	0	0	4	9
glare	2	1	0	2	0	0	0	0	0	2	1	1	0	1	0	0	1	1	0	0	4	8
water leaks	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	2	1	1	2	5
lights too dim	2	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4
no window	0	2	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	1	5
new carpet, tacked down, office	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	2	4
walls recently painted	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	2	0	0	0	0	2	4
uncomfortable workstation	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2
photocopier present	0	1	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	2	3
use heater	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
new carpet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	2	2
private office	1	1	1	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	3	1
low pay	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2
used chemicals at workspace	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	2	2
Location: AHU #																						
15SW2	0	0	0	0	0	2	0	0	2	1	0	0	0	0	0	0	2	2	0	0	4	5
16	0	0	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	6
G1-LG1	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	1	0	1	0	5	1
NEG-1,2	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	1	1	1	4
14	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	2
WT1 FL 1-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
CM 2,7,8,10	0	0	0	0	-2	-1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	1
2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	4
21	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Personal: physical/medical																						
sensitivity to chemicals	1	0	0	0	0	0	2	0	2	2	0	0	2	1	2	0	0	0	2	2	11	5
mold allergy	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0
Personal: psychological/social																						
conflicting demands	0	0	0	2	2	0	1	0	1	0	2	1	2	2	1	0	2	1	1	1	12	7
workload	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3

[a] Negative sign indicates significantly lower frequency of comfort or odor concerns

Table 38. VARIABLES ASSOCIATED[a] WITH AT LEAST THREE OF THE 10 COMFORT/ODOR FACTORS

Workplace Characteristics	
Dust	(all four comfort concerns and all six odor factors)
Glare	(hot air, dry air, odors of paint, cosmetics, dampness)
Noise	(hot air, dry air, cold air, odors of paint and cosmetics)
Use Fan	(hot air, humid air, cold air [negative], odor of cosmetics)
Water Leaks	(odors of dampness, cosmetics, tobacco smoke)
Personal Characteristics	
Chemical Sensitivity	(humid air, odors of paint, photocopying, new carpet, tobacco smoke)
Conflicting Demands	(dry air, cold air, odors of cosmetics, photocopying, dampness, tobacco smoke)
Locations	
AHU 15, SW-2	(cold air, damp/musty odor, odor of paint & other chemicals)
AHU 16	(cold air, damp/musty odor, dry air)

[a] Significant at $p < 0.01$ in at least two (of four) regressions

Table 39. VARIABLES ASSOCIATED[a] WITH ONE OR TWO COMFORT/ODOR FACTORS

Workplace characteristics	
Walls Recently Painted	(odor of paint/chemicals; new carpet odor)
Used Chemicals at Workspace	(odor of paint/other chemicals)
Lights Too Dim	(hot air, dry air)
No Window	(hot air)
Private Office	(hot air)
Workload	(hot air)
Uncomfortable Workstation	(dry air)
Use of a Heater	(cold air)
Low Pay	(humid air)
Photocopier Present	(odor of photocopying/printing)
New Carpet	(odor of new carpet)
New Carpet, Tacked Down, Office	(odor of new carpet)
Locations	
AHU 2	(humid air, damp/musty odor)
AHU 14	(cold air)
AHU 21	(humid air)
AHU G1-LG1	(odor of photocopying/printing)
AHU WT1 FL 1-3	(odor of tobacco smoke)
AHU NEG-1,2	(odors of tobacco smoke, new carpet [negative])
AHU CM 2,7,8,10	(cold air [negative])
Personal Characteristics	
Mold Allergy	(damp/musty odor)

[a] Significant at $p < 0.01$ in at least two (of four) regressions

Table 40. VARIABLES ASSOCIATED[a] WITH NO HEALTH, COMFORT, OR ODOR FACTORS

Personal Characteristics
Allergic to Animals
Allergic: Other
Smoker
Psychosocial Variables
Job Control
Utilization of Skills
Workplace Characteristics
Building
Location in Building
Private Cubicle or Semiprivate Office
Open Area or Share Office with Two or More
Estimated Supply Air Flow Rate
Shelf Index
Wood Index
Fabric-Covered Partitions Nearby
Laser Printer Nearby
Photocopier Nearby
Plants Nearby
Hours at Photocopier
New Furniture
New Equipment
Walls Recently Rearranged
Location Variables
About 57 of 66 AHU/floor combinations
Comfort/Odor Factors
Humid Air
Musty/Damp Odor
Tobacco Smoke Odor

[a] Significant at $p < 0.01$ in at least two regressions for each factor

Table 41. SYMPTOM PREVALENCE IN MANHATTAN FAMILIES COMPARED TO EPA EMPLOYEES

Symptom	Percent of days with symptom Manhattan	Waterside Mall	Ratio: WSM/NYC
Eye irritation	1.8	21	12
Aching muscles	1.2	13	11
Headache	2.4	21	8.7
Nausea	0.6	4.4	8.0
Sore throat	1.8	11	6.1
Wheezing	0.77	4.0	5.2
Fever	0.70	3.0	4.3
Stuffy nose	8.0	30	3.7
Cough	5.2	16	3.1

Source: Manhattan data: Lebowitz, 1972a.
WSM data: calculated from Exhibit ES-5, p. ES-11, Volume I.

Table 42. COMPARISON OF BRITISH, DANISH, NETHERLANDS AND US BUILDING STUDIES

Characteristic	UK[a]	DK[b]	Neth.[c]	US[d]
Number of buildings	47	28	61	3
Type (Public/private)	Both	Public	Both	Public
Number of respondents	4373	3507	7043	3955
Response rate	92%	80%	74%	81%
Number of health symptoms	10	12	18	32
Number of symptom groups[e]	10	2	5	12
No. rooms measured for IAQ	0	14	0	100

[a] Wilson and Hedge, 1987.

[b] Skov *et al*., 1989, 1990.

[c] Zweers *et al*., 1990

[d] This study

[e] Number of symptom groupings for analytical purposes

Table 43. FINDINGS OF THREE EUROPEAN BUILDING STUDIES

I. British study (Wilson & Hedge; Raw et al.)
(N = 4400 workers, 47 buildings, 90% response rate)

Self-reported productivity was decreased by:

1. Sharing office with five or more workers
2. Sharing office with one or more smokers
3. Lack of control over temperature, ventilation, and lighting
4. Lack of comfort
5. Three or more building-related symptoms (out of 10)
6. Age (but no regular pattern)

Self-reported productivity was unaffected by:

1. Gender
2. Job classification (an effect was noted but this was explained by the number of people sharing the room; the authors concluded that "Managers report higher productivity not because they are managers but because they are less likely to share their offices.")
3. Length of time respondent had worked at the building
4. Time spent at a video display terminal
5. Hours per day (or days per week) at the office
6. When sunlight entered the office
7. Job stress

One or more Sick Building Syndrome-type symptoms (dry eyes, itching eyes, stuffy nose, runny nose, dry throat, headache, lethargy) were increased by:

1. Working for a public rather than private organization
2. Air-conditioned buildings
3. Humidified buildings
4. Being female

(continued)

Table 43. (Continued) FINDINGS OF THREE EUROPEAN BUILDING STUDIES

II. Danish study (Skov & Valbjorn, 1987; Skov et al., 1990)
(N = 3500 workers, 14 buildings, 80% response rate)

Mucous membrane irritation or "general symptoms" were increased by:

1. Being female
2. Hayfever
3. Migraine
4. Smoking
5. Not drinking coffee or drinking more than 6 cups per day
6. Indoor climate problems at home
7. Working > 40 hours per week
8. Being a clerk
9. Working 7 hours per day
10. Handling carbonless copy paper
11. Photocopying > 25 sheets per day
12. Spending more than 1 hour per day at a VDT
13. Not having varied work
14. Job dissatisfaction
15. Dissatisfaction with fellow workers
16. Workload
17. Lack of influence over job and high work speed
18. Floor dust
19. Organic fraction of floor dust
20. Carpets
21. Area of the office
22. Number of workstations in the office
23. Shelf factor
24. Fleece factor
25. High temperature
26. Age of building
27. Type of supply air ventilation system

Symptoms were unaffected by:

1. Office volume
2. Workplace area
3. Ventilation rate
4. Relative humidity
5. Temperature
6. Carbon dioxide
7. Formaldehyde
8. Static electricity
9. Volatile organic compounds
10. Man-made mineral fibers

Table 43. (Continued) FINDINGS OF THREE EUROPEAN BUILDING STUDIES

III. Netherlands Study (Preller, et al., 1990)
(N = 7000 workers, 61 office buildings, 75% response rate)

Self-reported absenteeism was increased by:

1. Humidification (either spray or steam)
2. Lack of control over temperature
3. Openable windows
4. Hours in front of a video display terminal
5. Being female
6. Being middle-aged (worst) or young (next worst)
7. Lack of education
8. Being a smoker
9. Having allergies or CNS symptoms
10. Lack of job satisfaction

Self-reported absenteeism was unaffected by:

1. Type of ventilation (natural vs. mechanical)
2. Recirculation
3. Wearing of contact lenses
4. Passive smoking
5. Number of people in the workplace ($\geq$ 10 vs. < 10)
6. "Fleece factor" (2 of the following present: wall-to-wall carpeting, curtains, bookshelves)

ESTIMATED SUPPLY AIR FLOW RATES PROVIDED TO EPA EMPLOYEES

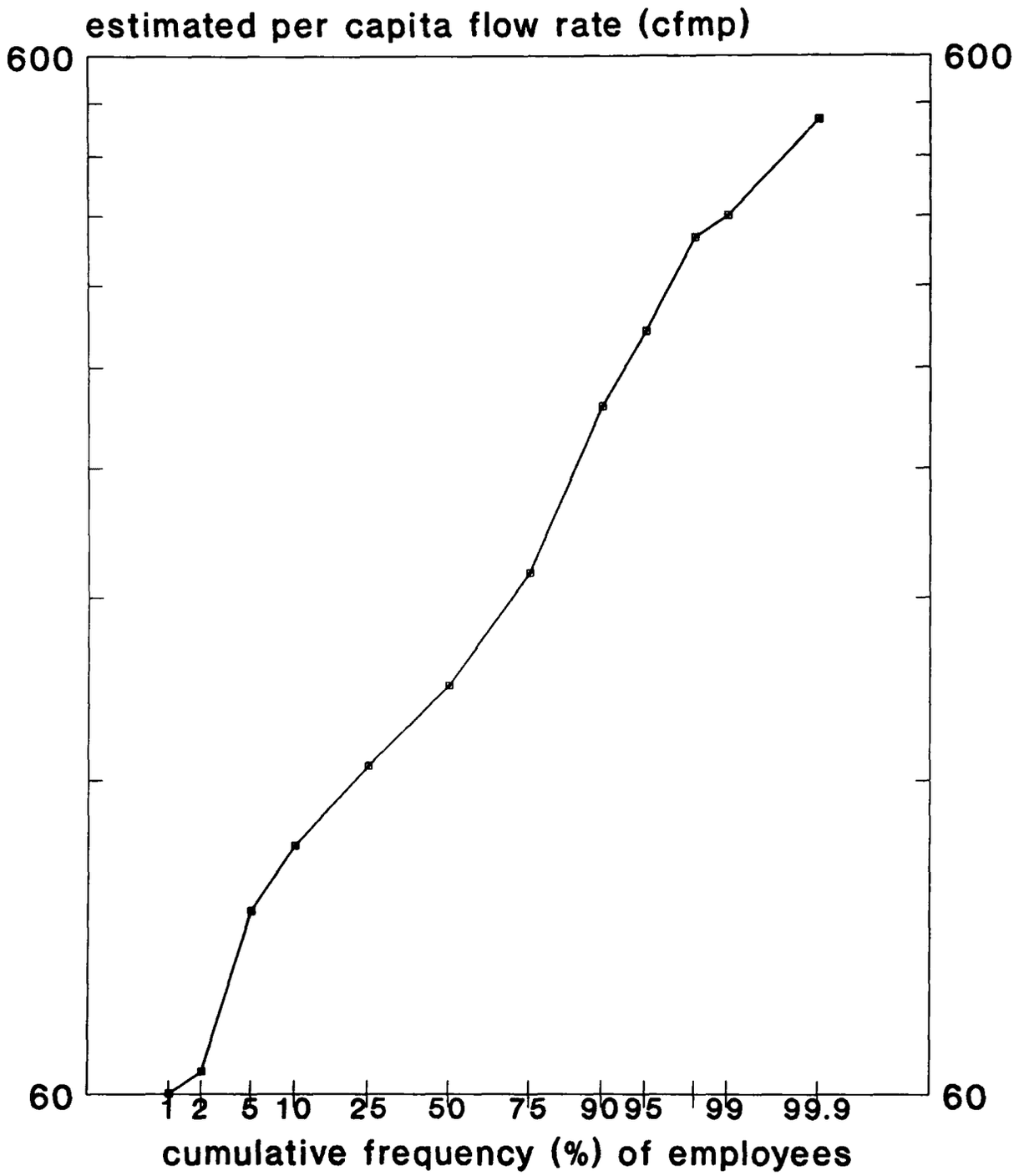

Figure 1. Cumulative frequency distribution of estimated per capita supply air flow rates in the three EPA Headquarters buildings. Supply air flow rates were measured for about 30 air handling units and estimated for the remaining 20 from design parameters. The number of employees is about 5000.

RELATIONSHIP BETWEEN THREE SETS OF LINEAR REGRESSIONS
AND TWO SETS OF LOGISTIC REGRESSIONS

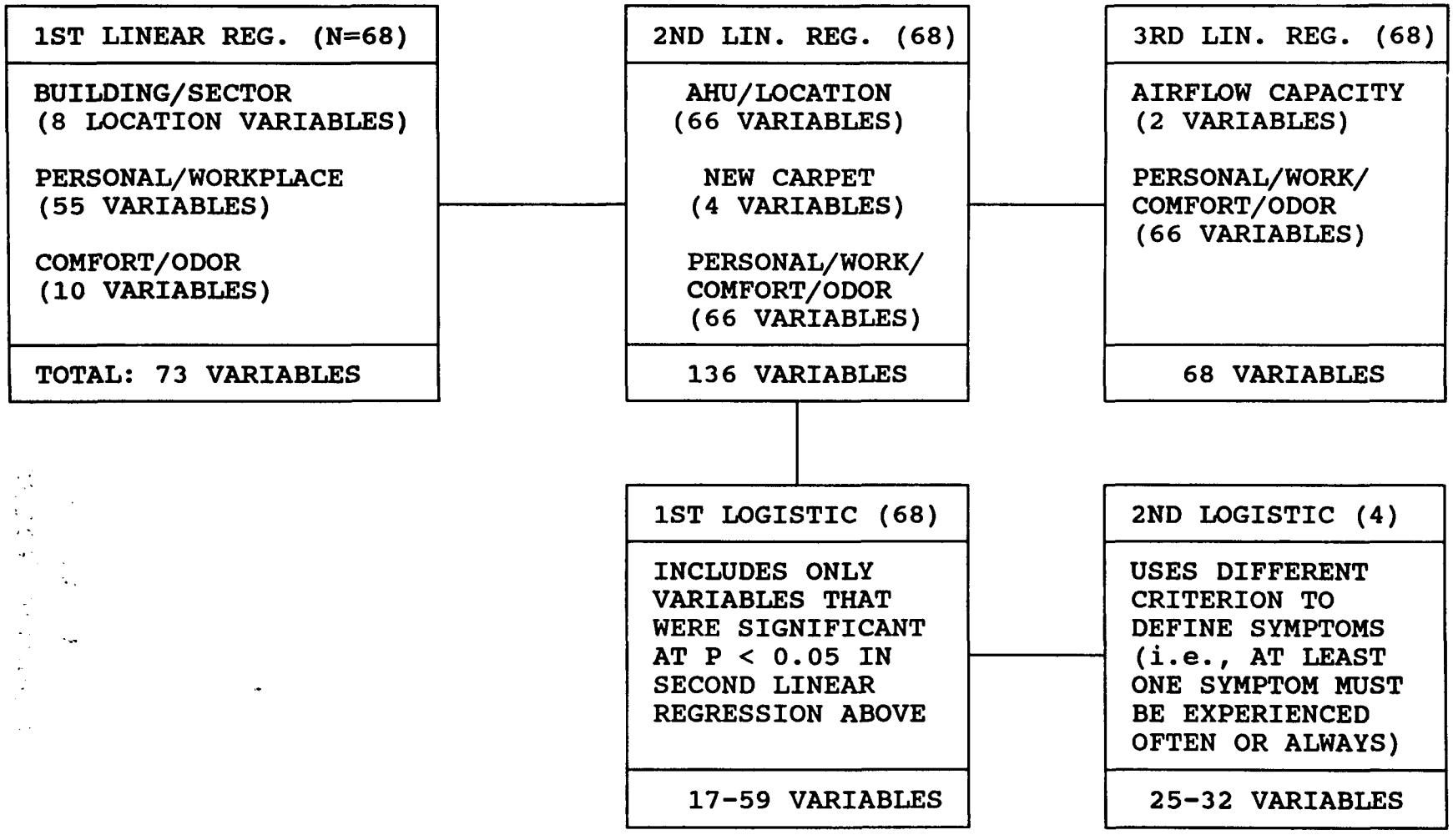

Fig. 2. Relationships among the regressions. Each set of regressions except the last involved 68 separate analyses. The number of observations in each regression ranged between 3800 and 3900 for most cases.

APPENDIX A

EPA STUDY QUESTIONNAIRE

PLEASE READ BEFORE COMPLETING QUESTIONNAIRE

Many questions in the questionnaire concern either last week or last year. By "LAST YEAR" we mean the 12-month period ending today. If you have worked in the building for less than one year, answer the "LAST YEAR" questions only for the part of the year that you worked in this building.

Please report your ACTUAL EXPERIENCES LAST WEEK even if last week was unusual for you. By "LAST WEEK" we mean any or all days worked from last Monday through Friday.

CONFIDENTIALITY

To protect your privacy, the identification for your questionnaire is the bar-code label on the cover. The bar-code cannot be read by EPA computers or staff. Additionally, the survey forms will be gathered by staff from Westat, Inc., an independent survey research firm, and processed away from EPA. Your name and other information necessary for the survey and analysis that might identify you, such as your room and telephone number, will not be disclosed to individuals, unions, or management of EPA. Reports of the survey will not give your name, nor will data be presented in such a way that you, or anyone else, could be identified.

STUDY SPONSORS AND ORGANIZATION

The study has been developed and is being conducted by the National Institute for Occupational Safety and Health (NIOSH), the John B. Pierce Foundation Laboratory at Yale University, and Westat, Inc. It is being managed by EPA and NIOSH, and is being supported by funds from EPA.

PART I. DESCRIPTION OF YOUR WORKSTATION

This section asks you to describe your workstation. Your answers to these questions will help us to construct a picture of your work surroundings.

By WORKSTATION we mean your desk, office, cubicle, or place that is your primary work area. This description is obvious for many people, but more difficult for those whose jobs require them to move about the building. If you do move about the building, your workstation is the specific location where you spend more time than any other single location. If your workstation has been relocated, use the location where you are now.

1. **There are many different types of workstations. Please check the categories that best describe the space in which your current workstation is located.**

   a. **Type of space** *(Check one)*

   1. ☐ Enclosed office with door
   2. ☐ Cubicle with floor to ceiling bookcases or partitions and no door
   3. ☐ Cubicle surrounded by mid-height bookcases or partitions
   4. ☐ Open office area
   5. ☐ Stacks (e.g., books or periodicals)
   6. ☐ Loading dock, laboratory, copy center, or print shops
   7. ☐ Work all around the building
   8. ☐ Other (specify) _____

   _____

   b. **Type of space sharing** *(Check one)*

   1. ☐ Single occupant
   2. ☐ Shared with one other person
   3. ☐ Shared with two or more other persons
   4. ☐ Other *(describe)* _____

   _____

2. **How many years of service do you have with EPA?** *(Enter number of months if less than one year.)*

   _____ years _____ months

3. a. **How many years have you been working in this building?** *(Enter number of months if less than one year.)*

   _____ years _____ months

   b. **During a typical week, how many hours do you spend in this building?**

   _____ hours per week

4. a. **How many years have you worked at your current workstation?** *(Enter number of months if less than one year.)*

   _____ years _____ months

   b. **During an average workday, how many hours do you spend at your workstation?**

   _____ hours per day

5. **How many days did you work in this building last week?**

   _____ days last week

6. **What time do you usually:**

		AM	PM
a. Arrive at work	____:____	☐	☐
b. Leave work	____:____	☐	☐

c. Varies *(describe)* _____

_____

7. **Which of the following items are presently located within 15 feet of your workstation?** *(Check "no" or "yes" for each item.)*

	No 1	Yes 2
a. Metal desk	☐	☐
b. Wood or composition desk	☐	☐
c. Metal bookshelves or bookcases	☐	☐
d. Wood or composition bookshelves or bookcases	☐	☐
e. File cabinet(s)	☐	☐
f. Other metal furniture	☐	☐
g. Other wood or composition furniture	☐	☐
h. Fabric-covered partitions	☐	☐
i. Portable humidifier	☐	☐
j. Laser printer	☐	☐
k. Photocopy machine	☐	☐
l. Live plants	☐	☐

8. **Is there carpeting on most or all of the floor at your workstation?**

1. ☐ No
2. ☐ Yes

9. **During a typical day LAST WEEK, how much time did you spend working with each of the following items?** *(If you worked with an item at all, but less than 1 hour, enter 1 hour per day.)*

	Hours per day
a. Computer or word processor with screen/keyboard	____
b. Photocopy machine	____
c. Photographic developing and processing	____
d. Printing processing (press, binding materials, etc.)	____
e. Other chemicals such as glues, adhesives, cleansers, white out, rubber cement, pesticides, etc.	____

NOTE: **If you have worked in this building for less than a year, answer the following questions for the part of the year that you worked in this building.**

10. **Were any of the following items regularly used at your workstation during the LAST YEAR:** *(Check "no" or "yes" for each item.)*

	No 1	Yes 2
a. Portable fan	☐	☐
b. Portable air filter, or cleaner, or negative-ion generator	☐	☐
c. Portable heater	☐	☐
d. Desk lamp	☐	☐

11. During the LAST YEAR (and since you've been in your current workstation) have any of the following changes taken place within 15 feet of your current workstation? *(Check "no" or "yes" for each item.)*

		No 1	Yes 2
a.	New carpeting	☐	☐
b.	New drapes or curtains	☐	☐
c.	New furniture	☐	☐
d.	New equipment, such as a computer	☐	☐
e.	Walls painted	☐	☐
f.	Rearranged walls	☐	☐

12. At any time during the LAST YEAR, have you noticed evidence of new or continuing water leaks from the ceiling, floors, walls, or pipes near your workstation?

1. ☐ No
2. ☐ Yes

PART II. INFORMATION ABOUT YOUR HEALTH AND WELL-BEING

This section asks questions about the status of your health and well-being. Your answers to these questions will help us construct a profile of the health status of the employees in this building. Please answer all the questions even if you don't associate these health conditions with your work.

1. a. Do you wear contact lenses?

1. ☐ Never → *Go to Q.2*
2. ☐ Sometimes
3. ☐ Often
4. ☐ Always

b. Do you wear contact lenses at work?

1. ☐ Never
2. ☐ Sometimes → *Go to Q.2*
3. ☐ Often → *Go to Q.2*
4. ☐ Always → *Go to Q.2*

c. If never worn at work, why?

_____

_____

_____

2. During work, how often do you wear eyeglasses (NOT including contacts) for close-up work?

1. ☐ Never
2. ☐ Sometimes
3. ☐ Often
4. ☐ Always

3. Which of the following best describes your history of smoking tobacco products such as cigarettes, cigars or pipes?

1. ☐ Never smoked → *Go to Q.7*
2. ☐ Former smoker → *Go to Q.7*
3. ☐ Current smoker

4. Do you smoke tobacco products at your workstation?

1. ☐ Never
2. ☐ Sometimes
3. ☐ Often

5. Do you smoke tobacco products elsewhere at work?

1. ☐ Never
2. ☐ Sometimes
3. ☐ Often

6. In a typical 24 hour day, how many CIGARETTES do you usually smoke?

1 ☐ None
2. ☐ 1 to 5
3. ☐ 6 to 10
4. ☐ 11 to 20
5. ☐ 21 to 30
6. ☐ 31 or more

Please answer the three questions to the right about each symptom listed below, even if you believe the symptom is not related to the building. *(For each symptom, answer the first question. If the response is "never," go down to the next symptom.)*	Please indicate how often during the LAST YEAR you have experienced this symptom while working in this building.					Please indicate how many days LAST WEEK you experienced this symptom while working in this building.	Does the symptom usually change when not at work?		
	Never	Rarely	Some-times	Often	Always	*(Fill in No. of days)*	Gets Worse	Stays Same	Gets Better
a. headache	1	2	3	4	5		1	2	3
b. nauses	1	2	3	4	5		1	2	3
c. runny nose	1	2	3	4	5		1	2	3
d. stuffy nose/sinus congestion	1	2	3	4	5		1	2	3
e. sneezing	1	2	3	4	5		1	2	3
f. cough	1	2	3	4	5		1	2	3
g. wheezing or whistling in chest	1	2	3	4	5		1	2	3
h. shortness of breath	1	2	3	4	5		1	2	3
i. chest tightness	1	2	3	4	5		1	2	3
j. dry, itching, or tearing eyes	1	2	3	4	5		1	2	3
k. sore/strained eyes	1	2	3	4	5		1	2	3
l. blurry/double vision	1	2	3	4	5		1	2	3
m. burning eyes	1	2	3	4	5		1	2	3
n. sore throat	1	2	3	4	5		1	2	3
o. hoarseness	1	2	3	4	5		1	2	3
p. dry throat	1	2	3	4	5		1	2	3
q. unusual fatigue or tiredness	1	2	3	4	5		1	2	3
r. sleepinessa or drowsiness	1	2	3	4	5		1	2	3

7. *(continued)*

(For each symptom, answer the first question. If the response is "never," go down to the next symptom.)	Please indicate how often during the LAST YEAR you have experienced this symptom while working in this building.					Please indicate how many days LAST WEEK you experienced this symptom while working in this building.	Does the symptom usually change when not at work?		
	Never	Rarely	Some-times	Often	Always	*(Fill in No. of days)*	Gets Worse	Stays Same	Gets Better
s. chills	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
t. fever	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
u. aching muscles or joints	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
v. problems with contact lenses	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
w. difficulty remembering things	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
x. dizziness/lightheadedness	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
y. feeling depressed	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
z. tension or nervousness	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
aa. difficulty concentrating	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
bb. dry or itchy skin	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
cc. pain or stiffness in upper back	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
dd. pain or stiffness in lower back	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
ee. pain or numbness in shoulder/neck	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐
ff. pain or numbness in hands or wrists	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	____	1 ☐	2 ☐	3 ☐

NOTE: **The next four questions (Questions 8-11) refer to your symptoms described in Question 7. If you reported that you never experienced any of these symptoms, go to Question 12.**

8. **How often during the LAST YEAR have any of your symptoms reduced your ability to work in this building?**

   1. ☐ Never
   2. ☐ Rarely
   3. ☐ Sometimes
   4. ☐ Often
   5. ☐ Always

9. a. **Have any of your symptoms caused you to stay home from work or leave work early during the LAST YEAR?**

   1. ☐ Never → *Go to Q.10*
   2. ☐ Rarely
   3. ☐ Sometimes
   4. ☐ Often

   b. **Which symptoms?**

   _____

   _____

   _____

10. **In which season(s) are you bothered more by the symptoms you reported in Question 7?** *(Check all that apply.)*

    1. ☐ Winter
    2. ☐ Spring
    3. ☐ Summer
    4. ☐ Fall
    5. ☐ No relation to seasons

11. a. **Do you associate any of the symptoms you reported in Question 7 with your work in this building?**

    1. ☐ No → *Go to Q.12*
    2. ☐ Yes

    b. **Have these symptoms:**

    1. ☐ improved over the last year
    2. ☐ become worse over the last year
    3. ☐ stayed the same

12. **During the LAST YEAR, have you had an illness in which you had repeated episodes of THREE OR MORE of the following symptoms at the same time: wheezing, cough, shortness of breath, fever, chills, aching joints/muscles?**

    1. ☐ No
    2. ☐ Yes

13. **During the LAST YEAR, have you had any chest illnesses, such as bronchitis or pneumonia, that have kept you off work, indoors at home, or in bed?**

    1. ☐ No
    2. ☐ Yes

14. **Has a physician ever told you that you have, or had, eczema?**

    1. ☐ No
    2. ☐ Yes

15. **During the LAST YEAR, have you had any episodes of wheezing (whistling in the chest) WITHOUT fever, or chills, or sore throat?**

    1. ☐ No
    2. ☐ Yes

16. a. **Has a physician ever told you that you have, or had, asthma?**

1. ☐ No → *Go to Q.17*
2. ☐ Yes

b. **In what year was it first diagnosed?**

19 _____

c. **Have you had an asthma attack during the LAST YEAR?**

1. ☐ No
2. ☐ Yes

17. **Comparing your health since working in this building with your health before you began to work in this building . . .**

a. **. . . do you have infections (e.g., colds, flu, bronchitis, etc.) . . .**

1. ☐ more frequently?
2. ☐ less frequently?
3. ☐ with the same frequency?

b. **. . . do your infections (e.g., colds, flu, bronchitis, etc.) tend to . . .**

1. ☐ last longer?
2. ☐ last a shorter amount of time?
3. ☐ last about the same amount of time?

18. **Do you believe you are or may be allergic to any of the following?** *(Check "no" or "yes" for each item.)*

		No 1	Yes 2
a.	pollen or plants	☐	☐
b.	animals	☐	☐
c.	dust	☐	☐
d.	molds	☐	☐
e.	Other *(specify)* _____	☐	☐

19. **During the LAST YEAR, how often do you believe you have experienced EYE, NOSE, THROAT, OR RESPIRATORY IRRITATION at your workstation from:**

	ALWAYS 1	OFTEN 2	SOMETIMES 3	RARELY 4	NEVER 5
a. Tobacco smoke	☐	☐	☐	☐	☐
b. Fumes from a photocopying machine	☐	☐	☐	☐	☐
c. Fumes from printing processing (press, binding materials, etc.)	☐	☐	☐	☐	☐
d. Fumes from other chemicals such as adhesives, glues, cleansers, white out, rubber cement, etc.	☐	☐	☐	☐	☐
e. Fumes from pesticides	☐	☐	☐	☐	☐
f. Fumes from new carpeting	☐	☐	☐	☐	☐
g. Fumes from new drapes, curtains, or furniture	☐	☐	☐	☐	☐
h. Fumes from paint	☐	☐	☐	☐	☐
i. Fumes from cleaning of carpets, drapes, or other furnishings	☐	☐	☐	☐	☐
j. Other *(specify)* _____	☐	☐	☐	☐	☐

20. **Do you consider yourself especially sensitive to any of the items in Question19?**

1. ☐ No
2. ☐ Yes

21. **How old are you?**

_____ years

22. **Are you:**

1. ☐ Male → *Go to Part III on pg. 11*
2. ☐ Female

Women working in office buildings have occasionally reported patterns of gynecological or women's health problems. The following questions have been included to help sort out some of these issues in this building.

As with the rest of the questions in this survey, your responses are entirely voluntary and will be kept confidential.

23. **During the LAST YEAR have you menstruated (had a period)?**

1 ☐ No → *Go to Q.29*
2. ☐ Yes

24. **How often during the LAST YEAR has your period been regular? (By regular, we mean your periods come about once a month, you can usually predict when they will come plus or minus 4 days, and each time they last about the same number of days.)**

1, ☐ Never
2. ☐ Rarely
3. ☐ About half the time
4. ☐ Often
5. ☐ Always

25. a. **How many days does your menstrual flow (period) typically last?**

_____ days

b. **During the last year, what was the LONGEST period you had?**

_____ days

c. **During the last year, what was the SHORTEST period you had?**

_____ days

26. a. **How many days does your cycle typically last? (Count from the first day of one period to the first day of the next.)**

_____ days

b. **During the last year, what was the LONGEST cycle you had?**

_____ days

c. **During the last year, what was the SHORTEST cycle you had?**

_____ days

27. **How often during the LAST YEAR has there been bleeding or spotting between your periods?**

1. ☐ Never
2. ☐ 1 - 3 times
3. ☐ 4 - 6 times
4. ☐ 7 - 9 times
5. ☐ 10 or more times

28. a. Some women experience menstrual symptoms, such as headaches, weight gain, irritability, cramping, breast tenderness, or back pain. How often have you experienced any of these menstrual symptoms during the LAST YEAR?

1. ☐ Never → *Go to Q.29*
2. ☐ 1 - 3 times
3. ☐ 4 - 6 times
4. ☐ 7 - 9 times
5. ☐ 10 or more times

b. When you experience these symptoms, typically how severe are they?

1. ☐ Mild; could be ignored at times
2. ☐ Moderate; pain, bloating, or mood change noticeably present
3. ☐ Severe; difficult to do most tasks
4. ☐ Extreme; incapacitating

29. During the LAST YEAR have you been . . . *(Check "no" or "yes" for each item.)*

	No 1	Yes 2
a. Pregnant or nursing?	☐	☐
b. Taking birth control pills? . . .	☐	☐
c. Going through menopause (change of life)?	☐	☐
d. Post-menopausal (completed menopause)? . . .	☐	☐
e. Taking estrogen replacement therapy?	☐	☐

30. a. During the LAST YEAR have you been taking hormones prescribed by a physician?

1. ☐ No → *Go to Q.31*
2. ☐ Yes

b. Specify what kind(s) and what they were prescribed for.

_____

_____

_____

31. a. Has a physician ever told you that you had . . . *(Check "no" or "yes" for each item.)*

	No 1	Yes 2	Year First Diagnosed
Fibroids?	☐	☐	____
Cysts?	☐	☐	____
Enlarged uterus?	☐	☐	____

→ *If all are "no," go to Part III*

b. Have there been noticeable changes during the last year? *(Check one box for each item.)*

	Decreased In Size 1	Increased In Size 2	No Change 3	Other, Specify Below 4
Fibroids . . .	☐	☐	☐	☐
Cysts	☐	☐	☐	☐
Enlarged uterus	☐	☐	☐	☐

Specify _____

_____

_____

PART III. INFORMATION ABOUT YOUR PRESENT WORK ENVIRONMENT

This section asks you to report specific responses to the physical environment at your present workstation. You or a co-worker may have altered your work environment with a portable fan, heater, humidifier, etc. If so, please tell us how your work environment would have been without this equipment.

1. At your present workstation, HOW OFTEN . . . *(Please check one box for last year and one box for last week.)*

	. . . during the LAST YEAR					. . . during the LAST WEEK				
	Never	Rarely	Some-times	Often	Always	Never	Rarely	Some-times	Often	Always
a. was there too much air movement?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
b. was there too little air movement?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
c. did you want to adjust the air movement?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
d. was the temperature too hot?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
e. was the temperature too cold?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
f. did you want to adjust the temperature?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
g. was it too humid? . . .	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
h. was it too dry?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
i. did you want to adjust the humidity?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
j. was the air too stuffy?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
k. was it too noisy?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
l. was it too quiet?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
m. was the work area too dusty?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

2. **During the LAST YEAR, how often, if at all, have you noticed any of these types of ODORS at your present workstation?** *(Check one box for each item.)*

	ALWAYS	OFTEN	SOMETIMES	RARELY	NEVER
	1	2	3	4	5
a. Body odor	☐	☐	☐	☐	☐
b. Cosmetics, such as perfume or after-shave	☐	☐	☐	☐	☐
c. Tobacco smoke	☐	☐	☐	☐	☐
d. Fishy smells	☐	☐	☐	☐	☐
e. Other food smells	☐	☐	☐	☐	☐
f. Musty or damp basement smells	☐	☐	☐	☐	☐
g. Odors from new carpet	☐	☐	☐	☐	☐
h. Odors from new drapes or curtains	☐	☐	☐	☐	☐
i. Odors from diesel or other engine exhaust	☐	☐	☐	☐	☐
j. Odors from a photocopying machine	☐	☐	☐	☐	☐
k. Odors from printing processing (press, binding materials, etc.)	☐	☐	☐	☐	☐

	ALWAYS	OFTEN	SOMETIMES	RARELY	NEVER
2. *(continued)*					
l. Odors from other chemicals such as adhesives, glues, cleansers, white out, rubber cement, pesticides, etc.	☐	☐	☐	☐	☐
m. Odors from pesticides	☐	☐	☐	☐	☐
n. Odors from cleaning of carpets, drapes, or other furnishings	☐	☐	☐	☐	☐
o. Odors from paint	☐	☐	☐	☐	☐
p. Other unpleasant odors *(describe)* _____	☐	☐	☐	☐	☐

3. **In which seasons would you most like to adjust the physical conditions around your workstation?** *(Check all that apply)*

	None	Winter	Spring	Summer	Fall
	1	2	3	4	5
a. Air movement	☐	☐	☐	☐	☐
b. Temperature	☐	☐	☐	☐	☐
c. Humidity	☐	☐	☐	☐	☐
d. Odors	☐	☐	☐	☐	☐

4. **Please rate the lighting at your workstation.**

1. ☐ Much too dim
2. ☐ A little too dim
3. ☐ Just right
4. ☐ A little too bright
5. ☐ Much too bright

5. a. **Do you experience a reflection or "glare" in your field of vision when at your workstation?**

1. ☐ Never → *Go to Q.6*
2. ☐ Sometimes
3. ☐ Often
4. ☐ Always

b. **Where does the reflection or glare come from?** *(Check all that apply)*

1. ☐ Window, sunlight, outside reflection
2. ☐ Overhead fluorescent lights
3. ☐ Video display screen and/or reflections when looking at screen
4. ☐ Desk lamp
5. ☐ Other *(specify)* _____

6. **Can you see out an outside window from your workstation?**

1. ☐ No
2. ☐ Yes

7. a. **How comfortable is the chair at your workstation?**

1. ☐ Reasonably comfortable
2. ☐ Somewhat uncomfortable
3. ☐ Very uncomfortable
4. ☐ Don't have one specific chair → *Go to Q.8*

b. **Is your chair easily adjustable?**

1. ☐ No
2. ☐ Yes
3. ☐ Not adjustable

8. **How comfortable is the current set-up of your desk or work table (that is, height and general arrangement of the table, chair, and equipment you work with)?**

1. ☐ Reasonably comfortable
2. ☐ Somewhat uncomfortable
3. ☐ Very uncomfortable
4. ☐ Don't have one specific desk or work table

9. a. **During the LAST YEAR, how many times per week did you go outdoors, weather permitting, during work hours (for lunch, break, or other reasons)?**

____ time(s) per week → If zero, go to Q.10

b. **How many of these times did you go outdoors primarily to get some fresh air?**

____ time(s) per week for fresh air

NOTE: The next four questions concern the overall physical environment at your workstation, that is, the air quality, temperature, light, noise, odor, etc.

10. During the LAST WEEK, how satisfied were you with the physical environment at your workstation?

1. ☐ Very satisfied
2. ☐ Somewhat satisfied
3. ☐ Not too satisfied
4. ☐ Not at all satisfied

11. During the LAST YEAR, how satisfied were you with the overall physical environment at your workstation?

1. ☐ Very satisfied
2. ☐ Somewhat satisfied
3. ☐ Not too satisfied
4. ☐ Not at all satisfied

12. During the LAST YEAR, has the overall physical environment in the vicinity of your workstation:

1. ☐ improved
2. ☐ become worse
3. ☐ stayed the same

13. During a typical work day, does the overall physical environment in the vicinity of your workstation:

1. ☐ improve during the day
2. ☐ become worse during the day
3. ☐ stay the same

PART IV. CHARACTERISTICS OF YOUR JOB

This section asks you to describe your job in terms of specific qualities. In order to gain a better understanding of your work environment, we would like to know how you feel about your job situation. As stated before, your responses will be kept confidential.

1. **We would like you to think about the TYPE OF WORK YOU DO IN YOUR JOB.** *(Check one box for each statement)*

   a. **All in all, how satisfied are you with your job?**

      1. ☐ Very satisfied
      2. ☐ Somewhat satisfied
      3. ☐ Not too satisfied
      4. ☐ Not at all satisfied

   b. **Knowing what you know now, if you had to decide again whether to take the job you now have, what would you decide? Would you . . .**

      1. ☐ Decide without hesitation to take the same job
      2. ☐ Have some second thoughts
      3. ☐ Decide definitely not to take the same job

   c. **If you were free right now to go into any type of job you wanted, what would your choice be? Would you . . .**

      1. ☐ Take the same job
      2. ☐ Take a different job
      3. ☐ Not want to work

   d. **If a friend of yours told you he/she was interested in working in a job like yours, what would you tell him/her? Would you . . .**

      1. ☐ Strongly recommend it
      2. ☐ Have doubts about recommending it
      3. ☐ Advise against it

2. **How satisfied are you with your salary?**

   1. ☐ Very satisfied
   2. ☐ Somewhat satisfied
   3. ☐ Not too satisfied
   4. ☐ Not at all satisfied

3. **How satisfied are you with your opportunity for advancement at EPA?**

   1. ☐ Very satisfied
   2. ☐ Somewhat satisfied
   3. ☐ Not too satisfied
   4. ☐ Not at all satisfied

4. Conflicts can occur in any job. For example, someone may ask you to do work in a way which is different from what you think is best, or you may find that it is diffcult to satisfy everyone. HOW OFTEN do you face problems in your work like the ones listed below? *(Check one box for each statement)*

	VERY OFTEN	FAIRLY OFTEN	SOMETIMES	RARELY OR NEVER
a. Persons equal in rank and authority over you ask you to do things which conflict.	1 ☐	2 ☐	3 ☐	4 ☐
b. People in a good position to see if you do what they ask give you things to do which conflict with one another.	1 ☐	2 ☐	3 ☐	4 ☐
c. People whose requests should be met give you things which conflict with other work you have to do.	1 ☐	2 ☐	3 ☐	4 ☐

5. The next series of questions asks HOW MUCH influence you now have in each of several areas at work. By influence we mean the degree to which you control what is done by others and have freedom to determine what you do yourself. *(Check one box for each question)*

	VERY MUCH	MUCH	A MODERATE AMOUNT	LITTLE	VERY LITTLE
a. How much influence do you have over the amount of work you do?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
b. How much influence do you have over the availability of materials you need to do your work?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
c. How much do you influence the policies and procedures in your work group?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
d. How much influence do you have over the arrangement of furniture and other work equipment at your workstation?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

6. **The next series of questions asks HOW OFTEN certain things happen at your job.** *(Check one box for each question)*

	VERY OFTEN	FAIRLY OFTEN	SOMETIMES	OCCASIONALLY	RARELY
a. How often does your job require you to work very fast?	1	2	3	4	5
b. How often does your job require you to work very hard?	1	2	3	4	5
c. How often does your job leave you with little time to get things done?	1	2	3	4	5
d. How often is there a great deal to be done?	1	2	3	4	5
e. How often does your job let you use the skills and knowledge you learned in school?	1	2	3	4	5
f. How often are you given a chance to do the things you do best?	1	2	3	4	5

6. *(Continued)*

	VERY OFTEN	FAIRLY OFTEN	SOMETIMES	OCCASIONALLY	RARELY
g. How often can you use the skills from your previous experience and training?	1	2	3	4	5
h. How often are you clear on what your job responsibilities are?	1	2	3	4	5
i. How often can you predict what others will expect of you on the job?	1	2	3	4	5
j. How much of the time are your work objectives well defined?	1	2	3	4	5
k. How often are you clear about what others expect of you on the job?	1	2	3	4	5

7. **In order to better understand your responsibilities outside your normal working day, the next series of questions deals with other significant aspects of your life.** *(Check "no" or "yes" for each question)*

	No 1	Yes 2
a. **Do you have children at home?**	☐	☐
b. **Do you have major responsibility for childcare duties?**	☐	☐
c. **Do you have major responsibility for housecleaning duties?**	☐	☐
d. **Do you have major responsibility for the care of an elderly or disabled person on a regular basis?**	☐	☐
e. **Are you taking courses for credit toward a degree or a diploma?**	☐	☐
f. **Do you have a regular commitment of five hours or more per week, paid or unpaid, outside of this job?** *(Include volunteer work, charitable work, second job, etc.)*	☐	☐

PART V. CONCLUDING QUESTIONS

This section concludes this survey. Your answers to these questions, like your answers to the previous questions, will be kept confidential. This information is needed for statistical purposes.

1. **What day of the week did you complete this survey?**

   1. ☐ Monday
   2. ☐ Tuesday
   3. ☐ Wednesday
   4. ☐ Thursday
   5. ☐ Friday

2. **Which of the following best describes your current living and financial arrangements?**

   1. ☐ Live alone, sole provider of rent/mortgage, utilities, food, and other living expenses.
   2. ☐ Live alone, but receive assistance from one or more others in paying rent/mortgage, utilities, food, and other living expenses.
   3. ☐ Live with one or more other persons, but sole provider of rent/mortgage, utilities, food, and other living expenses.
   4. ☐ Live with one or more other persons who help to pay rent/mortgage, utilities, food, and other living expenses.

3. **What is the highest grade you completed in school?**

   1. ☐ 8th grade or less
   2. ☐ 9th, 10th, or 11th grade
   3. ☐ High school graduate
   4. ☐ 2 years of college or Associate Degree
   5. ☐ Bachelor's or technical degree
   6. ☐ Some graduate work
   7. ☐ Graduate or professional degree

4. a. **What is your pay plan and grade (e.g., GS-5, GM-14, SES-2, WG-2, etc.)?**

   _____

   b. **Which of the following best describes your job duties and responsibilities?** *(If more than one applies, check the ONE box for the job duties on which you spend the most time.)*

   1. ☐ Managerial (such as administrator, manager, etc.)
   2. ☐ Professional (such as engineer, scientist, lawyer, etc.)
   3. ☐ Technical (such as technician, programmer, etc.)
   4. ☐ Administrative Support (such as clerical, computer operator, etc.)
   5. ☐ Service (such as health services, food preparation, janitorial, etc.)
   6. ☐ Craftsman (such as mechanic, repairer, etc.)
   7. ☐ Operator or laborer
   8. ☐ *Other (specify)*_____

   _____

The following information is needed so that your workstation can be located within this building. This is necessary so that we can relate your responses to the air measurements that will be taken in a few weeks. As with the rest of the questions in this survey, this information will be kept confidential. Please tell us:

5. a. **Your room number**

   _____

   b. **Your workstation telephone number (your direct or private number.)**

   _____

6. **Is there anything else you would like to tell us about environmental or health matters in this building? If so, please use this space provided for that purpose.**

Please put your completed questionnaire in the return envelope provided. Seal it and take it to one of the return boxes located near the elevators and building exits.

PLEASE READ THE NEXT PAGE

In a few weeks we plan to conduct air measurements in this building. At that time people whose workstations are close to the air measurement locations will be asked a few additional questions. You may be recontacted at that time.

Thank you very much for your time and patience in filling out this questionnaire.

APPENDIX B

IDENTIFICATION OF AIR HANDLING UNITS FOR EPA BUILDINGS

IDENTIFICATION OF AIR HANDLING UNITS FOR EPA BUILDINGS

Poor indoor air quality may be the result of the ventilation system. The system may not supply enough fresh air, or it may be contaminated. In the former case, symptoms might decrease as the air flow increases; in the latter case, they may get worse with increasing air flow. On the other hand, if the air flow is short circuited (a portion does not reach the occupant), the amount of air flow might be irrelevant, and symptoms would show no dependence on the flow rate, although they might show a relationship with individual air handling units. In order to handle these possibilities, two variables were created and added to the data set. One variable was created by identifying every room with an air handling unit (AHU). The second variable consists of a total air flow capacity associated with each AHU. The following section provides a description of the information sources used to create these variables.

All the air handling units (AHUs) that were bringing in outside air to the Waterside Mall, Fairchild, and Crystal Mall buildings at the time of the questionnaire census and monitoring survey (February-March 1989) were identified. A total of 42 such units have been identified at Waterside. (Another 41 air conditioning units were identified, but most of these have been determined to provide recirculation only, without bringing in any outside air.) At Fairchild, two units supplied the entire building. At Crystal, a total of five units were identified.

Sources of Information

Several sources of information have been used to determine the airflow capacities and rooms served by each AHU:

(1) Blueprints prepared in 1980-81 by Town Center Management
(2) A balancing report prepared in 1986
(3) Measurements performed during March 1989 by K. Maclachlan Associates
(4) A report by Engineering Design Associates (Jan. 1990)
(5) Conversations with Mike Shamus of EPA's OARM
(6) A telephone conversation with John Mayoral, building manager at Fairchild
(7) A telephone conversation with the office of Gary Wadkins, chief engineer for Charles E. Smith (owner of Crystal Mall building)

In some cases connected with the Waterside Mall building, these sources did not use the same identification system for the AHUs; in these cases, attempts were made to reconcile differences through discussions with M. Shamus.

Assignment of AHUs to respondents

A series of maps was prepared from the blueprints contained in the EDA report identifying the areas served by each air handling unit. Based on these maps, each respondent was then assigned a unique air handling unit according to his or her room number as identified on the questionnaire. The final assignments of AHUs are contained in a SAS file to be made available in the Public Use Data Tape. The color-coded maps are available for inspection at the office of the author of this report, Dr. Lance Wallace (703-349-8970).

This information on AHUs was then combined with information on room location to test two hypotheses: 1) that specific AHUs might be associated with health symptoms, comfort, or odor complaints; 2) that certain locations might have higher prevalence rates for these conditions.

Calculation of capacities

Supply air flow rates for 31 AHUs were measured during the week of monitoring in March of 1989. Supply air flow rates for most of these 31 AHUs and for a number of additional AHUs were also determined in the 1986 balancing reports. In most cases, the 1989 flow rates were within 30% of the 1986 flow rates (Table B-1).

In the absence of measured flow rates, supply air design capacities (in cubic feet per minute or in tons) have been included. For five cases where both a measured flow rate and a capacity (in tons) were provided, the relationship between the two was fairly consistent (one ton corresponded to an average measured flow rate of about 320 cfm, with an observed range of 240-400 cfm). This relationship was then used to convert all capacities originally given only in tons to cfm units.

These measured or calculated supply air capacities were then summed across all AHUs serving a particular sector, such as the West Tower, 2nd floor of the Mall, etc. The areas of each of the sectors were then calculated from the blueprints, and the supply airflow capacity per unit area within each

cfm). This relationship was then used to convert all capacities originally given only in tons to cfm units.

These measured or calculated supply air capacities were then summed across all AHUs serving a particular sector, such as the West Tower, 2nd floor of the Mall, etc. The areas of each of the sectors were then calculated from the blueprints, and the capacity per unit area within each sector was determined (Table B-2.) A common design goal is 1 cfm/sq.ft., and the table indicates that some sectors are quite close to that mark. The newest sector, Northeast Mall, appears to exceed that mark by a factor of two. The garage and lower garage areas, which include the print shop, appear to fall below that mark by a factor of two. (It should be noted here that a new AHU has since been added to supply the print shop with additional fresh air.) The next lowest sectors were the second and third floors of the Mall, which reached about 70% and 80% of the design goal, respectively. (Again new AHUs have been added to both of these sectors since the time of the study.)

To derive a per capita capacity (cfm per person, or cfmp) the number of people served by each AHU was calculated by using the computerized form of the EPA Directory for the period of the survey (February-March 1989). This data file is also contained in the Public Use Data Tape. This per capita capacity was used in testing the hypothesis that health or comfort might be affected by the amount of airflow provided.

Calculation of outside air provided per person

During the monitoring period, the amount of outdoor air supplied by 30 AHUs was calculated (EPA, 1990a). For these cases, it is possible to calculate the average amount of outdoor air per person (cfmp) by dividing the measured outdoor air flow rate by the number of people served. (In part of the second floor of the Mall, this may be a misleading calculation, because the high ceilings offer increased possibility for short-circuit flow from the ceiling diffusers to the ceiling returns, thereby not delivering fresh air to the workers below.) These calculations are summarized in Tables B-3 and B-4.

However, since direct information on outside air delivered is lacking for the remainder of the AHUs, which constitute about half of the total air flow in the three buildings, no attempt was made to use a measure of fresh air delivered per person in the analysis of the questionnaire responses.

RECORD OF DECISIONS ON IDENTIFICATION OF AHUS

The various sources of information on AHUs sometimes disagreed or were ambiguous regarding identifications, capacities, or areas served by AHUs. Some of the decisions made are documented below. The discussion is organized by the page number of the blueprints incorporated into the 1990 EDA report.

BP Pg.	Sector/ Floor	Discussion
26	SE2	AHU#3 becomes SE2-1 Unit "A" becomes SE2-2
27	SE3	AHU #1 becomes SE 3-1 AHU #2 becomes SE 3-2 EDG reports three units on SE 3rd floor. From internal evidence, I associate EDG's "SE3" with AHU#3 on second floor. Thus McLachlan's SE3 = EDG's SE3 = our SE2-1.
28	M2	Five units (Rooftop 1, 2,and 3; South Unit 2; Split Unit 1) were installed after the monitoring period. At the time, these areas were served by AHU #21 in Fan Room #11. (Personal information from M. Shamus; documented by K. McLachlan) Unit A-11-1 serves only TV room--no offices
29	M2	AHU -17 serves non-EPA areas (Shamus) Unmarked area including rooms 2501-03 served by AHU-3 (Shamus)
30	M2	Two separate unmarked areas (including rooms 2107 and 2416, respectively) are both assigned to AHU #2 (Shamus)
31	SW	"New 15-ton Unit" becomes SW-2
33	M3	AC-2, 9, and 15 assumed to provide no outside air Unmarked area (Room 3519) not assigned (no questionnaires back from that room anyway).
34	M3	AC-3, 10, 11, 14, 3100, 3105-7. and BWE09C all assumed to provide no outside air AHU-11 assumed to be gone or inoperable
35	M3	AC-5, 6 assumed to provide no outdoor air

36	M3	AHU-7 serves commercial space (Shamus) AC-7, 12, 13, 16 and 3706 assumed to provide no outdoor air
37	LG100	One unit
38	G-100	Two units. Areas are marked on blueprint (by Shamus), but room identifier cannot be discerned.
39	NEB	AC-A (Liebert unit) in B029 assumed to provide no outside air Two unnamed units are named NEG-1 and NEG-2
40	NEG	"AHU-1 from basement" (our NEG-1) serves only corridors. Outdoor AHU (NEG-3) serves low-numbered rooms (Shamus) AHU #4 becomes NEG-4
43	NE3	This blueprint is missing. Shamus says there are two AHUs. No way at present to identify rooms.

TABLE B-1. COMPARISON OF MEASURED SUPPLY AIRFLOW RATES (cfm) FOR SELECTED AIR HANDLING UNITS IN WATERSIDE MALL

AHU ID	1989[1]	1986[2]	89/86
1	15809	14300	1.11
4	16105	13507	1.19
5	9636	21522	0.45
6	28440	24277	1.17
7	12930	11305	1.14
9	17635	12640	1.40
10	7644	5390	1.42
12	11422	11575	0.99
13	12036	12755	0.94
14	10282	7385	1.39
15	27868	17790	1.57
16	10780	8940	1.21
18	14250	10285	1.43
19	7562	5755	1.31
20	8921	6745	1.32
SE2-2	3659	3605	1.02
SE3-1	27350	25325	1.08

[1] Measurements March 6-10, 1989 by McLachlan Associates

[2] Results from 1986 balancing report, as shown in 1990 report by Engineering Design Group (EDG)

Table B-2. ESTIMATED SUPPLY AIRFLOW RATES PER SQUARE FOOT BY SECTOR

SECTOR	AREA (ft^2) (000)	FLOW RATE CFM (000)	CFM / ft^2
Northeast Mall	52	101	1.9
West Tower	180	181	1.0
East Tower	195	164	0.9
Southeast Mall	59	52	0.9
3rd Floor Mall	157	122	0.8
2nd Floor Mall	205	148	0.7
Garage & Lower Garage	44	18	0.4

Table B-3. Outside Air Delivered per Person by [redacted] Handling Units at Waterside Mall, Areas Served, [redacted] Capacities in Cubic Feet per Minute per Person (CFMP)

No.	ID	Service Sector	Sample Room	Capacity[a] (CFM)	Occupants[b]	Occ.	CFM Air (%)[a]	Fresh Air (CFMP)
1	1	M3	3402	15809	108	146	27	39
2	4	M3	3234	16105	85	189	18	34
3	5	M3	3201	9636	142	68	22	15
4	6	M3	3002	28440	139	205	26	53
5	8	M3	3702A	11329	60	189	16	30
6	9	M3	3702C	17635	73	242	23	56
7	12	M3	3600	11422	57	200	15	30
8	13	M3	3100	12036	59	204	20	41
9	2	M2	2107	10095	31	326	25	82
10	3	M2	2501	12566	24	524	24	126
11	10	M2	2701	7644	26	294	13	38
12	14	M2	2102	10282	109	94	60	56
13	16	M2	2817	10780	68	159	58	92
14	18	M2	2821	14400	92	157	58	91
15	19	M2	2603	7562	19	398	23	92
16	20	M2	2632	8921	32	279	17	47
17	21	M2	2902	15574	49	318	20;49[d]	64;156
19	B	M2	2123	2255	8[c]	282	19	54
22	E	M2	2435	3285	24	137	16	22
26	15	SW,M2	2	27868	114	244	52	127
29	SE2-2	SE	256	3605	30	120	18	22
31	SE3-2	SE	312	12700	83	153	45	69
42	ETB	ET	55	7219	38	190	43	82

[a] Supply air capacities and % outside air provided from measurements in March, 1989.

[b] No. of occupants from EPA Computerized Directory for March, 1989.

[c] Number of people returning questionnaires, when this number is larger than the number given by the EPA Directory.

[d] Measurements made 3/7/89 and 3/8/89.

Table B-4. Capacities, Number of Occupants Served, and Outside Air Delivered by Air Handling Units on Each Floor of the Towers

	Number of Occupants on Each Floor[a]						Measured Capacities[b] (cfm)	
	East Tower			West Tower				
Fl.	ET1	ET2	ET3	WT1	WT2	WT3	ET1	ET2
1	14	30	---	---	---	---	5000	4750
2	30	36	---	20	27	---	5890	5090
3	52	37	---	27	35	---	7670	6855
4	40	30	19	39	33	14	4630	4213*
5	38	24	32	38	34	25	4540	4131*
6	28	19	30	20	42	41	4320	3931*
7	41	29	40	33	41	33	4840	4404*
8	35	42	17	23	33	26	4290	3904*
9	17	30	49	25	42	17	4360	3968*
10	30	18	32	34	37	5	4690	4268*
11	31	35	27	23	30	4	4100	3870
12	15	12	19	16	18	0	4380	3890
Tot	367	342	265	298	370	165	58710	53470

Average Capacities by Floor[c] (cfm) and Floors Served by West Tower, East Tower-3

WT1	6564	(1-12)
WT2	5062	(1-12)
WT3	4121	(4-11)
ET3	3002	(4-11)

Per Capita Capacities (cfmp):

Fl.	ET1	ET2	ET3	WT1	WT2	WT3
1	357	158	---	---	---	---
2	196	141	---	328	187	---
3	148	185	---	274	145	---
4	116	140	158	168	153	294
5	119	172	94	173	149	165
6	154	207	100	328	120	100
7	118	152	75	199	123	125
8	123	93	176	285	153	159
9	256	132	61	263	121	242
10	156	237	94	193	137	824
11	132	111	111	285	169	999
12	292	324	158	410	281	---

Table B-4 (Continued)

Outside Air Delivered (cfmp)

Fl.	ET1 (23)[d]	ET2 (41)	ET3 (83)	WT1 (53)	WT2 (36)	WT3 (30)
1	82	65	---	---	---	---
2	45	58	---	173	67	---
3	34	76	---	145	52	---
4	27	57	131	89	55	88
5	27	71	78	92	54	50
6	35	85	83	174	43	30
7	27	62	62	105	44	38
8	28	38	146	151	55	48
9	59	54	51	139	44	73
10	36	97	78	102	49	247
11	30	46	92	151	61	300
12	67	133	131	217	101	---

* Calculated values

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[a] From EPA computerized Directory (about March 1989)

[b] From 1986 balancing reports

[c] From March 1989 measurements: total capacity/(no. of floors)

[d] From March 1989 measurements: percent outside air

APPENDIX C

METHODS AND RESULTS OF PRINCIPAL COMPONENTS ANALYSIS OF HEALTH, COMFORT, ODOR, AND PSYCHO-SOCIAL QUESTIONS

METHODS AND RESULTS OF PRINCIPAL COMPONENTS ANALYSIS OF HEALTH, COMFORT, ODOR, AND PSYCHO-SOCIAL QUESTIONS

Three types of dependent variables were included in the questionnaire: health symptoms, comfort concerns, and odors. Each category had multiple questions, some of which might be highly correlated (e.g., dry throat with sore throat). Running separate regressions on highly correlated dependent variables would be redundant and costly. Therefore a principal components analysis (PCA) was carried out on each of these three types of dependent variables to identify the major factors within each category. The Varimax rotation method was used to provide the maximum amount of differentiation of the factors. Factors are listed in order of the variance explained by each factor. (See Tables 7-10 for the amount of the variance.)

Health symptoms

There were 32 questions on health symptoms. One symptom was problems with contact lenses, which applies only to the subgroup of persons wearing contact lenses. Therefore this symptom was eliminated from PCA. The PCA on the remaining 31 symptoms (Table C-1) identified a total of nine factors. The symptoms associated with each factor are identified by underlining. For example, the major components of factor 9 are headache and nausea. Two symptoms -- dizziness and dry skin -- did not load heavily on any factor.

Thus, in all succeeding linear and logistic regressions, a total of 12 health symptom factors were employed as dependent variables.

Comfort concerns

Ten questions on perceived air movement, temperature, and humidity were included in the questionnaire. The PCA identified four factors (Table C-2). The first factor included perceptions of too little air movement and air that was too hot and too stuffy. Other factors included perceptions of dry air, cold drafty air, and

humid air. All four factors were employed in all succeeding regressions.

Odors noticed

Fifteen question on odors were reduced to six factors by PCA (Table C-3). The first factor was chemical odors, including odors of fresh paint and carpet cleaning. The second factor included cosmetics, body odor, and food smells (other than fishy odors). Tobacco smoke odor did not correlate with any of the other odors. All six factors were employed in the succeeding analysis.

Psycho-social factors

Besides the three dependent variable categories described above, one set of independent variables was also subjected to PCA. This group consisted of all questions in Part IV of the questionnaire: the so-called "psycho-social" questions dealing with job satisfaction, perceived workload, etc. These questions were drawn from a larger set of questions that have often been used in workplace investigations by industrial hygienists and psychologists. The parent set of questions has been repeatedly validated; however, it was felt to be desirable to test whether the reduced set of questions would retain the qualities of the full set.

For the most part, the PCA (Table C-4) showed the expected relationships. Six factors (role ambiguity, workload, job satisfaction, influence over job, role conflict, and skill utilization) were identified in accordance with expectation. A seventh factor dealt with satisfaction with salary and advancement opportunities. Since this was the weakest of the factors, it was not employed in the regressions.

Table C-1. PRINCIPAL COMPONENTS ANALYSIS OF SYMPTOM VARIABLES
NFACTORS = 9

Orthogonal Transformation Matrix

	1	2	3	4	5	6	7	8	9
1	0.41558	0.41589	0.39013	0.34041	0.32397	0.33388	0.26028	0.24132	0.20936
2	-0.42568	-0.50565	0.07468	0.59082	0.21892	0.35824	-0.04241	-0.15780	0.07418
3	0.29310	-0.17496	-0.62954	-0.12051	0.49346	0.13872	0.39818	-0.16138	-0.15905
4	0.33962	0.04051	-0.32849	0.46818	-0.70231	0.14464	0.13319	-0.14951	-0.04091
5	0.61535	-0.59947	0.42393	-0.09604	-0.00681	-0.10194	-0.14614	-0.15896	-0.12640
6	-0.18413	-0.30754	0.19030	-0.30948	-0.29844	0.11796	0.72436	0.19894	0.26882
7	-0.02081	-0.08949	-0.00990	0.44286	0.12527	-0.78662	0.28691	0.26673	-0.08604
8	-0.17809	0.21394	0.33133	0.01257	-0.02860	0.06235	0.32081	-0.34534	-0.76530
9	-0.01163	0.17712	0.11043	0.00747	0.06895	-0.27028	0.15121	-0.78308	0.49230

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6	FACTOR7	FACTOR8	FACTOR9		
II7A1	0.14413	0.15119	0.22328	0.21304	0.07730	0.15432	0.05173	0.12333	0.71051	ii7a1	HEADACHE
II7B1	0.11454	0.13875	0.14453	0.06173	0.25641	0.08930	0.36561	0.22610	0.53707	ii7b1	NAUSEA
II7C1	0.09923	0.12904	0.13463	0.80077	0.07129	0.08482	0.08667	0.04110	0.05835	ii7c1	RUNNY NOSE
II7D1	0.14060	0.11364	0.19745	0.68636	0.12849	0.16775	0.01781	-0.01339	0.24177	ii7d1	STUFFY NOSE
II7E1	0.09668	0.06106	0.14653	0.74599	0.12337	0.13967	0.13043	0.16867	0.00186	ii7e1	SNEEZING
II7F1	0.08302	0.07116	0.04232	0.52309	0.25076	0.41487	0.20657	0.12661	0.00742	ii7f1	COUGH
II7G1	0.10223	0.07291	0.08313	0.23426	0.73508	0.19856	0.08869	0.00127	0.04760	ii7g1	WHEEZING
II7H1	0.16708	0.13623	0.15439	0.11926	0.78902	0.09991	0.08737	0.13008	0.07163	ii7h1	SHORTNESS OF BREATH
II7I1	0.14140	0.15584	0.16396	0.06051	0.77901	0.15021	0.05309	0.02698	0.09323	ii7i1	CHEST TIGHTNESS
II7J1	0.14524	0.14027	0.71251	0.29954	0.12116	0.14757	0.00543	0.03874	0.13469	ii7j1	DRY/TEARING EYES
II7K1	0.15509	0.20534	0.74441	0.11860	0.07456	0.14986	0.03654	0.07023	0.14452	ii7k1	SORE EYES
II7L1	0.15045	0.10137	0.58419	-0.01221	0.22121	-0.02137	0.21204	0.31504	-0.05376	ii7l1	BLURRY VISION
II7M1	0.14987	0.06910	0.76930	0.15107	0.14487	0.16105	0.06180	0.08865	0.12577	ii7m1	BURNING EYES
II7N1	0.12361	0.16503	0.12078	0.26228	0.12740	0.67600	0.20802	0.01428	0.18061	ii7n1	SORE THROAT
II7O1	0.14474	0.10828	0.13101	0.12583	0.26181	0.74270	0.13728	0.10119	-0.01432	ii7o1	HOARSENESS
II7P1	0.20292	0.11673	0.26114	0.17635	0.11083	0.66411	0.03530	0.18348	0.13897	ii7p1	DRY THROAT
II7Q1	0.18823	0.34435	0.23590	0.15966	0.13406	0.20830	0.07044	0.57888	0.28387	ii7q1	FATIGUE
II7R1	0.15784	0.30296	0.17013	0.19873	0.03240	0.19002	0.00999	0.67461	0.18937	ii7r1	SLEEPINESS
II7S1	0.20597	0.08259	0.09435	0.16066	0.04179	0.08309	0.74592	0.13440	0.05161	ii7s1	CHILLS
II7T1	0.13536	0.21327	0.04422	0.12701	0.13057	0.25848	0.71678	-0.11084	0.10691	ii7t1	FEVER
II7U1	0.59816	0.21065	0.12453	0.12703	0.13450	0.13016	0.32470	0.10961	0.02742	ii7u1	ACHING MUSCLES/JOINTS
II7W1	0.18362	0.59489	0.16855	0.06895	0.12876	0.05245	0.20315	0.30565	-0.23405	ii7w1	DIFFICULTY REMEMBERING
II7X1	0.19963	0.35354	0.25582	0.02050	0.27315	0.07061	0.34446	0.29496	0.20514	ii7x1	DIZZINESS
II7Y1	0.12528	0.73639	0.06310	0.07305	0.15109	0.06684	0.09949	0.13973	0.19318	ii7y1	DEPRESSED
II7Z1	0.20308	0.76628	0.08992	0.09670	0.12365	0.12247	0.07878	-0.01601	0.19170	ii7z1	TENSION
II7AA1	0.16390	0.76463	0.18132	0.11334	0.07322	0.10588	0.07974	0.20231	0.02875	ii7aa1	DIFFICULTY CONCENTRATI
II7BB1	0.24415	0.40980	0.36971	0.20504	-0.00153	0.22972	0.07993	-0.09559	-0.02230	ii7bb1	DRY SKIN
II7CC1	0.75705	0.19844	0.18107	0.11268	0.08187	0.11310	0.06358	0.01435	0.14334	ii7cc1	UPPER BACK PAIN
II7DD1	0.69851	0.23314	0.13981	0.12636	0.08054	0.14026	0.04778	-0.02195	0.11803	ii7dd1	LOWER BACK PAIN
II7EE1	0.76979	0.15977	0.12182	0.04769	0.11776	0.10335	0.06446	0.08259	0.08465	ii7ee1	SHOULDER/NECK PA
II7FF1	0.61844	0.03323	0.09937	0.07925	0.17264	0.03857	0.17921	0.32330	-0.11094	ii7ff1	HAND/WRIST PAIN

Table C-2. PRINCIPAL COMPONENTS ANALYSIS OF PHYSICAL ENVIRONMENT VARIABLES

NFACTOR = 4

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3	4
1	0.78304	0.58892	0.10901	0.16775
2	-0.13684	-0.02598	0.98624	0.08910
3	0.38377	-0.68326	-0.02084	0.62084
4	-0.46994	0.43088	-0.12257	0.76058

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4		
III1A1	-0.19615	0.00578	0.78015	0.14878	III1A1	TOO MUCH AIR MOVEMENT
III1B1	0.80012	0.27630	-0.20494	0.04829	III1B1	TOO LITTLE AIR MOVEMENT
III1C1	0.76008	0.27845	0.23921	0.03717	III1C1	WANT TO ADJUST AIR MOVEMENT
III1D1	0.71702	0.09324	-0.13619	0.20301	III1D1	TOO HOT
III1E1	0.11125	0.04121	0.81525	-0.04137	III1E1	TOO COLD
III1F1	0.67353	0.17081	0.47867	-0.02496	III1F1	WANT TO ADJUST TEMPERATURE
III1G1	0.17353	0.07803	0.08759	0.95897	III1G1	TOO HUMUD
III1H1	0.25548	0.90678	0.05528	-0.02637	III1H1	TOO DRY
III1I1	0.27676	0.88046	0.06158	0.12914	III1I1	WANT TO ADJUST HUMIDITY
III1J1	0.66710	0.48768	-0.08668	0.11827	III1J1	TOO STUFFY

Table C-3 PRINCIPAL COMPONENTS ANALYSIS OF ODOR VARIABLES

NFACTOR = 6

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3	4	5	6
1	0.54341	0.38586	0.42664	0.42898	0.38489	0.20405
2	-0.34345	0.78917	-0.20611	-0.34689	0.17163	0.25880
3	-0.39354	-0.28089	0.68948	-0.35005	0.37555	0.16515
4	-0.42041	-0.21078	-0.38850	0.54183	0.56393	0.12769
5	0.50510	-0.27215	-0.38521	-0.51950	0.46603	0.18802
6	0.00190	-0.17584	-0.02834	0.09823	-0.38232	0.90136

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6		
III2A	-0.07342	0.61626	0.25794	0.14021	0.13154	0.27829	III2A	BODY ODOR
III2B	0.14899	0.79207	0.15705	0.07332	-0.04218	0.08898	III2B	COSMETICS ODORS
III2C	0.15905	0.17767	0.08627	0.05833	0.14764	0.92108	III2C	TOBACCO SMOKE ODORS
III2D	0.12278	0.39080	-0.06952	0.09752	0.69941	0.13236	III2D	FISHY SMELLS
III2E	0.25166	0.69586	-0.08586	0.01919	0.35282	-0.06058	III2E	OTHER FOOD SMELLS
III2F	0.07096	0.09820	0.25641	0.31060	0.59419	0.10789	III2F	MUSTY/DAMP SMELLS
III2G	0.31312	0.07144	0.05198	0.78590	0.12790	0.03324	III2G	NEW CARPET ODORS
III2H	0.12997	0.09479	0.29324	0.77266	0.14956	0.03493	III2H	NEW DRAPES ODORS
III2I	0.23363	-0.08279	0.44912	0.04223	0.58963	0.02843	III2I	DIESEL/ENGINE EXHAUST ODORS
III2J	0.22101	0.26068	0.70684	0.21054	0.01598	0.04195	III2J	PHOTOCOPYING MACHINE ODORS
III2K	0.21638	0.06334	0.75932	0.13604	0.22031	0.08427	III2K	PRINTING PROCESSING ODORS
III2L	0.69795	0.27359	0.28081	0.07289	0.03464	-0.01780	III2L	OTHER CHEMICAL ODORS
III2M	0.68683	-0.01708	0.30797	0.03695	0.23079	0.12187	III2M	PESTICIDE ODORS
III2N	0.62385	0.07036	0.13348	0.38672	0.10113	0.09324	III2N	CARPET CLEANING ODORS
III2O	0.66029	0.13090	-0.02279	0.39457	0.09236	0.08765	III2O	PAINT ODORS

Table C-4 PRINCIPAL COMPONENTS ANALYSIS OF JOB SATISFACTION VARIABLES

NFACTORS = 7

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3	4	5	6	7
1	0.56288	0.17734	0.48223	0.37234	-0.24524	0.41282	0.22354
2	-0.08544	0.84764	-0.10291	0.06359	0.48156	0.14524	-0.08115
3	-0.59255	0.04736	0.63807	-0.20966	0.04380	0.01932	0.43962
4	-0.39118	-0.19544	-0.10435	0.88017	0.14360	0.00329	0.05054
5	0.26983	-0.43180	0.21319	-0.08297	0.81687	0.14296	-0.02644
6	0.30382	0.10441	-0.14149	0.08405	0.13472	-0.64629	0.65868
7	0.08129	0.11079	0.52286	0.15719	-0.00044	-0.60825	-0.55952

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6	FACTOR7	
RIV1A	0.19621	0.06099	0.71292	0.11326	-0.13419	0.23907	0.22641	RIV1A SATISFIED WITH JOB
RIV1B	0.19001	0.02402	0.78291	0.10229	-0.12432	0.12495	0.16342	RIV1B WOULD TAKE JOB AGAIN
RIV1C	0.04901	0.02275	0.69655	0.03471	-0.03376	0.11258	-0.03049	RIV1C TYPE OF JOB WANTED
RIV1D	0.18100	-0.00307	0.75745	0.13462	-0.12554	0.10619	0.16066	RIV1D RECOMMEND JOB TO FRIEND
RIV2	0.04334	-0.00540	0.09295	0.05301	-0.09038	0.06524	0.88510	RIV2 SATISFIED WITH SALARY
RIV3	0.13896	0.00189	0.35835	0.11876	-0.06921	0.07947	0.71715	RIV3 SATIS. W/ OPPORTUN. TO ADVANCE
IV4A	-0.11463	0.09201	-0.12058	-0.04277	0.83101	-0.02618	-0.07341	IV4A PEERS REQUEST CONFLICTING TASKS
IV4B	-0.17610	0.12680	-0.12478	-0.07655	0.84706	-0.03223	-0.08819	IV4B SUPVS REQUEST CONFLCTING TASKS
IV4C	-0.14115	0.34288	-0.11489	-0.07045	0.71296	-0.08780	-0.01270	IV4C PRTY REQUEST CONFLICT W/ OTHR WRK
IV5A	0.08206	-0.06145	0.10991	0.72758	-0.02502	0.19590	0.02070	IV5A INFLUENCE - AMT. OF WORK
IV5B	0.21298	-0.09858	0.09170	0.72353	-0.00591	0.03702	0.04279	IV5B INFLUENCE - AVAIL. OF MATERIALS
IV5C	0.14259	0.25200	0.14922	0.70114	-0.01942	0.17083	0.09509	IV5C INFLUENCE - POLICIES & PROCEDURES
IV5D	0.06752	0.15702	0.00927	0.63259	-0.11634	0.02706	0.03521	IV5D INFLUENCE - FURNITURE ARRANGEMENTS
IV6A	0.06029	0.82052	0.00371	0.07739	0.13046	0.04321	-0.00735	IV6A HOW OFTEN HAVE TO WORK VERY FAST
IV6B	0.06217	0.86946	0.03772	0.05905	0.06731	0.13801	-0.00940	IV6B HOW OFTEN HAVE TO WORK VERY HARD
IV6C	-0.05398	0.84930	-0.00427	0.03848	0.18094	0.04538	0.01765	IV6C HOW OFTN LITTLE TIME TO COMPL TASK
IV6D	0.10352	0.81451	0.06907	0.03567	0.08814	0.16234	0.00270	IV6D HOW OFTEN GREAT DEAL TO BE DONE
IV6E	0.20599	0.12229	0.17126	0.08900	-0.04984	0.82070	0.00551	IV6E HOW OFTEN USE SKILLS & KNOWLEDGE
IV6F	0.28798	0.16920	0.29249	0.24649	-0.08717	0.68279	0.12327	IV6F HOW OFTEN DO THINGS YOU DO BEST
IV6G	0.22941	0.18903	0.21003	0.20831	-0.03336	0.74510	0.10023	IV6G HOW OFTN USE SKILLS FROM PREV EXP
IV6H	0.80104	0.04708	0.14960	0.16191	-0.13139	0.19471	0.03386	IV6H HOW OFTEN CLEAR ON RESPONSIBILITY
IV6I	0.81263	0.07117	0.14648	0.19622	-0.06972	0.14060	0.04131	IV6I HOW OFTEN PREDICT OTHERS EXPECT
IV6J	0.82402	0.02507	0.15188	0.09029	-0.15261	0.17447	0.08113	IV6J HOW OFTEN WORK OBJECT WELL DEFIND
IV6K	0.86102	0.03838	0.15756	0.12447	-0.13617	0.13082	0.06885	IV6K HOW OFTN CLR WHAT OTHERS EXPECT

APPENDIX D

NUMBER OF MEN AND WOMEN AT EACH LEVEL OF THE HEALTH, COMFORT AND ODOR INDICES AND ASSOCIATED BINARY VARIABLES EMPLOYED IN THE LINEAR AND LOGISTIC REGRESSIONS

APPENDIX D

NUMBER OF MEN AND WOMEN AT EACH LEVEL OF THE HEALTH, COMFORT AND ODOR INDICES AND ASSOCIATED BINARY VARIABLES EMPLOYED IN THE LINEAR AND LOGISTIC REGRESSIONS

The dependent variables for the linear regressions were the indices constructed from the factors identified by Principal Components Analysis (Appendix C). Each factor consisted of responses to one or more questions on health, comfort or odor symptoms. Each response was graded on a scale of 0 to 3, with 0 used for "never" or "rarely" during the past year, 1 for "sometimes," 2 for "often" and 3 for "always." Since the number of questions contained in a factor varied from 1 to 5, the high scores for the indices range from 3 to 15. Tables D-1 through D-22 document the number of men and women at each level of the 12 health, 4 comfort and 6 odor indices.

For the logistic regressions, the indices had to be reduced to binary (0,1) variables. It was decided to select the cutoff point at the same index value for both men and women, and to have at least 10% of respondenst of each gender in the "positive" category. (Since women consistently reported more health symptoms than men, this effectively resulted in having more women than men in the "positive" category for every health variable.) The number of men and women in the (0,1) categories for each health variable is shown in the sections of Tables D-1 through D-22 marked "BINARY VARIABLE FREQUENCIES." The percentages associated with the "positive" category for each sex are related to the values of p occurring in the expression for the odds ratio for that condition, as listed in Appendix E.

An alternative two-part criterion for defining a "positive" health variable has been used in previous studies: requiring that (1) all symptoms be "work-related" in some sense, and that (2) at least one symptom included in the health variable occur sufficiently often. As a test of how this criterion might affect our results, we chose the eye irritation factor to run a separate set of logistic regressions on. If the respondent reported that the symptom improved after work, and happened "sometimes," "often," or "always" within the

last year, the response was scored as work-related. Since there were four symptoms within this category, a respondent could score up to four work-related symptoms. The scores using this criterion are given in Table D-23.

The second requirement was met by requiring that at least one of the four symptoms occur either "often" or "always". Using this criterion in place of our first approach of selecting a cutoff point on the index resulted in a different (and larger) number of men and women categorized as "positive" (last part of Table D-23.) The accompanying linear and logistic regressions using this criterion are presented in Appendix F.

Table D-1. HEADACHE AND NAUSEA

Frequency Percent Row Pct Col Pct	F	M	Total
0	537 13.75 37.32 26.65	902 23.10 62.68 47.72	1439 36.85
1	736 18.85 52.50 36.53	666 17.06 47.50 35.24	1402 35.90
2	497 12.73 66.09 24.67	255 6.53 33.91 13.49	752 19.26
3	188 4.81 77.69 9.33	54 1.38 22.31 2.86	242 6.20
4	47 1.20 82.46 2.33	10 0.26 17.54 0.53	57 1.46
5	8 0.20 72.73 0.40	3 0.08 27.27 0.16	11 0.28
6	2 0.05 100.00 0.10	0 0.00 0.00 0.00	2 0.05
Total	2015 51.60	1890 48.40	3905 100.00

Frequency Missing = 50

(Continued)

Table D-1 (continued). HEADACHE AND NAUSEA

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1273 32.60 44.81 63.18	1568 40.15 55.19 82.96	2841 72.75
1	742 19.00 69.74 36.82	322 8.25 30.26 17.04	1064 27.25
Total	2015 51.60	1890 48.40	3905 100.00

Frequency Missing = 50

Table D-2. STUFFY NOSE/SINUS CONGESTION, RUNNY NOSE, SNEEZING, COUGH

Frequency Percent Row Pct Col Pct	F	M	Total
0	357 9.20 42.86 17.81	476 12.26 57.14 25.36	833 21.46
1	213 5.49 46.41 10.62	246 6.34 53.59 13.11	459 11.82
2	248 6.39 46.10 12.37	290 7.47 53.90 15.45	538 13.86
3	299 7.70 54.76 14.91	247 6.36 45.24 13.16	546 14.06
4	330 8.50 52.88 16.46	294 7.57 47.12 15.66	624 16.07
5	193 4.97 59.20 9.63	133 3.43 40.80 7.09	326 8.40
6	144 3.71 61.80 7.18	89 2.29 38.20 4.74	233 6.00

(Continued)

Table D-2 (continued). STUFFY NOSE/SINUS CONGESTION, RUNNY NOSE, SNEEZING, COUGH

Frequency Percent Row Pct Col Pct	F	M	Total
7	116 2.99 69.46 5.79	51 1.31 30.54 2.72	167 4.30
8	55 1.42 61.11 2.74	35 0.90 38.89 1.86	90 2.32
9	26 0.67 81.25 1.30	6 0.15 18.75 0.32	32 0.82
10	15 0.39 71.43 0.75	6 0.15 28.57 0.32	21 0.54
11	3 0.08 50.00 0.15	3 0.08 50.00 0.16	6 0.15
12	6 0.15 85.71 0.30	1 0.03 14.29 0.05	7 0.18
Total	2005 51.65	1877 48.35	3882 100.00

Frequency Missing = 73

(Continued)

Table D-2 (continued). STUFFY NOSE/SINUS CONGESTION, RUNNY NOSE, SNEEZING, COUGH

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1447 37.27 48.23 72.17	1553 40.01 51.77 82.74	3000 77.28
1	558 14.37 63.27 27.83	324 8.35 36.73 17.26	882 22.72
Total	2005 51.65	1877 48.35	3882 100.00

Frequency Missing = 73

Table D-3. WHEEZING, SHORTNESS OF BREATH, CHEST TIGHTNESS

Frequency Percent Row Pct Col Pct	F	M	Total
0	1494 38.37 49.26 74.25	1539 39.52 50.74 81.77	3033 77.89
1	210 5.39 54.69 10.44	174 4.47 45.31 9.25	384 9.86
2	142 3.65 62.28 7.06	86 2.21 37.72 4.57	228 5.86
3	82 2.11 67.21 4.08	40 1.03 32.79 2.13	122 3.13
4	38 0.98 69.09 1.89	17 0.44 30.91 0.90	55 1.41

(Continued)

Table D-3 (continued). WHEEZING, SHORTNESS OF BREATH, CHEST TIGHTNESS

Frequency Percent Row Pct Col Pct	F	M	Total
5	16 0.41 59.26 0.80	11 0.28 40.74 0.58	27 0.69
6	21 0.54 70.00 1.04	9 0.23 30.00 0.48	30 0.77
7	5 0.13 71.43 0.25	2 0.05 28.57 0.11	7 0.18
8	2 0.05 50.00 0.10	2 0.05 50.00 0.11	4 0.10
9	2 0.05 50.00 0.10	2 0.05 50.00 0.11	4 0.10
Total	2012 51.67	1882 48.33	3894 100.00

Frequency Missing = 61

(Continued)

Table D-3 (continued). WHEEZING, SHORTNESS OF BREATH, CHEST TIGHTNESS

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1704 43.76 49.87 84.69	1713 43.99 50.13 91.02	3417 87.75
1	308 7.91 64.57 15.31	169 4.34 35.43 9.98	477 12.25
Total	2012 51.67	1882 48.33	3894 100.00

Frequency Missing = 61

Table D-4. DRY, ITCHING OR TEARING EYES, SORE EYES, BURNING EYES, BLURRY VISION

Frequency Percent Row Pct Col Pct	F	M	Total
0	515 13.24 42.32 25.63	702 18.05 57.68 37.34	1217 31.29
1	291 7.48 46.12 14.48	340 8.74 53.88 18.09	631 16.23
2	283 7.28 50.36 14.09	279 7.17 49.64 14.84	562 14.45
3	264 6.79 56.29 13.14	205 5.27 43.71 10.90	469 12.06
4	200 5.14 62.11 9.96	122 3.14 37.89 6.49	322 8.28
5	142 3.65 61.21 7.07	90 2.31 38.79 4.79	232 5.97
6	124 3.19 64.92 6.17	67 1.72 35.08 3.56	191 4.91

(Continued)

Table D-4 (continued). DRY, ITCHING OR TEARING EYES, SORE EYES, BURNING EYES, BLURRY VISION

Frequency Percent Row Pct Col Pct	F	M	Total
7	64 1.65 73.56 3.19	23 0.59 26.44 1.22	87 2.24
8	59 1.52 71.08 2.94	24 0.62 28.92 1.28	83 2.13
9	24 0.62 70.59 1.19	10 0.26 29.41 0.53	34 0.87
10	13 0.33 61.90 0.65	8 0.21 38.10 0.43	21 0.54
11	14 0.36 66.67 0.70	7 0.18 33.33 0.37	21 0.54
12	16 0.41 84.21 0.80	3 0.08 15.79 0.16	19 0.49
Total	2009 51.66	1880 48.34	3889 100.00

Frequency Missing = 66

(Continued)

Table D-4 (continued). DRY, ITCHING OR TEARING EYES, SORE EYES, BURNING EYES, BLURRY VISION

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1553 39.93 48.52 77.30	1648 42.38 51.48 87.66	3201 82.31
1	456 11.73 66.28 22.70	232 5.97 33.72 12.34	688 17.69
Total	2009 51.66	1880 48.34	3889 100.00

Frequency Missing = 66

Table D-5. SORE THROAT, HOARSENESS, DRY THROAT

Frequency Percent Row Pct Col Pct	F	M	Total
0	827 21.21 44.51 40.96	1031 26.44 55.49 54.84	1858 47.65
1	418 10.72 53.32 20.70	366 9.39 46.68 19.47	784 20.11
2	285 7.31 57.93 14.12	207 5.31 42.07 11.01	492 12.62
3	265 6.80 61.20 13.13	168 4.31 38.80 8.94	433 11.11
4	105 2.69 66.88 5.20	52 1.33 33.12 2.77	157 4.03

(Continued)

Table D-5 (continued). SORE THROAT, HOARSENESS, DRY THROAT

Frequency Percent Row Pct Col Pct	F	M	Total
5	51 1.31 62.96 2.53	30 0.77 37.04 1.60	81 2.08
6	48 1.23 76.19 2.38	15 0.38 23.81 0.80	63 1.62
7	9 0.23 56.25 0.45	7 0.18 43.75 0.37	16 0.41
8	6 0.15 85.71 0.30	1 0.03 14.29 0.05	7 0.18
9	5 0.13 62.50 0.25	3 0.08 37.50 0.16	8 0.21
Total	2019 51.78	1880 48.22	3899 100.00

Frequency Missing = 56

(Continued)

Table D-5 (continued). SORE THROAT, HOARSENESS, DRY THROAT

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1530 39.24 48.82 75.78	1604 41.14 51.18 85.32	3134 80.38
1	489 12.54 63.92 24.22	276 7.08 36.08 14.68	765 19.62
Total	2019 51.78	1880 48.22	3899 100.00

Frequency Missing = 56

Table D-6. SLEEPINESS, UNUSUAL FATIGUE

Frequency Percent Row Pct Col Pct	F	M	Total
0	518 13.25 41.74 25.64	723 18.50 58.26 38.27	1241 31.75
1	360 9.21 47.37 17.82	400 10.23 52.63 21.18	760 19.44
2	550 14.07 53.50 27.23	478 12.23 46.50 25.30	1028 26.30
3	220 5.63 67.90 10.89	104 2.66 32.10 5.51	324 8.29
4	255 6.52 63.43 12.62	147 3.76 36.57 7.78	402 10.28
5	37 0.95 71.15 1.83	15 0.38 28.85 0.79	52 1.33
6	80 2.05 78.43 3.96	22 0.56 21.57 1.16	102 2.61
Total	2020 51.68	1889 48.32	3909 100.00

Frequency Missing = 46

(Continued)

Table D-6 (continued). SLEEPINESS, UNUSUAL FATIGUE

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1648 42.16 49.15 81.58	1705 43.62 50.85 90.26	3353 85.78
1	372 9.52 66.91 18.42	184 4.71 33.09 9.74	556 14.22
Total	2020 51.68	1889 48.32	3909 100.00

Frequency Missing = 46

Table D-7. CHILLS AND FEVER

Frequency Percent Row Pct Col Pct	F	M	Total
0	1370 35.03 46.44 67.72	1580 40.40 53.56 83.69	2950 75.43
1	365 9.33 65.53 18.04	192 4.91 34.47 10.17	557 14.24
2	214 5.47 68.15 10.58	100 2.56 31.85 5.30	314 8.03
3	55 1.41 79.71 2.72	14 0.36 20.29 0.74	69 1.76
4	18 0.46 94.74 0.89	1 0.03 5.26 0.05	19 0.49
6	1 0.03 50.00 0.05	1 0.03 50.00 0.05	2 0.05
Total	2023 51.73	1888 48.27	3911 100.00

Frequency Missing = 44

(Continued)

Table D-7 (continued). CHILLS AND FEVER

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1370 35.03 46.44 67.72	1580 40.40 53.56 83.69	2950 75.43
1	653 16.70 67.95 32.28	308 7.88 32.05 16.31	961 24.57
Total	2023 51.73	1888 48.27	3911 100.00

Frequency Missing = 44

Table D-8. ACHING MUSCLES OR JOINTS, PAIN IN BACK, SHOULDER, NECK, WRISTS

Frequency Percent Row Pct Col Pct	F	M	Total
0	710 18.26 43.64 35.36	917 23.58 56.36 48.75	1627 41.84
1	270 6.94 47.45 13.45	299 7.69 52.55 15.90	569 14.63
2	251 6.45 56.53 12.50	193 4.96 43.47 10.26	444 11.42
3	209 5.37 59.89 10.41	140 3.60 40.11 7.44	349 8.97
4	169 4.35 55.05 8.42	138 3.55 44.95 7.34	307 7.89
5	117 3.01 61.58 5.83	73 1.88 38.42 3.88	190 4.89
6	79 2.03 67.52 3.93	38 0.98 32.48 2.02	117 3.01
7	62 1.59 69.66 3.09	27 0.69 30.34 1.44	89 2.29

(Continued)

Table D-8 (continued). ACHING MUSCLES, PAIN IN BACK, NECK, WRISTS

Frequency Percent Row Pct Col Pct	F	M	Total
8	39 1.00 66.10 1.94	20 0.51 33.90 1.06	59 1.52
9	30 0.77 66.67 1.49	15 0.39 33.33 0.80	45 1.16
10	32 0.82 76.19 1.59	10 0.26 23.81 0.53	42 1.08
11	11 0.28 73.33 0.55	4 0.10 26.67 0.21	15 0.39
12	13 0.33 81.25 0.65	3 0.08 18.75 0.16	16 0.41
13	7 0.18 87.50 0.35	1 0.03 12.50 0.05	8 0.21
14	5 0.13 83.33 0.25	1 0.03 16.67 0.05	6 0.15
15	4 0.10 66.67 0.20	2 0.05 33.33 0.11	6 0.15
Total	2008 51.63	1881 48.37	3889 100.0

Frequency Missing = 66

Table D-8 (continued). ACHING MUSCLES, PAIN IN BACK, SHOULDER, NECK, WRISTS

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1609 41.37 48.82 80.13	1687 43.38 51.18 89.69	3296 84.75
1	399 10.26 67.28 19.87	194 4.99 32.72 10.31	593 15.25
Total	2008 51.63	1881 48.37	3889 100.00

Frequency Missing = 66

Table D-9. DIFFICULTY CONCENTRATING, REMEMBERING; DEPRESSION, TENSION

Frequency Percent Row Pct Col Pct	F	M	Total
0	634 16.31 45.55 31.62	758 19.51 54.45 40.30	1392 35.82
1	339 8.72 50.82 16.91	328 8.44 49.18 17.44	667 17.16
2	305 7.85 54.66 15.21	253 6.51 45.34 13.45	558 14.36
3	230 5.92 52.87 11.47	205 5.28 47.13 10.90	435 11.19
4	200 5.15 56.50 9.98	154 3.96 43.50 8.19	354 9.11
5	109 2.80 56.19 5.44	85 2.19 43.81 4.52	194 4.99
6	75 1.93 60.48 3.74	49 1.26 39.52 2.60	124 3.19

(Continued)

Table D-9 (continued). DIFFICULTY CONCENTRATING, REMEMBERING; DEPRESSION, TENSION

Frequency Percent Row Pct Col Pct	F	M	Total
7	41 1.06 57.75 2.04	30 0.77 42.25 1.59	71 1.83
8	40 1.03 83.33 2.00	8 0.21 16.67 0.43	48 1.24
9	16 0.41 72.73 0.80	6 0.15 27.27 0.32	22 0.57
10	5 0.13 55.56 0.25	4 0.10 44.44 0.21	9 0.23
11	6 0.15 85.71 0.30	1 0.03 14.29 0.05	7 0.18
12	5 0.13 100.00 0.25	0 0.00 0.00 0.00	5 0.13
Total	2005 51.60	1881 48.40	3886 100.00

Frequency Missing = 69

(Continued)

Table D-9 (continued). DIFFICULTY CONCENTRATING, REMEMBERING; DEPRESSION, TENSION

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1508 38.81 49.41 75.21	1544 39.73 50.59 82.08	3052 78.54
1	497 12.79 59.59 24.79	337 8.67 40.41 17.92	834 21.46
Total	2005 51.60	1881 48.40	3886 100.00

Frequency Missing = 69

Table D-10. DIZZINESS

Frequency Percent Row Pct Col Pct	F	M	Total
0	1449 37.04 47.14 71.73	1625 41.54 52.86 85.89	3074 78.58
1	449 11.48 65.74 22.23	234 5.98 34.26 12.37	683 17.46
2	106 2.71 78.52 5.25	29 0.74 21.48 1.53	135 3.45
3	16 0.41 80.00 0.79	4 0.10 20.00 0.21	20 0.51
Total	2020 51.64	1892 48.36	3912 100.00

Frequency Missing = 43

(Continued)

Table D-10 (continued). DIZZINESS

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1449 37.04 47.14 71.73	1625 41.54 52.86 85.89	3074 78.58
1	571 14.60 68.14 28.27	267 6.83 31.86 14.11	838 21.42
Total	2020 51.64	1892 48.36	3912 100.00

Frequency Missing = 43

Table D-11. DRY OR ITCHY SKIN

Frequency Percent Row Pct Col Pct	F	M	Total
0	964 24.67 45.71 47.75	1145 29.30 54.29 60.61	2109 53.97
1	523 13.38 54.31 25.90	440 11.26 45.69 23.29	963 24.64
2	360 9.21 60.40 17.83	236 6.04 39.60 12.49	596 15.25
3	172 4.40 71.67 8.52	68 1.74 28.33 3.60	240 6.14
Total	2019 51.66	1889 48.34	3908 100.00

Frequency Missing = 47

(Continued)

Table D-11 (continued). DRY OR ITCHY SKIN

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1487 38.05 48.40 73.65	1585 40.56 51.60 83.91	3072 78.61
1	532 13.61 63.64 26.35	304 7.78 36.36 16.09	836 21.39
Total	2019 51.66	1889 48.34	3908 100.00

Frequency Missing = 47

Table D-12. PROBLEMS WITH CONTACT LENSES

Frequency Percent Row Pct Col Pct	F	M	Total
0	130 16.62 51.79 27.25	121 15.47 48.21 39.67	251 32.10
1	171 21.87 62.18 35.85	104 13.30 37.82 34.10	275 35.17
2	123 15.73 68.72 25.79	56 7.16 31.28 18.36	179 22.89
3	53 6.78 68.83 11.11	24 3.07 31.17 7.87	77 9.85
Total	477 61.00	305 39.00	782 100.00

Frequency Missing = 3173

(Continued)

Table D-12 (continued). PROBLEMS WITH CONTACT LENSES

BINARY VARIABLE FREQUENCIES

Frequency Percent Row Pct Col Pct	F	M	Total
0	301 38.49 57.22 63.10	225 28.77 42.78 73.77	526 67.26
1	176 22.51 68.75 36.90	80 10.23 31.25 26.23	256 32.74
Total	477 61.00	305 39.00	782 100.00

Frequency Missing = 3173

Table D-13. HOT STUFFY AIR

Frequency Percent Row Pct Col Pct	F	M	Total
0	60 1.60 36.36 3.15	105 2.81 63.64 5.71	165 4.41
1	48 1.28 44.86 2.52	59 1.58 55.14 3.21	107 2.86
2	70 1.87 39.11 3.68	109 2.91 60.89 5.93	179 4.78
3	95 2.54 45.89 4.99	112 2.99 54.11 6.09	207 5.53
4	145 3.88 45.17 7.62	176 4.70 54.83 9.57	321 8.58
5	205 5.48 45.66 10.78	244 6.52 54.34 13.27	449 12.00
6	177 4.73 54.46 9.31	148 3.96 45.54 8.05	325 8.69
7	169 4.52 53.48 8.89	147 3.93 46.52 7.99	316 8.45

Table D-13 (continued). HOT STUFFY AIR

Frequency Percent Row Pct Col Pct	F	M	Total
8	161 4.30 53.49 8.46	140 3.74 46.51 7.61	301 8.05
9	161 4.30 50.79 8.46	156 4.17 49.21 8.48	317 8.47
10	175 4.68 49.16 9.20	181 4.84 50.84 9.84	356 9.52
11	128 3.42 62.75 6.73	76 2.03 37.25 4.13	204 5.45
12	100 2.67 58.82 5.26	70 1.87 41.18 3.81	170 4.54
13	74 1.98 55.64 3.89	59 1.58 44.36 3.21	133 3.56
14	72 1.92 69.23 3.79	32 0.86 30.77 1.74	104 2.78
15	62 1.66 71.26 3.26	25 0.67 28.74 1.36	87 2.33
Total	1902 50.84	1839 49.16	3741 100.00

Frequency Missing = 214

(continued)

Table D-13 (continued). HOT STUFFY AIR

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1291 34.51 48.05 67.88	1396 37.32 51.95 75.91	2687 71.83
1	611 16.33 57.97 32.12	443 11.84 42.03 24.09	1054 28.17
Total	1902 50.84	1839 49.16	3741 100.00

Frequency Missing = 214

Table D-14. DRY AIR

Frequency Percent Row Pct Col Pct	F	M	Total
0	432 11.38 40.79 22.34	627 16.51 59.21 33.66	1059 27.89
1	192 5.06 52.89 9.93	171 4.50 47.11 9.18	363 9.56
2	391 10.30 47.98 20.22	424 11.17 52.02 22.76	815 21.46
3	210 5.53 56.45 10.86	162 4.27 43.55 8.70	372 9.80
4	326 8.59 51.26 16.86	310 8.16 48.74 16.64	636 16.75
5	106 2.79 62.72 5.48	63 1.66 37.28 3.38	169 4.45
6	277 7.30 72.32 14.32	106 2.79 27.68 5.69	383 10.09
Total	1934 50.93	1863 49.07	3797 100.00

Frequency Missing = 158

(continued)

Table D-14 (continued). DRY AIR

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1225 32.26 46.95 63.34	1384 36.45 53.05 74.29	2609 68.71
1	709 18.67 59.68 36.66	479 12.62 40.32 25.71	1188 31.29
Total	1934 50.93	1863 49.07	3797 100.00

Frequency Missing = 158

Table D-15. COLD DRAFTY AIR

Frequency Percent Row Pct Col Pct	F	M	Total
0	437 11.45 41.23 22.48	623 16.32 58.77 33.26	1060 27.77
1	611 16.01 47.62 31.43	672 17.61 52.38 35.88	1283 33.61
2	469 12.29 55.24 24.13	380 9.96 44.76 20.29	849 22.24
3	219 5.74 67.38 11.27	106 2.78 32.62 5.66	325 8.51
4	133 3.48 64.56 6.84	73 1.91 35.44 3.90	206 5.40
5	35 0.92 71.43 1.80	14 0.37 28.57 0.75	49 1.28
6	40 1.05 88.89 2.06	5 0.13 11.11 0.27	45 1.18
Total	1944 50.93	1873 49.07	3817 100.00

Frequency Missing = 138

(continued)

Table D-15 (continued). COLD DRAFTY AIR

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1048 27.46 44.73 53.91	1295 33.93 55.27 69.14	2343 61.38
1	896 23.47 60.79 46.09	578 15.14 39.21 30.86	1474 38.62
Total	1944 50.93	1873 49.07	3817 100.00

Frequency Missing = 138

Table D-16. HUMID AIR

Frequency Percent Row Pct Col Pct	F	M	Total
0	1360 35.57 48.36 69.49	1452 37.98 51.64 77.81	2812 73.55
1	388 10.15 53.96 19.83	331 8.66 46.04 17.74	719 18.81
2	149 3.90 67.12 7.61	73 1.91 32.88 3.91	222 5.81
3	60 1.57 85.71 3.07	10 0.26 14.29 0.54	70 1.83
Total	1957 51.19	1866 48.81	3823 100.00

Frequency Missing = 132

(continued)

Table D-16 (continued). HUMID AIR

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1360 35.57 48.36 69.49	1452 37.98 51.64 77.81	2812 73.55
1	597 15.62 59.05 30.51	414 10.83 40.95 22.19	1011 26.45
Total	1957 51.19	1866 48.81	3823 100.00

Frequency Missing = 132

Table D-17. ODOR OF FRESH PAINT, CARPET CLEANING, OTHER CHEMICALS

Frequency Percent Row Pct Col Pct	F	M	Total
0	1350 35.38 47.86 68.74	1471 38.55 52.14 79.43	2821 73.93
1	336 8.81 60.76 17.11	217 5.69 39.24 11.72	553 14.49
2	157 4.11 61.33 7.99	99 2.59 38.67 5.35	256 6.71
3	53 1.39 59.55 2.70	36 0.94 40.45 1.94	89 2.33
4	40 1.05 65.57 2.04	21 0.55 34.43 1.13	61 1.60
5	11 0.29 91.67 0.56	1 0.03 8.33 0.05	12 0.31

(Continued)

Table D-17 (continued). ODOR OF FRESH PAINT, CARPET CLEANING, OTHER CHEMICALS

Frequency Percent Row Pct Col Pct	F	M	Total
6	6 0.16 75.00 0.31	2 0.05 25.00 0.11	8 0.21
7	4 0.10 57.14 0.20	3 0.08 42.86 0.16	7 0.18
8	3 0.08 75.00 0.15	1 0.03 25.00 0.05	4 0.10
10	2 0.05 100.00 0.10	0 0.00 0.00 0.00	2 0.05
12	2 0.05 66.67 0.10	1 0.03 33.33 0.05	3 0.08
Total	1964 51.47	1852 48.53	3816 100.00

Frequency Missing = 139

(continued)

Table D-17 (continued). ODOR OF FRESH PAINT, CARPET CLEANING, OTHER CHEMICALS

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1350 35.38 47.86 68.74	1471 38.55 52.14 79.43	2821 73.93
1	614 16.09 61.71 31.26	381 9.98 38.29 20.57	995 26.07
Total	1964 51.47	1852 48.53	3816 100.00

Frequency Missing = 139

Table D-18. ODOR OF COSMETICS, BODY ODOR, ENGINE EXHAUST

Frequency Percent Row Pct Col Pct	F	M	Total
0	640 16.65 43.18 32.50	842 21.91 56.82 44.93	1482 38.56
1	449 11.68 48.18 22.80	483 12.57 51.82 25.77	932 24.25
2	389 10.12 56.38 19.76	301 7.83 43.62 16.06	690 17.95
3	249 6.48 61.33 12.65	157 4.09 38.67 8.38	406 10.56
4	125 3.25 70.22 6.35	53 1.38 29.78 2.83	178 4.63

(Continued)

Table D-18 (continued). ODOR OF COSMETICS, BODY ODOR, ENGINE EXHAUST

Frequency Percent Row Pct Col Pct	F	M	Total
5	64 1.67 72.73 3.25	24 0.62 27.27 1.28	88 2.29
6	32 0.83 78.05 1.63	9 0.23 21.95 0.48	41 1.07
7	9 0.23 75.00 0.46	3 0.08 25.00 0.16	12 0.31
8	6 0.16 85.71 0.30	1 0.03 14.29 0.05	7 0.18
9	6 0.16 85.71 0.30	1 0.03 14.29 0.05	7 0.18
Total	1969 51.24	1874 48.76	3843 100.00

Frequency Missing = 112

(continued)

Table D-18 (continued). ODOR OF COSMETICS, BODY ODOR, ENGINE EXHAUST

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1478 38.46 47.62 75.06	1626 42.31 52.38 86.77	3104 80.77
1	491 12.78 66.44 24.94	248 6.45 33.56 13.23	739 19.23
Total	1969 51.24	1874 48.76	3843 100.00

Frequency Missing = 112

Table D-19. ODOR OF PHOTOCOPIES, PRINTING PROCESS

Frequency Percent Row Pct Col Pct	F	M	Total
0	1758 45.56 50.65 88.88	1713 44.39 49.35 91.07	3471 89.95
1	133 3.45 54.07 6.72	113 2.93 45.93 6.01	246 6.37
2	55 1.43 58.51 2.78	39 1.01 41.49 2.07	94 2.44
3	16 0.41 59.26 0.81	11 0.29 40.74 0.58	27 0.70
4	7 0.18 63.64 0.35	4 0.10 36.36 0.21	11 0.29
5	2 0.05 100.00 0.10	0 0.00 0.00 0.00	2 0.05
6	7 0.18 87.50 0.35	1 0.03 12.50 0.05	8 0.21
Total	1978 51.26	1881 48.74	3859 100.00

Frequency Missing = 96

(continued)

Table D-19 (continued). ODOR OF PHOTOCOPIES, PRINTING PROCESS

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1758 45.56 50.65 88.88	1713 44.39 49.35 91.07	3471 89.95
1	220 5.70 56.70 11.12	168 4.35 43.30 8.93	388 10.05
Total	1978 51.26	1881 48.74	3859 100.00

Frequency Missing = 96

Table D-20. ODOR OF NEW CARPETS, DRAPES

Frequency Percent Row Pct Col Pct	F	M	Total
0	1640 42.58 51.19 83.00	1564 40.60 48.81 83.37	3204 83.18
1	186 4.83 48.95 9.41	194 5.04 51.05 10.34	380 9.87
2	105 2.73 54.40 5.31	88 2.28 45.60 4.69	193 5.01
3	24 0.62 60.00 1.21	16 0.42 40.00 0.85	40 1.04
4	13 0.34 61.90 0.66	8 0.21 38.10 0.43	21 0.55
5	2 0.05 66.67 0.10	1 0.03 33.33 0.05	3 0.08
6	6 0.16 54.55 0.30	5 0.13 45.45 0.27	11 0.29
Total	1976 51.30	1876 48.70	3852 100.00

Frequency Missing = 103

(continued)

Table D-20 (continued). ODOR OF NEW CARPETS, DRAPES

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1640 42.58 51.19 83.00	1564 40.60 48.81 83.37	3204 83.18
1	336 8.72 51.85 17.00	312 8.10 48.15 16.63	648 16.82
Total	1976 51.30	1876 48.70	3852 100.00

Frequency Missing = 103

Table D-21. DAMP/MUSTY ODOR; FISHY SMELLS; ENGINE EXHAUST

Frequency Percent Row Pct Col Pct	F	M	Total
0	1498 38.91 50.44 75.73	1472 38.23 49.56 78.63	2970 77.14
1	287 7.45 52.09 14.51	264 6.86 47.91 14.10	551 14.31
2	108 2.81 55.96 5.46	85 2.21 44.04 4.54	193 5.01
3	54 1.40 65.06 2.73	29 0.75 34.94 1.55	83 2.16
4	17 0.44 60.71 0.86	11 0.29 39.29 0.59	28 0.73

(Continued)

Table D-21 (continued). DAMP/MUSTY ODOR; FISHY SMELLS; ENGINE EXHAUST

Frequency Percent Row Pct Col Pct	F	M	Total
5	4 0.10 40.00 0.20	6 0.16 60.00 0.32	10 0.26
6	6 0.16 75.00 0.30	2 0.05 25.00 0.11	8 0.21
7	2 0.05 66.67 0.10	1 0.03 33.33 0.05	3 0.08
8	0 0.00 0.00 0.00	1 0.03 100.00 0.05	1 0.03
9	2 0.05 66.67 0.10	1 0.03 33.33 0.05	3 0.08
Total	1978 51.38	1872 48.62	3850 100.00

Frequency Missing = 105

(continued)

Table D-21 (continued). DAMP/MUSTY ODOR; FISHY SMELLS; ENGINE EXHAUST

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1498 38.91 50.44 75.73	1472 38.23 49.56 78.63	2970 77.14
1	480 12.47 54.55 24.27	400 10.39 45.45 21.37	880 22.86
Total	1978 51.38	1872 48.62	3850 100.00

Frequency Missing = 105

Table D-22. ODOR OF TOBACCO SMOKE

Frequency Percent Row Pct Col Pct	F	M	Total
0	1687 43.56 50.62 84.77	1646 42.50 49.38 87.41	3333 86.06
1	205 5.29 53.66 10.30	177 4.57 46.34 9.40	382 9.86
2	63 1.63 56.25 3.17	49 1.27 43.75 2.60	112 2.89
3	35 0.90 76.09 1.76	11 0.28 23.91 0.58	46 1.19
Total	1990 51.38	1883 48.62	3873 100.00

Frequency Missing = 82

(continued)

Table D-22 (continued). ODOR OF TOBACCO SMOKE

BINARY VARIABLE FREQUENCY

Frequency Percent Row Pct Col Pct	F	M	Total
0	1687 43.56 50.62 84.77	1646 42.50 49.38 87.41	3333 86.06
1	303 7.82 56.11 15.23	237 6.12 43.89 12.59	540 13.94
Total	1990 51.38	1883 48.62	3873 100.00

Frequency Missing = 82

Table D-23. DRY, ITCHING OR TEARING EYES, SORE EYES, BURNING EYES, BLURRY VISION

FREQUENCIES USING WORK-RELATED CRITERION
(Symptoms improve after leaving work)

Frequency Percent Row Pct Col Pct	F	M	Total
0	1048 26.55 49.13 51.40	1085 27.48 50.87 56.84	2133 54.03
1	437 11.07 55.39 21.43	352 8.92 44.61 18.44	789 19.98
2	316 8.00 53.56 15.50	274 6.94 46.44 14.35	590 14.94
3	177 4.48 55.14 8.68	144 3.65 44.86 7.54	321 8.13
4	61 1.55 53.04 2.99	54 1.37 46.96 2.83	115 2.91
Total	2039 51.65	1909 48.35	3948 100.00

Frequency Missing = 7

(Continued)

Table D-23 (continued). DRY, ITCHING OR TEARING EYES, SORE EYES, BURNING EYES, BLURRY VISION

BINARY VARIABLE FREQUENCIES USING ALTERNATIVE CRITERION
(At least one symptom must have occurred "often" or "always" last year)

Frequency Percent Row Pct Col Pct	F	M	Total
0	1485 37.61 50.82 72.83	1437 36.40 49.18 75.28	2922 74.01
1	554 14.03 54.00 27.17	472 11.96 46.00 24.72	1026 25.99
Total	2039 51.65	1909 48.35	3948 100.00

Frequency Missing - 7

APPENDIX E

RESULTS OF LOGISTIC REGRESSIONS

APPENDIX E. Results of Logistic Regressions

This appendix presents the results of the logistic regressions carried out on the health, comfort, and odor factors identified in the principal components analysis (PCA). The first 48 tables provide the results of individual regressions on the 12 health symptom factors. There are four tables on each health factor since regressions were run separately for men and women, and also with and without the comfort and odor indices as independent variables. The final 20 tables provide the results of regressions on the four comfort factors and 6 odor factors, again separately for men and women.

The variables included in each logistic regression were those that had achieved at least the 0.05 level of significance for either men or women in the second linear regression.

Definitions and sources of the independent variables are provided in Table 3. Definitions of the dependent variables are found in Appendix B and Appendix D. The maximum number of persons potentially in each cell of the binary dependent variable in each regression is provided in Table 11. Definitions of the combination air handling unit (AHU) and location variables may be found in Tables 5 and 6. Thus AHU WT2 Fl 46 stands for AHU # WT2 serving floors 4-6 of the West Tower.

Interpretation of Logistic Regression Results

Logistic regressions are often employed in models comparing prevalence rates. The form of the model is

$$\frac{p}{1 \quad p} = \exp\left(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_i x_i + \ldots + \beta_n x_n\right)$$

where p = prevalence rate (fraction of persons with the given symptom)

β_0 = intercept (prevalence rate when all independent variables are zero, or at their lowest level)

β_i = coefficient of the ith independent variable

x_i = value of the ith independent variable (0 or 1 if binary, other values if continuous or multilevel)

n = number of independent variables

The term p/(1-p) is called the "odds" (Hosmer and Lemeshow, 1989) and represents the likelihood that the health or comfort complaint will be present in a member of the population of interest. For example, if 75% of male respondents reported a headache in the last year, the odds would be 0.75/0.25 = 3, meaning that men having headaches last year are three times as numerous as those not having headaches last year. Taking the logarithm of both sides of the equation results in a linear equation:

$$\ln \frac{p}{1 - p} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_i x_i + \ldots + \beta_n x_n$$

The effect of any variable x_i on the prevalence ratio p is given by the coefficient β_i. For example, if the variable is a binary (0,1) variable such as a dusty office, we can evaluate the above equation for $x_{dust} = 1$ (dusty office) and again for $x_{dust} = 0$ (clean office). The difference between the two values is the effect of the dusty office. This difference is simply β_{dust}, as can be seen by noticing that all the other terms on the right-hand side remain unchanged, and therefore their difference is zero. Since the difference of two logarithms is the ratio of the antilogarithm, and we have seen earlier that the antilogarithm is the odds, we can exponentiate the difference (β_{dust}) to obtain the "odds ratio": $\exp \beta_{dust}$. This odds ratio describes the effect of the dusty office on the prevalence p of the health symptom compared to the effect of the clean office:

$$\text{Odds ratio} = \exp \beta_{dust} = \frac{[p/(1-p)]_{dusty}}{[p/(1-p)]_{clean}}$$

The significance of the relationship between variables is likely to be more stable than the numerical magnitude of the odds ratio. This is because the odds ratio depends so strongly on the choices made in creating indices and cutoff points for the dependent variables. As can be seen from the above discussion, these choices are somewhat arbitrary.

As an example of how to interpret the odds ratios listed in Appendix E, we note that the first table shows that the odds ratio for reporting headache and nausea among women with dusty offices is 1.31. This means that the odds that women with dusty offices will report headache and nausea are about 31%

higher than the odds for women with clean offices. However, the lower 99% confidence limit is 0.97. This means that we cannot say with 99% confidence that women with dusty offices will have increased episodes of headache and nausea compared to women with clean offices.

When the comfort and odor factors were included as independent variables in the logistic regressions, they retained their original indices, which varied between 0 and 3, 6, 9, 12, or 15 as described above. Thus these 10 variables were not binary, but rather multilevel. For a multilevel variable, exp (β_i) describes the relative effect of one level of the variable compared to the next lower level. This has the effect of producing odds ratios that appear smaller than those for binary variables. Thus it will be noticed in Table 3 of Appendix E that the odds ratio for headache and nausea among women reporting hot stuffy air is only about 1.07. This means that each step along the 15-point index for hot stuffy air is about 7% more likely than the previous step to be associated with headache and nausea. Thus there is actually about a $(1.07)^{14} = 2.58$ ratio, or a 158% difference, in the prevalence of headache and nausea between women who reported hot stuffy air the most (15 on the index) and those who reported it the least.

Response Variable: Headache and Nausea
Number of Observations: 1652
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2198.248	2083.105	.
SC	2203.658	2272.446	.
-2 LOG L	2196.248	2013.105	183.143 with 34 DF (p=0.0001)
Score	.	.	174.601 with 34 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.3542	0.5498	18.3314	0.0001	0.09497	0.02304	0.3914
Use Lamp	0.0858	0.1100	0.6083	0.4354	1.08959	0.82073	1.4465
New Carpet/Drapes	0.0809	0.1429	0.3203	0.5714	1.08426	0.75035	1.5668
Glare	0.3839	0.1125	11.6474	0.0006	1.46800	1.09867	1.9615
Noise	0.3352	0.1161	8.3352	0.0039	1.39822	1.03679	1.8857
Dust	0.2720	0.1173	5.3780	0.0204	1.31259	0.97029	1.7756
High Pay	-0.3026	0.1442	4.4048	0.0358	0.73889	0.50964	1.0713
Job Satisfaction	-0.2625	0.1198	4.8002	0.0285	0.76913	0.56490	1.0472
Role Conflict	0.2187	0.0921	5.6325	0.0176	1.24446	0.98162	1.5777
Workload	0.1142	0.0664	2.9551	0.0856	1.12098	0.94474	1.3301
Role Clarity	-0.0048	0.0656	0.0054	0.9417	0.99521	0.84048	1.1784
External Stress	0.0919	0.0450	4.1796	0.0409	1.09626	0.97627	1.2310
College Grad	-0.3162	0.1399	5.1067	0.0238	0.72891	0.50835	1.0452
Allergy to Pollen	0.3208	0.1314	5.9630	0.0146	1.37823	0.98247	1.9334
Allergy to Animals	-0.1847	0.1624	1.2929	0.2555	0.83135	0.54714	1.2632
Allergy to Dust	-0.0796	0.1442	0.3047	0.5810	0.92349	0.63695	1.3389
Allergy to Molds	0.2584	0.1470	3.0910	0.0787	1.29486	0.88668	1.8909
Chem. Sensitivity	0.4220	0.1199	12.3965	0.0004	1.52501	1.11979	2.0769
Nonsmoker	0.3831	0.1520	6.3564	0.0117	1.46682	0.99158	2.1698
NEG3	1.0559	0.5427	3.7852	0.0517	2.87456	0.71028	11.6336
FCFL2	-0.3846	0.5244	0.5380	0.4633	0.68072	0.17632	2.6281
FCFL8	-0.1619	0.4081	0.1575	0.6915	0.85053	0.29725	2.4336
ET1FL89	-0.3476	0.4344	0.6401	0.4237	0.70638	0.23071	2.1628
ET2FL13	-0.9029	0.4797	3.5433	0.0598	0.40539	0.11782	1.3949
WT1FL13	-0.9085	0.5497	2.7313	0.0984	0.40313	0.09783	1.6612
WT1FL67	-1.3857	0.6569	4.4494	0.0349	0.25015	0.04606	1.3586
WT1FL89	-0.5469	0.5469	0.9999	0.3173	0.57874	0.14146	2.3677
WT2FL45	-0.1418	0.4728	0.0900	0.7642	0.86779	0.25673	2.9333
WT2FL67	-0.3476	0.4911	0.5009	0.4791	0.70638	0.19935	2.5030
WT3FL47	-1.0051	0.5939	2.8635	0.0906	0.36601	0.07926	1.6901
WT3FL811	-1.2550	1.1415	1.2089	0.2716	0.28508	0.01506	5.3952
Glued Carpet, Hall	-0.0636	0.1436	0.1958	0.6581	0.93838	0.64823	1.3584
Tackd Carpet, Hall	-0.1361	0.2054	0.4393	0.5075	0.87276	0.51417	1.4814
Private Office	-0.1587	0.1743	0.8285	0.3627	0.85325	0.54460	1.3368
Cubicle or Shared	-0.0723	0.1345	0.2895	0.5905	0.93025	0.65785	1.3154

Association of Predicted Probabilities and Observed Responses

Concordant = 69.2%	Somers' D = 0.387
Discordant = 30.5%	Gamma = 0.389
Tied = 0.3%	Tau-a = 0.183
(643860 pairs)	c = 0.694

Response Variable: Headache and Nausea
Number of Observations: 1657
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1513.790	1394.560	.
SC	1519.202	1584.007	.
-2 LOG L	1511.790	1324.560	187.229 with 34 DF (p=0.0001)
Score	.	.	181.963 with 34 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.7723	0.7667	24.2087	0.0001	0.02300	0.00319	0.1657
Use Lamp	0.3242	0.1465	4.8994	0.0269	1.38292	0.94821	2.0169
New Carpet/Drapes	0.4123	0.1736	5.6438	0.0175	1.51029	0.96571	2.3620
Glare	0.2366	0.1457	2.6355	0.1045	1.26693	0.87047	1.8440
Noise	0.4428	0.1577	7.8805	0.0050	1.55706	1.03724	2.3374
Dust	0.4586	0.1482	9.5811	0.0020	1.58186	1.07987	2.3172
High Pay	-0.1070	0.1864	0.3296	0.5659	0.89853	0.55590	1.4523
Job Satisfaction	-0.2181	0.1541	2.0021	0.1571	0.80405	0.54061	1.1959
Role Conflict	0.2201	0.1185	3.4511	0.0632	1.24620	0.91837	1.6911
Workload	0.3107	0.0930	11.1531	0.0008	1.36438	1.07372	1.7337
Role Clarity	-0.1823	0.0910	4.0127	0.0452	0.83335	0.65921	1.0535
External Stress	0.1119	0.0620	3.2607	0.0710	1.11840	0.95331	1.3121
College Grad	-0.1268	0.3134	0.1636	0.6859	0.88091	0.39293	1.9749
Allergy to Pollen	-0.0770	0.1650	0.2179	0.6407	0.92589	0.60529	1.4163
Allergy to Animals	-0.2989	0.2010	2.2102	0.1371	0.74163	0.44190	1.2447
Allergy to Dust	0.1500	0.1841	0.6631	0.4155	1.16183	0.72308	1.8668
Allergy to Molds	0.5620	0.1877	8.9692	0.0027	1.75418	1.08165	2.8449
Chem. Sensitivity	0.5766	0.1569	13.5048	0.0002	1.77998	1.18818	2.6665
Nonsmoker	-0.2134	0.2185	0.9535	0.3288	0.80783	0.46013	1.4183
NEG3	1.5916	0.6405	6.1754	0.0130	4.91160	0.94334	25.5728
FCFL2	0.2225	0.5389	0.1705	0.6797	1.24920	0.31170	5.0063
FCFL8	0.2893	0.5236	0.3053	0.5806	1.33549	0.34663	5.1454
ET1FL89	-0.2485	0.6919	0.1290	0.7194	0.77997	0.13123	4.6359
ET2FL13	-0.2037	0.5202	0.1534	0.6953	0.81571	0.21358	3.1153
WT1FL13	0.1574	0.7138	0.0486	0.8255	1.17046	0.18612	7.3607
WT1FL67	-0.9196	0.6659	1.9072	0.1673	0.39868	0.07172	2.2161
WT1FL89	-38.8228 #	.	.	.	.	.	.
WT2FL45	-0.0952	0.6885	0.0191	0.8900	0.90919	0.15431	5.3568
WT2FL67	-1.0919	0.7895	1.9128	0.1667	0.33558	0.04391	2.5647
WT3FL47	-1.1484	0.7777	2.1803	0.1398	0.31714	0.04278	2.3513
WT3FL811	1.5133	0.7187	4.4338	0.0352	4.54169	0.71314	28.9240
Glued Carpet, Hall	-0.1148	0.2154	0.2841	0.5940	0.89154	0.51188	1.5528
Tackd Carpet, Hall	-0.0537	0.2534	0.0449	0.8321	0.94772	0.49339	1.8204
Private Office	-0.0333	0.2362	0.0198	0.8880	0.96725	0.52637	1.7774
Cubicle or Shared	0.0874	0.2230	0.1537	0.6950	1.09133	0.61444	1.9384

Association of Predicted Probabilities and Observed Responses

Concordant = 74.2%	Somers' D = 0.488
Discordant = 25.4%	Gamma = 0.490
Tied = 0.4%	Tau-a = 0.138
(387750 pairs)	c = 0.744

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Headache and Nausea (Including Comfort and Odor)
Number of Observations: 1549
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2059.642	1921.914	.
SC	2064.988	2098.311	.
-2 LOG L	2057.642	1855.914	201.728 with 32 DF (p=0.0001)
Score	.	.	190.806 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.8814	0.5433	11.9941	0.0005	0.15238	0.03759	0.6176
Glare	0.2893	0.1170	6.1154	0.0134	1.33549	0.98798	1.8052
Noise	0.2228	0.1198	3.4592	0.0629	1.24957	0.91777	1.7013
High Pay	-0.2513	0.1479	2.8858	0.0894	0.77779	0.53137	1.1385
Job Satisfaction	-0.2909	0.1218	5.7081	0.0169	0.74759	0.54626	1.0231
Workload	0.1108	0.0648	2.9228	0.0873	1.11717	0.94542	1.3201
Role Clarity	-0.0487	0.0664	0.5396	0.4626	0.95247	0.80272	1.1301
External Stress	0.0585	0.0467	1.5672	0.2106	1.06024	0.94007	1.1958
Wear Contact Lens	-0.0451	0.1323	0.1163	0.7331	0.95590	0.67984	1.3441
College Grad	-0.3374	0.1445	5.4507	0.0196	0.71362	0.49183	1.0354
Allergy to Pollen	0.2001	0.1280	2.4427	0.1181	1.22152	0.87842	1.6986
Allergy to Molds	0.1016	0.1392	0.5334	0.4652	1.10694	0.77338	1.5844
Chem. Sensitivity	0.3368	0.1237	7.4126	0.0065	1.40046	1.01831	1.9260
Nonsmoker	0.2630	0.1588	2.7430	0.0977	1.30083	0.86410	1.9583
Hot Stuffy Air	0.0667	0.0194	11.7500	0.0006	1.06897	1.01687	1.1238
Dry Air	0.0644	0.0340	3.5893	0.0582	1.06652	0.97708	1.1641
Paint Odor	0.1844	0.0603	9.3568	0.0022	1.20250	1.02949	1.4046
Photocopies Odor	0.1532	0.1067	2.0627	0.1509	1.16556	0.88545	1.5343
New Carpet Odor	0.0592	0.0857	0.4767	0.4899	1.06099	0.85081	1.3231
AHU20	0.5694	0.6155	0.8558	0.3549	1.76721	0.36199	8.6273
AHU21	1.1458	0.6890	2.7652	0.0963	3.14496	0.53309	18.5536
AHU4	-0.1580	0.6154	0.0660	0.7973	0.85385	0.17495	4.1673
CM FL7	0.1155	0.3839	0.0905	0.7635	1.12243	0.41752	3.0175
CM FL8	-0.1445	0.4601	0.0986	0.7535	0.86545	0.26455	2.8312
ET1FL67	0.1198	0.4032	0.0883	0.7664	1.12727	0.39898	3.1850
WT1FL13	-0.9907	0.5934	2.7868	0.0950	0.37132	0.08052	1.7124
WT1FL67	-1.2245	0.6785	3.2568	0.0711	0.29390	0.05118	1.6876
WT2FL67	-0.1079	0.4900	0.0485	0.8258	0.89772	0.25407	3.1719
USATOE	0.5906	0.5366	1.2117	0.2710	1.80507	0.45308	7.1914
Glued Carpet, Hall	-0.1357	0.1338	1.0281	0.3106	0.87310	0.61856	1.2324
Tackd Carpet, Hall	0.0608	0.2238	0.0739	0.7857	1.06269	0.59708	1.8914
Private Office	-0.2559	0.1815	1.9886	0.1585	0.77422	0.48508	1.2357
Cubicle or Shared	-0.1032	0.1411	0.5350	0.4645	0.90195	0.62708	1.2973

Association of Predicted Probabilities and Observed Responses

Concordant = 70.5%	Somers' D = 0.413
Discordant = 29.2%	Gamma = 0.414
Tied = 0.3%	Tau-a = 0.195
(565440 pairs)	c = 0.706

Response Variable: Headache and Nausea (Including Comfort and Odor)
Number of Observations: 1565
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1412.793	1240.435	.
SC	1418.149	1417.171	.
-2 LOG L	1410.793	1174.435	236.358 with 32 DF (p=0.0001)
Score	.	.	245.274 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-4.11950	0.7907	27.1409	0.0001	0.01625	0.00212	0.1246
Glare	0.08030	0.1563	0.2635	0.6077	1.08361	0.72446	1.6208
Noise	0.22500	0.1675	1.8042	0.1792	1.25232	0.81344	1.9280
High Pay	-0.00546	0.2027	0.0007	0.9785	0.99455	0.59001	1.6765
Job Satisfaction	-0.26460	0.1593	2.7577	0.0968	0.76751	0.50918	1.1569
Workload	0.29860	0.0931	10.2877	0.0013	1.34797	1.06054	1.7133
Role Clarity	-0.15070	0.0924	2.6621	0.1028	0.86011	0.67792	1.0912
External Stress	0.10540	0.0661	2.5445	0.1107	1.11115	0.93719	1.3174
Wear Contact Lens	-0.23310	0.2095	1.2389	0.2657	0.79207	0.46173	1.3588
College Grad	-0.19480	0.3459	0.3171	0.5734	0.82300	0.33762	2.0062
Allergy to Pollen	-0.14840	0.1675	0.7856	0.3754	0.86209	0.55997	1.3272
Allergy to Molds	0.52630	0.1741	9.1386	0.0025	1.69266	1.08093	2.6506
Chem. Sensitivity	0.46990	0.1670	7.9198	0.0049	1.59983	1.04051	2.4598
Nonsmoker	-0.08020	0.2411	0.1106	0.7394	0.92293	0.49595	1.7175
Hot Stuffy Air	0.10330	0.0259	15.8455	0.0001	1.10882	1.03726	1.1853
Dry Air	0.14280	0.0472	9.1693	0.0025	1.15350	1.02144	1.3026
Paint Odor	0.26740	0.0891	9.0124	0.0027	1.30656	1.03860	1.6437
Photocopies Odor	-0.32780	0.1674	3.8325	0.0503	0.72051	0.46812	1.1090
New Carpet Odor	0.31350	0.1101	8.1095	0.0044	1.36821	1.03033	1.8169
AHU20	-0.18630	1.0771	0.0299	0.8627	0.83002	0.05177	13.3073
AHU21	0.41240	0.7227	0.3257	0.5682	1.51044	0.23474	9.7189
AHU4	0.47310	0.5196	0.8289	0.3626	1.60496	0.42089	6.1202
CM FL7	1.17800	0.3687	10.2086	0.0014	3.24787	1.25637	8.3961
CM FL8	0.33760	0.3878	0.7581	0.3839	1.40158	0.51614	3.8060
ET1FL67	1.54390	0.5413	8.1357	0.0043	4.68282	1.16127	18.8835
WT1FL13	-0.06840	0.8407	0.0066	0.9351	0.93389	0.10709	8.1437
WT1FL67	-0.65180	0.6605	0.9739	0.3237	0.52111	0.09506	2.8566
WT2FL67	-0.47680	0.6788	0.4933	0.4825	0.62077	0.10803	3.5672
USATOE	0.74420	0.5569	1.7858	0.1814	2.10476	0.50139	8.8355
Glued Carpet, Hall	0.00086	0.1921	0.0000	0.9964	1.00086	0.61019	1.6417
Tackd Carpet, Hall	0.06320	0.2833	0.0498	0.8235	1.06524	0.51346	2.2100
Private Office	-0.06580	0.2541	0.0670	0.7958	0.93632	0.48658	1.8018
Cubicle or Shared	0.11300	0.2413	0.2192	0.6397	1.11963	0.60134	2.0846

Association of Predicted Probabilities and Observed Responses

Concordant = 78.5%	Somers' D = 0.573
Discordant = 21.2%	Gamma = 0.575
Tied = 0.4%	Tau-a = 0.159
(340344 pairs)	c = 0.787

Response Variable: Stuffy Nose/Sinus Congestion, Runny Nose, Sneezing, Cough
Number of Observations: 1683
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1987.902	1759.304	.
SC	1993.330	1905.869	.
-2 LOG L	1985.902	1705.304	280.598 with 26 DF (p=0.0001)
Score	.	.	269.289 with 26 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.6428	0.4871	55.9341	0.0001	0.02618	0.00746	0.0918
Hours at VDT	0.0694	0.0277	6.2738	0.0123	1.07186	0.99805	1.1511
Used Chemicals	0.0419	0.1449	0.0836	0.7725	1.04279	0.71794	1.5146
Water Leaks Nearby	-0.1289	0.1820	0.5017	0.4788	0.87906	0.55006	1.4049
Glare	0.2265	0.1251	3.2796	0.0701	1.25420	0.90868	1.7311
Dust	0.5452	0.1323	16.9720	0.0001	1.72495	1.22678	2.4254
High Pay	-0.3561	0.1531	5.4071	0.0201	0.70040	0.47214	1.0390
Role Conflict	0.2553	0.0855	8.9193	0.0028	1.29085	1.03567	1.6089
External Stress	0.0910	0.0515	3.1165	0.0775	1.09527	0.95919	1.2507
Wear Contact Lens	-0.1090	0.1409	0.5987	0.4391	0.89673	0.62378	1.2891
Allergy to Pollen	0.4417	0.1372	10.3694	0.0013	1.55535	1.09229	2.2147
Allergy to Dust	0.6917	0.1555	19.7804	0.0001	1.99711	1.33794	2.9810
Allergy to Molds	0.3781	0.1499	6.3584	0.0117	1.45951	0.99199	2.1474
Chem. Sensitivity	0.4046	0.1278	10.0246	0.0015	1.49870	1.07830	2.0830
Sole Provider	0.2028	0.1838	1.2170	0.2700	1.22483	0.76287	1.9665
Under 30	-0.5809	0.1605	13.0927	0.0003	0.55939	0.36996	0.8458
AHU12	0.6251	0.4787	1.7053	0.1916	1.86843	0.54442	6.4124
AHU13	0.8217	0.4858	2.8611	0.0907	2.27436	0.65069	7.9496
AHU4	1.0796	0.5231	4.2587	0.0390	2.94350	0.76498	11.3261
NEG3	0.6563	0.5879	1.2466	0.2642	1.92765	0.42395	8.7647
SE21	0.2704	0.3310	0.6669	0.4141	1.31049	0.55864	3.0742
ET1F1011	0.5491	0.4019	1.8662	0.1719	1.73169	0.61496	4.8763
ET2FL89	0.4423	0.5377	0.6768	0.4107	1.55628	0.38953	6.2178
USATOE	1.0931	0.5269	4.3046	0.0380	2.98351	0.76782	11.5929
Tackd Carpet, Room	0.3029	0.2234	1.8376	0.1752	1.35378	0.76141	2.4070
Private Office	0.2358	0.1862	1.6027	0.2055	1.26592	0.78360	2.0451
Cubicle or Shared	0.1486	0.1439	1.0659	0.3019	1.16021	0.80085	1.6808

Association of Predicted Probabilities and Observed Responses

Concordant = 75.2%	Somers' D = 0.507
Discordant = 24.5%	Gamma = 0.508
Tied = 0.3%	Tau-a = 0.203
(567122 pairs)	c = 0.754

Response Variable: Stuffy Nose/Sinus Congestion, Runny Nose, Sneezing, Cough
Number of Observations: 1689
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1554.194	1427.457	.
SC	1559.626	1574.118	.
-2 LOG L	1552.194	1373.457	178.737 with 26 DF (p=0.0001)
Score	.	.	179.086 with 26 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.6343	0.5643	41.4842	0.0001	0.02640	0.00617	0.1130
Hours at VDT	0.0531	0.0342	2.4140	0.1203	1.05454	0.96561	1.1517
Used Chemicals	0.2998	0.2035	2.1705	0.1407	1.34959	0.79898	2.2796
Water Leaks Nearby	0.4481	0.1866	5.7691	0.0163	1.56534	0.96794	2.5314
Glare	0.1472	0.1446	1.0366	0.3086	1.15859	0.79829	1.6815
Dust	0.8477	0.1428	35.2548	0.0001	2.33427	1.61583	3.3722
High Pay	0.0934	0.2077	0.2022	0.6529	1.09790	0.64298	1.8747
Role Conflict	0.2628	0.1021	6.6252	0.0101	1.30057	0.99979	1.6918
External Stress	0.0254	0.0612	0.1717	0.6786	1.02573	0.87612	1.2009
Wear Contact Lens	0.1736	0.1820	0.9099	0.3401	1.18958	0.74436	1.9011
Allergy to Pollen	0.0605	0.1588	0.1453	0.7031	1.06237	0.70570	1.5993
Allergy to Dust	0.6699	0.1775	14.2420	0.0002	1.95404	1.23696	3.0868
Allergy to Molds	0.3936	0.1776	4.9125	0.0267	1.48231	0.93810	2.3422
Chem. Sensitivity	0.3953	0.1511	6.8423	0.0089	1.48483	1.00608	2.1914
Sole Provider	-0.2019	0.1649	1.4998	0.2207	0.81718	0.53436	1.2497
Under 30	0.0607	0.2956	0.0421	0.8374	1.06258	0.49621	2.2754
AHU12	1.1456	0.6359	3.2459	0.0716	3.14433	0.61111	16.1784
AHU13	-0.2661	0.6813	0.1526	0.6961	0.76636	0.13251	4.4323
AHU4	0.2421	0.5288	0.2096	0.6471	1.27392	0.32625	4.9743
NEG3	0.9558	0.6871	1.9351	0.1642	2.60075	0.44301	15.2682
SE21	0.2161	0.4484	0.2323	0.6299	1.24123	0.39103	3.9400
ET1F1011	-0.0240	0.4856	0.0024	0.9606	0.97629	0.27946	3.4107
ET2FL89	-1.0230	0.7768	1.7346	0.1878	0.35951	0.04860	2.6592
USATOE	-0.7388	0.6788	1.1845	0.2764	0.47769	0.08313	2.7450
Tackd Carpet, Room	0.1222	0.2665	0.2103	0.6465	1.12998	0.56876	2.2450
Private Office	-0.0495	0.2288	0.0469	0.8286	0.95171	0.52788	1.7158
Cubicle or Shared	-0.0424	0.2172	0.0380	0.8454	0.95849	0.54777	1.6772

Association of Predicted Probabilities and Observed Responses

Concordant = 73.9%	Somers' D = 0.482
Discordant = 25.7%	Gamma = 0.484
Tied = 0.4%	Tau-a = 0.138
(406818 pairs)	c = 0.741

Response Variable: Stuffy Nose/Sinus Congestion, Runny Nose, Sneezing, Cough (Including Comfort and Odor)
Number of Observations: 1629
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1926.008	1693.505	.
SC	1931.403	1887.751	.
-2 LOG L	1924.008	1621.505	302.503 with 35 DF (p=0.0001)
Score	.	.	284.890 with 35 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.4468	0.2616	73.6068	0.0001	0.03185	0.01623	0.0625
Hours at VDT	0.0616	0.0280	4.8185	0.0282	1.06354	0.98953	1.1431
Dust	0.2773	0.1412	3.8580	0.0495	1.31956	0.91720	1.8984
Wear Glasses	0.3970	0.1276	9.6842	0.0019	1.48736	1.07069	2.0662
Allergy to Pollen	0.5291	0.1405	14.1736	0.0002	1.69740	1.18196	2.4376
Allergy to Dust	0.7746	0.1577	24.1260	0.0001	2.16972	1.44537	3.2571
Allergy to Molds	0.2627	0.1546	2.8865	0.0893	1.30044	0.87324	1.9366
Sole Provider	0.3225	0.1848	3.0462	0.0809	1.38057	0.85766	2.2223
Hot Stuffy Air	0.0439	0.0214	4.2058	0.0403	1.04488	0.98884	1.1041
Dry Air	0.1326	0.0377	12.3622	0.0004	1.14179	1.03612	1.2582
Cold Drafty Air	0.1529	0.0455	11.2888	0.0008	1.16521	1.03634	1.3101
Paint Odor	0.1655	0.0558	8.7798	0.0030	1.17998	1.02200	1.3624
Photocopies Odor	0.1362	0.0995	1.8723	0.1712	1.14591	0.88682	1.4807
Under 30	-0.4520	0.1594	8.0374	0.0046	0.63635	0.42206	0.9595
AHU13	1.0138	0.5443	3.4684	0.0626	2.75605	0.67820	11.2000
AHU20	0.7225	0.7247	0.9939	0.3188	2.05958	0.31844	13.3208
AHU4	1.4280	0.6156	5.3802	0.0204	4.17035	0.85403	20.3643
NEG3	1.0109	0.5843	2.9931	0.0836	2.74807	0.61002	12.3797
SE21	0.3013	0.3682	0.6698	0.4131	1.35161	0.52352	3.4896
SE22	0.2292	0.7438	0.0949	0.7580	1.25759	0.18511	8.5440
SE31	-0.2690	0.6829	0.1552	0.6936	0.76414	0.13158	4.4378
SE32	0.0155	0.4392	0.0012	0.9718	1.01562	0.32763	3.1484
AWU15SW2	-0.2531	0.5448	0.2158	0.6423	0.77639	0.19080	3.1592
NEG1NEG2	1.1376	0.7449	2.3326	0.1267	3.11927	0.45783	21.2522
FCFL6	0.7270	0.5387	1.8213	0.1772	2.06886	0.51649	8.2870
FCFL8	0.3439	0.4472	0.5915	0.4418	1.41044	0.44571	4.4633
ET1FL13	0.0976	0.4236	0.0531	0.8178	1.10252	0.37024	3.2831
ET1FL89	-0.2443	0.5234	0.2179	0.6407	0.78325	0.20340	3.0161
ET2FL89	0.6151	0.5453	1.2724	0.2593	1.84984	0.45403	7.5368
WT1FL13	0.5845	0.5264	1.2329	0.2668	1.79409	0.46232	6.9623
WT1FL89	0.7611	0.5390	1.9935	0.1580	2.14063	0.53400	8.5811
UGHAHU19	0.5632	0.6081	0.8577	0.3544	1.75628	0.36668	8.4121
USATOE	0.8064	0.5163	2.4393	0.1183	2.23983	0.59239	8.4688
Glued Carpet, Room	-0.2875	0.2799	1.0549	0.3044	0.75014	0.36476	1.5427
Private Office	-0.1071	0.1738	0.3796	0.5378	0.89844	0.57418	1.4058
Cubicle or Shared	0.0278	0.1466	0.0361	0.8494	1.02819	0.70480	1.5000

Association of Predicted Probabilities and Observed Responses

Concordant = 76.5%	Somers' D = 0.532
Discordant = 23.3%	Gamma = 0.534
Tied = 0.2%	Tau-a = 0.214
(532004 pairs)	c = 0.766

Response Variable: Stuffy Nose/Sinus Congestion, Runny Nose, Sneezing, Cough (Including Comfort and Odor)
Number of Observations: 1642
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1473.028	1357.651	.
SC	1478.432	1552.183	.
-2 LOG L	1471.028	1285.651	185.377 with 35 DF (p=0.0001)
Score	.	.	184.988 with 35 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.64940	0.3329	20.1689	0.0001	0.02601	0.01103	0.0613
Hours at VDT	0.06510	0.0350	3.4641	0.0627	1.06727	0.97525	1.1680
Dust	0.68250	0.1552	19.3279	0.0001	1.97882	1.32671	2.9514
Wear Glasses	0.07210	0.1537	0.2201	0.6390	1.07476	0.72337	1.5968
Allergy to Pollen	0.10200	0.1650	0.3822	0.5364	1.10738	0.72394	1.6939
Allergy to Dust	0.61250	0.1855	10.8992	0.0010	1.84504	1.14414	2.9753
Allergy to Molds	0.45020	0.1830	6.0538	0.0139	1.56863	0.97902	2.5133
Sole Provider	-0.24530	0.1740	1.9877	0.1586	0.78247	0.49981	1.2250
Hot Stuffy Air	0.09290	0.0245	14.3370	0.0002	1.09735	1.03024	1.1688
Dry Air	0.05140	0.0450	1.3036	0.2536	1.05274	0.93752	1.1821
Cold Drafty Air	0.06630	0.0642	1.0640	0.3023	1.06855	0.90567	1.2607
Paint Odor	0.13560	0.0768	3.1165	0.0775	1.14522	0.93966	1.3958
Photocopies Odor	0.16860	0.1441	1.3691	0.2420	1.18365	0.81660	1.7157
Under 30	-0.12030	0.2729	0.1941	0.6595	0.88665	0.43898	1.7909
AHU13	0.04820	0.6420	0.0056	0.9402	1.04938	0.20077	5.4849
AHU20	0.40690	0.8624	0.2226	0.6371	1.50215	0.16290	13.8522
AHU4	0.07590	0.5383	0.0199	0.8879	1.07885	0.26961	4.3170
NEG3	0.68210	0.7386	0.8527	0.3558	1.97803	0.29507	13.2598
SE21	-0.07180	0.4944	0.0211	0.8846	0.93072	0.26044	3.3260
SE22	0.84550	0.7373	1.3150	0.2515	2.32914	0.34862	15.5613
SE31	0.00850	0.8359	0.0001	0.9919	1.00854	0.11709	8.6866
SE32	-0.16940	0.6914	0.0600	0.8064	0.84417	0.14221	5.0111
AWU15SW2	0.15960	0.4740	0.1133	0.7364	1.17304	0.34596	3.9774
NEG1NEG2	0.17630	0.8003	0.0485	0.8257	1.19280	0.15179	9.3734
FCFL6	0.52600	0.6360	0.6840	0.4082	1.69215	0.32879	8.7088
FCFL8	0.20260	0.5690	0.1268	0.7218	1.22458	0.28276	5.3034
ET1FL13	0.13410	0.5302	0.0640	0.8003	1.14351	0.29180	4.4812
ET1FL89	-0.21440	0.6660	0.1036	0.7475	0.80703	0.14515	4.4871
ET2FL89	-0.38420	0.6612	0.3377	0.5612	0.68100	0.12400	3.7399
WT1FL13	-1.22220	1.1018	1.2305	0.2673	0.29458	0.01724	5.0331
WT1FL89	-0.93590	1.0670	0.7694	0.3804	0.39223	0.02511	6.1269
UGHAHU19	-0.20760	0.6191	0.1125	0.7373	0.81253	0.16490	4.0036
USATOE	-0.16270	0.5869	0.0768	0.7816	0.84985	0.18739	3.8542
Glued Carpet, Room	0.00052	0.3436	0.0000	0.9988	1.00052	0.41288	2.4245
Private Office	0.09600	0.2332	0.1695	0.6806	1.10076	0.60367	2.0072
Cubicle or Shared	0.00470	0.2290	0.0004	0.9836	1.00471	0.55699	1.8123

Association of Predicted Probabilities and Observed Responses

Concordant = 75.0%	Somers' D = 0.503
Discordant = 24.6%	Gamma = 0.505
Tied = 0.4%	Tau-a = 0.139
(371541 pairs)	c = 0.752

Response Variable: Wheezing, Shortness of Breath, Chest Tightness
Number of Observations: 1226
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1268.921	1071.673	.
SC	1274.032	1204.573	.
-2 LOG L	1266.921	1019.673	247.247 with 25 DF (p=0.0001)
Score	.	.	245.894 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.1938	0.3037	10.5561	0.0001	0.04102	0.01876	0.0897
Used Chemicals	0.3101	0.1916	2.6203	0.1055	1.36356	0.83238	2.2337
New Furniture	0.0743	0.1651	0.2024	0.6528	1.07713	0.70399	1.6481
Walls Painted	0.5243	0.1876	7.8087	0.0052	1.68928	1.04190	2.7389
Lights Too Dim	0.4270	0.2621	2.6535	0.1033	1.53265	0.78023	3.0107
Dust	0.4513	0.1698	7.0662	0.0079	1.57035	1.01399	2.4320
Medium Pay	-0.2627	0.1869	1.9757	0.1598	0.76897	0.47514	1.2445
Role Conflict	0.6456	0.1094	34.8304	0.0001	1.90713	1.43877	2.5280
Asthma	1.5842	0.2310	47.0275	0.0001	4.87539	2.68893	8.8397
College Grad	-0.7816	0.1837	18.0925	0.0001	0.45767	0.28513	0.7346
Allergy to Animals	0.1672	0.2086	0.6423	0.4229	1.18199	0.69063	2.0229
Chem. Sensitivity	0.8739	0.1646	28.1813	0.0001	2.39624	1.56814	3.6616
Sole Provider	0.6996	0.2245	9.7134	0.0018	2.01295	1.12895	3.5891
Under 30	-0.6761	0.2215	9.3151	0.0023	0.50860	0.28746	0.8999
G1LG1	1.7115	0.8318	4.2335	0.0396	5.53726	0.64972	47.1916
CM FL2	0.1467	0.5153	0.0810	0.7760	1.15801	0.30706	4.3672
FCFL3	-0.1683	0.8721	0.0373	0.8470	0.84510	0.08938	7.9903
ET1FL89	1.2824	0.5378	5.6855	0.0171	3.60528	0.90215	14.4078
ET1F1011	-0.4818	0.6018	0.6409	0.4234	0.61767	0.13107	2.9108
WT2FL67	-1.9093	1.0947	3.0419	0.0811	0.14818	0.00883	2.4859
ET3FL811	-0.9682	1.1027	0.7710	0.3799	0.37977	0.02218	6.5036
Glued Carpet, Hall	0.0157	0.1891	0.0069	0.9337	1.01582	0.62411	1.6534
Tackd Carpet, Room	0.6958	0.2633	6.9844	0.0082	2.00531	1.01769	3.9514
Tackd Carpet, Hall	-0.1179	0.3584	0.1083	0.7421	0.88878	0.35305	2.2375
Private Office	-0.0310	0.2357	0.0173	0.8954	0.96948	0.52826	1.7792
Cubicle or Shared	0.0915	0.1977	0.2145	0.6433	1.09582	0.65851	1.8235

Association of Predicted Probabilities and Observed Responses

Concordant = 78.9%	Somers' D = 0.580
Discordant = 20.8%	Gamma = 0.582
Tied = 0.3%	Tau-a = 0.194
(251160 pairs)	c = 0.790

Response Variable: Wheezing, Shortness of Breath, Chest Tightness
Number of Observations: 1494
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	997.726	926.591	.
SC	1003.035	1064.630	.
-2 LOG L	995.726	874.591	121.136 with 25 DF (p=0.0001)
Score	.	.	129.063 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.4710	0.5023	47.7533	0.0001	0.03109	0.00852	0.11337
Used Chemicals	0.4080	0.2569	2.5219	0.1123	1.50381	0.77587	2.91472
New Furniture	0.4001	0.1888	4.4890	0.0341	1.49197	0.91737	2.42650
Walls Painted	0.2228	0.2213	1.0145	0.3138	1.24957	0.70662	2.20973
Lights Too Dim	0.2949	0.3841	0.5892	0.4427	1.34299	0.49930	3.61229
Dust	0.9034	0.1852	23.7969	0.0001	2.46798	1.53162	3.97679
Medium Pay	-0.4499	0.2923	2.3683	0.1238	0.63769	0.30033	1.35400
Role Conflict	0.2362	0.1343	3.0932	0.0786	1.26643	0.89605	1.78989
Asthma	1.4224	0.2369	36.0381	0.0001	4.14706	2.25274	7.63432
College Grad	-0.2664	0.3800	0.4914	0.4833	0.76613	0.28786	2.03904
Allergy to Animals	-0.2073	0.2436	0.7244	0.3947	0.81278	0.43396	1.52229
Chem. Sensitivity	0.6804	0.1922	12.5316	0.0004	1.97467	1.20357	3.23979
Sole Provider	0.2002	0.2014	0.9880	0.3202	1.22165	0.72716	2.05239
Under 30	-0.0337	0.3992	0.0071	0.9328	0.96686	0.34575	2.70375
G1LG1	-37.6174 #	.	.	.	.	.	.
CM FL2	-1.8527	1.0561	3.0778	0.0794	0.15681	0.01032	2.38170
FCFL3	-0.6841	1.0895	0.3942	0.5301	0.50454	0.03048	8.35159
ET1FL89	-37.4162 #	.	.	.	.	.	.
ET1F1011	-0.5133	0.8076	0.4040	0.5250	0.59852	0.07474	4.79262
WT2FL67	0.1954	0.6689	0.0854	0.7701	1.21580	0.21704	6.81064
ET3FL811	-0.4532	0.7084	0.4092	0.5224	0.63559	0.10249	3.94180
Glued Carpet, Hall	-0.2408	0.2213	1.1836	0.2766	0.78600	0.44447	1.38995
Tackd Carpet, Room	0.5307	0.2990	3.1502	0.0759	1.70012	0.78700	3.67269
Tackd Carpet, Hall	-0.2699	0.4399	0.3763	0.5396	0.76346	0.24584	2.37093
Private Office	0.1068	0.3079	0.1204	0.7286	1.11271	0.50341	2.45948
Cubicle or Shared	0.3043	0.3050	0.9956	0.3184	1.35568	0.61793	2.97421

Association of Predicted Probabilities and Observed Responses

Concordant = 74.3%	Somers' D = 0.493
Discordant = 25.0%	Gamma = 0.497
Tied = 0.7%	Tau-a = 0.092
(207545 pairs)	c = 0.747

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Wheezing, Shortness of Breath, Chest Tightness (Including Comfort and Odor)
Number of Observations: 1177
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1187.120	968.518	.
SC	1192.191	1110.499	.
-2 LOG L	1185.120	912.518	272.602 with 27 DF (p=0.0001)
Score	.	.	274.946 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-4.22190	0.4233	99.4699	0.0001	0.01467	0.00493	0.0437
Walls Painted	0.21390	0.2031	1.1090	0.2923	1.23850	0.73397	2.0898
Noise	0.07190	0.1812	0.1574	0.6916	1.07455	0.67377	1.7137
Dust	0.12690	0.1944	0.4259	0.5140	1.13530	0.68806	1.8732
Role Conflict	0.63810	0.1287	24.5803	0.0001	1.89288	1.35875	2.6370
Workload	0.19190	0.1025	3.5063	0.0611	1.21155	0.93040	1.5777
Wear Contact Lens	0.10020	0.2008	0.2488	0.6179	1.10539	0.65898	1.8542
Asthma	1.46470	0.2598	31.7741	0.0001	4.32625	2.21545	8.4481
College Grad	-0.81740	0.2016	16.4437	0.0001	0.44158	0.26271	0.7422
Allergy to Animals	0.48980	0.2505	3.8234	0.0505	1.63199	0.85600	3.1114
Allergy to Dust	-0.63970	0.2362	7.3358	0.0068	0.52745	0.28703	0.9692
Allergy to Molds	0.40280	0.2387	2.8473	0.0915	1.49601	0.80889	2.7668
Sole Provider	0.76480	0.2414	10.0354	0.0015	2.14856	1.15368	4.0014
Hot Stuffy Air	0.10240	0.0248	17.0149	0.0001	1.10783	1.03927	1.1809
Paint Odor	0.46360	0.0890	27.1387	0.0001	1.58979	1.26407	1.9994
Photocopies Odor	0.25250	0.1567	2.5957	0.1072	1.28724	0.85971	1.9274
New Carpet Odor	0.09360	0.1217	0.5913	0.4419	1.09812	0.80260	1.5025
Musty/Diesel Odor	0.00488	0.1003	0.0024	0.9612	1.00489	0.77609	1.3012
Under 30	-0.38280	0.2296	2.7798	0.0955	0.68195	0.37748	1.2320
AHU16	1.62860	0.6123	7.0731	0.0078	5.09673	1.05265	24.6773
AHU9	0.50390	0.5117	0.9699	0.3247	1.65516	0.44298	6.1845
NE1	-0.25030	0.5512	0.2063	0.6497	0.77857	0.18821	3.2207
NEG3	1.35530	0.8675	2.4410	0.1182	3.87792	0.41504	36.2334
SE32	0.20160	0.5472	0.1357	0.7126	1.22336	0.29880	5.0088
G1LG1	1.89310	1.0292	3.3831	0.0659	6.63992	0.46855	94.0963
WT2FL67	-1.38810	1.0988	1.5960	0.2065	0.24955	0.01472	4.2309
Private Office	-0.26050	0.2570	1.0276	0.3107	0.77067	0.39751	1.4941
Cubicle or Shared	-0.07730	0.2102	0.1353	0.7130	0.92561	0.53860	1.5907

Association of Predicted Probabilities and Observed Responses

Concordant = 81.1%	Somers' D = 0.625
Discordant = 18.6%	Gamma = 0.627
Tied = 0.3%	Tau-a = 0.202
(223482 pairs)	c = 0.812

Response Variable: Wheezing, Shortness of Breath, Chest Tightness (Including Comfort and Odor)
Number of Observations: 1464
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	916.385	788.785	.
SC	921.674	936.875	.
-2 LOG L	914.385	732.785	181.600 with 27 DF (p=0.0001)
Score	.	.	219.585 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-5.3178	0.7323	52.7272	0.0001	0.00490	0.00074	0.0323
Walls Painted	0.3057	0.2499	1.4961	0.2213	1.35757	0.71317	2.5843
Noise	-0.3601	0.2158	2.7843	0.0952	0.69761	0.40012	1.2163
Dust	0.5013	0.2167	5.3525	0.0207	1.65087	0.94467	2.8850
Role Conflict	0.2309	0.1566	2.1732	0.1404	1.25973	0.84156	1.8857
Workload	0.1756	0.1244	1.9938	0.1579	1.19196	0.86515	1.6422
Wear Contact Lens	-0.2926	0.2882	1.0311	0.3099	0.74632	0.35523	1.5680
Asthma	1.2168	0.2735	19.7905	0.0001	3.37637	1.66907	6.8301
College Grad	0.0271	0.4674	0.0034	0.9538	1.02747	0.30823	3.4251
Allergy to Animals	-0.4072	0.2753	2.1876	0.1391	0.66551	0.32747	1.3525
Allergy to Dust	0.1811	0.2623	0.4763	0.4901	1.19854	0.60982	2.3556
Allergy to Molds	0.6036	0.2623	5.2938	0.0214	1.82869	0.93045	3.5941
Sole Provider	0.1595	0.2237	0.5084	0.4758	1.17292	0.65918	2.0870
Hot Stuffy Air	0.1205	0.0302	15.9675	0.0001	1.12806	1.04363	1.2193
Paint Odor	0.2732	0.1220	5.0138	0.0251	1.31416	0.95976	1.7994
Photocopies Odor	0.2189	0.1942	1.2703	0.2597	1.24471	0.75476	2.0527
New Carpet Odor	0.2478	0.1415	3.0652	0.0800	1.28120	0.88985	1.8447
Musty/Diesel Odor	0.3191	0.1017	9.8372	0.0017	1.37589	1.05878	1.7880
Under 30	-0.4173	0.4298	0.9426	0.3316	0.65882	0.21774	1.9934
AHU16	0.9325	0.6205	2.2588	0.1329	2.54085	0.51381	12.5649
AHU9	-1.6160	1.1412	2.0052	0.1568	0.19869	0.01051	3.7574
NE1	1.0596	0.4928	4.6223	0.0316	2.88522	0.81070	10.2682
NEG3	1.6975	0.7213	5.5387	0.0186	5.46028	0.85166	35.0077
SE32	-37.5638 #	.	.	.	.	.	.
G1LG1	-37.0511 #	.	.	.	.	.	.
WT2FL67	0.6112	0.6762	0.8170	0.3661	1.84264	0.32281	10.5180
Private Office	0.1522	0.3569	0.1819	0.6698	1.16439	0.46432	2.9200
Cubicle or Shared	0.2996	0.3517	0.7255	0.3943	1.34932	0.54532	3.3387

Association of Predicted Probabilities and Observed Responses

Concordant = 80.5%	Somers' D = 0.617
Discordant = 18.9%	Gamma = 0.621
Tied = 0.6%	Tau-a = 0.105
(182988 pairs)	c = 0.808

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision
Number of Observations: 1762
Sex: Females

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1869.798	1690.610	.
SC	1875.272	1871.258	.
-2 LOG L	1867.798	1624.610	243.188 with 32 DF (p=0.0001)
Score	.	.	230.186 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.9155	0.5560	49.5913	0.0001	0.01993	0.00476	0.0835
Laser Printer Nearby	-0.3248	0.1363	5.6772	0.0172	0.72267	0.50869	1.0267
Plants Nearby	-0.0254	0.1280	0.0393	0.8428	0.97492	0.70108	1.3557
Hours at VDT	0.0619	0.0286	4.6785	0.0305	1.06386	0.98830	1.1452
1 Hour at Copier	0.0865	0.1455	0.3534	0.5522	1.09035	0.74953	1.5861
Use Heater	0.3961	0.1446	7.5084	0.0061	1.48602	1.02389	2.1567
Walls Painted	0.5118	0.1424	12.9206	0.0003	1.66829	1.15601	2.4076
Water Leaks Nearby	0.2300	0.1807	1.6195	0.2032	1.25860	0.79019	2.0047
Window Nearby	-0.2172	0.1349	2.5922	0.1074	0.80477	0.56853	1.1392
Lights Too Dim	0.3552	0.2110	2.8348	0.0922	1.42647	0.82834	2.4565
Glare	0.6890	0.1329	26.8571	0.0001	1.99172	1.41432	2.8049
Noise	0.1644	0.1343	1.4993	0.2208	1.17869	0.83397	1.6659
Dust	0.3303	0.1386	5.6772	0.0172	1.39139	0.97362	1.9884
Workload	0.3415	0.0719	22.5589	0.0001	1.40706	1.16916	1.6934
External Stress	-0.0253	0.0536	0.2221	0.6374	0.97502	0.84927	1.1194
Wear Contact Lens	0.7762	0.1377	31.7892	0.0001	2.17320	1.52422	3.0985
Wear Glasses	0.2500	0.1281	3.8112	0.0509	1.28403	0.92313	1.7860
College Grad	-0.3440	0.1514	5.1636	0.0231	0.70893	0.47998	1.0471
Allergy to Animals	-0.1353	0.1715	0.6218	0.4304	0.87345	0.56153	1.3586
Allergy to Molds	0.3972	0.1442	7.5889	0.0059	1.48765	1.02607	2.1569
Chem. Sensitivity	0.5184	0.1317	15.4922	0.0001	1.67934	1.19619	2.3576
Sole Provider	0.1864	0.1920	0.9431	0.3315	1.20490	0.73477	1.9758
AHU12	0.7096	0.4433	2.5619	0.1095	2.03318	0.64899	6.3696
AHU16	0.1747	0.5500	0.1009	0.7508	1.19089	0.28878	4.9111
SE31	-1.6316	1.0444	2.4406	0.1182	0.19562	0.01327	2.8828
G1LG1	0.9698	0.8106	1.4312	0.2316	2.63742	0.32683	21.2829
FCFL2	0.6999	0.5027	1.9388	0.1638	2.01355	0.55153	7.3511
ET1FL67	-0.2347	0.5609	0.1752	0.6756	0.79081	0.18645	3.3541
ET1F1011	0.4391	0.4538	0.9365	0.3332	1.55131	0.48196	4.9933
ET2F1011	0.2432	0.5127	0.2250	0.6352	1.27532	0.34044	4.7775
Tackd Carpet, Hall	-0.5486	0.3007	3.3280	0.0681	0.57776	0.26628	1.2536
Private Office	-0.0969	0.1904	0.2591	0.6107	0.90765	0.55579	1.4823
Cubicle or Shared	0.2213	0.1527	2.1010	0.1472	1.24770	0.84193	1.8490

Association of Predicted Probabilities and Observed Responses

Concordant = 74.4%	Somers' D = 0.491
Discordant = 25.3%	Gamma = 0.493
Tied = 0.3%	Tau-a = 0.170
(537040 pairs)	c = 0.746

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision
Number of Observations: 1732
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1285.566	1167.230	.
SC	1291.023	1347.312	.
-2 LOG L	1283.566	1101.230	182.336 with 32 DF (p=0.0001)
Score	.	.	188.200 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-5.54390	0.7469	55.0945	0.0001	0.00391	0.00057	0.0268
Laser Printer Nearby	0.08970	0.1731	0.2687	0.6042	1.09385	0.70033	1.7085
Plants Nearby	0.23180	0.1674	1.9172	0.1662	1.26087	0.81920	1.9406
Hours at VDT	0.00266	0.0402	0.0044	0.9472	1.00266	0.90403	1.1121
1 Hour at Copier	-0.30630	0.1792	2.9217	0.0874	0.73617	0.46398	1.1680
Use Heater	0.49970	0.2309	4.6826	0.0305	1.64823	0.90928	2.9877
Walls Painted	-0.06960	0.2029	0.1175	0.7318	0.93277	0.55307	1.5731
Water Leaks Nearby	0.15210	0.2181	0.4867	0.4854	1.16428	0.66383	2.0420
Window Nearby	-0.55440	0.1747	10.0704	0.0015	0.57442	0.36625	0.9009
Lights Too Dim	0.45510	0.3002	2.2991	0.1294	1.57633	0.72745	3.4158
Glare	0.32480	0.1663	3.8119	0.0509	1.38375	0.90160	2.1238
Noise	0.36680	0.1780	4.2480	0.0393	1.44311	0.91235	2.2826
Dust	0.60520	0.1682	12.9406	0.0003	1.83162	1.18758	2.8249
Workload	0.36960	0.0993	13.8613	0.0002	1.44716	1.12053	1.8690
External Stress	0.18250	0.0695	6.9022	0.0086	1.20021	1.00347	1.4355
Wear Contact Lens	0.81770	0.1922	18.1070	0.0001	2.26528	1.38070	3.7166
Wear Glasses	0.25270	0.1717	2.1653	0.1412	1.28750	0.82729	2.0037
College Grad	-0.42220	0.3243	1.6941	0.1931	0.65560	0.28434	1.5116
Allergy to Animals	0.11480	0.2074	0.3062	0.5800	1.12165	0.65740	1.9137
Allergy to Molds	0.42740	0.1760	5.8977	0.0152	1.53327	0.97436	2.4128
Chem. Sensitivity	0.61110	0.1703	12.8781	0.0003	1.84246	1.18816	2.8571
Sole Provider	0.03930	0.1815	0.0469	0.8286	1.04008	0.65165	1.6600
AHU12	1.10110	0.6615	2.7704	0.0960	3.00747	0.54721	16.5291
AHU16	1.65240	0.4874	11.4943	0.0007	5.21949	1.48714	18.3191
SE31	-0.90890	1.1012	0.6812	0.4092	0.40297	0.02362	6.8743
G1LG1	-0.39800	1.1798	0.1138	0.7359	0.67166	0.03216	14.0295
FCFL2	-0.30040	0.7559	0.1579	0.6911	0.74052	0.10565	5.1903
ET1FL67	-1.04780	1.0660	0.9663	0.3256	0.35071	0.02251	5.4642
ET1F1011	-0.03080	0.5682	0.0029	0.9568	0.96967	0.22436	4.1908
ET2F1011	-0.51600	0.6828	0.5711	0.4498	0.59690	0.10281	3.4656
Tackd Carpet, Hall	0.62400	0.2948	4.4813	0.0343	1.86638	0.87336	3.9885
Private Office	-0.23860	0.2562	0.8673	0.3517	0.78773	0.40715	1.5240
Cubicle or Shared	0.05790	0.2471	0.0550	0.8146	1.05961	0.56067	2.0026

Association of Predicted Probabilities and Observed Responses

Concordant = 76.4%	Somers' D = 0.534
Discordant = 23.1%	Gamma = 0.536
Tied = 0.5%	Tau-a = 0.114
(320931 pairs)	c = 0.767

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision (Including Comfort and Odor)

Number of Observations: 1730
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1853.524	1613.039	.
SC	1858.980	1754.892	.
-2 LOG L	1851.524	1561.039	290.485 with 25 DF (p=0.0001)
Score	.	.	278.745 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-4.9092	0.3658	80.1091	0.0001	0.00738	0.00288	0.0189
Hours at VDT	0.0573	0.0291	3.8811	0.0488	1.05897	0.98249	1.1414
1 Hour at Copier	0.0969	0.1496	0.4199	0.5170	1.10175	0.74941	1.6197
Use Heater	0.3717	0.1480	6.3080	0.0120	1.45020	0.99050	2.1233
Walls Painted	0.4622	0.1452	10.1272	0.0015	1.58756	1.09217	2.3077
Glare	0.6592	0.1357	23.5817	0.0001	1.93325	1.36293	2.7422
Workload	0.2620	0.0730	12.8904	0.0003	1.29953	1.07676	1.5684
Wear Contact Lens	0.8314	0.1401	35.2201	0.0001	2.29653	1.60080	3.2946
Wear Glasses	0.2843	0.1306	4.7406	0.0295	1.32883	0.94921	1.8603
Allergy to Animals	-0.1965	0.1750	1.2606	0.2615	0.82160	0.52346	1.2896
Allergy to Molds	0.3898	0.1474	6.9927	0.0082	1.47669	1.01015	2.1587
Chem. Sensitivity	0.4022	0.1362	8.7189	0.0031	1.49511	1.05269	2.1235
Hot Stuffy Air	0.0759	0.0220	11.8445	0.0006	1.07885	1.01941	1.1418
Dry Air	0.0927	0.0381	5.9100	0.0151	1.09713	0.99457	1.2103
Cosmetic, Body Odor	0.0596	0.0408	2.1402	0.1435	1.06141	0.95552	1.1790
Photocopies Odor	0.3662	0.0940	15.1789	0.0001	1.44224	1.13208	1.8374
AHU10	0.3592	0.8968	0.1604	0.6888	1.43218	0.14214	14.4307
AHU12	0.4950	0.4784	1.0708	0.3008	1.64050	0.47838	5.6258
AHU16	0.4872	0.5294	0.8468	0.3575	1.62775	0.41622	6.3658
AHU21	0.4370	0.7140	0.3746	0.5405	1.54806	0.24604	9.7402
NE1	0.8155	0.3622	5.0695	0.0244	2.26031	0.88912	5.7461
SE32	0.9715	0.3927	6.1190	0.0134	2.64190	0.96070	7.2652
FCFL2	0.8944	0.5076	3.1043	0.0781	2.44587	0.66154	9.0429
FCFL6	1.0423	0.4738	4.8383	0.0278	2.83573	0.83677	9.6100
Private Office	-0.2038	0.1909	1.1399	0.2857	0.81563	0.49880	1.3337
Cubicle or Shared	0.1965	0.1513	1.6872	0.1940	1.21714	0.82428	1.7972

Association of Predicted Probabilities and Observed Responses

Concordant = 76.7%	Somers' D = 0.538
Discordant = 23.0%	Gamma = 0.539
Tied = 0.3%	Tau-a = 0.189
(524496 pairs)	c = 0.769

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision (Including Comfort and Odor)

Number of Observations: 1728
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1292.394	1104.712	.
SC	1297.849	1246.535	.
-2 LOG L	1290.394	1052.712	237.682 with 25 DF (p=0.0001)
Score	.	.	243.197 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-5.6472	0.5303	13.3935	0.0001	0.00353	0.00090	0.0138
Hours at VDT	0.0446	0.0404	1.2238	0.2686	1.04561	0.94226	1.1603
1 Hour at Copier	-0.2703	0.1845	2.1463	0.1429	0.76315	0.47446	1.2275
Use Heater	0.4184	0.2320	3.2511	0.0714	1.51953	0.83591	2.7622
Walls Painted	0.0459	0.2024	0.0515	0.8205	1.04697	0.62159	1.7635
Glare	0.2237	0.1679	1.7751	0.1827	1.25070	0.81155	1.9275
Workload	0.3081	0.0995	9.5828	0.0020	1.36084	1.05315	1.7584
Wear Contact Lens	0.7789	0.1934	16.2267	0.0001	2.17907	1.32406	3.5862
Wear Glasses	0.2883	0.1763	2.6731	0.1021	1.33416	0.84717	2.1011
Allergy to Animals	0.0559	0.2079	0.0723	0.7879	1.05749	0.61900	1.8066
Allergy to Molds	0.3608	0.1778	4.1175	0.0424	1.43448	0.90736	2.2678
Chem. Sensitivity	0.5677	0.1728	10.7946	0.0010	1.76420	1.13040	2.7534
Hot Stuffy Air	0.1104	0.0266	17.2369	0.0001	1.11672	1.04277	1.1959
Dry Air	0.1939	0.0502	14.9090	0.0001	1.21397	1.06672	1.3816
Cosmetic, Body Odor	0.2074	0.0593	12.2255	0.0005	1.23047	1.05616	1.4336
Photocopies Odor	0.4350	0.1380	9.9326	0.0016	1.54496	1.08276	2.2045
AHU10	0.8138	0.7623	1.1395	0.2858	2.25647	0.31667	16.0785
AHU12	1.2297	0.6905	3.1719	0.0749	3.42020	0.57751	20.2555
AHU16	1.3243	0.4942	7.1807	0.0074	3.75955	1.05258	13.4282
AHU21	0.0806	0.8482	0.0090	0.9243	1.08394	0.12192	9.6366
NE1	0.5606	0.4626	1.4686	0.2256	1.75172	0.53203	5.7676
SE32	-1.2345	1.0700	1.3311	0.2486	0.29098	0.01848	4.5806
FCFL2	-1.3004	1.0583	1.5098	0.2192	0.27242	0.01784	4.1611
FCFL6	0.3130	0.6578	0.2265	0.6341	1.36752	0.25120	7.4446
Private Office	-0.0182	0.2617	0.0048	0.9446	0.98196	0.50040	1.9270
Cubicle or Shared	0.1454	0.2521	0.3326	0.5641	1.15650	0.60410	2.2140

Association of Predicted Probabilities and Observed Responses

Concordant = 79.8%	Somers' D = 0.601
Discordant = 19.7%	Gamma = 0.603
Tied = 0.4%	Tau-a = 0.130
(322695 pairs)	c = 0.800

Response Variable: Sore Throat, Hoarseness, Dry Throat
Number of Observations: 1721
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1916.967	1829.492	.
SC	1922.417	2020.265	.
-2 LOG L	1914.967	1759.492	155.475 with 34 DF (p=0.0001)
Score	.	.	150.368 with 34 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.3300	0.5179	41.3377	0.0001	0.03579	0.00943	0.1359
Laser Printer Nearby	-0.2825	0.1273	4.9274	0.0264	0.75390	0.54312	1.0465
New Furniture	0.3877	0.1209	10.2908	0.0013	1.47359	1.07924	2.0120
Window Nearby	-0.1941	0.1284	2.2857	0.1306	0.82358	0.59164	1.1464
Glare	0.1722	0.1236	1.9411	0.1636	1.18792	0.86399	1.6333
Noise	0.1133	0.1265	0.8022	0.3704	1.11997	0.80851	1.5514
Dust	0.4476	0.1318	11.5394	0.0007	1.56455	1.11414	2.1971
Role Conflict	0.3662	0.0882	17.2261	0.0001	1.44224	1.14912	1.8101
Workload	0.0240	0.0705	0.1154	0.7340	1.02429	0.85418	1.2283
External Stress	0.0973	0.0500	3.7912	0.0515	1.10219	0.96899	1.2537
Allergy to Molds	0.3609	0.1313	7.5593	0.0060	1.43462	1.02293	2.0120
Chem. Sensitivity	0.3573	0.1268	7.9414	0.0048	1.42946	1.03114	1.9817
Sole Provider	0.4153	0.1753	5.6126	0.0178	1.51483	0.96438	2.3795
Nonsmoker	0.0981	0.1616	0.3690	0.5436	1.10307	0.72747	1.6726
Under 30	-0.3300	0.1520	4.7113	0.0300	0.71892	0.48600	1.0635
AHU20	-0.5153	0.7833	0.4328	0.5106	0.59732	0.07941	4.4928
ETB	-1.6670	1.0737	2.4107	0.1205	0.18881	0.01188	3.0007
NEG3	-1.6080	0.7958	4.0824	0.0433	0.20029	0.02578	1.5558
NEG4	-1.2119	0.8237	2.1646	0.1412	0.29763	0.03566	2.4842
SE22	0.4224	0.6802	0.3858	0.5345	1.52562	0.26453	8.7986
G1LG1	0.3966	0.7632	0.2701	0.6033	1.48676	0.20817	10.6186
NEG1NEG2	-1.6302	1.0840	2.2616	0.1326	0.19589	0.01200	3.1969
CM FL2	-0.5192	0.4764	1.1877	0.2758	0.59500	0.17440	2.0299
FCFL6	-0.1807	0.5233	0.1192	0.7299	0.83469	0.21681	3.2134
ET1FL67	-0.4466	0.4834	0.8537	0.3555	0.63980	0.18418	2.2225
ET1F1011	-0.0952	0.4285	0.0494	0.8241	0.90919	0.30149	2.7418
WT1FL89	-0.6671	0.6496	1.0545	0.3045	0.51319	0.09628	2.7354
WT1F1011	-1.2436	0.6429	3.7419	0.0531	0.28834	0.05504	1.5106
WT2F1011	0.4120	0.4421	0.8688	0.3513	1.50983	0.48343	4.7155
ET3FL811	-0.1197	0.5728	0.0437	0.8344	0.88719	0.20286	3.8800
WT3FL47	-0.2121	0.5810	0.1332	0.7151	0.80888	0.18109	3.6131
Tackd Carpet, Room	0.6349	0.2244	8.0061	0.0047	1.88683	1.05849	3.3634
Tackd Carpet, Hall	0.2172	0.2632	0.6808	0.4093	1.24259	0.63078	2.4478
Private Office	-0.1026	0.1711	0.3597	0.5487	0.90249	0.58080	1.4024
Cubicle or Shared	-0.0998	0.1407	0.5030	0.4782	0.90502	0.62987	1.3004

Association of Predicted Probabilities and Observed Responses

Concordant = 69.4%	Somers' D = 0.391
Discordant = 30.2%	Gamma = 0.393
Tied = 0.4%	Tau-a = 0.145
(547300 pairs)	c = 0.696

Response Variable: Sore Throat, Hoarseness, Dry Throat
Number of Observations: 1706
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1430.683	1339.740	.
SC	1436.125	1530.207	.
-2 LOG L	1428.683	1269.740	158.943 with 34 DF (p=0.0001)
Score	.	.	152.983 with 34 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-4.6943	0.6550	51.3592	0.0001	0.00915	0.00169	0.0494
Laser Printer Nearby	-0.0799	0.1605	0.2477	0.6187	0.92321	0.61058	1.3959
New Furniture	0.3490	0.1503	5.3874	0.0203	1.41765	0.96255	2.0879
Window Nearby	-0.5158	0.1563	10.8981	0.0010	0.59702	0.39915	0.8930
Glare	0.3322	0.1500	4.9060	0.0268	1.39403	0.94724	2.0516
Noise	0.2101	0.1600	1.7249	0.1891	1.23380	0.81705	1.8631
Dust	0.6459	0.1528	17.8693	0.0001	1.90770	1.28697	2.8278
Role Conflict	0.2107	0.1141	3.4100	0.0648	1.23454	0.92015	1.6564
Workload	0.1184	0.0914	1.6770	0.1953	1.12569	0.88954	1.4245
External Stress	0.1177	0.0637	3.4062	0.0650	1.12491	0.95467	1.3255
Allergy to Molds	0.3843	0.1531	6.3030	0.0121	1.46859	0.98997	2.1786
Chem. Sensitivity	0.4692	0.1584	8.7715	0.0031	1.59871	1.06307	2.4043
Sole Provider	-0.0210	0.1669	0.0158	0.8999	0.97922	0.63703	1.5052
Nonsmoker	0.4330	0.2621	2.7293	0.0985	1.54188	0.78492	3.0288
Under 30	-0.2375	0.2985	0.6328	0.4263	0.78860	0.36552	1.7014
AHU20	-0.7722	1.0812	0.5101	0.4751	0.46200	0.02851	7.4855
ETB	0.1333	0.8546	0.0243	0.8760	1.14259	0.12642	10.3269
NEG3	-0.7252	0.8363	0.7519	0.3859	0.48423	0.05616	4.1750
NEG4	-1.7788	1.1034	2.5989	0.1069	0.16884	0.00984	2.8967
SE22	-1.1637	1.0867	1.1467	0.2842	0.31233	0.01901	5.1327
G1LG1	-0.3059	1.1600	0.0695	0.7920	0.73646	0.03710	14.6181
NEG1NEG2	-38.5795 #	.	.	.	.	.	.
CM FL2	-1.9052	1.0343	3.3929	0.0655	0.14879	0.01036	2.1365
FCFL6	-0.7305	0.7646	0.9128	0.3394	0.48167	0.06720	3.4525
ET1FL67	-0.3049	0.6640	0.2109	0.6461	0.73720	0.13327	4.0778
ET1F1011	-0.5607	0.5563	1.0158	0.3135	0.57081	0.13619	2.3925
WT1FL89	-0.8261	1.0747	0.5908	0.4421	0.43775	0.02747	6.9750
WT1F1011	-37.2038 #	.	.	.	.	.	.
WT2F1011	-0.5424	0.7853	0.4770	0.4898	0.58135	0.07689	4.3953
ET3FL811	-1.4415	0.6631	4.7263	0.0297	0.23657	0.04287	1.3056
WT3FL47	-0.5169	0.6283	0.6768	0.4107	0.59637	0.11820	3.0090
Tackd Carpet, Room	0.6795	0.2715	6.2640	0.0123	1.97289	0.98031	3.9705
Tackd Carpet, Hall	0.5456	0.3062	3.1745	0.0748	1.72564	0.78414	3.7976
Private Office	0.1781	0.2457	0.5252	0.4686	1.19494	0.63456	2.2502
Cubicle or Shared	0.1082	0.2424	0.1994	0.6552	1.11427	0.59677	2.0805

Association of Predicted Probabilities and Observed Responses

Concordant	73.2%	Somers' D	= 0.469
Discordant	= 26.3%	Gamma	= 0.471
Tied	= 0.5%	Tau-a	= 0.118
(366408 pairs)		c	= 0.735

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Sore Throat, Hoarseness, Dry Throat (Including Comfort and Odor)
Number of Observations: 1621
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1813.464	1657.160	.
SC	1818.855	1818.883	.
-2 LOG L	1811.464	1597.160	214.305 with 29 DF (p=0.0001)
Score	.	.	214.702 with 29 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.4840	0.5082	47.0036	0.0001	0.03068	0.00829	0.1136
Fabric Partitions	-0.0026	0.1363	0.0004	0.9848	0.99740	0.70208	1.4170
Use Fan	0.2095	0.1348	2.4154	0.1201	1.23306	0.87132	1.7450
Use Heater	-0.3440	0.1604	4.5978	0.0320	0.70893	0.46898	1.0716
New Furniture	0.2275	0.1281	3.1553	0.0757	1.25546	0.90259	1.7463
Window Nearby	-0.1298	0.1341	0.9366	0.3332	0.87827	0.62173	1.2407
Glare	0.1217	0.1301	0.8752	0.3495	1.12942	0.80780	1.5791
External Stress	0.0652	0.0528	1.5257	0.2168	1.06737	0.93164	1.2229
Wear Contact Lens	-0.0659	0.1486	0.1967	0.6574	0.93622	0.63846	1.3729
Wear Glasses	0.1685	0.1277	1.7414	0.1870	1.18353	0.85176	1.6445
Allergy to Molds	0.3103	0.1388	4.9993	0.0254	1.36383	0.95385	1.9500
Chem. Sensitivity	0.2271	0.1359	2.7921	0.0947	1.25496	0.88428	1.7810
Sole Provider	0.3000	0.1883	2.5368	0.1112	1.34986	0.83105	2.1925
Nonsmoker	0.0725	0.1696	0.1827	0.6690	1.07519	0.69462	1.6643
Hot Stuffy Air	0.0259	0.0223	1.3458	0.2460	1.02624	0.96895	1.0869
Dry Air	0.1878	0.0381	24.2694	0.0001	1.20659	1.09380	1.3310
Cold Drafty Air	0.1738	0.0469	13.7488	0.0002	1.18982	1.05441	1.3426
Paint Odor	0.2835	0.0592	22.9028	0.0001	1.32777	1.13997	1.5465
Cosmetic, Body Odor	0.0367	0.0410	0.7994	0.3713	1.03738	0.93341	1.1529
New Carpet Odor	0.0976	0.0869	1.2616	0.2613	1.10252	0.88139	1.3791
AHU21	0.2278	0.8169	0.0778	0.7803	1.25583	0.15312	10.2999
ETB	-1.6206	1.0932	2.1978	0.1382	0.19778	0.01184	3.3052
NE1	0.0929	0.3789	0.0601	0.8063	1.09735	0.41348	2.9123
NEG4	-1.1297	0.8311	1.8480	0.1740	0.32313	0.03798	2.7489
SE22	0.1040	0.7178	0.0210	0.8848	1.10960	0.17464	7.0502
SE32	1.2651	0.3792	11.1295	0.0008	3.54345	1.33413	9.4114
NEG1NEG2	-0.9088	1.0983	0.6847	0.4080	0.40301	0.02380	6.8238
Tackd Carpet, Room	0.3990	0.2271	3.0866	0.0789	1.49033	0.83027	2.6752
Private Office	-0.1094	0.1760	0.3866	0.5341	0.89637	0.56963	1.4105
Cubicle or Shared	-0.1212	0.1503	0.6497	0.4202	0.88586	0.60147	1.3047

Association of Predicted Probabilities and Observed Responses

Concordant = 73.1%	Somers' D = 0.466
Discordant = 26.5%	Gamma = 0.467
Tied = 0.3%	Tau-a = 0.173
(488400 pairs)	c = 0.733

Response Variable: Sore Throat, Hoarseness, Dry Throat (Including Comfort and Odor)
Number of Observations: 1625
Sex = Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1348.626	1199.520	.
SC	1354.019	1361.318	.
-2 LOG L	1346.626	1139.520	207.106 with 29 DF (p=0.0001)
Score	.	.	213.024 with 29 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Lower Limit	Upper Limit
Intercept	-4.8160	0.6728	51.2436	0.0001	0.00810	0.00143	0.0458
Fabric Partitions	-0.2831	0.1699	2.7776	0.0956	0.75344	0.48638	1.1671
Use Fan	-0.1836	0.1707	1.1574	0.2820	0.83227	0.53616	1.2919
Use Heater	-0.4388	0.2800	2.4553	0.1171	0.64481	0.31346	1.3264
New Furniture	0.3593	0.1599	5.0480	0.0247	1.43233	0.94876	2.1624
Window Nearby	-0.3816	0.1652	5.3373	0.0209	0.68277	0.44613	1.0449
Glare	0.1643	0.1615	1.0341	0.3092	1.17857	0.77746	1.7866
External Stress	0.1129	0.0666	2.8759	0.0899	1.11952	0.94303	1.3290
Wore Contact Lens	-0.5479	0.2298	5.6858	0.0171	0.57816	0.31986	1.0451
Wore Glasses	0.2482	0.1687	2.1642	0.1413	1.28172	0.82997	1.9794
Allergy to Molds	0.3698	0.1623	5.1911	0.0227	1.44745	0.95286	2.1987
Chem. Sensitivity	0.3773	0.1678	5.0553	0.0246	1.45834	0.94653	2.2469
Sole Provider	-0.0205	0.1790	0.0131	0.9089	0.97971	0.61779	1.5536
Non-Smoker	0.5015	0.2714	3.4155	0.0646	1.65120	0.82068	3.3222
Hot Stuffy Air	0.0461	0.0269	2.9351	0.0867	1.04718	0.97707	1.1223
Dry Air	0.2742	0.0474	33.3970	0.0001	1.31548	1.16427	1.4863
Cold Drafty Air	-0.0328	0.0714	0.2112	0.6459	0.96773	0.80515	1.1631
Paint Odor	0.2297	0.0848	7.3393	0.0067	1.25822	1.01132	1.5654
Cosmetic, Body Odor	0.1541	0.0588	6.8654	0.0088	1.16661	1.00263	1.3574
New Carpet Odor	0.0567	0.1085	0.2734	0.6011	1.05834	0.80028	1.3996
AHU21	0.8031	0.6870	1.3666	0.2424	2.23245	0.38037	13.1026
ETB	0.3576	0.8643	0.1712	0.6790	1.42989	0.15430	13.2505
NE1	0.8127	0.4109	3.9123	0.0479	2.25399	0.78210	6.4959
NEG4	-1.1944	1.1133	1.1510	0.2833	0.30289	0.01721	5.3306
SE22	-0.8829	1.1028	0.6409	0.4234	0.41358	0.02414	7.0845
SE32	-0.5417	0.7949	0.4644	0.4956	0.58176	0.07507	4.5085
NEG1NEG2	37.0158#	.	.	.	.	.	.
Tackd Carpet, Room	0.4632	0.2824	2.6911	0.1009	1.58915	0.76777	3.2893
Private Office	0.2856	0.2619	1.1893	0.2755	1.33056	0.67770	2.6124
Cubicle or Shared	0.2755	0.2557	1.1606	0.2813	1.31719	0.68169	2.5451

Association of Predicted Probabilities and Observed Responses

Concordant = 76.9%	Somers' D = 0.542
Discordant = 22.7%	Gamma = 0.545
Tied = 0.4%	Tau-a = 0.135
(327804 pairs)	c = 0.771

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Sleepiness, Unusual Fatigue
Number of Observations: 1785
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1713.938	1599.078	.
SC	1719.425	1708.821	.
-2 LOG L	1711.938	1559.078	152.860 with 19 DF (p=0.0001)
Score	.	.	155.174 with 19 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.8151	0.5251	11.9487	0.0005	0.16282	0.04210	0.6297
Laser Printer Nearby	-0.1882	0.1381	1.8572	0.1729	0.82845	0.58045	1.1824
Use Heater	0.1631	0.1499	1.1844	0.2765	1.17715	0.80008	1.7319
New Furniture	0.1345	0.1306	1.0618	0.3028	1.14396	0.81716	1.6015
Water Leaks Nearby	0.3114	0.1809	2.9615	0.0853	1.36534	0.85676	2.1758
Window Nearby	-0.1020	0.1378	0.5484	0.4590	0.90303	0.63320	1.2878
Lights Too Dim	0.8461	0.2037	17.2582	0.0001	2.33054	1.37901	3.9386
Glare	0.2649	0.1352	3.8385	0.0501	1.30330	0.92001	1.8463
Noise	0.1779	0.1381	1.6602	0.1976	1.19471	0.83707	1.7051
Dust	0.4056	0.1446	7.8656	0.0050	1.50020	1.03366	2.1773
Job Satisfaction	-0.6508	0.1231	27.9339	0.0001	0.52163	0.37988	0.7163
External Stress	0.0829	0.0529	2.4577	0.1169	1.08643	0.94803	1.2450
College Grad	-0.3464	0.1509	5.2689	0.0217	0.70723	0.47945	1.0432
Allergy to Molds	0.0738	0.1431	0.2662	0.6059	1.07659	0.74466	1.5565
Chem. Sensitivity	0.5995	0.1342	19.9680	0.0001	1.82121	1.28892	2.5733
G1LG1	0.6570	0.8295	0.6273	0.4283	1.92900	0.22769	16.3429
WT1F1011	0.0547	0.4682	0.0136	0.9070	1.05622	0.31620	3.5282
UGHAHU19	-0.3295	0.7791	0.1789	0.6723	0.71928	0.09667	5.3520
Private Office	-0.1784	0.1983	0.8091	0.3684	0.83661	0.50197	1.3943
Cubicle or Shared	-0.0387	0.1507	0.0658	0.7976	0.96204	0.65253	1.4184

Association of Predicted Probabilities and Observed Responses

Concordant = 70.4%	Somers' D = 0.412
Discordant = 29.2%	Gamma = 0.414
Tied = 0.5%	Tau-a = 0.125
(481274 pairs)	c = 0.706

Response Variable: Sleepiness, Unusual Fatigue
Number of Observations: 1785
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1117.231	1042.543	.
SC	1122.710	1152.118	.
-2 LOG L	1115.231	1002.543	112.688 with 19 DF (p=0.0001)
Score	.	.	111.772 with 19 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.2813	0.7360	19.8755	0.0001	0.03758	0.00564	0.25023
Laser Printer Nearby	0.2004	0.1802	1.2368	0.2661	1.22189	0.76813	1.94370
Use Heater	-0.0653	0.2766	0.0558	0.8133	0.93679	0.45941	1.91023
New Furniture	0.2997	0.1737	2.9762	0.0845	1.34945	0.86265	2.11098
Water Leaks Nearby	0.5755	0.2200	6.8417	0.0089	1.77802	1.00882	3.13372
Window Nearby	-0.5944	0.1780	11.1504	0.0008	0.55189	0.34891	0.87295
Lights Too Dim	0.3499	0.3115	1.2619	0.2613	1.41893	0.63602	3.16554
Glare	0.4248	0.1759	5.8310	0.0157	1.52928	0.97208	2.40589
Noise	0.3164	0.1894	2.7896	0.0949	1.37218	0.84240	2.23512
Dust	0.4464	0.1781	6.2811	0.0122	1.56268	0.98769	2.47239
Job Satisfaction	-0.4398	0.1608	7.4818	0.0062	0.64417	0.42570	0.97475
External Stress	0.1744	0.0726	5.7601	0.0164	1.19053	0.98746	1.43536
College Grad	0.1927	0.3524	0.2989	0.5846	1.21252	0.48915	3.00562
Allergy to Molds	0.3622	0.1796	4.0646	0.0438	1.43649	0.90443	2.28154
Chem. Sensitivity	0.2868	0.1852	2.3977	0.1215	1.33216	0.82673	2.14658
G1LG1	-38.0834 #	.	.	.	.	.	.
WT1F1011	-36.5466 #	.	.	.	.	.	.
UGHAHU19	-0.8225	0.8247	0.9947	0.3186	0.43933	0.05250	3.67637
Private Office	-0.9382	0.2378	15.5664	0.0001	0.39133	0.21208	0.72207
Cubicle or Shared	-0.6947	0.2278	9.2981	0.0023	0.49922	0.27762	0.89773

Association of Predicted Probabilities and Observed Responses

Concordant = 72.2%	Somers' D = 0.452
Discordant = 27.1%	Gamma = 0.455
Tied = 0.7%	Tau-a = 0.078
(270569 pairs)	c = 0.726

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Sleepiness, Unusual Fatigue (Including Comfort and Odor)
Number of Observations: 1582
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1497.243	1313.465	.
SC	1502.609	1415.428	.
-2 LOG L	1495.243	1275.465	219.778 with 18 DF (p=0.0001)
Score	.	.	221.116 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.3999	0.6631	26.2883	0.0001	0.03338	0.00605	0.1842
Laser Printer Nearby	-0.1918	0.1525	1.5804	0.2087	0.82547	0.55731	1.2227
Window Nearby	-0.0301	0.1507	0.0400	0.8415	0.97035	0.65816	1.4306
Glare	0.1657	0.1500	1.2203	0.2693	1.18022	0.80196	1.7369
Medium Pay	-0.2368	0.1625	2.1239	0.1450	0.78915	0.51923	1.1994
Job Satisfaction	-0.4551	0.1534	8.8051	0.0030	0.63438	0.42730	0.9418
Underutilization	0.1759	0.0757	5.3982	0.0202	1.19232	0.98108	1.4490
External Stress	0.0612	0.0587	1.0850	0.2976	1.06311	0.91392	1.2367
College Grad	-0.3057	0.1675	3.3289	0.0681	0.73661	0.47846	1.1340
Allergy to Molds	-0.1251	0.1613	0.6013	0.4381	0.88241	0.58239	1.3370
Chem. Sensitivity	0.5259	0.1509	12.1498	0.0005	1.69198	1.14704	2.4958
Hot Stuffy Air	0.1625	0.0226	51.7450	0.0001	1.17645	1.10991	1.2470
Cold Drafty Air	0.0675	0.0511	1.7457	0.1864	1.06983	0.93788	1.2203
Paint Odor	0.1675	0.0612	7.4823	0.0062	1.18235	1.00990	1.3842
Cosmetic, Body Odor	0.1498	0.0434	11.9130	0.0006	1.16160	1.03873	1.2990
New Carpet Odor	0.0385	0.0940	0.1678	0.6821	1.03925	0.81575	1.3240
FCFL2	1.2550	0.5678	4.8846	0.0271	3.50784	0.81249	15.1447
Private Office	-0.2007	0.2190	0.8393	0.3596	0.81816	0.46541	1.4383
Cubicle or Shared	-0.0366	0.1700	0.0463	0.8297	0.96406	0.62218	1.4938

Association of Predicted Probabilities and Observed Responses

Concordant = 75.1%	Somers' D = 0.505
Discordant = 24.5%	Gamma = 0.507
Tied = 0.4%	Tau-a = 0.150
(370656 pairs)	c = 0.753

Response Variable: Sleepiness, Unusual Fatigue (Including Comfort and Odor)
Number of Observations: 1625
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1011.609	883.791	.
SC	1017.002	986.263	.
-2 LOG L	1009.609	845.791	163.818 with 18 DF (p=0.0001)
Score	.	.	172.386 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-5.1505	0.9629	28.6120	0.0001	0.00580	0.00049	0.06925
Laser Printer Nearby	0.1064	0.1975	0.2899	0.5903	1.11227	0.66874	1.84995
Window Nearby	-0.2565	0.1949	1.7324	0.1881	0.77375	0.46834	1.27834
Glare	0.2810	0.1920	2.1419	0.1433	1.32445	0.80768	2.17188
Medium Pay	0.2255	0.2352	0.9197	0.3376	1.25295	0.68360	2.29647
Job Satisfaction	-0.2454	0.2085	1.3857	0.2391	0.78239	0.45726	1.33870
Underutilization	0.1432	0.1073	1.7818	0.1819	1.15396	0.87529	1.52136
External Stress	0.1576	0.0780	4.0869	0.0432	1.17070	0.95760	1.43122
College Grad	0.2913	0.4138	0.4956	0.4814	1.33817	0.46087	3.88549
Allergy to Molds	0.3488	0.1941	3.2284	0.0724	1.41737	0.85967	2.33684
Chem. Sensitivity	0.2276	0.2018	1.2721	0.2594	1.25558	0.74659	2.11158
Hot Stuffy Air	0.1908	0.0288	43.7537	0.0001	1.21022	1.12368	1.30342
Cold Drafty Air	0.0851	0.0822	1.0728	0.3003	1.08883	0.88104	1.34561
Paint Odor	0.1018	0.0990	1.0573	0.3038	1.10716	0.85794	1.42878
Cosmetic, Body Odor	0.0491	0.0705	0.4851	0.4861	1.05033	0.87590	1.25949
New Carpet Odor	0.2286	0.1101	4.3054	0.0380	1.25684	0.94647	1.66899
FCFL2	-37.3697 #	.	.	.	.	.	.
Private Office	-0.8080	0.2712	8.8768	0.0029	0.44575	0.22166	0.89638
Cubicle or Shared	-0.5674	0.2525	5.0478	0.0247	0.56700	0.29587	1.08659

Association of Predicted Probabilities and Observed Responses

Concordant = 79.4%	Somers' D = 0.593
Discordant = 20.1%	Gamma = 0.596
Tied = 0.5%	Tau-a = 0.101
(223896 pairs)	c = 0.796

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Chills and Fever
Number of Observations: 1723
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2164.657	2020.459	.
SC	2170.109	2156.754	.
-2 LOG L	2162.657	1970.459	192.198 with 24 DF (p=0.0001)
Score	.	.	182.412 with 24 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.46230	0.3130	21.8229	0.0001	0.23170	0.10346	0.51892
Hours at Work	0.00656	0.0365	0.0322	0.8575	1.00658	0.91625	1.10582
>1 Hour at Copier	0.11470	0.1613	0.5054	0.4771	1.12154	0.74022	1.69929
Use Heater	0.28350	0.1277	4.9319	0.0264	1.32777	0.95556	1.84496
New Carpet/Drapes	-0.47680	0.1639	8.4633	0.0036	0.62077	0.40697	0.94687
New Furniture	0.26120	0.1171	4.9770	0.0257	1.29849	0.96036	1.75567
Walls Rearranged	-0.26000	0.1477	3.0989	0.0783	0.77105	0.52704	1.12803
Lights Too Dim	0.12040	0.2012	0.3582	0.5495	1.12795	0.67174	1.89400
Glare	0.18970	0.1143	2.7533	0.0971	1.20889	0.90056	1.62277
Noise	0.22440	0.1172	3.6652	0.0556	1.25157	0.92542	1.69267
Dust	0.40290	0.1200	11.2677	0.0008	1.49616	1.09832	2.03810
High Pay	-0.44810	0.1507	8.8372	0.0030	0.63884	0.43331	0.94186
Role Conflict	0.30810	0.0797	14.9624	0.0001	1.36084	1.10826	1.67097
College Grad	-0.43120	0.1366	9.9715	0.0016	0.64973	0.45700	0.92375
Allergy to Molds	0.22090	0.1250	3.1206	0.0773	1.24720	0.90384	1.72099
Chem. Sensitivity	0.20130	0.1185	2.8878	0.0893	1.22299	0.90126	1.65957
Sole Provider	0.23050	0.1653	1.9453	0.1631	1.25923	0.82258	1.92767
AHU21	0.42750	0.7025	0.3703	0.5428	1.53342	0.25104	9.36650
AWU15SW2	0.17630	0.4269	0.1705	0.6796	1.19280	0.39717	3.58226
NEG1NEG2	-1.31840	1.0719	1.5128	0.2187	0.26756	0.01691	4.23259
CM FL2	-1.68740	0.6190	7.4300	0.0064	0.18500	0.03756	0.91132
WT2FL67	-0.80220	0.5037	2.5365	0.1112	0.44834	0.12249	1.64104
Tackd Carpet, Room	0.22010	0.1991	1.2214	0.2691	1.24620	0.74619	2.08128
Private Office	-0.41710	0.1738	5.7587	0.0164	0.65896	0.42113	1.03108
Cubicle or Shared	-0.33560	0.1313	6.5371	0.0106	0.71491	0.50975	1.00263

Association of Predicted Probabilities and Observed Responses

Concordant = 70.3%	Somers' D = 0.409
Discordant = 29.4%	Gamma = 0.410
Tied = 0.3%	Tau-a = 0.178
(647010 pairs)	c = 0.704

Response Variable: Chills and Fever
Number of Observations: 1724
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1534.980	1484.565	.
SC	1540.433	1620.875	.
-2 LOG L	1532.980	1434.565	98.415 with 24 DF (p=0.0001)
Score	.	.	102.310 with 24 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.2539	0.4574	50.6040	0.0001	0.03862	0.01189	0.12548
Hours at Work	0.1316	0.0425	9.5988	0.0019	1.14065	1.02237	1.27262
>1 Hour at Copier	0.2896	0.3137	0.8521	0.3560	1.33589	0.59542	2.99724
Use Heater	0.6637	0.1986	11.1711	0.0008	1.94196	1.16428	3.23909
New Carpet/Drapes	0.0496	0.1893	0.0686	0.7934	1.05085	0.64530	1.71127
New Furniture	0.1982	0.1464	1.8323	0.1759	1.21921	0.83617	1.77771
Walls Rearranged	-0.1534	0.1967	0.6078	0.4356	0.85779	0.51680	1.42376
Lights Too Dim	0.1038	0.2835	0.1341	0.7142	1.10938	0.53446	2.30273
Glare	0.3134	0.1402	4.9985	0.0254	1.36807	0.95337	1.96316
Noise	0.4020	0.1502	7.1642	0.0074	1.49481	1.01520	2.20101
Dust	0.3136	0.1437	4.7603	0.0291	1.36834	0.94500	1.98134
High Pay	0.0109	0.1803	0.0037	0.9517	1.01096	0.63537	1.60858
Role Conflict	0.2772	0.1020	7.3782	0.0066	1.31943	1.01455	1.71592
College Grad	-0.6427	0.2753	5.4494	0.0196	0.52587	0.25876	1.06873
Allergy to Molds	0.0299	0.1498	0.0399	0.8416	1.03035	0.70048	1.51556
Chem. Sensitivity	0.3430	0.1527	5.0463	0.0247	1.40917	0.95089	2.08831
Sole Provider	0.0201	0.1563	0.0166	0.8974	1.02030	0.68213	1.52612
AHU21	0.2496	0.7199	0.1203	0.7287	1.28351	0.20092	8.19941
AWU15SW2	1.1247	0.4024	7.8102	0.0052	3.07929	1.09212	8.68226
NEG1NEG2	-0.2533	0.7103	0.1272	0.7214	0.77623	0.12455	4.83767
CM FL2	-1.0692	0.7419	2.0771	0.1495	0.34328	0.05078	2.32085
WT2FL67	-0.1724	0.5199	0.1100	0.7402	0.84164	0.22054	3.21190
Tackd Carpet, Room	0.5383	0.2445	4.8467	0.0277	1.71309	0.91253	3.21598
Private Office	-0.0447	0.2219	0.0406	0.8403	0.95628	0.53993	1.69370
Cubicle or Shared	-0.0895	0.2121	0.1779	0.6732	0.91439	0.52947	1.57912

Association of Predicted Probabilities and Observed Responses

Concordant = 68.0%	Somers' D = 0.367
Discordant = 31.3%	Gamma = 0.369
Tied = 0.7%	Tau-a = 0.100
(405483 pairs)	c = 0.683

Response Variable: Chills and Fever (Including Comfort and Odor)
Number of Observations: 1640
Sex = Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2039.951	1791.691	.
SC	2045.354	1899.740	.
-2 LOG L	2037.951	1751.691	286.260 with 19 DF (p=0.0001)
Score	.	.	270.662 with 19 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.0802	0.3671	8.6610	0.0033	0.33953	0.13188	0.8741
Hours at Work	-0.0275	0.0388	0.5031	0.4781	0.97287	0.88034	1.0751
Use Heater	0.1324	0.1400	0.8933	0.3446	1.14156	0.79593	1.6373
Glare	0.2125	0.1207	3.0975	0.0784	1.23677	0.90627	1.6878
Job Satisfaction	-0.4087	0.1145	12.7542	0.0004	0.66451	0.49478	0.8925
College Grad	-0.4899	0.1230	15.8726	0.0001	0.61269	0.44631	0.8411
Live Alone	0.1607	0.1399	1.3191	0.2508	1.17433	0.81899	1.6838
Sole Provider	0.1374	0.1830	0.5634	0.4529	1.14729	0.71605	1.8382
Dry Air	0.0585	0.0300	3.7896	0.0516	1.06024	0.98140	1.1454
Cold Drafty Air	0.3865	0.0439	77.4982	0.0001	1.47182	1.31444	1.6480
Paint Odor	0.1959	0.0530	13.6550	0.0002	1.21641	1.06117	1.3943
Cosmetic, Body Odor	0.1289	0.0395	10.6261	0.0011	1.13758	1.02752	1.2594
Musty/Diesel Odor	0.1576	0.0693	5.1686	0.0230	1.17070	0.97930	1.3995
AHU13	0.9579	0.5314	3.2490	0.0715	2.60622	0.66300	10.2450
AHU21	0.8585	0.6458	1.7675	0.1837	2.35962	0.44705	12.4545
NEG1NEG2	-1.5197	1.0848	1.9625	0.1612	0.21878	0.01338	3.5778
CM FL2	-2.3512	1.0231	5.2816	0.0216	0.09525	0.00683	1.3288
WT1FL45	-1.3517	0.6451	4.3910	0.0361	0.25880	0.04912	1.3635
WT2FL67	-1.0561	0.6100	2.9977	0.0834	0.34781	0.07226	1.6741
WT3FL811	37.5946#	.	.	.	.	.	.

Association of Predicted Probabilities and Observed Responses

Concordant = 75.3%	Somers' D = 0.509
Discordant = 24.4%	Gamma = 0.510
Tied = 0.3%	Tau-a = 0.219
(578151 pairs)	c = 0.754

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Chills and Fever (Including Comfort and Odor)
Number of Observations: 1685
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1461.605	1328.838	.
SC	1467.035	1437.429	.
-2 LOG L	1459.605	1288.838	170.767 with 19 DF (p=0.0001)
Score	.	.	182.931 with 19 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.90430	0.4878	35.4497	0.0001	0.05479	0.01559	0.1925
Hours at Work	0.12420	0.0449	7.6379	0.0057	1.13224	1.00857	1.2711
Use Heater	0.39880	0.2137	3.4834	0.0620	1.49004	0.85925	2.5839
Glare	0.37680	0.1480	6.4802	0.0109	1.45761	0.99556	2.1341
Job Satisfaction	-0.21370	0.1369	2.4386	0.1184	0.80759	0.56759	1.1491
College Grad	-0.72650	0.2547	8.1363	0.0043	0.48360	0.25092	0.9320
Live Alone	0.35470	0.2004	3.1317	0.0768	1.42575	0.85084	2.3891
Sole Provider	0.00482	0.1713	0.0008	0.9776	1.00483	0.64633	1.5622
Dry Air	0.13100	0.0392	11.1353	0.0008	1.13997	1.03048	1.2611
Cold Drafty Air	0.46500	0.0591	61.9116	0.0001	1.59201	1.36719	1.8538
Paint Odor	0.21490	0.0748	8.2526	0.0041	1.23974	1.02246	1.5032
Cosmetic, Body Odor	0.00814	0.0591	0.0190	0.8904	1.00817	0.86580	1.1740
Musty/Diesel Odor	0.19740	0.0853	5.3512	0.0207	1.21823	0.97791	1.5176
AHU13	-0.53940	0.8186	0.4342	0.5099	0.58310	0.07078	4.8034
AHU21	0.56140	0.7473	0.5644	0.4525	1.75313	0.25573	12.0185
NEG1NEG2	0.19730	0.6967	0.0802	0.7770	1.21811	0.20242	7.3302
CM FL2	-0.58530	0.7435	0.6196	0.4312	0.55694	0.08204	3.7809
WT1FL45	-0.48480	0.7607	0.4062	0.5239	0.61582	0.08678	4.3700
WT2FL67	-0.13530	0.5491	0.0607	0.8054	0.87345	0.21229	3.5937
WT3FL811	0.40400	0.7356	0.3017	0.5828	1.49780	0.22517	9.9633

Association of Predicted Probabilities and Observed Responses

Concordant = 74.5%	Somers' D = 0.495
Discordant = 25.0%	Gamma = 0.497
Tied = 0.5%	Tau-a = 0.130
(373986 pairs)	c = 0.748

Response Variable: Aching Muscles or Joints, Pain in Back, Shoulder, Neck, Wrists
Number of Observations: 1717
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1679.694	1519.637	.
SC	1685.142	1683.087	.
-2 LOG L	1677.694	1459.637	218.057 with 29 DF (p=0.0001)
Score	.	.	215.403 with 29 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.52530	0.3888	82.2006	0.0001	0.02944	0.01081	0.0802
W5	0.00603	0.0471	0.0164	0.8982	1.00605	0.89110	1.1358
Laser Printer Nearby	-0.24860	0.1420	3.0653	0.0800	0.77989	0.54097	1.1243
1 Hour at Copier	-0.20370	0.1497	1.8511	0.1737	0.81571	0.55470	1.1995
Walls Painted	0.15420	0.1584	0.9478	0.3303	1.16672	0.77582	1.7546
Water Leaks Nearby	0.28730	0.1855	2.3997	0.1214	1.33282	0.82651	2.1493
Lights Too Dim	0.41650	0.2150	3.7532	0.0527	1.51664	0.87167	2.6388
Glare	0.54230	0.1418	14.6218	0.0001	1.71996	1.19366	2.4783
Noise	0.28860	0.1437	4.0340	0.0446	1.33456	0.92167	1.9324
Dust	0.37840	0.1509	6.2875	0.0122	1.45995	0.98973	2.1536
High Pay	-0.57990	0.1700	11.6409	0.0006	0.55995	0.36138	0.8676
Role Conflict	0.26590	0.0978	7.3886	0.0066	1.30460	1.01407	1.6784
Workload	0.18510	0.0797	5.3995	0.0201	1.20334	0.98000	1.4776
Wear Contact Lens	0.13840	0.1557	0.7903	0.3740	1.14843	0.76899	1.7151
Allergy to Molds	0.42420	0.1441	8.6690	0.0032	1.52837	1.05443	2.2153
Chem. Sensitivity	0.28870	0.1403	4.2302	0.0397	1.33469	0.92987	1.9158
Live Alone	0.07260	0.1596	0.2066	0.6494	1.07530	0.71282	1.6221
Sole Provider	0.37830	0.1942	3.7947	0.0514	1.45980	0.88518	2.4074
Discomfort Index	0.29130	0.0549	28.1417	0.0001	1.33817	1.16169	1.5414
Under 30	-0.73910	0.1957	14.2687	0.0002	0.47754	0.28845	0.7906
Over 40	0.31050	0.1506	4.2521	0.0392	1.36411	0.92548	2.0106
AHU14	2.04530	0.6280	10.6062	0.0011	7.73148	1.53353	38.9792
AHU21	0.90240	0.7373	1.4980	0.2210	2.46551	0.36903	16.4724
AHU9	0.45860	0.4318	1.1279	0.2882	1.58186	0.52011	4.8111
SE21	0.15040	0.3801	0.1566	0.6923	1.16230	0.43660	3.0942
G1LG1	1.25290	0.8540	2.1527	0.1423	3.50048	0.38790	31.5888
CM FL10	-0.09370	0.4951	0.0358	0.8500	0.91056	0.25434	3.2598
FCFL6	-0.19780	0.5769	0.1176	0.7317	0.82053	0.18565	3.6266
Private Office	-0.26600	0.2105	1.5963	0.2064	0.76644	0.44564	1.3182
Cubicle or Shared	-0.28900	0.1578	3.3530	0.0671	0.74901	0.49883	1.1247

Association of Predicted Probabilities and Observed Responses

Concordant = 74.6%	Somers' D = 0.497
Discordant = 25.0%	Gamma = 0.499
Tied = 0.4%	Tau-a = 0.154
(456652 pairs)	c = 0.748

Response Variable: Aching Muscles or Joints, Pain in Back, Shoulder, Neck, Wrists
Number of Observations: 1754
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1175.428	1098.407	.
SC	1180.897	1262.496	.
-2 LOG L	1173.428	1038.407	135.021 with 29 DF (p=0.0001)
Score	.	.	142.459 with 29 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-4.9858	0.6073	67.3910	0.0001	0.00683	0.00143	0.0327
Shelf Index	0.0335	0.0604	0.3075	0.5792	1.03407	0.88507	1.2082
Laser Printer Nearby	0.2127	0.1812	1.3776	0.2405	1.23701	0.77564	1.9728
1 Hour at Copier	-0.2233	0.1872	1.4233	0.2329	0.79987	0.49385	1.2955
Walls Painted	0.1840	0.2010	0.8373	0.3602	1.20202	0.71621	2.0173
Water Leaks Nearby	0.0536	0.2308	0.0539	0.8163	1.05506	0.58220	1.9120
Lights Too Dim	0.7803	0.2949	7.0021	0.0081	2.18213	1.02085	4.6644
Glare	0.6654	0.1750	14.4609	0.0001	1.94527	1.23937	3.0532
Noise	0.3917	0.1868	4.3977	0.0360	1.47949	0.91439	2.3938
Dust	0.2320	0.1744	1.7698	0.1834	1.26112	0.80473	1.9764
High Pay	0.2744	0.2586	1.1254	0.2888	1.31574	0.67587	2.5614
Role Conflict	0.2448	0.1282	3.6465	0.0562	1.27737	0.91811	1.7772
Workload	0.1332	0.1066	1.5623	0.2113	1.14248	0.86814	1.5035
Wear Contact Lens	-0.4884	0.2536	3.7103	0.0541	0.61361	0.31928	1.1792
Allergy to Molds	0.6616	0.1740	14.4605	0.0001	1.93789	1.23785	3.0338
Chem. Sensitivity	0.4533	0.1777	6.5051	0.0108	1.57350	0.99555	2.4869
Live Alone	0.5219	0.2256	5.3503	0.0207	1.68523	0.94248	3.0133
Sole Provider	-0.0613	0.2020	0.0921	0.7615	0.94054	0.55897	1.5826
Discomfort Index	0.1365	0.0738	3.4231	0.0643	1.14625	0.94780	1.3863
Under 30	0.2784	0.3855	0.5217	0.4701	1.32101	0.48936	3.5660
Over 40	0.3488	0.1886	3.4213	0.0644	1.41737	0.87194	2.3040
AHU14	0.3802	1.0619	0.1282	0.7203	1.46258	0.09487	22.5482
AHU21	0.7179	0.7369	0.9490	0.3300	2.05012	0.30717	13.6830
AHU9	0.6626	0.5561	1.4195	0.2335	1.93983	0.46305	8.1264
SE21	0.5794	0.4733	1.4986	0.2209	1.78497	0.52739	6.0413
G1LG1	1.8023	0.9661	3.4800	0.0621	6.06358	0.50340	73.0375
CM FL10	0.8812	0.3991	4.8755	0.0272	2.41379	0.86340	6.7482
FCFL6	0.7518	0.5604	1.8002	0.1797	2.12081	0.50068	8.9835
Private Office	-0.0365	0.2833	0.0166	0.8975	0.96416	0.46474	2.0003
Cubicle or Shared	0.0339	0.2657	0.0163	0.8983	1.03448	0.52176	2.0510

Association of Predicted Probabilities and Observed Responses

Concordant = 73.8%	Somers' D = 0.484
Discordant = 25.5%	Gamma = 0.487
Tied = 0.7%	Tau-a = 0.090
(287493 pairs)	c = 0.742

Response Variable: Aching Muscles or Joints, Pain in Back, Shoulder, Neck, Wrists (Including Comfort and Odor)
Number of Observations: 1661
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1618.421	1453.193	.
SC	1623.836	1604.818	.
-2 LOG L	1616.421	1397.193	219.228 with 27 DF (p=0.0001)
Score	.	.	219.919 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.2214	0.3846	70.1621	0.0001	0.03990	0.01481	0.1075
Laser Printer Nearby	-0.2769	0.1473	3.5318	0.0602	0.75813	0.51874	1.1080
Hours at VDT	0.0254	0.0313	0.6613	0.4161	1.02573	0.94627	1.1119
1 Hour at Copier	-0.3458	0.1969	3.0837	0.0791	0.70765	0.42613	1.1752
>1 Hour at Copier	-0.3317	0.2610	1.6154	0.2037	0.71770	0.36640	1.4058
Water Leaks Nearby	0.1814	0.1916	0.8968	0.3436	1.19889	0.73186	1.9640
Glare	0.5709	0.1445	15.6196	0.0001	1.76986	1.21978	2.5680
High Pay	-0.4695	0.1751	7.1865	0.0073	0.62531	0.39830	0.9817
Workload	0.2511	0.0763	10.8197	0.0010	1.28544	1.05607	1.5646
Wear Contact Lens	0.0805	0.1574	0.2617	0.6090	1.08383	0.72255	1.6257
Allergy to Molds	0.4517	0.1487	9.2320	0.0024	1.57098	1.07106	2.3042
Chem. Sensitivity	0.1917	0.1467	1.7084	0.1912	1.21131	0.83011	1.7676
Live Alone	0.0894	0.1625	0.3027	0.5822	1.09352	0.71950	1.6620
Sole Provider	0.2144	0.2039	1.1062	0.2929	1.23912	0.73283	2.0952
Discomfort Index	0.2502	0.0558	20.1087	0.0001	1.28428	1.11233	1.4828
Cold Drafty Air	0.1930	0.0477	16.3866	0.0001	1.21288	1.07264	1.3715
Paint Odor	0.1166	0.0557	4.3760	0.0364	1.12367	0.97347	1.2970
Cosmetic, Body Odor	0.1463	0.0427	11.7652	0.0006	1.15754	1.03697	1.2921
Photocopies Odor	0.1014	0.1043	0.9452	0.3309	1.10672	0.84597	1.4478
Tobacco Smoke Odor	0.1110	0.1122	0.9792	0.3224	1.11739	0.83692	1.4919
Under 30	-0.9595	0.1928	24.7573	0.0001	0.38308	0.23313	0.6295
AHU21	1.2951	0.6767	3.6627	0.0556	3.65136	0.63885	20.8693
AHU9	0.4145	0.4391	0.8911	0.3452	1.51361	0.48840	4.6909
G1LG1	1.1053	1.0917	1.0251	0.3113	3.02013	0.18142	50.2756
CM FL10	0.0445	0.5295	0.0071	0.9331	1.04550	0.26727	4.0898
FCFL6	-0.3975	0.6418	0.3837	0.5357	0.67200	0.12863	3.5106
Private Office	-0.3117	0.2174	2.0553	0.1517	0.73220	0.41823	1.2819
Cubicle or Shared	-0.2160	0.1631	1.7550	0.1852	0.80574	0.52933	1.2265

Association of Predicted Probabilities and Observed Responses

Concordant = 75.5%	Somers' D = 0.513
Discordant = 24.2%	Gamma = 0.515
Tied = 0.4%	Tau-a = 0.158
(425020 pairs)	c = 0.756

Response Variable: Aching Muscles or Joints, Pain in Back, Shoulder, Neck, Wrists (Including Comfort and Odor)
Number of Observations: 1697
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1102.252	1028.898	.
SC	1107.689	1181.123	.
-2 LOG L	1100.252	972.898	127.355 with 27 DF (p=0.0001)
Score	.	.	136.150 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-5.0202	0.5824	74.3105	0.0001	0.00660	0.00147	0.0296
Laser Printer Nearby	0.1976	0.1860	1.1287	0.2880	1.21847	0.75462	1.9674
Hours at VDT	0.0633	0.0409	2.3909	0.1220	1.06535	0.95881	1.1837
1 Hour at Copier	0.0614	0.2208	0.0775	0.7808	1.06332	0.60207	1.8780
>1 Hour at Copier	0.9785	0.3867	6.4037	0.0114	2.66046	0.98252	7.2040
Water Leaks Nearby	0.0403	0.2410	0.0279	0.8672	1.04112	0.55961	1.9370
Glare	0.6485	0.1809	12.8488	0.0003	1.91267	1.20022	3.0480
High Pay	0.4899	0.2708	3.2725	0.0704	1.63215	0.81247	3.2788
Workload	0.1884	0.1026	3.3689	0.0664	1.20732	0.92691	1.5725
Wear Contact Lens	-0.6453	0.2642	5.9666	0.0146	0.52451	0.26557	1.0359
Allergy to Molds	0.7647	0.1796	18.1232	0.0001	2.14835	1.35263	3.4122
Chem. Sensitivity	0.4861	0.1846	6.9378	0.0084	1.62596	1.01063	2.6160
Live Alone	0.5575	0.2317	5.7893	0.0161	1.74630	0.96141	3.1720
Sole Provider	-0.1201	0.2129	0.3181	0.5727	0.88683	0.51246	1.5347
Discomfort Index	0.1673	0.0749	4.9940	0.0254	1.18211	0.97468	1.4337
Cold Drafty Air	0.1372	0.0733	3.4997	0.0614	1.14706	0.94969	1.3854
Paint Odor	0.0789	0.0939	0.7063	0.4007	1.08210	0.84960	1.3782
Cosmetic, Body Odor	0.1416	0.0683	4.2986	0.0381	1.15212	0.96624	1.3737
Photocopies Odor	0.1781	0.1702	1.0950	0.2954	1.19494	0.77079	1.8525
Tobacco Smoke Odor	-0.2533	0.1926	1.7305	0.1883	0.77623	0.47263	1.2749
Under 30	0.0414	0.3895	0.0113	0.9153	1.04227	0.38215	2.8427
AHU21	1.1605	0.7325	2.5096	0.1132	3.19153	0.48364	21.0609
AHU9	0.6779	0.5693	1.4178	0.2338	1.96974	0.45447	8.5371
G1LG1	1.6436	1.0250	2.5712	0.1088	5.17376	0.36906	72.5300
CM FL10	0.9761	0.4148	5.5359	0.0186	2.65409	0.91172	7.7263
FCFL6	0.4808	0.6053	0.6309	0.4270	1.61737	0.34012	7.6910
Private Office	0.0583	0.2943	0.0392	0.8430	1.06003	0.49668	2.2624
Cubicle or Shared	0.0813	0.2785	0.0852	0.7704	1.08470	0.52934	2.2227

Association of Predicted Probabilities and Observed Responses

Concordant = 74.7%	Somers' D = 0.502
Discordant = 24.6%	Gamma = 0.505
Tied = 0.7%	Tau-a = 0.090
(258232 pairs)	c = 0.751

Response Variable: Difficulty Concentrating, Remembering; Depression, Tension
Number of Observations: 1713
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1921.386	1742.712	.
SC	1926.832	1889.754	.
-2 LOG L	1919.386	1688.712	230.674 with 26 DF (p=0.0001)
Score	.	.	223.299 with 26 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.1064	0.5926	12.6339	0.0004	0.12168	0.02644	0.55998
Laser Printer Nearby	-0.0617	0.1286	0.2304	0.6312	0.94016	0.67505	1.30941
New Furniture	0.0733	0.1268	0.3340	0.5633	1.07605	0.77621	1.49173
Walls Painted	0.0956	0.1477	0.4186	0.5176	1.10032	0.75211	1.60974
Water Leaks Nearby	0.2093	0.1761	1.4128	0.2346	1.23281	0.78323	1.94048
Window Nearby	-0.1139	0.1299	0.7691	0.3805	0.89235	0.63857	1.24698
Glare	0.2747	0.1266	4.7046	0.0301	1.31614	0.94988	1.82362
Noise	0.3231	0.1301	6.1628	0.0130	1.38140	0.98803	1.93139
Dust	0.5541	0.1337	17.1607	0.0001	1.74037	1.23329	2.45594
Job Satisfaction	-0.7378	0.1318	31.3245	0.0001	0.47816	0.34051	0.67147
Role Conflict	0.2306	0.0975	5.5940	0.0180	1.25936	0.97965	1.61892
Workload	0.2674	0.0751	12.6849	0.0004	1.30656	1.07674	1.58543
Role Clarity	-0.1652	0.0714	5.3530	0.0207	0.84772	0.70530	1.01890
External Stress	0.0456	0.0507	0.8088	0.3685	1.04666	0.91851	1.19268
Chem. Sensitivity	0.4308	0.1241	12.0577	0.0005	1.53849	1.11753	2.11802
Live Alone	0.2055	0.1417	2.1043	0.1469	1.22814	0.85255	1.76919
AHU20	0.2293	0.7053	0.1057	0.7451	1.25772	0.20443	7.73807
ETB	-1.0609	1.1083	0.9163	0.3384	0.34614	0.01992	6.01394
SE21	0.7096	0.3180	4.9811	0.0256	2.03318	0.89622	4.61249
CM FL10	0.7660	0.4390	3.0442	0.0810	2.15114	0.69429	6.66496
ET2FL67	0.7712	0.5092	2.2939	0.1299	2.16236	0.58246	8.02771
ET2F1011	0.0683	0.4639	0.0217	0.8830	1.07069	0.32410	3.53710
WT1FL45	0.5758	0.4244	1.8407	0.1749	1.77855	0.59604	5.30715
ET3FL47	0.1963	0.5542	0.1255	0.7231	1.21689	0.29191	5.07293
UGHAHU19	0.6106	0.5353	1.3014	0.2540	1.84154	0.46379	7.31212
Private Office	-0.0446	0.1768	0.0636	0.8009	0.95638	0.60651	1.50808
Cubicle or Shared	0.0800	0.1431	0.3126	0.5761	1.08329	0.74929	1.56616

Association of Predicted Probabilities and Observed Responses

Concordant = 73.3%	Somers' D = 0.469
Discordant = 26.4%	Gamma = 0.470
Tied = 0.3%	Tau-a = 0.175
(547400 pairs)	c = 0.734

Response Variable: Difficulty Concentrating, Remembering; Depression, Tension
Number of Observations: 1728
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1621.880	1420.217	.
SC	1627.335	1567.494	.
-2 LOG L	1619.880	1366.217	253.663 with 26 DF (p=0.0001)
Score	.	.	247.504 with 26 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.15290	0.6714	22.0507	0.0001	0.04273	0.00758	0.2409
Laser Printer Nearby	-0.23260	0.1535	2.2956	0.1297	0.79247	0.53365	1.1768
New Furniture	0.00707	0.1486	0.0023	0.9621	1.00710	0.68679	1.4768
Walls Painted	0.34160	0.1768	3.7329	0.0534	1.40720	0.89240	2.2190
Water Leaks Nearby	0.47690	0.1902	6.2860	0.0122	1.61107	0.98703	2.6297
Window Nearby	-0.06890	0.1466	0.2209	0.6383	0.93342	0.63984	1.3617
Glare	0.26970	0.1429	3.5609	0.0592	1.30957	0.90628	1.8923
Noise	0.45770	0.1544	8.7926	0.0030	1.58043	1.06180	2.3524
Dust	0.20950	0.1452	2.0814	0.1491	1.23306	0.84829	1.7924
Job Satisfaction	-0.95060	0.1501	40.0982	0.0001	0.38651	0.26256	0.5690
Role Conflict	0.35080	0.1139	9.4912	0.0021	1.42020	1.05907	1.9045
Workload	0.31790	0.0902	12.4113	0.0004	1.37424	1.08931	1.7337
Role Clarity	-0.27920	0.0864	10.4296	0.0012	0.75639	0.60546	0.9449
External Stress	0.18650	0.0620	9.0517	0.0026	1.20502	1.02715	1.4137
Chem. Sensitivity	0.47980	0.1512	10.0656	0.0015	1.61575	1.09451	2.3852
Live Alone	0.39290	0.1914	4.2117	0.0401	1.48127	0.90470	2.4253
AHU20	-0.32810	1.0797	0.0923	0.7612	0.72029	0.04463	11.6256
ETB	-0.68740	0.8752	0.6169	0.4322	0.50288	0.05276	4.7928
SE21	0.35760	0.3913	0.8355	0.3607	1.42989	0.52184	3.9180
CM FL10	-0.73090	0.4858	2.2639	0.1324	0.48148	0.13775	1.6829
ET2FL67	0.35890	0.7854	0.2088	0.6477	1.43175	0.18932	10.8275
ET2F1011	-0.61450	0.5753	1.1409	0.2855	0.54091	0.12289	2.3809
WT1FL45	-0.40160	0.7650	0.2756	0.5996	0.66925	0.09327	4.8020
ET3FL47	-0.68920	0.5591	1.5192	0.2177	0.50198	0.11890	2.1192
UGHAHU19	-0.43640	0.7595	0.3302	0.5656	0.64636	0.09137	4.5726
Private Office	0.05020	0.2177	0.0532	0.8176	1.05148	0.60014	1.8423
Cubicle or Shared	0.06520	0.2159	0.0911	0.7628	1.06737	0.61204	1.8615

Association of Predicted Probabilities and Observed Responses

Concordant = 77.0%	Somers' D = 0.544
Discordant = 22.6%	Gamma = 0.546
Tied = 0.3%	Tau-a = 0.160
(437360 pairs)	c = 0.772

Response Variable: Difficulty Concentrating, Remembering; Depression, Tension (Including Comfort and Odor)
Number of Observations: 1611
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1812.194	1632.982	.
SC	1817.579	1794.520	.
-2 LOG L	1810.194	1572.982	237.212 with 29 DF (p=0.0001)
Score	.	.	233.309 with 29 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.7555	0.4350	16.2898	0.0001	0.17282	0.05636	0.5300
Use Fan	-0.2825	0.1338	4.4560	0.0348	0.75390	0.53410	1.0641
New Furniture	0.1108	0.1315	0.7104	0.3993	1.11717	0.79617	1.5676
Walls Painted	-0.0265	0.1555	0.0291	0.8646	0.97385	0.65242	1.4536
Water Leaks Nearby	0.2315	0.1823	1.6119	0.2042	1.26049	0.78812	2.0160
Glare	0.3812	0.1323	8.3017	0.0040	1.46404	1.04122	2.0586
Job Satisfaction	-0.7577	0.1355	31.2555	0.0001	0.46874	0.33063	0.6645
Role Conflict	0.2200	0.1026	4.5985	0.0320	1.24608	0.95667	1.6230
Workload	0.3006	0.0786	14.6456	0.0001	1.35067	1.10310	1.6538
Role Clarity	-0.1960	0.0737	7.0761	0.0078	0.82201	0.67987	0.9939
Chem. Sensitivity	0.4939	0.1315	14.1086	0.0002	1.63869	1.16784	2.2994
Hot Stuffy Air	0.0433	0.0191	5.1721	0.0230	1.04425	0.99412	1.0969
Paint Odor	0.1553	0.0539	8.3116	0.0039	1.16801	1.01659	1.3420
Cosmetic, Body Odor	0.1098	0.0415	6.9929	0.0082	1.11605	1.00290	1.2420
Tobacco Smoke Odor	-0.2198	0.1138	3.7274	0.0535	0.80268	0.59873	1.0761
SE21	0.8487	0.3551	5.7117	0.0169	2.33661	0.93610	5.8325
SE22	1.0844	0.6945	2.4382	0.1184	2.95766	0.49429	17.6977
CM FL10	0.7173	0.4532	2.5046	0.1135	2.04889	0.63754	6.5847
FCFL7	0.0867	0.5379	0.0260	0.8720	1.09057	0.27282	4.3594
ET1F1011	0.7446	0.4234	3.0928	0.0786	2.10560	0.70746	6.2669
ET2FL67	0.8515	0.5122	2.7640	0.0964	2.34316	0.62630	8.7664
ET2F1011	0.5332	0.4811	1.2283	0.2677	1.70438	0.49356	5.8856
WT1FL13	0.8725	0.5403	2.6077	0.1063	2.39289	0.59493	9.6245
WT1FL45	0.4939	0.4727	1.0915	0.2961	1.63869	0.48492	5.5377
WT2FL13	0.4260	0.3966	1.1542	0.2827	1.53112	0.55121	4.2531
Glued Carpet, Room	-0.4023	0.3047	1.7439	0.1866	0.66878	0.30507	1.4661
Glued Carpet, Hall	-0.1041	0.1555	0.4482	0.5032	0.90114	0.60371	1.3451
Tackd Carpet, Hall	-0.1809	0.2704	0.4475	0.5035	0.83452	0.41584	1.6747
Private Office	0.0577	0.1843	0.0980	0.7542	1.05940	0.65898	1.7031
Cubicle or Shared	0.2387	0.1505	2.5158	0.1127	1.26960	0.86158	1.8708

Association of Predicted Probabilities and Observed Responses

Concordant = 74.8%	Somers' D = 0.499
Discordant = 24.9%	Gamma = 0.501
Tied = 0.3%	Tau-a = 0.187
(486018 pairs)	c = 0.750

Response Variable: Difficulty Concentrating, Remembering; Depression, Tension (Including Comfort and Odor)
Number of Observations: 1597
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1497.087	1297.299	.
SC	1502.463	1458.575	.
-2 LOG L	1495.087	1237.299	257.788 with 29 DF (p=0.0001)
Score	.	.	253.022 with 29 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.9989	0.5051	15.6594	0.0001	0.13548	0.03688	0.4977
Use Fan	-0.3597	0.1598	5.0655	0.0244	0.69789	0.46239	1.0533
New Furniture	-0.0964	0.1570	0.3769	0.5393	0.90810	0.60603	1.3607
Walls Painted	0.2107	0.1882	1.2534	0.2629	1.23454	0.76025	2.0047
Water Leaks Nearby	0.3974	0.2038	3.8036	0.0511	1.48795	0.88022	2.5153
Glare	0.1096	0.1532	0.5112	0.4746	1.11583	0.75198	1.6557
Job Satisfaction	-1.0365	0.1583	42.8785	0.0001	0.35469	0.23592	0.5333
Role Conflict	0.3141	0.1206	6.7819	0.0092	1.36903	1.00344	1.8678
Workload	0.3263	0.0954	11.7011	0.0006	1.38583	1.08388	1.7719
Role Clarity	-0.2459	0.0895	7.5488	0.0060	0.78200	0.62098	0.9848
Chem. Sensitivity	0.5075	0.1601	10.0416	0.0015	1.66113	1.09975	2.5091
Hot Stuffy Air	0.1061	0.0227	21.8102	0.0001	1.11193	1.04878	1.1789
Paint Odor	0.1392	0.0794	3.0760	0.0795	1.14935	0.93675	1.4102
Cosmetic, Body Odor	0.1181	0.0569	4.3136	0.0378	1.12536	0.97193	1.3030
Tobacco Smoke Odor	-0.0162	0.1453	0.0125	0.9111	0.98393	0.67672	1.4306
SE21	0.2710	0.4302	0.3969	0.5287	1.31128	0.43292	3.9717
SE22	0.8877	0.7467	1.4134	0.2345	2.42954	0.35494	16.6298
CM FL10	-0.9739	0.5317	3.3546	0.0670	0.37761	0.09599	1.4855
FCFL7	-0.3501	0.6194	0.3195	0.5719	0.70462	0.14289	3.4746
ET1F1011	-1.0194	0.8020	1.6156	0.2037	0.36081	0.04571	2.8478
ET2FL67	0.3830	0.8037	0.2271	0.6337	1.46668	0.18501	11.6270
ET2F1011	-0.6145	0.5913	1.0799	0.2987	0.54091	0.11793	2.4811
WT1FL13	0.7854	0.7098	1.2244	0.2685	2.19328	0.35238	13.6514
WT1FL45	0.0257	0.7821	0.0011	0.9738	1.02603	0.13683	7.6936
WT2FL13	0.3762	0.7137	0.2778	0.5981	1.45674	0.23170	9.1586
Glued Carpet, Room	0.0583	0.3435	0.0288	0.8652	1.06003	0.43755	2.5681
Glued Carpet, Hall	-0.2036	0.1809	1.2662	0.2605	0.81579	0.51191	1.3000
Tackd Carpet, Hall	-0.0764	0.3059	0.0623	0.8029	0.92645	0.42130	2.0372
Private Office	0.0846	0.2278	0.1380	0.7102	1.08828	0.60519	1.9570
Cubicle or Shared	0.1451	0.2288	0.4022	0.5260	1.15616	0.64128	2.0844

Association of Predicted Probabilities and Observed Responses

Concordant = 77.8%	Somers' D = 0.560
Discordant = 21.8%	Gamma = 0.562
Tied = 0.3%	Tau-a = 0.164
(372892 pairs)	c = 0.780

Response Variable: Dizziness
Number of Observations: 1689
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2012.654	1878.285	.
SC	2018.086	2204.198	.
-2 LOG L	2010.654	1758.285	252.369 with 59 DF (p=0.0001)
Score	.	.	242.088 with 59 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.9775	0.3510	71.9603	0.0001	0.05092	0.02062	0.1258
Laser Printer Nearby	-0.1733	0.1293	1.7968	0.1801	0.84089	0.60268	1.1732
Hours at VDT	0.0474	0.0276	2.9516	0.0858	1.04854	0.97658	1.1258
>1 Hour at Copier	-0.1472	0.1817	0.6559	0.4180	0.86312	0.54050	1.3783
New Carpet/Drapes	0.0856	0.1738	0.2425	0.6224	1.08937	0.69621	1.7046
Walls Painted	0.3688	0.1533	5.7856	0.0162	1.44600	0.97424	2.1462
Window Nearby	-0.0685	0.1321	0.2685	0.6044	0.93379	0.66445	1.3123
Dust	0.5731	0.1291	19.6992	0.0001	1.77376	1.27193	2.4736
High Pay	-0.3230	0.1690	3.6528	0.0560	0.72397	0.46844	1.1189
Role Conflict	0.2597	0.0923	7.9228	0.0049	1.29654	1.02218	1.6445
Workload	0.2431	0.0762	10.1857	0.0014	1.27520	1.04792	1.5518
Underutilization	0.1260	0.0617	4.1721	0.0411	1.13428	0.96760	1.3297
Wear Glasses	0.1090	0.1230	0.7847	0.3757	1.11516	0.81233	1.5309
College Grad	-0.5422	0.1537	12.4434	0.0004	0.58147	0.39136	0.8639
Allergy to Pollen	-0.1306	0.1374	0.9038	0.3418	0.87757	0.61598	1.2502
Allergy to Molds	0.0906	0.1461	0.3845	0.5352	1.09483	0.75145	1.5951
Allergy: Other	0.1372	0.1881	0.5322	0.4657	1.14706	0.70656	1.8622
Chem. Sensitivity	0.8111	0.1290	39.5471	0.0001	2.25038	1.61413	3.1374
Live Alone	0.0157	0.1419	0.0123	0.9118	1.01582	0.70480	1.4641
Under 30	-0.2595	0.1547	2.8149	0.0934	0.77144	0.51788	1.1491
AHU10	1.8909	0.8206	5.3100	0.0212	6.62533	0.80014	54.8590
AHU12	0.4786	0.4651	1.0588	0.3035	1.61381	0.48700	5.3479
NEG3	0.5155	0.6059	0.7240	0.3948	1.67448	0.35159	7.9749
NEG4	-0.6715	0.7414	0.8203	0.3651	0.51094	0.07567	3.4499
SE21	0.9681	0.3248	8.8840	0.0029	2.63294	1.14044	6.0787
SE22	2.0117	0.7664	6.8897	0.0087	7.47602	1.03816	53.8362
SE32	0.3939	0.4027	0.9569	0.3280	1.48275	0.52547	4.1839
NEG1NEG2	-0.3093	0.7692	0.1617	0.6876	0.73396	0.10119	5.3237
FCFL2	-0.8780	0.7028	1.5606	0.2116	0.41561	0.06799	2.5406
FCFL3	-0.8477	0.7605	1.2423	0.2650	0.42840	0.06040	3.0385
FCFL8	-0.5390	0.5532	0.9492	0.3299	0.58333	0.14029	2.4255
ET1FL13	-0.6687	0.5528	1.4631	0.2264	0.51237	0.12335	2.1283
ET1FL45	-0.1849	0.5563	0.1105	0.7396	0.83119	0.19831	3.4838
ET1FL89	-1.3710	0.6378	4.6211	0.0316	0.25385	0.04910	1.3126
ET1F1011	-0.2999	0.4740	0.4005	0.5268	0.74089	0.21851	2.5121
ET2FL13	-0.3184	0.5479	0.3377	0.5612	0.72731	0.17732	2.9832
ET2FL45	0.7527	0.5464	1.8978	0.1683	2.12272	0.51953	8.6731
ET2FL67	0.5819	0.5762	1.0198	0.3126	1.78944	0.40560	7.8947
ET2FL89	-0.2898	0.6245	0.2154	0.6426	0.74841	0.14979	3.7394
ET2F1011	0.0679	0.5019	0.0183	0.8924	1.07026	0.29376	3.8993
WT1FL13	-0.6873	0.6544	1.1028	0.2936	0.50293	0.09320	2.7140
WT1FL45	-0.9982	0.5964	2.8015	0.0942	0.36854	0.07930	1.7128
WT1FL67	-0.1964	0.6030	0.1061	0.7446	0.82168	0.17382	3.8842
WT1FL89	0.0763	0.5891	0.0168	0.8969	1.07929	0.23664	4.9225
WT1F1011	-0.5848	0.5253	1.2391	0.2657	0.55722	0.14400	2.1563

WT2FL13	0.0514	0.4478	0.0132	0.9086	1.05274	0.33216	3.3365
WT2FL45	0.0932	0.5637	0.0274	0.8686	1.09768	0.25695	4.6893
WT2FL67	-0.8252	0.5983	1.9022	0.1678	0.43815	0.09382	2.0463
WT2FL89	-0.6001	0.5253	1.3049	0.2533	0.54876	0.14181	2.1235
WT2F1011	-0.7640	0.5669	1.8165	0.1777	0.46580	0.10814	2.0064
ET3FL47	-0.2493	0.6367	0.1533	0.6954	0.77935	0.15116	4.0182
ET3FL811	-1.4490	0.8334	3.0230	0.0821	0.23480	0.02744	2.0094
WT3FL47	-1.1220	0.7401	2.2984	0.1295	0.32563	0.04839	2.1913
WT3FL811	-38.0551 #	.	.	.	.	.	.
UGHAHU19	-0.0570	0.6539	0.0076	0.9305	0.94459	0.17527	5.09086
Glued Carpet, Hall	0.5804	0.3535	2.6961	0.1006	1.78675	0.71877	4.44161
Tackd Carpet, Room	0.5027	0.2880	3.0456	0.0810	1.65318	0.78727	3.47150
Tackd Carpet, Hall	0.2697	0.3515	0.5890	0.4428	1.30957	0.52953	3.23867
Private Office	-0.2880	0.1948	2.1871	0.1392	0.74976	0.45393	1.23838
Cubicle or Shared	-0.0154	0.1474	0.0109	0.9167	0.98472	0.67361	1.43951

Association of Predicted Probabilities and Observed Responses

Concordant = 73.5%	Somers' D = 0.472
Discordant = 26.2%	Gamma = 0.474
Tied = 0.3%	Tau-a = 0.192
(578124 pairs)	c = 0.736

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Dizziness
Number of Observations: 1705
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1394.854	1373.085	.
SC	1400.295	1699.564	.
-2 LOG L	1392.854	1253.085	139.769 with 59 DF (p=0.0001)
Score	.	.	133.412 with 59 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.3602	0.5461	37.8652	0.0001	0.03473	0.00851	0.1418
Laser Printer Nearby	0.0448	0.1630	0.0755	0.7835	1.04582	0.68723	1.5915
Hours at VDT	0.0252	0.0363	0.4791	0.4888	1.02552	0.93397	1.1260
>1 Hour at Copier	-0.6539	0.4326	2.2850	0.1306	0.52001	0.17063	1.5848
New Carpet/Drapes	0.4547	0.2069	4.8277	0.0280	1.57570	0.92471	2.6850
Walls Painted	-0.1488	0.2055	0.5247	0.4688	0.86174	0.50755	1.4631
Window Nearby	-0.5530	0.1709	10.4665	0.0012	0.57522	0.37038	0.8934
Dust	0.4171	0.1512	7.6074	0.0058	1.51755	1.02799	2.2403
High Pay	0.1119	0.2241	0.2494	0.6175	1.11840	0.62790	1.9921
Role Conflict	0.3900	0.1205	10.4699	0.0012	1.47698	1.08285	2.0146
Workload	0.1423	0.0991	2.0635	0.1509	1.15292	0.89317	1.4882
Underutilization	0.1718	0.0810	4.5015	0.0339	1.18744	0.96381	1.4630
Wear Glasses	0.4093	0.1631	6.2968	0.0121	1.50576	0.98921	2.2920
College Grad	-0.4793	0.3202	2.2413	0.1344	0.61922	0.27141	1.4127
Allergy to Pollen	-0.1536	0.1667	0.8491	0.3568	0.85761	0.55821	1.3176
Allergy to Molds	0.2896	0.1739	2.7730	0.0959	1.33589	0.85354	2.0908
Allergy: Other	0.4857	0.2250	4.6592	0.0309	1.62531	0.91037	2.9017
Chem. Sensitivity	0.4297	0.1666	6.6532	0.0099	1.53680	1.00054	2.3605
Live Alone	0.2392	0.2026	1.3938	0.2378	1.27023	0.75375	2.1406
Under 30	-0.0769	0.3267	0.0554	0.8139	0.92598	0.39913	2.1483
AHU10	0.7181	0.7584	0.8963	0.3438	2.05053	0.29068	14.4651
AHU12	-1.4010	1.0810	1.6796	0.1950	0.24635	0.01521	3.9895
NEG3	-1.3443	1.1318	1.4107	0.2349	0.26072	0.01412	4.8125
NEG4	-1.2573	1.1080	1.2875	0.2565	0.28442	0.01638	4.9377
SE21	0.1840	0.4016	0.2099	0.6469	1.20202	0.42719	3.3822
SE22	0.3170	0.7131	0.1976	0.6566	1.37300	0.21872	8.6188
SE32	-1.6945	1.0808	2.4583	0.1169	0.18369	0.01135	2.9732
NEG1NEG2	-0.8066	0.8487	0.9032	0.3419	0.44637	0.05014	3.9735
FCFL2	-1.0105	0.7210	1.9646	0.1610	0.36404	0.05682	2.3322
FCFL3	-1.4566	0.8970	2.6371	0.1044	0.23303	0.02312	2.3492
FCFL8	-2.0097	0.8826	5.1843	0.0228	0.13403	0.01380	1.3020
ET1FL13	-1.3692	0.7759	3.1143	0.0776	0.25431	0.03446	1.8767
ET1FL45	-1.4987	0.8803	2.8985	0.0887	0.22342	0.02314	2.1575
ET1FL89	-2.1030	1.1236	3.5029	0.0613	0.12209	0.00676	2.2065
ET1F1011	-0.2770	0.5813	0.2271	0.6337	0.75805	0.16958	3.3886
ET2FL13	-1.5600	0.7182	4.7177	0.0299	0.21014	0.03304	1.3365
ET2FL45	-0.9989	0.7447	1.7990	0.1798	0.36828	0.05408	2.5079
ET2FL67	-0.5190	0.8320	0.3892	0.5327	0.59512	0.06979	5.0745
ET2FL89	-2.1632	0.8887	5.9245	0.0149	0.11496	0.01165	1.1344
ET2F1011	-0.9270	0.6542	2.0077	0.1565	0.39574	0.07337	2.1345
WT1FL13	-0.9572	0.9221	1.0775	0.2992	0.38397	0.03570	4.1294
WT1FL45	-1.9533	1.1169	3.0588	0.0803	0.14181	0.00798	2.5189
WT1FL67	-2.2135	0.8837	6.2740	0.0123	0.10932	0.01122	1.0649
WT1FL89	-0.3109	0.8753	0.1261	0.7225	0.73279	0.07687	6.9858
WT1F1011	-38.4547 #	.	.	.	.	.	.
WT2FL13	-39.5523 #	.	.	.	.	.	.
WT2FL45	-0.7441	0.7434	1.0019	0.3169	0.47516	0.07001	3.2249

WT2FL67	-1.1584	0.7157	2.6197	0.1055	0.31399	0.04969	1.9843
WT2FL89	-0.3002	0.8078	0.1381	0.7101	0.74067	0.09245	5.9340
WT2F1011	-1.0248	0.8672	1.3965	0.2373	0.35887	0.03844	3.3505
ET3FL47	-1.2486	0.6931	3.2458	0.0716	0.28691	0.04812	1.7106
ET3FL811	-1.0339	0.6424	2.5905	0.1075	0.35562	0.06797	1.8606
WT3FL47	-1.6182	0.7779	4.3270	0.0375	0.19826	0.02673	1.4706
WT3FL811	0.1513	0.8487	0.0318	0.8586	1.16335	0.13069	10.3558
UGHAHU19	-1.0919	0.8084	1.8243	0.1768	0.33558	0.04182	2.6927
Glued Carpet, Hall	1.0553	0.4789	4.8568	0.0275	2.87284	0.83665	9.8645
Tackd Carpet, Room	0.3933	0.3372	1.3601	0.2435	1.48186	0.62168	3.5322
Tackd Carpet, Hall	1.0708	0.4847	4.8797	0.0272	2.91771	0.83712	10.1694
Private Office	-0.1061	0.2499	0.1801	0.6713	0.89933	0.47244	1.7120
Cubicle or Shared	-0.1668	0.2371	0.4950	0.4817	0.84637	0.45952	1.5589

Association of Predicted Probabilities and Observed Responses

Concordant = 71.7%	Somers' D = 0.438
Discordant = 27.8%	Gamma = 0.441
Tied = 0.5%	Tau-a = 0.107
(354046 pairs)	c = 0.719

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Dizziness (Including Comfort and Odor
Number of Observations: 1632
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept + Covariates	Chi-Square for Covariates
AIC	1924.105	1758.721	.
SC	1929.503	1985.419	.
-2 LOG L	1922.105	1674.721	247.384 with 41 DF (p=0.0001)
Score	.	.	241.104 with 41 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Up Limit
Intercept	-2.4929	0.3015	68.3803	0.0001	12.0963	5.56355	26.2999
Laser Printer Nearby	-0.1702	0.1319	1.6652	0.1969	1.1855	0.84402	1.6652
Use Fan	-0.1741	0.1292	1.8139	0.1780	1.1902	0.85324	1.6602
Walls Painted	0.2418	0.1461	2.7389	0.0979	0.7852	0.53894	1.1440
Water Leaks Nearby	-0.3046	0.1926	2.5026	0.1137	1.3561	0.82569	2.2272
Dust	0.4338	0.1357	10.2224	0.0014	0.6480	0.45687	0.9192
High Pay	-0.2721	0.1650	2.7184	0.0992	1.3127	0.85818	2.0080
Workload	0.2283	0.0697	10.7442	0.0010	0.7959	0.66508	0.9524
College Grad	-0.5142	0.1529	11.3126	0.0008	1.6723	1.12787	2.4795
Chem. Sensitivity	0.6328	0.1255	25.4085	0.0001	0.5311	0.38439	0.7338
Over 40	-0.3683	0.1370	7.2253	0.0072	1.4453	1.01551	2.0569
AHU10	2.0984	0.9338	5.0503	0.0246	0.1227	0.01107	1.3594
AHU18	0.7197	0.5030	2.0476	0.1524	0.4869	0.13326	1.7790
SE22	1.8664	0.8001	5.4407	0.0197	0.1547	0.01969	1.2149
FC FL2	-1.3559	0.6860	3.9072	0.0481	3.8803	0.66283	22.7152
FC FL3	-0.6775	0.6868	0.9733	0.3239	1.9689	0.33565	11.5501
FC FL8	-0.4648	0.4851	0.9180	0.3380	1.5917	0.45620	5.5534
ET1FL13	-0.3364	0.4519	0.5543	0.4566	1.3999	0.43706	4.4839
ET1FL45	-0.0191	0.4876	0.0015	0.9688	1.0193	0.29027	3.5793
ET1FL89	-1.2127	0.5856	4.2883	0.0384	3.3626	0.74393	15.1986
ET2FL13	-0.1038	0.4563	0.0517	0.8201	1.1094	0.34245	3.5939
ET2FL89	-0.0176	0.5730	0.0009	0.9755	1.0178	0.23260	4.4533
ET2F1011	0.2595	0.4469	0.3371	0.5615	0.7714	0.24397	2.4393
WT1FL45	-1.5340	0.6479	5.6064	0.0179	4.6367	0.87372	24.6060
Hot Stuffy Air	0.0626	0.0185	11.4685	0.0007	0.9393	0.89560	0.9852
Paint Odor	0.2340	0.0597	15.3615	0.0001	0.7914	0.67856	0.9229
New Carpet Odor	0.1849	0.0881	4.4018	0.0359	0.8312	0.66243	1.0429
WT1FL67	0.0207	0.5408	0.0015	0.9695	0.9795	0.24322	3.9448
WT1F1011	-0.2103	0.4503	0.2181	0.6405	1.2340	0.38687	3.9364
WT2FL13	-0.1553	0.3865	0.1614	0.6878	1.1680	0.43157	3.1611
WT2FL67	-0.7937	0.5333	2.2153	0.1366	2.2116	0.55985	8.7362
WT2F1011	-0.5862	0.5223	1.2596	0.2617	1.7971	0.46802	6.9009
ET3FL47	-0.3093	0.6115	0.2557	0.6131	1.3625	0.28198	6.5832
ET3FL811	-1.0100	0.8014	1.5883	0.2076	2.7456	0.34840	21.6370
WT3FL47	-0.8124	0.6767	1.4415	0.2299	2.2533	0.39425	12.8788
UGHAHU19	-0.1172	0.6463	0.0329	0.8561	1.1243	0.21274	5.9421
Glued Carpet, Room	-0.0265	0.2371	0.0125	0.9110	1.0269	0.55751	1.8913
Glued Carpet, Corridor	0.4857	0.1934	6.3086	0.0120	0.6153	0.37385	1.0126
Tacked Carpet, Room	0.5394	0.2289	5.5530	0.0184	0.5831	0.32334	1.0515
Tacked Carpet, Corridor	0.3100	0.2795	1.2300	0.2674	0.7334	0.35701	1.5068
Private Office	-0.3316	0.1959	2.8646	0.0905	1.3932	0.84111	2.3077
Cubicle or Shared	0.0360	0.1506	0.0570	0.8113	0.9646	0.65446	1.4218

Association of Predicted Probabilities and Observed Responses

Concordant = 73.3%	Somers' D = 0.469
Discordant = 26.4%	Gamma = 0.470
Tied = 0.3%	Tau-a = 0.187
(531900 pairs)	c = 0.734

Response Variable: Dizziness (Including Comfort and Odor)
Number of Observations: 1637
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept + Covariates	Chi-Square for Covariates
AIC	1330.824	1271.192	.
SC	1336.225	1498.018	.
-2 LOG L	1328.824	1187.192	141.632 with 41 DF (p=0.0001)
Score	.	.	153.885 with 41 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.0260	0.5122	34.9010	0.0001	20.6146	5.51005	77.1250
Laser Printer Nearby	-0.0052	0.1677	0.0010	0.9752	1.0052	0.65260	1.5484
Use Fan	0.0108	0.1644	0.0043	0.9477	0.9893	0.64772	1.5109
Walls Painted	-0.1352	0.1980	0.4660	0.4948	1.1448	0.68739	1.9065
Water Leaks Nearby	0.1402	0.2190	0.4097	0.5221	0.8692	0.49443	1.5280
Dust	0.1919	0.1619	1.4040	0.2361	0.8254	0.54392	1.2525
High Pay	0.2239	0.2126	1.1090	0.2923	0.7994	0.46229	1.3823
Workload	0.1261	0.0917	1.8935	0.1688	0.8815	0.69606	1.1164
College Grad	-0.2563	0.3277	0.6114	0.4342	1.2921	0.55552	3.0055
Chem. Sensitivity	0.5515	0.1622	11.5618	0.0007	0.5761	0.37934	0.8749
Over 40	-0.0262	0.1623	0.0260	0.8720	1.0265	0.67578	1.5594
AHU10	1.0102	0.7263	1.9347	0.1642	0.3641	0.05607	2.3649
AHU18	1.0734	0.4423	5.8903	0.0152	0.3418	0.10940	1.0682
SE22	0.6964	0.7751	0.8071	0.3690	0.4984	0.06767	3.6702
FC FL2	-0.5394	0.6652	0.6575	0.4174	1.7150	0.30908	9.5158
FC FL3	-0.9775	0.7943	1.5143	0.2185	2.6578	0.34348	20.5655
FC FL8	-1.0800	0.7816	1.9095	0.1670	2.9447	0.39321	22.0520
ET1FL13	-0.4798	0.6028	0.6336	0.4260	1.6158	0.34198	7.6340
ET1FL45	-0.9087	0.7951	1.3060	0.2531	2.4811	0.31999	19.2378
ET1FL89	-1.7878	1.0611	2.8389	0.0920	5.9763	0.38845	91.9453
ET2FL13	-0.8821	0.5901	2.2349	0.1349	2.4160	0.52835	11.0474
ET2FL89	-1.7090	0.8581	3.9658	0.0464	5.5234	0.60564	50.3735
ET2F1011	-0.3810	0.5700	0.4469	0.5038	1.4637	0.33712	6.3555
WT1FL45	-1.4765	1.0569	1.9515	0.1624	4.3776	0.28763	66.6246
Hot Stuffy Air	0.0905	0.0241	14.0702	0.0002	0.9135	0.85849	0.9720
Paint Odor	0.1128	0.0869	1.6841	0.1944	0.8933	0.71416	1.1175
New Carpet Odor	0.4160	0.1105	14.1767	0.0002	0.6597	0.49626	0.8769
WT1FL67	-1.3001	0.7819	2.7644	0.0964	3.6697	0.48965	27.5024
WT1F1011	-37.4769	.	.	.	.	.	.
WT2FL13	-37.8149	.	.	.	.	.	.
WT2FL67	-0.5742	0.6065	0.8961	0.3438	1.7757	0.37227	8.4701
WT2F1011	-0.9342	0.7933	1.3867	0.2390	2.5452	0.32978	19.6434
ET3FL47	-0.7945	0.6121	1.6850	0.1943	2.2133	0.45737	10.7110
ET3FL811	-0.6696	0.5430	1.5206	0.2175	1.9535	0.48231	7.9119
WT3FL47	-1.0339	0.6685	2.3916	0.1220	2.8120	0.50250	15.7361
UGHAHU19	-0.3540	0.6859	0.2663	0.6058	1.4248	0.24344	8.3385
Glued Carpet, Room	-0.3861	0.3168	1.4853	0.2229	1.4712	0.65052	3.3274
Glued Carpet, Corridor	0.4009	0.2650	2.2890	0.1303	0.6697	0.33840	1.3254
Tacked Carpet, Room	-0.0734	0.2931	0.0628	0.8022	1.0762	0.50579	2.2897
Tacked Carpet, Corridor	0.6576	0.3567	3.3978	0.0653	0.5181	0.20671	1.2986
Private Office	-0.2737	0.2466	1.2316	0.2671	1.3148	0.69660	2.4817
Cubicle or Shared	-0.1489	0.2389	0.3883	0.5332	1.1606	0.62719	2.1475

Association of Predicted Probabilities and Observed Responses

Concordant = 72.9%	Somers' D	= 0.464
Discordant = 26.5%	Gamma	= 0.467
Tied 0.6%	Tau-a	= 0.112
(323610 pairs)	c	= 0.732

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Dry or Itchy Skin
Number of Observations: 1828
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2154.861	2053.672	.
SC	2160.372	2235.535	.
-2 LOG L	2152.861	1987.672	165.189 with 32 DF (p=0.0001)
Score	.	.	160.093 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.16780	0.1714	59.9703	0.0001	0.11443	0.07358	0.1779
Plants Nearby	0.07060	0.1120	0.3976	0.5283	1.07315	0.80420	1.4321
Use Heater	0.43900	0.1288	11.6181	0.0007	1.55116	1.11317	2.1615
Glare	0.08350	0.1141	0.5354	0.4643	1.08709	0.81024	1.4585
Dust	0.59080	0.1198	24.3313	0.0001	1.80543	1.32604	2.4581
Medium Pay	0.29640	0.1200	6.0985	0.0135	1.34501	0.98736	1.8322
Allergy to Molds	0.44170	0.1215	13.2236	0.0003	1.55535	1.13737	2.1269
Chem. Sensitivity	0.15040	0.1183	1.6153	0.2038	1.16230	0.85698	1.5764
Eczema	0.91760	0.1844	24.7594	0.0001	2.50328	1.55673	4.0254
Discomfort Index	0.09520	0.0476	4.0003	0.0455	1.09988	0.97295	1.2434
AHU20	-0.44990	0.6859	0.4301	0.5119	0.63769	0.10896	3.7321
ETB	0.99030	0.5617	3.1084	0.0779	2.69204	0.63341	11.4414
SE32	-0.21900	0.3942	0.3088	0.5784	0.80332	0.29099	2.2177
CM FL2	-1.96730	0.7374	7.1172	0.0076	0.13983	0.02092	0.9345
ET1FL13	-0.04190	0.3780	0.0123	0.9117	0.95897	0.36217	2.5391
ET1FL67	-0.00467	0.4994	0.0001	0.9925	0.99534	0.27496	3.6031
ET1FL89	1.09600	0.4236	6.6955	0.0097	2.99217	1.00482	8.9102
ET1F1011	0.55590	0.4293	1.6771	0.1953	1.74351	0.57696	5.2687
ET2FL45	0.02780	0.4927	0.0032	0.9550	1.02819	0.28898	3.6583
ET2FL67	-0.05380	0.5804	0.0086	0.9261	0.94762	0.21248	4.2262
ET2F1011	0.73700	0.4336	2.8897	0.0891	2.08966	0.68389	6.3850
WT1FL13	0.24470	0.4771	0.2631	0.6080	1.27724	0.37370	4.3654
WT1FL45	0.48960	0.3510	1.9453	0.1631	1.63166	0.66062	4.0300
WT1FL67	0.53030	0.4676	1.2861	0.2568	1.69944	0.50954	5.6680
WT2FL13	0.79230	0.3323	5.6837	0.0171	2.20847	0.93828	5.1982
WT2FL45	-0.17570	0.4553	0.1488	0.6997	0.83887	0.25962	2.7106
WT2FL89	0.14320	0.3540	0.1637	0.6858	1.15396	0.46361	2.8723
WT2F1011	0.74080	0.4090	3.2816	0.0701	2.09761	0.73141	6.0158
ET3FL47	-0.67840	0.6585	1.0613	0.3029	0.50743	0.09304	2.7674
ET3FL811	0.69240	0.5746	1.4525	0.2281	1.99851	0.45486	8.7808
Tackd Carpet, Hall	-0.88760	0.3042	8.5101	0.0035	0.41164	0.18802	0.9012
Private Office	0.16940	0.1525	1.2345	0.2665	1.18459	0.79976	1.7546
Cubicle or Shared	0.28000	0.1303	4.6222	0.0316	1.32313	0.94587	1.8509

Association of Predicted Probabilities and Observed Responses

Concordant = 68.3%	Somers' D = 0.370
Discordant = 31.3%	Gamma = 0.371
Tied = 0.4%	Tau-a = 0.148
(667296 pairs)	c = 0.685

Response Variable: Dry or Itchy Skin
Number of Observations: 1764
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1581.886	1508.647	.
SC	1587.362	1689.333	.
-2 LOG L	1579.886	1442.647	137.239 with 32 DF (p=0.0001)
Score	.	.	147.146 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.0829	0.2312	81.1450	0.0001	0.12457	0.06867	0.22598
Plants Nearby	0.1178	0.1392	0.7168	0.3972	1.12502	0.78602	1.61023
Use Heater	0.2161	0.2178	0.9841	0.3212	1.24123	0.70825	2.17527
Glare	0.3279	0.1399	5.4951	0.0191	1.38805	0.96804	1.99029
Dust	0.5098	0.1403	13.1967	0.0003	1.66496	1.15996	2.38981
Medium Pay	-0.2169	0.1910	1.2894	0.2562	0.80501	0.49218	1.31668
Allergy to Molds	0.1418	0.1471	0.9293	0.3350	1.15235	0.78889	1.68326
Chem. Sensitivity	0.3716	0.1520	5.9746	0.0145	1.45005	0.98025	2.14503
Eczema	1.4505	0.1903	58.0911	0.0001	4.26525	2.61245	6.96371
Discomfort Index	0.0073	0.0649	0.0125	0.9110	1.00728	0.85220	1.19057
AHU20	-1.1380	1.0827	1.1047	0.2932	0.32046	0.01970	5.21237
ETB	-37.1249 #	.	.	.	.	.	.
SE32	-0.8219	0.7729	1.1308	0.2876	0.43960	0.06003	3.21906
CM FL2	-0.8888	0.6219	2.0422	0.1530	0.41115	0.08284	2.04054
ET1FL13	0.0002	0.4811	0.0000	0.9997	1.00019	0.28964	3.45390
ET1FL67	-1.1899	0.8262	2.0741	0.1498	0.30425	0.03622	2.55587
ET1FL89	-0.9573	0.7812	1.5014	0.2205	0.38393	0.05132	2.87218
ET1F1011	-0.7305	0.5741	1.6194	0.2032	0.48167	0.10977	2.11358
ET2FL45	-0.4324	0.6449	0.4494	0.5026	0.64895	0.12323	3.41734
ET2FL67	-1.6160	1.1055	2.1370	0.1438	0.19869	0.01152	3.42728
ET2F1011	-1.1876	0.6713	3.1298	0.0769	0.30495	0.05410	1.71887
WT1FL13	-0.2484	0.7735	0.1032	0.7481	0.78005	0.10636	5.72096
WT1FL45	0.3581	0.5036	0.5055	0.4771	1.43061	0.39095	5.23504
WT1FL67	-0.8697	0.6276	1.9203	0.1658	0.41908	0.08321	2.11065
WT2FL13	-1.4842	1.0530	1.9866	0.1587	0.22668	0.01504	3.41551
WT2FL45	-1.5016	1.0293	2.1281	0.1446	0.22277	0.01572	3.15780
WT2FL89	-1.5125	1.0510	2.0711	0.1501	0.22036	0.01470	3.30315
WT2F1011	-0.4330	0.6672	0.4212	0.5163	0.64856	0.11629	3.61723
ET3FL47	-1.7659	0.7834	5.0816	0.0242	0.17103	0.02273	1.28677
ET3FL811	-0.9614	0.5255	3.3465	0.0673	0.38236	0.09876	1.48036
Tackd Carpet, Hall	0.6815	0.3751	3.3009	0.0692	1.97684	0.75220	5.19532
Private Office	-0.2869	0.2119	1.8332	0.1757	0.75059	0.43485	1.29557
Cubicle or Shared	-0.0548	0.2077	0.0697	0.7918	0.94667	0.55442	1.61645

Association of Predicted Probabilities and Observed Responses

Concordant = 70.1%	Somers' D = 0.411
Discordant = 29.0%	Gamma = 0.414
Tied = 0.8%	Tau-a = 0.113
(428643 pairs)	c = 0.705

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Dry or Itchy Skin (Including Comfort and Odor)
Number of Observations: 1746
Sex: Females

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2061.388	1902.485	.
SC	2066.853	2000.856	.
-2 LOG L	2059.388	1866.485	192.903 with 17 DF (p=0.0001)
Score	.	.	186.702 with 17 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.2720	0.1623	95.8589	0.0001	0.10311	0.06788	0.15662
Use Heater	0.5171	0.1324	15.2465	0.0001	1.67716	1.19248	2.35882
Use Lamp	-0.1773	0.1182	2.2485	0.1337	0.83753	0.61768	1.13563
Dust	0.5224	0.1243	17.6643	0.0001	1.68607	1.22410	2.32239
Medium Pay	0.3382	0.1234	7.5064	0.0061	1.40242	1.02053	1.92722
Eczema	0.9022	0.1891	22.7529	0.0001	2.46502	1.51449	4.01213
Dry Air	0.2530	0.0299	71.4911	0.0001	1.28788	1.19241	1.39100
Humid Air	-0.1738	0.0776	5.0136	0.0251	0.84046	0.68818	1.02644
CM FL10	0.5130	0.4076	1.5842	0.2082	1.67029	0.58451	4.77301
ET1FL89	0.8779	0.4392	3.9954	0.0456	2.40584	0.77610	7.45794
ET1F1011	0.7365	0.4381	2.8256	0.0928	2.08861	0.67567	6.45623
ET2F1011	0.8018	0.4442	3.2585	0.0711	2.22955	0.71002	7.00104
WT1FL67	0.5622	0.4817	1.3622	0.2432	1.75453	0.50730	6.06818
WT2F1011	0.8791	0.4206	4.3677	0.0366	2.40873	0.81516	7.11756
ET3FL811	0.4940	0.6331	0.6088	0.4353	1.63886	0.32082	8.37177
Tackd Carpet, Hall	-0.9612	0.2908	10.9213	0.0010	0.38243	0.18081	0.80888
Private Office	-0.0448	0.1579	0.0805	0.7767	0.95619	0.63664	1.43613
Cubicle or Shared	0.1512	0.1347	1.2583	0.2620	1.16323	0.82219	1.64574

Association of Predicted Probabilities and Observed Responses

Concordant = 70.3%	Somers' D = 0.410
Discordant = 29.2%	Gamma = 0.412
Tied = 0.5%	Tau-a = 0.164
(610029 pairs)	c = 0.705

Response Variable: Dry or Itchy Skin (Including Comfort and Odor)
Number of Observations: 1719
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1542.956	1384.756	.
SC	1548.406	1482.847	.
-2 LOG L	1540.956	1348.756	192.200 with 17 DF (p=0.0001)
Score	.	.	205.630 with 17 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.7208	0.2468	21.5066	0.0001	0.06582	0.03486	0.12430
Use Heater	0.0498	0.2246	0.0492	0.8245	1.05106	0.58933	1.87455
Use Lamp	0.1487	0.1456	1.0436	0.3070	1.16032	0.79743	1.68837
Dust	0.2581	0.1472	3.0744	0.0795	1.29447	0.88596	1.89134
Medium Pay	-0.2870	0.1967	2.1299	0.1445	0.75051	0.45217	1.24570
Eczema	1.5875	0.1959	65.6600	0.0001	4.89150	2.95312	8.10222
Dry Air	0.3604	0.0393	84.2839	0.0001	1.43390	1.29585	1.58667
Humid Air	-0.1014	0.1195	0.7188	0.3965	0.90357	0.66416	1.22928
CM FL10	-0.8204	0.5198	2.4914	0.1145	0.44026	0.11539	1.67968
ET1FL89	-0.6977	0.7782	0.8038	0.3699	0.49773	0.06705	3.69486
ET1F1011	0.0679	0.5564	0.0149	0.9028	1.07026	0.25528	4.48701
ET2F1011	-0.8309	0.6610	1.5799	0.2088	0.43566	0.07937	2.39130
WT1FL67	-0.7570	0.6485	1.3628	0.2431	0.46907	0.08825	2.49312
WT2F1011	-0.0196	0.6628	0.0009	0.9764	0.98059	0.17782	5.40742
ET3FL811	-0.4188	0.5117	0.6699	0.4131	0.65784	0.17606	2.45798
Tackd Carpet, Hall	0.1961	0.3212	0.3726	0.5416	1.21665	0.53189	2.78295
Private Office	-0.1845	0.2208	0.6983	0.4033	0.83152	0.47082	1.46856
Cubicle or Shared	0.1249	0.2147	0.3384	0.5608	1.13304	0.65170	1.96987

Association of Predicted Probabilities and Observed Responses

Concordant = 74.1%	Somers' D = 0.491
Discordant = 25.1%	Gamma = 0.495
Tied = 0.8%	Tau-a = 0.135
(407540 pairs)	c = 0.745

Response Variable: Problems with Contact Lenses
Number of Observations: 426
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	562.766	550.192	.
SC	566.821	615.064	.
-2 LOG L	560.766	518.192	42.574 with 15 DF (p=0.0002)
Score	.	.	40.806 with 15 DF (p=0.0003)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-0.5677	1.0856	0.2735	0.6010	0.56683	0.03459	9.289
Hours at Work	-0.0994	0.0713	1.9428	0.1634	0.90538	0.75347	1.088
Use Lamp	0.5746	0.2151	7.1363	0.0076	1.77642	1.02071	3.092
New Carpet/Drapes	0.5028	0.2795	3.2364	0.0720	1.65334	0.80478	3.397
Dust	0.6743	0.2348	8.2476	0.0041	1.96266	1.07192	3.594
Job Satisfaction	-0.2008	0.2167	0.8587	0.3541	0.81808	0.46813	1.430
Workload	-0.0558	0.1225	0.2077	0.6485	0.94573	0.68980	1.297
External Stress	-0.0239	0.0895	0.0715	0.7891	0.97638	0.77534	1.230
Allergy to Dust	0.6073	0.2197	7.6417	0.0057	1.83547	1.04222	3.232
AHU14	0.1010	1.4945	0.0046	0.9461	1.10628	0.02355	51.979
AHU3	1.7218	1.2712	1.8348	0.1756	5.59459	0.21165	147.881
AWU15SW2	0.7984	0.7510	1.1302	0.2877	2.22198	0.32104	15.379
CM FL2	-0.6673	0.7279	0.8404	0.3593	0.51309	0.07868	3.346
CM FL10	-0.3124	0.9123	0.1173	0.7320	0.73169	0.06977	7.673
Private Office	0.4632	0.3148	2.1642	0.1413	1.58915	0.70629	3.576
Cubicle or Shared	0.3734	0.2688	1.9291	0.1649	1.45267	0.72685	2.903

Association of Predicted Probabilities and Observed Responses

Concordant = 68.0%	Somers' D = 0.364
Discordant = 31.7%	Gamma = 0.365
Tied = 0.3%	Tau-a = 0.170
(42233 pairs)	c = 0.682

Response Variable: Problems with Contact Lenses
Number of Observations: 290
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	339.692	329.104	.
SC	343.362	387.822	.
-2 LOG L	337.692	297.104	40.588 with 15 DF (p=0.0004)
Score	.	.	38.348 with 15 DF (p=0.0008)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-5.2081	1.5690	11.0181	0.0009	0.0055	0.00010	0.311
Hours at Work	0.2291	0.0939	5.9582	0.0146	1.2575	0.98729	1.602
Use Lamp	0.2202	0.3022	0.5310	0.4662	1.2463	0.57220	2.715
New Carpet/Drapes	0.2623	0.3674	0.5097	0.4753	1.2999	0.50453	3.349
Dust	0.6010	0.3028	3.9390	0.0472	1.8239	0.83610	3.979
Job Satisfaction	-0.9035	0.3103	8.4782	0.0036	0.4051	0.18217	0.901
Workload	0.4903	0.1815	7.2971	0.0069	1.6328	1.02302	2.606
External Stress	0.2591	0.1410	3.3756	0.0662	1.2958	0.90112	1.863
Allergy to Dust	0.2642	0.3001	0.7747	0.3788	1.3024	0.60118	2.821
AHU14	-1.0026	1.1700	0.7344	0.3915	0.3669	0.01802	7.473
AHU3	-0.7004	1.2834	0.2978	0.5853	0.4964	0.01820	13.540
AWU15SW2	2.3571	1.2484	3.5651	0.0590	10.5603	0.42368	263.217
CM FL2	-37.6177 #	.	.	.	.	.	.
CM FL10	-0.0690	1.2071	0.0033	0.9544	0.9333	0.04165	20.915
Private Office	-0.0943	0.4117	0.0525	0.8188	0.9100	0.31511	2.628
Cubicle or Shared	-0.6131	0.4404	1.9375	0.1639	0.5417	0.17420	1.684

Association of Predicted Probabilities and Observed Responses

Concordant = 72.7%	Somers' D = 0.457
Discordant - 27.0%	Gamma = 0.459
Tied = 0.3%	Tau-a = 0.180
(16536 pairs)	c = 0.729

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Problems with Contact Lenses (Including Comfort and Odor)
Number of Observations: 447
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	590.690	569.770	.
SC	594.792	668.231	.
-2 LOG L	588.690	521.770	66.920 with 23 DF (p=0.0001)
Score	.	.	63.154 with 23 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.9716	0.3213	37.6525	0.0001	0.1392	0.06085	0.319
Use Lamp	0.6647	0.2193	9.1878	0.0024	1.9439	1.10493	3.420
Allergy to Dust	0.7165	0.2182	10.7830	0.0010	2.0473	1.16698	3.592
Cosmetic, Body Odor	0.2986	0.0739	16.3108	0.0001	1.3480	1.11431	1.631
NEG1NEG2	1.6728	1.2993	1.6577	0.1979	5.3271	0.18746	151.381
CM FL10	-0.7298	0.8663	0.7098	0.3995	0.4820	0.05175	4.490
FCFL8	0.9511	0.7113	1.7879	0.1812	2.5886	0.41428	16.174
ET1FL67	1.7707	0.9480	3.4889	0.0618	5.8750	0.51102	67.542
ET1F1011	2.3428	1.1577	4.0957	0.0430	10.4103	0.52759	205.416
ET2FL13	1.0160	0.8503	1.4278	0.2321	2.7621	0.30901	24.689
ET2FL89	1.5758	0.9702	2.6378	0.1043	4.8346	0.39715	58.853
ET2F1011	1.9606	0.8506	5.3125	0.0212	7.1036	0.79410	63.545
WT1FL13	0.2741	1.2988	0.0446	0.8328	1.3153	0.04635	37.330
WT1FL67	0.7218	0.9992	0.5219	0.4700	2.0581	0.15690	26.997
WT1FL89	1.2046	0.9500	1.6078	0.2048	3.3354	0.28863	38.544
WT1F1011	0.8941	0.8764	1.0406	0.3077	2.4451	0.25576	23.376
WT2FL45	0.1309	0.8605	0.0232	0.8791	1.1399	0.12421	10.460
WT2FL89	-0.2096	0.8641	0.0589	0.8083	0.8109	0.08755	7.511
ET3FL47	1.4090	0.7757	3.2992	0.0693	4.0919	0.55477	30.181
WT3FL811	0.6136	1.1438	0.2878	0.5917	1.8471	0.09702	35.164
Glued Carpet, Hall	-0.6919	0.3189	4.7071	0.0300	0.5006	0.22016	1.138
Tackd Carpet, Hall	-1.8424	0.7196	6.5548	0.0105	0.1584	0.02482	1.011
Private Office	0.6388	0.3082	4.2948	0.0382	1.8942	0.85631	4.190
Cubicle or Shared	0.4029	0.2727	2.1826	0.1396	1.4962	0.74113	3.020

Association of Predicted Probabilities and Observed Responses

Concordant = 71.4%	Somers' D = 0.437
Discordant = 27.7%	Gamma = 0.440
Tied = 0.8%	Tau-a = 0.204
(46530 pairs)	c = 0.718

Response Variable: Problems with Contact Lenses (Including Comfort and Odor)
Number of Observations: 285
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	330.510	336.048	.
SC	334.163	423.708	.
-2 LOG L	328.510	288.048	40.462 with 23 DF (p=0.0136)
Score	.	.	32.085 with 23 DF (p=0.0984)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-0.8924	0.4563	3.8246	0.0505	0.40967	0.12646	1.327
Use Lamp	-0.1076	0.3068	0.1231	0.7257	0.89799	0.40742	1.979
Allergy to Dust	0.6453	0.2988	4.6638	0.0308	1.90656	0.88302	4.117
Cosmetic, Body Odor	0.1753	0.1177	2.2171	0.1365	1.19160	0.87995	1.614
NEG1NEG2	0.2949	1.4691	0.0403	0.8409	1.34299	0.03052	59.104
CM FL10	-38.2100 #	.	.	.	.	.	.
FCFL8	0.5663	1.2988	0.1901	0.6628	1.76174	0.06208	49.999
ET1FL67	0.3371	1.3318	0.0641	0.8002	1.40088	0.04534	43.285
ET1F1011	0.2050	1.4103	0.0211	0.8844	1.22753	0.03245	46.429
ET2FL13	-37.4111 #	.	.	.	.	.	.
ET2FL89	0.8698	1.4686	0.3508	0.5537	2.38643	0.05430	104.890
ET2F1011	-37.6704 #	.	.	.	.	.	.
WT1FL13	1.9408	1.3195	2.1633	0.1413	6.96432	0.23265	208.478
WT1FL67	1.0650	1.5352	0.4813	0.4879	2.90084	0.05559	151.362
WT1FL89	-37.2378 #	.	.	.	.	.	.
WT1F1011	-37.9149 #	.	.	.	.	.	.
WT2FL45	-37.4807 #	.	.	.	.	.	.
WT2FL89	1.3995	1.0956	1.6316	0.2015	4.05317	0.24105	68.154
ET3FL47	-37.7074 #	.	.	.	.	.	.
WT3FL811	-37.6848 #	.	.	.	.	.	.
Glued Carpet, Hall	-0.4534	0.3714	1.4907	0.2221	0.63546	0.24411	1.654
Tackd Carpet, Hall	-0.6255	0.8039	0.6054	0.4365	0.53499	0.06745	4.243
Private Office	-0.2189	0.4225	0.2685	0.6043	0.80340	0.27056	2.386
Cubicle or Shared	-0.6268	0.4571	1.8806	0.1703	0.53430	0.16459	1.734

Association of Predicted Probabilities and Observed Responses

Concordant = 70.4%	Somers' D = 0.423
Discordant = 28.1%	Gamma = 0.430
Tied = 1.6%	Tau-a = 0.165
(15750 pairs)	c = 0.712

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Hot Stuffy Air
Number of Observations: 1742
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2201.640	2008.870	.
SC	2207.102	2216.456	.
-2 LOG L	2199.640	1932.870	266.770 with 37 DF (p=0.0001)
Score	.	.	243.775 with 37 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.8844	0.3042	89.8847	0.0001	0.05589	0.02553	0.1224
Photocopier Nearby	-0.1102	0.1659	0.4414	0.5064	0.89565	0.58417	1.3732
Use Fan	0.7350	0.1144	41.2666	0.0001	2.08548	1.55318	2.8002
Window Nearby	-0.0818	0.1229	0.4436	0.5054	0.92146	0.67140	1.2646
Lights Too Dim	0.5534	0.2033	7.4130	0.0065	1.73916	1.03014	2.9362
Glare	0.3248	0.1160	7.8467	0.0051	1.38375	1.02632	1.8657
Noise	0.2671	0.1179	5.1344	0.0235	1.30617	0.96405	1.7697
Dust	0.6590	0.1231	28.6584	0.0001	1.93286	1.40761	2.6541
Workload	0.2512	0.0658	14.5792	0.0001	1.28557	1.08513	1.5230
Underutilization	-0.1345	0.0563	5.6985	0.0170	0.87415	0.75614	1.0106
Allergy to Molds	0.3304	0.1236	7.1414	0.0075	1.39152	1.01208	1.9132
Chem. Sensitivity	0.2851	0.1198	5.6637	0.0173	1.32990	0.97677	1.8107
Discomfort Index	0.1048	0.0483	4.6975	0.0302	1.11049	0.98057	1.2576
AHU13	-0.8849	0.5606	2.4921	0.1144	0.41276	0.09739	1.7493
AHU16	0.1304	0.5285	0.0609	0.8051	1.13928	0.29200	4.4452
NEG4	1.1551	0.6211	3.4587	0.0629	3.17434	0.64092	15.7219
NEG1NEG2	-0.9064	0.8355	1.1770	0.2780	0.40398	0.04695	3.4759
FC FL2	-0.7824	0.6182	1.6016	0.2057	0.45731	0.09303	2.2481
FC FL6	0.1035	0.4761	0.0472	0.8280	1.10905	0.32532	3.7808
FC FL8	0.1626	0.4304	0.1427	0.7056	1.17657	0.38825	3.5655
FCNOFL	1.2876	0.6790	3.5956	0.0579	3.62408	0.63033	20.8365
ET1FL67	0.1837	0.4587	0.1604	0.6888	1.20166	0.36865	3.9169
ET1F1011	-0.6927	0.4910	1.9903	0.1583	0.50022	0.14121	1.7720
ET2FL45	-0.7940	0.6514	1.4857	0.2229	0.45203	0.08442	2.4206
ET2FL89	0.9468	0.5066	3.4928	0.0616	2.57745	0.69893	9.5048
ET2F1011	-0.5671	0.5442	1.0861	0.2973	0.56717	0.13960	2.3043
WT1FL13	0.2732	0.5394	0.2565	0.6125	1.31416	0.32749	5.2735
WT1FL67	-0.4629	0.5606	0.6818	0.4090	0.62946	0.14852	2.6677
WT1F1011	-0.9980	0.5675	3.0931	0.0786	0.36862	0.08545	1.5902
WT2FL67	0.1580	0.4821	0.1074	0.7431	1.17117	0.33828	4.0548
WT2F1011	0.4256	0.4438	0.9195	0.3376	1.53051	0.48791	4.8010
ET3FL47	0.1672	0.5925	0.0796	0.7778	1.18199	0.25690	5.4384
ET3FL811	-0.4684	0.6971	0.4516	0.5016	0.62600	0.10392	3.7710
Glued Carpet, Hall	-0.2863	0.1571	3.3241	0.0683	0.75104	0.50108	1.1257
Tackd Carpet, Room	0.1426	0.2307	0.3821	0.5365	1.15327	0.63656	2.0894
Tackd Carpet, Hall	-0.6696	0.3279	4.1697	0.0412	0.51191	0.21997	1.1913
Private Office	0.4023	0.1573	6.5393	0.0106	1.49526	0.99710	2.2423
Cubicle or Shared	0.2319	0.1328	3.0513	0.0807	1.26099	0.89566	1.7753

Association of Predicted Probabilities and Observed Responses

Concordant = 72.7%	Somers' D = 0.456
Discordant = 27.1%	Gamma = 0.457
Tied = 0.3%	Tau-a = 0.201
(666832 pairs)	c = 0.728

Response Variable: Hot Stuffy Air
Number of Observations: 1723
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1897.510	1659.054	.
SC	1902.962	1866.223	.
-2 LOG L	1895.510	1583.054	312.456 with 37 DF (p=0.0001)
Score	.	.	287.886 with 37 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.3746	0.4067	68.8541	0.0001	0.03423	0.01201	0.0976
Photocopier Nearby	0.0562	0.1997	0.0791	0.7785	1.05781	0.63240	1.7694
Use Fan	0.9725	0.1277	57.9792	0.0001	2.64455	1.90322	3.6746
Window Nearby	-0.6047	0.1418	18.1821	0.0001	0.54624	0.37909	0.7871
Lights Too Dim	0.7993	0.2476	10.4231	0.0012	2.22398	1.17525	4.2085
Glare	0.3019	0.1304	5.3570	0.0206	1.35243	0.96656	1.8923
Noise	0.4183	0.1372	9.2905	0.0023	1.51938	1.06702	2.1635
Dust	0.8046	0.1316	37.3616	0.0001	2.23580	1.59297	3.1381
Workload	0.2831	0.0788	12.8972	0.0003	1.32724	1.08341	1.6259
Underutilization	0.0683	0.0662	1.0638	0.3023	1.07069	0.90282	1.2698
Allergy to Molds	0.2177	0.1365	2.5431	0.1108	1.24321	0.87466	1.7671
Chem. Sensitivity	0.0953	0.1440	0.4379	0.5081	1.09999	0.75908	1.5940
Discomfort Index	0.1273	0.0581	4.8049	0.0284	1.13576	0.97788	1.3191
AHU13	-1.2515	0.6703	3.4864	0.0619	0.28608	0.05088	1.6083
AHU16	-0.1804	0.5013	0.1294	0.7190	0.83494	0.22952	3.0372
NEG4	0.1427	0.6978	0.0418	0.8380	1.15338	0.19112	6.9604
NEG1NEG2	-1.0226	0.8268	1.5300	0.2161	0.35966	0.04275	3.0260
FC FL2	-1.5907	0.7697	4.2707	0.0388	0.20378	0.02806	1.4800
FC FL6	-1.2290	0.8084	2.3117	0.1284	0.29259	0.03646	2.3477
FC FL8	0.1039	0.4796	0.0469	0.8285	1.10949	0.32253	3.8166
FCNOFL	0.0022	1.2097	0.0000	0.9985	1.00224	0.04443	22.6108
ET1FL67	-37.9532 #	.	.	.	.	.	.
ET1F1011	-0.5150	0.5668	0.8254	0.3636	0.59750	0.13875	2.5730
ET2FL45	-0.4071	0.5849	0.4845	0.4864	0.66558	0.14752	3.0030
ET2FL89	-0.1888	0.5658	0.1113	0.7387	0.82795	0.19276	3.5562
ET2F1011	-0.8752	0.6736	1.6879	0.1939	0.41678	0.07351	2.3631
WT1FL13	-2.0713	1.1487	3.2515	0.0714	0.12602	0.00654	2.4297
WT1FL67	-0.5958	0.4885	1.4874	0.2226	0.55112	0.15658	1.9398
WT1F1011	-1.1599	1.0716	1.1716	0.2791	0.31352	0.01983	4.9557
WT2FL67	-0.0787	0.4789	0.0270	0.8694	0.92432	0.26919	3.1739
WT2F1011	-0.2224	0.6391	0.1211	0.7278	0.80060	0.15432	4.1534
ET3FL47	-0.8268	0.6191	1.7838	0.1817	0.43745	0.08878	2.1555
ET3FL811	-1.0522	0.5988	3.0875	0.0789	0.34917	0.07467	1.6328
Glued Carpet, Hall	0.2374	0.1801	1.7372	0.1875	1.26795	0.79729	2.0164
Tackd Carpet, Room	0.2766	0.2793	0.9803	0.3221	1.31864	0.64219	2.7076
Tackd Carpet, Hall	0.0072	0.4069	0.0003	0.9858	1.00726	0.35312	2.8731
Private Office	-0.1064	0.2037	0.2728	0.6014	0.89906	0.53199	1.5194
Cubicle or Shared	-0.0014	0.2019	0.0000	0.9946	0.99864	0.59366	1.6799

Association of Predicted Probabilities and Observed Responses

Concordant = 77.6%	Somers' D = 0.554
Discordant = 22.2%	Gamma = 0.556
Tied = 0.3%	Tau-a = 0.202
(540132 pairs)	c = 0.777

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Dry Air
Number of Observations: 1809
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2383.609	2221.669	.
SC	2389.109	2326.179	.
-2 LOG L	2381.609	2183.669	197.940 with 18 DF (p=0.0001)
Score	.	.	188.849 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.4203	0.3301	53.7650	0.0001	0.08889	0.03798	0.2081
Use Heater	-0.0123	0.1248	0.0097	0.9217	0.98778	0.71621	1.3623
New Furniture	-0.0870	0.1051	0.6862	0.4074	0.91668	0.69926	1.2017
Lights Too Dim	0.5013	0.1885	7.0690	0.0078	1.65087	1.01585	2.6828
Glare	0.2453	0.1079	5.1688	0.0230	1.27800	0.96788	1.6875
Noise	0.3034	0.1087	7.7930	0.0052	1.35446	1.02366	1.7921
Dust	0.8401	0.1132	55.1153	0.0001	2.31660	1.73065	3.1009
Role Conflict	0.0825	0.0803	1.0535	0.3047	1.08600	0.88307	1.3356
Role Clarity	0.0819	0.0585	1.9597	0.1615	1.08535	0.93352	1.2619
Allergy to Molds	0.3452	0.1156	8.9243	0.0028	1.41227	1.04856	1.9022
Chem. Sensitivity	0.1448	0.1115	1.6872	0.1940	1.15581	0.86725	1.5404
Discomfort Index	0.1275	0.0450	8.0162	0.0046	1.13598	1.01165	1.2756
AHU16	1.4609	0.5102	8.1983	0.0042	4.30984	1.15792	16.0414
AHU9	0.6871	0.3938	3.0440	0.0810	1.98794	0.72085	5.4823
G1LG1	-0.3641	0.8803	0.1711	0.6791	0.69482	0.07195	6.7097
NEG1NEG2	-0.8210	0.7998	1.0537	0.3047	0.43999	0.05606	3.4531
WT2FL13	0.4673	0.3404	1.8849	0.1698	1.59568	0.66394	3.8350
Private Office	0.7667	0.1398	30.0819	0.0001	2.15265	1.50167	3.0858
Cubicle or Shared	0.2999	0.1199	6.2523	0.0124	1.34972	0.99108	1.8382

Association of Predicted Probabilities and Observed Responses

Concordant = 69.1%	Somers' D = 0.385
Discordant = 30.6%	Gamma = 0.386
Tied = 0.3%	Tau-a = 0.179
(761714 pairs)	c = 0.693

Response Variable: Dry Air
Number of Observations: 1799
Sex: Males

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2051.756	1846.398	.
SC	2057.251	1950.803	.
-2 LOG L	2049.756	1808.398	241.358 with 18 DF (p=0.0001)
Score	.	.	238.787 with 18 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.7627	0.3902	50.1284	0.0001	0.06312	0.02310	0.1725
Use Heater	0.4116	0.1867	4.8604	0.0275	1.50923	0.93301	2.4413
New Furniture	0.1575	0.1205	1.7071	0.1914	1.17058	0.85821	1.5967
Lights Too Dim	0.7682	0.2399	10.2534	0.0014	2.15588	1.16209	3.9996
Glare	0.3171	0.1201	6.9645	0.0083	1.37314	1.00775	1.8710
Noise	0.3891	0.1266	9.4415	0.0021	1.47565	1.06500	2.0446
Dust	0.8146	0.1208	45.4660	0.0001	2.25827	1.65437	3.0826
Role Conflict	0.3511	0.0935	14.0893	0.0002	1.42063	1.11655	1.8075
Role Clarity	-0.0221	0.0704	0.0986	0.7535	0.97814	0.81591	1.1726
Allergy to Molds	0.2737	0.1255	4.7554	0.0292	1.31482	0.95162	1.8166
Chem. Sensitivity	0.2788	0.1319	4.4704	0.0345	1.32154	0.94085	1.8563
Discomfort Index	0.1584	0.0542	8.5551	0.0034	1.17163	1.01896	1.3472
AHU16	2.2871	0.4728	23.4034	0.0001	9.84634	2.91295	33.2825
AHU9	0.8933	0.4266	4.3849	0.0363	2.44318	0.81414	7.3318
G1LG1	-37.3187 #	.	.	.	.	.	.
NEG1NEG2	-1.6586	1.0504	2.4934	0.1143	0.19041	0.01272	2.8497
WT2FL13	0.5346	0.5558	0.9250	0.3362	1.70677	0.40773	7.1445
Private Office	-0.0509	0.1830	0.0774	0.7809	0.95037	0.59315	1.5227
Cubicle or Shared	-0.1461	0.1834	0.6347	0.4256	0.86407	0.53873	1.3859

Association of Predicted Probabilities and Observed Responses

Concordant = 73.1%	Somers' D = 0.466
Discordant = 26.5%	Gamma = 0.467
Tied = 0.3%	Tau-a = 0.178
(617694 pairs)	c = 0.733

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Cold Drafty Air
Number of Observations: 1764
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2436.300	2203.251	.
SC	2441.776	2411.314	.
-2 LOG L	2434.300	2127.251	307.050 with 37 DF (p=0.0001)
Score	.	.	278.424 with 37 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-0.87410	0.2875	9.2432	0.0024	0.4172	0.19895	0.8750
Fabric Partitions	-0.25480	0.1168	4.7600	0.0291	0.7751	0.57368	1.0472
Laser Printer Nearby	-0.17120	0.1138	2.2627	0.1325	0.8427	0.62854	1.1297
Hours at VDT	0.02830	0.0248	1.2998	0.2543	1.0287	0.96504	1.0966
Use Fan	-0.43400	0.1125	14.8828	0.0001	0.6479	0.48491	0.8657
Use Heater	1.09000	0.1348	65.4088	0.0001	2.9743	2.10172	4.2091
New Furniture	0.00901	0.1084	0.0069	0.9338	1.0091	0.76321	1.3341
Water Leaks Nearby	0.33010	0.1603	4.2405	0.0395	1.3911	0.92051	2.1023
Window Nearby	0.12580	0.1147	1.2033	0.2727	1.1341	0.84395	1.5239
Noise	0.43280	0.1112	15.1473	0.0001	1.5416	1.15760	2.0529
Dust	0.01260	0.1142	0.0122	0.9120	1.0127	0.75459	1.3590
High Pay	-0.25280	0.1317	3.6833	0.0550	0.7766	0.55319	1.0903
Role Conflict	0.24160	0.0836	8.3503	0.0039	1.2733	1.02659	1.5793
Workload	0.05040	0.0620	0.6599	0.4166	1.0517	0.89645	1.2338
Allergy to Dust	0.24710	0.1111	4.9448	0.0262	1.2803	0.96166	1.7045
Allergy: Other	-0.10860	0.1733	0.3928	0.5308	0.8971	0.57406	1.4019
Nonsmoker	0.08600	0.1428	0.3630	0.5468	1.0898	0.75438	1.5744
AHU14	2.47850	0.7950	9.7198	0.0018	11.9234	1.53815	92.4271
AHU16	0.24960	0.4926	0.2567	0.6124	1.2835	0.36083	4.5655
AHU3	-0.50630	0.7739	0.4280	0.5130	0.6027	0.08210	4.4250
AHU9	1.48050	0.4810	9.4714	0.0021	4.3951	1.27309	15.1736
NE32	0.87760	0.4261	4.2429	0.0394	2.4051	0.80249	7.2083
NEG3	0.81060	0.5706	2.0185	0.1554	2.2493	0.51723	9.7812
AWU15SW2	0.51850	0.4187	1.5333	0.2156	1.6795	0.57117	4.9385
CM FL2	-1.42600	0.4644	9.4285	0.0021	0.2403	0.07264	0.7948
CM FL7	-1.29960	0.4202	9.5650	0.0020	0.2726	0.09236	0.8048
CM FL8	-1.49800	0.5526	7.3485	0.0067	0.2236	0.05385	0.9282
CM FL10	-1.88520	0.5564	11.4783	0.0007	0.1518	0.03621	0.6364
CM FL11	-0.66790	0.4406	2.2979	0.1295	0.5128	0.16482	1.5953
FCFL6	-1.55670	0.5607	7.7092	0.0055	0.2108	0.04973	0.8937
FCFL7	-2.03640	0.5512	13.6472	0.0002	0.1305	0.03155	0.5398
FCNOFL	-1.22750	0.4122	8.8686	0.0029	0.2930	0.10133	0.8473
ET2FL67	-0.42320	0.4877	0.7530	0.3855	0.6549	0.18646	2.3005
WT1FL13	-0.47810	0.4938	0.9375	0.3329	0.6200	0.17375	2.2121
WT1FL67	1.08110	0.5336	4.1057	0.0427	2.9479	0.74568	11.6540
WT1F1011	-0.02690	0.3639	0.0055	0.9411	0.9735	0.38125	2.4856
Private Office	-0.37270	0.1699	4.8130	0.0282	0.6889	0.44470	1.0671
Cubicle or Shared	-0.14400	0.1306	1.2150	0.2703	0.8659	0.61852	1.2122

Association of Predicted Probabilities and Observed Responses

Concordant = 72.7%	Somers' D = 0.456
Discordant = 27.1%	Gamma = 0.458
Tied = 0.2%	Tau-a = 0.227
(773024 pairs)	c = 0.728

Response Variable: Cold Drafty Air
Number of Observations: 1780
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2194.995	2012.338	.
SC	2200.479	2220.744	.
-2 LOG L	2192.995	1936.338	256.657 with 37 DF (p=0.0001)
Score	.	.	231.551 with 37 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.4934	0.3620	17.0206	0.0001	0.22461	0.08840	0.5707
Fabric Partitions	0.1085	0.1285	0.7130	0.3985	1.11460	0.80050	1.5520
Laser Printer Nearby	-0.1161	0.1267	0.8389	0.3597	0.89039	0.64244	1.2340
Hours at VDT	-0.0380	0.0290	1.7234	0.1893	0.96271	0.89342	1.0374
Use Fan	-0.2981	0.1224	5.9348	0.0148	0.74223	0.54151	1.0174
Use Heater	0.9817	0.1799	29.7743	0.0001	2.66899	1.67913	4.2424
New Furniture	-0.0779	0.1184	0.4327	0.5107	0.92506	0.68188	1.2550
Water Leaks Nearby	0.0684	0.1623	0.1776	0.6734	1.07079	0.70491	1.6266
Window Nearby	0.2999	0.1210	6.1437	0.0132	1.34972	0.98827	1.8434
Noise	0.4534	0.1197	14.3453	0.0002	1.57365	1.15610	2.1420
Dust	0.3854	0.1187	10.5397	0.0012	1.47020	1.08289	1.9961
High Pay	0.1950	0.1545	1.5928	0.2069	1.21531	0.81628	1.8094
Role Conflict	0.1952	0.0922	4.4821	0.0343	1.21555	0.95858	1.5414
Workload	-0.1330	0.0689	3.7308	0.0534	0.87547	0.73309	1.0455
Allergy to Dust	0.1241	0.1156	1.1514	0.2833	1.13213	0.84056	1.5248
Allergy: Other	-0.1472	0.1921	0.5871	0.4435	0.86312	0.52621	1.4157
Nonsmoker	0.0486	0.1787	0.0738	0.7858	1.04980	0.66250	1.6635
AHU14	1.4540	0.5505	6.9772	0.0083	4.28020	1.03656	17.6739
AHU16	1.3136	0.4468	8.6452	0.0033	3.71954	1.17662	11.7583
AHU3	-1.8745	1.0571	3.1445	0.0762	0.15343	0.01008	2.3363
AHU9	1.1439	0.4411	6.7239	0.0095	3.13899	1.00766	9.7784
NE32	0.1927	0.4530	0.1811	0.6705	1.21252	0.37748	3.8947
NEG3	0.1382	0.6208	0.0496	0.8238	1.14821	0.23201	5.6824
AWU15SW2	0.9500	0.3668	6.7079	0.0096	2.58571	1.00514	6.6517
CM FL2	-1.9816	0.7377	7.2155	0.0072	0.13785	0.02061	0.9219
CM FL7	-1.0463	0.4221	6.1441	0.0132	0.35123	0.11841	1.0419
CM FL8	-1.7205	0.4386	15.3901	0.0001	0.17898	0.05783	0.5540
CM FL10	-0.8379	0.4009	4.3688	0.0366	0.43262	0.15403	1.2151
CM FL11	-1.7828	0.7476	5.6864	0.0171	0.16817	0.02451	1.1538
FCFL6	-1.7751	0.7477	5.6357	0.0176	0.16947	0.02469	1.1630
FCFL7	-38.7898 #	.	.	.	.	.	.
FCNOFL	-1.6641	0.5348	9.6822	0.0019	0.18936	0.04775	0.7509
ET2FL67	0.6936	0.5872	1.3953	0.2375	2.00091	0.44086	9.0814
WT1FL13	1.1617	0.5443	4.5558	0.0328	3.19536	0.78630	12.9853
WT1FL67	1.0947	0.3952	7.6727	0.0056	2.98829	1.07968	8.2708
WT1F1011	1.7816	0.5931	9.0248	0.0027	5.93935	1.28888	27.3694
Private Office	0.3224	0.2066	2.4338	0.1187	1.38044	0.81075	2.3504
Cubicle or Shared	0.0862	0.1913	0.2030	0.6523	1.09002	0.66592	1.7842

Association of Predicted Probabilities and Observed Responses

Concordant = 72.1%	Somers' D = 0.446
Discordant = 27.6%	Gamma = 0.447
Tied = 0.3%	Tau-a = 0.189
(673075 pairs)	c = 0.723

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Humid Air
Number of Observations: 1709
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2053.653	1836.383	.
SC	2059.096	1956.143	.
-2 LOG L	2051.653	1792.383	259.270 with 21 DF (p=0.0001)
Score	.	.	250.096 with 21 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.6673	0.4481	13.8424	0.0002	0.1888	0.05951	0.599
Use Fan	0.6817	0.1172	33.8204	0.0001	1.9772	1.46198	2.674
Noise	0.0278	0.1235	0.0507	0.8219	1.0282	0.74801	1.413
Dust	0.4589	0.1268	13.0896	0.0003	1.5823	1.14141	2.194
Medium Pay	-0.7749	0.1486	27.1774	0.0001	0.4607	0.31421	0.676
High Pay	-1.2377	0.1739	50.6647	0.0001	0.2901	0.18532	0.454
Role Conflict	0.1490	0.0847	3.0965	0.0785	1.1607	0.93315	1.444
External Stress	0.0875	0.0478	3.3505	0.0672	1.0914	0.96499	1.234
Allergy: Other	-0.1665	0.1987	0.7022	0.4020	0.8466	0.50745	1.412
Chem. Sensitivity	0.4576	0.1223	13.9875	0.0002	1.5803	1.15322	2.165
Nonsmoker	-0.4524	0.1478	9.3710	0.0022	0.6361	0.43469	0.931
Discomfort Index	0.0545	0.0501	1.1837	0.2766	1.0560	0.92815	1.201
AHU10	3.2910	1.1214	8.6132	0.0033	26.8697	1.49522	482.860
AHU2	0.4113	0.5237	0.6167	0.4323	1.5088	0.39151	5.814
AHU20	0.8684	0.6103	2.0249	0.1547	2.3831	0.49474	11.479
AHU21	1.8274	0.7001	6.8131	0.0090	6.2177	1.02423	37.745
AHU6	0.3078	0.2903	1.1243	0.2890	1.3604	0.64403	2.874
G1LG1	1.6259	0.9350	3.0242	0.0820	5.0830	0.45719	56.512
CM FL7	0.5532	0.3795	2.1244	0.1450	1.7388	0.65417	4.622
Tackd Carpet, Room	0.3894	0.1947	4.0009	0.0455	1.4761	0.89391	2.437
Private Office	-0.2582	0.1921	1.8059	0.1790	0.7724	0.47093	1.267
Cubicle or Shared	-0.3105	0.1411	4.8456	0.0277	0.7331	0.50968	1.054

Association of Predicted Probabilities and Observed Responses

Concordant = 73.8%	Somers' D = 0.480
Discordant = 25.9%	Gamma = 0.481
Tied = 0.3%	Tau-a = 0.197
(598764 pairs)	c = 0.740

Response Variable: Humid Air
Number of Observations: 1701
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1801.552	1703.494	.
SC	1806.991	1823.151	.
-2 LOG L	1799.552	1659.494	140.058 with 21 DF (p=0.0001)
Score	.	.	148.349 with 21 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.91620	0.5202	13.5712	0.0002	0.14717	0.03853	0.5620
Use Fan	0.64250	0.1238	26.9220	0.0001	1.90123	1.38208	2.6154
Noise	0.33090	0.1341	6.0925	0.0136	1.39222	0.98556	1.9667
Dust	0.43210	0.1279	11.4168	0.0007	1.54049	1.10808	2.1416
Medium Pay	-0.57390	0.2673	4.6096	0.0318	0.56332	0.28296	1.1215
High Pay	-0.87550	0.2496	12.2978	0.0005	0.41665	0.21905	0.7925
Role Conflict	0.10990	0.0947	1.3453	0.2461	1.11617	0.87455	1.4245
External Stress	0.04520	0.0545	0.6868	0.4072	1.04624	0.90920	1.2039
Allergy: Other	-0.47750	0.2271	4.4232	0.0355	0.62033	0.34559	1.1135
Chem. Sensitivity	0.27240	0.1407	3.7490	0.0528	1.31311	0.91389	1.8867
Nonsmoker	-0.00064	0.1935	0.0000	0.9973	0.99936	0.60708	1.6451
Discomfort Index	-0.01470	0.0596	0.0611	0.8048	0.98541	0.84516	1.1489
AHU10	0.85970	0.6242	1.8968	0.1684	2.36245	0.47320	11.7946
AHU2	1.79310	0.6703	7.1560	0.0075	6.00805	1.06866	33.7774
AHU20	2.21510	0.6930	10.2180	0.0014	9.16233	1.53715	54.6128
AHU21	2.22170	0.6891	10.3944	0.0013	9.22300	1.56296	54.4249
AHU6	0.79500	0.3461	5.2762	0.0216	2.21444	0.90796	5.4008
G1LG1	1.25640	0.8654	2.1074	0.1466	3.51275	0.37800	32.6443
CM FL7	0.36270	0.3472	1.0917	0.2961	1.43720	0.58761	3.5152
Tackd Carpet, Room	0.23900	0.2190	1.1909	0.2751	1.26998	0.72242	2.2325
Private Office	0.00745	0.2083	0.0013	0.9715	1.00748	0.58912	1.7229
Cubicle or Shared	0.19540	0.1958	0.9962	0.3182	1.21580	0.73419	2.0133

Association of Predicted Probabilities and Observed Responses

Concordant = 67.8%	Somers' D = 0.362
Discordant = 31.6%	Gamma = 0.364
Tied = 0.5%	Tau-a = 0.125
(499148 pairs)	c = 0.681

Response Variable: Odor of Paint, Carpet Cleaning
Number of Observations: 1834
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2278.368	2040.555	.
SC	2283.882	2255.611	.
-2 LOG L	2276.368	1962.555	313.812 with 38 DF (p=0.0001)
Score	.	.	297.955 with 38 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.55430	0.3693	47.8435	0.0001	0.07775	0.03003	0.2013
1 Hour at Copier	-0.18640	0.1245	2.2433	0.1342	0.82994	0.60223	1.1437
Used Chemicals	0.70720	0.1293	29.8997	0.0001	2.02830	1.45372	2.8300
Walls Painted	0.81780	0.1402	34.0470	0.0001	2.26551	1.57877	3.2510
Walls Rearranged	0.37320	0.1489	6.2835	0.0122	1.45237	0.98969	2.1314
Water Leaks Nearby	0.15230	0.1679	0.8225	0.3644	1.16451	0.75562	1.7947
Window Nearby	-0.24850	0.1187	4.3848	0.0363	0.77997	0.57449	1.0589
Glare	0.21130	0.1162	3.3049	0.0691	1.23528	0.91573	1.6663
Noise	0.35400	0.1176	9.0559	0.0026	1.42476	1.05239	1.9289
Dust	0.73690	0.1227	36.0865	0.0001	2.08945	1.52322	2.8662
Role Conflict	0.14760	0.0849	3.0201	0.0822	1.15905	0.93137	1.4424
Role Clarity	0.06940	0.0629	1.2172	0.2699	1.07186	0.91153	1.2604
Wear Glasses	-0.03170	0.1129	0.0789	0.7789	0.96880	0.72431	1.2958
Allergy to Molds	0.11840	0.1255	0.8903	0.3454	1.12569	0.81474	1.5553
Chem. Sensitivity	0.67490	0.1187	32.3100	0.0001	1.96384	1.44647	2.6662
AHU16	-0.41420	0.5299	0.6111	0.4344	0.66087	0.16877	2.5878
AHU5	0.09420	0.3649	0.0666	0.7963	1.09878	0.42922	2.8128
NE1	0.22860	0.3301	0.4795	0.4886	1.25684	0.53701	2.9416
NE31	-0.89480	0.6761	1.7519	0.1856	0.40869	0.07162	2.3323
NE32	-0.36390	0.4339	0.7034	0.4016	0.69496	0.22727	2.1251
AWU15SW2	1.77420	0.4578	15.0185	0.0001	5.89556	1.81286	19.1728
G1LG1	-0.50210	0.9439	0.2830	0.5947	0.60526	0.05321	6.8853
CM FL2	-0.22280	0.4258	0.2739	0.6008	0.80027	0.26723	2.3966
CM FL8	0.08140	0.4337	0.0352	0.8512	1.08480	0.35494	3.3155
FCFL2	-0.92550	0.5990	2.3872	0.1223	0.39633	0.08471	1.8543
ET1FL45	-1.18880	0.5868	4.1047	0.0428	0.30459	0.06718	1.3810
ET1FL67	-0.39610	0.4270	0.8605	0.3536	0.67294	0.22401	2.0215
ET1FL89	-0.49640	0.4700	1.1157	0.2908	0.60872	0.18139	2.0428
ET1F1011	-0.74370	0.4263	3.0430	0.0811	0.47535	0.15852	1.4254
ET2FL67	0.26780	0.4850	0.3050	0.5808	1.30709	0.37473	4.5593
ET2FL89	-1.32680	0.7660	3.0008	0.0832	0.26532	0.03688	1.9087
ET2F1011	0.10210	0.4080	0.0627	0.8024	1.10749	0.38716	3.1680
WT1FL67	0.23120	0.4888	0.2237	0.6362	1.26011	0.35774	4.4386
WT2FL89	0.38250	0.3622	1.1150	0.2910	1.46594	0.57665	3.7267
WT2F1011	-0.10870	0.4142	0.0689	0.7930	0.89700	0.30861	2.6072
ET3FL47	-1.23490	0.7773	2.5241	0.1121	0.29086	0.03927	2.1542
ET3FL811	-0.91240	0.6482	1.9813	0.1593	0.40156	0.07561	2.1326
Private Office	0.00182	0.1533	0.0001	0.9906	1.00182	0.67497	1.4869
Cubicle or Shared	-0.08290	0.1310	0.4004	0.5269	0.92044	0.65681	1.2899

Association of Predicted Probabilities and Observed Responses

Concordant = 74.9%	Somers' D = 0.500
Discordant = 24.8%	Gamma = 0.502
Tied = 0.3%	Tau-a = 0.215
(721864 pairs)	c = 0.750

Response Variable: Odor of Paint, Carpet Cleaning
Number of Observations: 1788
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1817.195	1586.689	.
SC	1822.683	1800.754	.
-2 LOG L	1815.195	1508.689	306.506 with 38 DF (p=0.0001)
Score	.	.	299.092 with 38 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.7999	0.4512	15.9138	0.0001	0.16532	0.05171	0.5286
1 Hour at Copier	0.0824	0.1539	0.2869	0.5922	1.08589	0.73049	1.6142
Used Chemicals	0.5170	0.1895	7.4399	0.0064	1.67699	1.02927	2.7323
Walls Painted	0.8961	0.1696	27.9324	0.0001	2.45003	1.58282	3.7924
Walls Rearranged	0.2067	0.1792	1.3314	0.2486	1.22961	0.77498	1.9510
Water Leaks Nearby	0.3818	0.1847	4.2747	0.0387	1.46492	0.91029	2.3575
Window Nearby	-0.4968	0.1422	12.2048	0.0005	0.60847	0.42185	0.8777
Glare	0.5277	0.1349	15.3025	0.0001	1.69503	1.19745	2.3994
Noise	0.5025	0.1432	12.3105	0.0005	1.65285	1.14295	2.3902
Dust	0.5732	0.1354	17.9317	0.0001	1.77393	1.25158	2.5143
Role Conflict	0.2037	0.1034	3.8787	0.0489	1.22593	0.93926	1.6001
Role Clarity	-0.1969	0.0781	6.3524	0.0117	0.82127	0.67160	1.0043
Wear Glasses	-0.3515	0.1350	6.7818	0.0092	0.70363	0.49695	0.9963
Allergy to Molds	0.2776	0.1411	3.8680	0.0492	1.31996	0.91771	1.8985
Chem. Sensitivity	0.5786	0.1449	15.9493	0.0001	1.78354	1.22794	2.5905
AHU16	0.7151	0.4403	2.6376	0.1044	2.04439	0.65763	6.3555
AHU5	-0.3868	0.4021	0.9254	0.3361	0.67923	0.24108	1.9136
NE1	-0.6832	0.5137	1.7686	0.1836	0.50500	0.13446	1.8967
NE31	-0.4286	0.5330	0.6466	0.4213	0.65142	0.16503	2.5713
NE32	-0.1871	0.6499	0.0829	0.7734	0.82936	0.15548	4.4240
AWU15SW2	1.2885	0.4024	10.2503	0.0014	3.62734	1.28649	10.2275
G1LG1	1.4872	0.8964	2.7525	0.0971	4.42469	0.43958	44.5373
CM FL2	-0.7790	0.5739	1.8429	0.1746	0.45886	0.10463	2.0125
CM FL8	-0.3218	0.3697	0.7575	0.3841	0.72484	0.27967	1.8786
FCFL2	-0.4178	0.5597	0.5574	0.4553	0.65849	0.15574	2.7843
ET1FL45	0.0796	0.5479	0.0211	0.8845	1.08285	0.26400	4.4415
ET1FL67	-0.7195	0.6468	1.2376	0.2659	0.48700	0.09203	2.5771
ET1FL89	-1.0015	0.7798	1.6496	0.1990	0.36733	0.04928	2.7381
ET1F1011	-0.9658	0.6452	2.2407	0.1344	0.38068	0.07223	2.0062
ET2FL67	-1.1504	1.0641	1.1688	0.2796	0.31651	0.02041	4.9073
ET2FL89	-0.3851	0.5859	0.4320	0.5110	0.68038	0.15041	3.0777
ET2F1011	0.4042	0.4546	0.7903	0.3740	1.49810	0.46447	4.8319
WT1FL67	-0.5633	0.5322	1.1205	0.2898	0.56933	0.14453	2.2426
WT2FL89	-0.2766	0.7806	0.1256	0.7230	0.75836	0.10153	5.6645
WT2F1011	-0.6758	0.7821	0.7467	0.3875	0.50875	0.06785	3.8148
ET3FL47	-0.4058	0.4921	0.6798	0.4096	0.66644	0.18760	2.3675
ET3FL811	-1.7077	0.6242	7.4856	0.0062	0.18128	0.03631	0.9051
Private Office	-0.1558	0.1994	0.6103	0.4347	0.85573	0.51199	1.4303
Cubicle or Shared	-0.3436	0.2002	2.9443	0.0862	0.70921	0.42345	1.1878

Association of Predicted Probabilities and Observed Responses

Concordant = 77.8%	Somers' D = 0.558
Discordant = 22.0%	Gamma = 0.560
Tied - 0.3%	Tau-a = 0.182
(521507 pairs)	c = 0.779

Response Variable: Odor of Cosmetics, Body Odor, Food
Number of Observations: 1739
ex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1969.253	1769.311	.
SC	1974.714	1922.221	.
-2 LOG L	1967.253	1713.311	253.942 with 27 DF (p=0.0001)
Score	.	.	237.856 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.4691	0.3632	16.3638	0.0001	0.23013	0.09029	0.58655
Hours at Work	-0.0795	0.0406	3.8283	0.0504	0.92358	0.83186	1.02540
Photocopier Nearby	0.3223	0.1604	4.0370	0.0445	1.38030	0.91312	2.08650
Plants Nearby	0.0338	0.1239	0.0744	0.7850	1.03438	0.75174	1.42328
Use Fan	0.3887	0.1276	9.2776	0.0023	1.47506	1.06184	2.04909
Use Lamp	-0.0366	0.1279	0.0819	0.7747	0.96406	0.69345	1.34027
Water Leaks Nearby	0.1503	0.1782	0.7117	0.3989	1.16218	0.73437	1.83922
Window Nearby	-0.2023	0.1327	2.3237	0.1274	0.81685	0.58034	1.14974
Glare	0.4287	0.1256	11.6494	0.0006	1.53526	1.11088	2.12176
Noise	0.2821	0.1295	4.7457	0.0294	1.32591	0.94981	1.85094
Dust	0.3527	0.1305	7.3064	0.0069	1.42290	1.01667	1.99146
Medium Pay	-0.3978	0.1656	5.7714	0.0163	0.67180	0.43850	1.02920
High Pay	-0.6863	0.2198	9.7491	0.0018	0.50344	0.28579	0.88684
Role Conflict	0.4548	0.0857	28.1651	0.0001	1.57586	1.26369	1.96514
College Grad	-0.6570	0.1598	16.8935	0.0001	0.51840	0.34347	0.78243
Eczema	-0.1873	0.2221	0.7111	0.3991	0.82919	0.46793	1.46936
Under 30	0.2334	0.1473	2.5122	0.1130	1.26289	0.86412	1.84567
AHU12	-2.2270	1.0796	4.2556	0.0391	0.10785	0.00668	1.74029
AHU21	-38.8452 #	.	.	.	.	.	.
AHU3	0.1708	0.8256	0.0428	0.8361	1.18625	0.14143	9.94973
AHU5	0.5296	0.3993	1.7593	0.1847	1.69825	0.60714	4.75025
ETB	-1.4776	1.0686	1.9122	0.1667	0.22818	0.01455	3.57911
CM FL2	0.9369	0.3863	5.8820	0.0153	2.55206	0.94345	6.90336
CM FL7	0.8179	0.3936	4.3166	0.0377	2.26574	0.82200	6.24520
ET1F1011	-0.3901	0.4589	0.7225	0.3953	0.67699	0.20758	2.20787
ET3FL811	-0.5140	0.6740	0.5815	0.4457	0.59810	0.10538	3.39473
Private Office	-0.2059	0.2043	1.0163	0.3134	0.81391	0.48086	1.37765
Cubicle or Shared	-0.0616	0.1466	0.1765	0.6744	0.94026	0.64453	1.37169

Association of Predicted Probabilities and Observed Responses

Concordant = 74.3%	Somers' D = 0.489
Discordant = 25.4%	Gamma = 0.491
Tied = 0.3%	Tau-a = 0.185
(571560 pairs)	c = 0.745

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Odor of Cosmetics, Body Odor, Food
Number of Observations: 1762
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1355.773	1269.129	.
SC	1361.248	1422.407	.
-2 LOG L	1353.773	1213.129	140.645 with 27 DF (p=0.0001)
Score	.	.	141.348 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.1670	0.5076	18.2219	0.0001	0.11452	0.03097	0.4234
Hours at Work	-0.0306	0.0463	0.4372	0.5085	0.96986	0.86082	1.0927
Photocopier Nearby	0.2486	0.2212	1.2624	0.2612	1.28223	0.72527	2.2669
Plants Nearby	0.2403	0.1551	2.3995	0.1214	1.27163	0.85279	1.8962
Use Fan	-0.0619	0.1592	0.1511	0.6974	0.93998	0.62375	1.4165
Use Lamp	0.3211	0.1583	4.1149	0.0425	1.37864	0.91697	2.0728
Water Leaks Nearby	0.6036	0.1944	9.6369	0.0019	1.82869	1.10830	3.0173
Window Nearby	-0.0867	0.1620	0.2866	0.5924	0.91695	0.60410	1.3918
Glare	0.3577	0.1547	5.3477	0.0207	1.43004	0.96001	2.1302
Noise	0.4928	0.1694	8.4631	0.0036	1.63689	1.05805	2.5324
Dust	0.6936	0.1579	19.2939	0.0001	2.00091	1.33222	3.0052
Medium Pay	-0.4186	0.3128	1.7902	0.1809	0.65797	0.29394	1.4728
High Pay	-0.8489	0.3204	7.0206	0.0081	0.42789	0.18745	0.9767
Role Conflict	0.3715	0.1102	11.3734	0.0007	1.44991	1.09158	1.9259
College Grad	-0.5101	0.2881	3.1348	0.0766	0.60044	0.28586	1.2612
Eczema	0.1425	0.2598	0.3009	0.5833	1.15315	0.59052	2.2518
Under 30	-0.1674	0.2827	0.3507	0.5537	0.84586	0.40835	1.7521
AHU12	-37.6905 #	.	.	.	.	.	.
AHU21	-0.7523	1.0814	0.4839	0.4866	0.47128	0.02907	7.6399
AHU3	1.3876	0.6571	4.4598	0.0347	4.00523	0.73706	21.7647
AHU5	-0.7833	0.6134	1.6310	0.2016	0.45690	0.09410	2.2185
ETB	-36.5162 #	.	.	.	.	.	.
CM FL2	0.6364	0.4669	1.8580	0.1729	1.88967	0.56760	6.2911
CM FL7	0.3728	0.4158	0.8038	0.3700	1.45179	0.49743	4.2372
ET1F1011	-0.4343	0.6361	0.4662	0.4947	0.64772	0.12582	3.3344
ET3FL811	-0.0153	0.4680	0.0011	0.9739	0.98482	0.29497	3.2880
Private Office	-0.2600	0.2433	1.1412	0.2854	0.77105	0.41200	1.4430
Cubicle or Shared	-0.0666	0.2216	0.0902	0.7639	0.93557	0.52864	1.6557

Association of Predicted Probabilities and Observed Responses

Concordant	72.9%	Somers' D	= 0.463
Discordant	- 26.6%	Gamma	= 0.465
Tied	= 0.6%	Tau-a	= 0.104
(348445 pairs)		c	= 0.731

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Odor from Photocopies, Printing
Number of Observations: 1749
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1187.150	1058.861	.
SC	1192.617	1299.400	.
-2 LOG L	1185.150	970.861	214.289 with 43 DF (p=0.0001)
Score	.	.	224.068 with 43 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.2530	0.4413	54.3430	0.0001	0.03866	0.01240	0.1205
Wood Index	0.0533	0.0916	0.3383	0.5608	1.05475	0.83305	1.3354
Fabric Partitions	-0.1966	0.1883	1.0909	0.2963	0.82152	0.50578	1.3344
Photocopier Nearby	1.4110	0.1886	55.9507	0.0001	4.10005	2.52229	6.6648
Plants Nearby	0.0060	0.1773	0.0011	0.9730	1.00602	0.63717	1.5884
1 Hour at Copier	-0.5068	0.1853	7.4823	0.0062	0.60242	0.37376	0.9710
Use Heater	0.3553	0.1904	3.4817	0.0620	1.42661	0.87357	2.3298
Window Nearby	-0.1616	0.1832	0.7779	0.3778	0.85078	0.53072	1.3639
Glare	-0.0188	0.1805	0.0109	0.9170	0.98138	0.61646	1.5623
Noise	0.0460	0.1831	0.0632	0.8014	1.04707	0.65333	1.6781
Dust	1.0485	0.2113	24.6113	0.0001	2.85337	1.65565	4.9175
Role Conflict	0.3210	0.1136	7.9865	0.0047	1.37851	1.02877	1.8471
Wear Glasses	-0.1459	0.1736	0.7062	0.4007	0.86424	0.55262	1.3516
Allergy: Other	0.5781	0.2396	5.8196	0.0158	1.78265	0.96165	3.3046
Chem. Sensitivity	0.5899	0.1778	11.0086	0.0009	1.80381	1.14098	2.8517
Eczema	0.5935	0.2711	4.7943	0.0286	1.81031	0.90046	3.6395
Nonsmoker	-0.3775	0.2153	3.0744	0.0795	0.68557	0.39372	1.1938
AHU14	-0.4703	0.9349	0.2531	0.6149	0.62481	0.05621	6.9449
AHU16	-38.1109 #	.	.	.	.	.	.
AHU18	-37.0425 #	.	.	.	.	.	.
AHU20	-37.0338 #	.	.	.	.	.	.
AHU4	-0.7099	1.0780	0.4337	0.5102	0.49169	0.03060	7.9013
AHU8	-1.2889	1.0456	1.5196	0.2177	0.27557	0.01864	4.0738
NE1	0.2341	0.5255	0.1984	0.6560	1.26377	0.32641	4.8929
NEG3	0.4098	0.8326	0.2423	0.6225	1.50652	0.17640	12.8659
NEG4	-0.6986	1.1475	0.3706	0.5427	0.49728	0.02587	9.5578
SE32	-0.0176	0.5757	0.0009	0.9756	0.98255	0.22300	4.3293
G1LG1	1.8803	0.9242	4.1395	0.0419	6.55547	0.60626	70.8836
FCFL2	0.8556	0.5850	2.1387	0.1436	2.35279	0.52134	10.6181
FCFL3	-0.1547	1.1190	0.0191	0.8901	0.85667	0.04797	15.2999
FCFL7	0.0672	0.7683	0.0076	0.9303	1.06951	0.14779	7.7395
ET1FL45	-1.1941	1.0570	1.2764	0.2586	0.30298	0.01990	4.6123
ET1F1011	0.1142	0.5507	0.0430	0.8357	1.12098	0.27133	4.6311
ET2FL13	-0.4836	0.6724	0.5173	0.4720	0.61656	0.10908	3.4851
ET2FL45	-0.9804	1.0652	0.8471	0.3574	0.37516	0.02413	5.8331
ET2FL67	-36.8985 #	.	.	.	.	.	.
ET2F1011	0.0657	0.6080	0.0117	0.9139	1.06791	0.22302	5.1136
WT1FL45	-0.2955	0.6423	0.2116	0.6455	0.74416	0.14226	3.8926
WT1FL67	0.3560	0.6458	0.3038	0.5815	1.42761	0.27047	7.5352
ET3FL811	-0.9613	1.1387	0.7126	0.3986	0.38240	0.02035	7.1850
Tackd Carpet, Room	0.4155	0.3302	1.5830	0.2083	1.51513	0.64720	3.5470
Tackd Carpet, Hall	0.1495	0.3477	0.1848	0.6673	1.16125	0.47418	2.8439
Private Office	-0.7495	0.2701	7.7007	0.0055	0.47260	0.23568	0.9477
Cubicle or Shared	-0.2616	0.1984	1.7376	0.1874	0.76982	0.46177	1.2834

Association of Predicted Probabilities and Observed Responses

Concordant = 78.9%	Somers' D = 0.583
Discordant = 20.6%	Gamma = 0.586
Tied = 0.5%	Tau-a = 0.111
(290718 pairs)	c = 0.791

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Odor from Photocopies, Printing
Number of Observations: 1724
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1016.374	873.950	.
SC	1021.827	1113.856	.
-2 LOG L	1014.374	785.950	228.424 with 43 DF (p=0.0001)
Score	.	.	229.242 with 43 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.9061	0.5425	28.6938	0.0001	0.05469	0.01352	0.2212
Wood Index	-0.1615	0.0963	2.8147	0.0934	0.85087	0.66394	1.0904
Fabric Partitions	-0.2807	0.2137	1.7243	0.1891	0.75525	0.43553	1.3097
Photocopier Nearby	1.4827	0.2311	41.1675	0.0001	4.40482	2.42877	7.9886
Plants Nearby	0.5035	0.2028	6.1632	0.0130	1.65450	0.98126	2.7896
1 Hour at Copier	0.4646	0.2425	3.6717	0.0553	1.59138	0.85208	2.9721
Use Heater	0.5100	0.2769	3.3936	0.0655	1.66529	0.81604	3.3984
Window Nearby	-0.6493	0.2090	9.6534	0.0019	0.52241	0.30493	0.8950
Glare	0.6318	0.2000	9.9785	0.0016	1.88099	1.12367	3.1487
Noise	0.3580	0.2187	2.6801	0.1016	1.43047	0.81434	2.5127
Dust	0.7431	0.2066	12.9340	0.0003	2.10244	1.23479	3.5798
Role Conflict	0.5459	0.1361	16.0965	0.0001	1.72616	1.21568	2.4510
Wear Glasses	-0.5828	0.1952	8.9146	0.0028	0.55833	0.33769	0.9231
Allergy: Other	0.1657	0.2912	0.3240	0.5692	1.18022	0.55742	2.4989
Chem. Sensitivity	0.5282	0.2093	6.3719	0.0116	1.69588	0.98910	2.9077
Eczema	0.1776	0.3162	0.3157	0.5742	1.19435	0.52891	2.6970
Nonsmoker	-0.9105	0.2672	11.6085	0.0007	0.40232	0.20214	0.8008
AHU14	-37.5719 #	.	.	.	.	.	.
AHU16	-0.6037	0.9103	0.4398	0.5072	0.54678	0.05241	5.7044
AHU18	-1.3685	1.0502	1.6979	0.1926	0.25449	0.01701	3.8069
AHU20	-36.2326 #	.	.	.	.	.	.
AHU4	-37.9683 #	.	.	.	.	.	.
AHU8	-37.5594 #	.	.	.	.	.	.
NE1	-1.2772	1.0412	1.5049	0.2199	0.27882	0.01908	4.0752
NEG3	-39.2688 #	.	.	.	.	.	.
NEG4	-37.7690 #	.	.	.	.	.	.
SE32	-1.6674	1.1224	2.2068	0.1374	0.18874	0.01048	3.4004
G1LG1	0.9214	1.0927	0.7110	0.3991	2.51281	0.15056	41.9381
FCFL2	-0.5394	0.7933	0.4624	0.4965	0.58310	0.07555	4.5003
FCFL3	-37.4971 #	.	.	.	.	.	.
FCFL7	-0.8847	1.0569	0.7007	0.4026	0.41284	0.02713	6.2832
ET1FL45	-0.4670	0.8191	0.3251	0.5686	0.62688	0.07600	5.1707
ET1F1011	-1.1820	0.8390	1.9848	0.1589	0.30666	0.03532	2.6625
ET2FL13	-0.6600	0.6525	1.0232	0.3118	0.51685	0.09625	2.7755
ET2FL45	-37.4315 #	.	.	.	.	.	.
ET2FL67	-1.1358	1.1443	0.9853	0.3209	0.32117	0.01685	6.1222
ET2F1011	-1.3705	0.8516	2.5900	0.1075	0.25398	0.02832	2.2778
WT1FL45	-0.5327	1.0545	0.2552	0.6134	0.58702	0.03881	8.8790
WT1FL67	-0.9272	0.7816	1.4073	0.2355	0.39566	0.05283	2.9630
ET3FL811	-0.7257	0.6359	1.3021	0.2538	0.48399	0.09406	2.4902
Tackd Carpet, Room	0.0246	0.4613	0.0028	0.9574	1.02491	0.31233	3.3633
Tackd Carpet, Hall	0.9532	0.3981	5.7319	0.0167	2.59400	0.93025	7.2334
Private Office	-0.5817	0.2802	4.3087	0.0379	0.55895	0.27158	1.1504
Cubicle or Shared	-0.3969	0.2673	2.2054	0.1375	0.67240	0.33774	1.3387

Association of Predicted Probabilities and Observed Responses

Concordant = 83.6%	Somers' D = 0.676
Discordant = 16.0%	Gamma = 0.679
Tied = 0.4%	Tau-a = 0.107
(234675 pairs)	c = 0.838

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Odor from New Carpet or Drapes
Number of Observations: 1766
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1601.937	1349.835	.
SC	1607.413	1678.424	.
-2 LOG L	1599.937	1229.835	370.102 with 59 DF (p=0.0001)
Score	.	.	400.402 with 59 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.5247	0.4798	53.9668	0.0001	0.0295	0.00856	0.101
Used Chemicals	0.3312	0.1765	3.5191	0.0607	1.3926	0.88385	2.194
New Carpet/Drapes	1.5898	0.1903	69.8245	0.0001	4.9028	3.00293	8.005
Walls Painted	0.4040	0.1913	4.4592	0.0347	1.4978	0.91504	2.452
Walls Rearranged	0.2469	0.1974	1.5643	0.2110	1.2801	0.76982	2.128
Water Leaks Nearby	0.0661	0.2186	0.0915	0.7623	1.0683	0.60834	1.876
Dust	0.5522	0.1660	11.0654	0.0009	1.7371	1.13268	2.664
Role Conflict	0.2678	0.1104	5.8856	0.0153	1.3071	0.98355	1.737
Role Clarity	-0.0205	0.0814	0.0631	0.8016	0.9797	0.79439	1.208
Wear Glasses	0.0808	0.1532	0.2783	0.5978	1.0842	0.73063	1.609
Asthma	0.4397	0.2436	3.2575	0.0711	1.5522	0.82877	2.907
Allergy to Pollen	-0.0329	0.1660	0.0392	0.8430	0.9676	0.63096	1.484
Allergy to Molds	0.2027	0.1763	1.3230	0.2501	1.2247	0.77767	1.929
Chem. Sensitivity	0.6838	0.1620	17.8278	0.0001	1.9814	1.30537	3.008
Under 30	-0.3934	0.1930	4.1553	0.0415	0.6748	0.41042	1.109
AHU12	1.1407	0.5336	4.5699	0.0325	3.1290	0.79148	12.370
AHU14	0.1251	0.7695	0.0264	0.8709	1.1333	0.15612	8.226
AHU2	-0.1917	0.7411	0.0669	0.7959	0.8256	0.12236	5.570
AHU20	-0.8747	0.8001	1.1953	0.2743	0.4170	0.05309	3.275
AHU3	1.1164	0.7871	2.0117	0.1561	3.0538	0.40205	23.196
AHU8	-0.0394	0.6496	0.0037	0.9516	0.9614	0.18037	5.124
ETB	1.1634	0.6465	3.2389	0.0719	3.2008	0.60533	16.925
NEG3	-1.0682	0.8181	1.7048	0.1917	0.3436	0.04177	2.827
NEG4	-1.1292	0.7583	2.2174	0.1365	0.3233	0.04584	2.280
NEG1NEG2	-38.2011 #	.	.	.	.	.	.
CM FL2	-1.4896	1.0354	2.0698	0.1502	0.2255	0.01566	3.247
CM FL7	-1.6409	0.7870	4.3467	0.0371	0.1938	0.02552	1.472
CM FL8	-1.2318	0.7967	2.3905	0.1221	0.2918	0.03747	2.272
FCFL2	-0.7411	0.7777	0.9081	0.3406	0.4766	0.06428	3.533
FCFL3	-0.7527	0.8736	0.7424	0.3889	0.4711	0.04963	4.471
FCFL7	-1.6143	0.7086	5.1900	0.0227	0.1990	0.03208	1.235
FCFL8	-0.0321	0.6195	0.0027	0.9587	0.9684	0.19634	4.777
ET1FL13	-0.7025	0.6510	1.1642	0.2806	0.4953	0.09260	2.650
ET1FL45	-0.8178	0.7147	1.3090	0.2526	0.4414	0.07003	2.782
ET1FL67	-1.5990	0.8580	3.4727	0.0624	0.2021	0.02217	1.843
ET1FL89	-0.9331	0.6724	1.9255	0.1653	0.3933	0.06959	2.223
ET1F1011	-0.5228	0.5250	0.9914	0.3194	0.5929	0.15332	2.292
ET2FL13	-0.3393	0.6732	0.2541	0.6142	0.7123	0.12575	4.034
ET2FL45	-0.2906	0.7297	0.1586	0.6905	0.7478	0.11414	4.899
ET2FL67	0.5145	0.6212	0.6860	0.4075	1.6728	0.33766	8.287
ET2F1011	-0.5693	0.5903	0.9301	0.3348	0.5659	0.12370	2.589
WT1FL13	-0.6705	0.8432	0.6323	0.4265	0.5115	0.05827	4.489
WT1FL45	-0.3813	0.6121	0.3881	0.5333	0.6830	0.14113	3.305
WT1FL67	0.5113	0.6685	0.5850	0.4443	1.6675	0.29797	9.331
WT1FL89	-0.8641	0.8338	1.0740	0.3000	0.4214	0.04919	3.610

WT1F1011	-0.4944	0.6024	0.6737	0.4118	0.6099	0.12923	2.879
WT2FL45	-0.9679	0.8266	1.3711	0.2416	0.3799	0.04517	3.194
WT2FL67	-1.0951	0.7373	2.2065	0.1374	0.3345	0.05007	2.235
WT2FL89	-0.4084	0.6149	0.4413	0.5065	0.6647	0.13637	3.240
WT2F1011	-1.3826	0.7486	3.4109	0.0648	0.2509	0.03648	1.726
ET3FL47	-1.0269	0.8965	1.3121	0.2520	0.3581	0.03557	3.606
ET3FL811	-0.3973	0.7053	0.3173	0.5732	0.6721	0.10925	4.135
WT3FL47	-39.2120 #	.	.	.	.	.	.
WT3FL811	2.7577	1.2084	5.2077	0.0225	15.7635	0.70108	354.440
Glued Carpet, Room	0.9010	0.2926	9.4850	0.0021	2.46206	1.15866	5.23171
Glued Carpet, Hall	0.3575	0.3830	0.8713	0.3506	1.42975	0.53307	3.83476
Tackd Carpet, Room	1.3260	0.2863	21.4476	0.0001	3.76595	1.80127	7.87355
Tackd Carpet, Hall	0.7890	0.4518	3.0497	0.0808	2.20119	0.68740	7.04865
Private Office	-0.1401	0.2141	0.4284	0.5128	0.86927	0.50076	1.50896
Cubicle or Shared	0.1501	0.1758	0.7293	0.3931	1.16195	0.73878	1.82752

Association of Predicted Probabilities and Observed Responses

Concordant = 81.8%	Somers' D = 0.639
Discordant = 17.9%	Gamma = 0.641
Tied = 0.3%	Tau-a = 0.179
(436293 pairs)	c = 0.820

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Odor from New Carpet or Drapes
Number of Observations: 1737
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1565.639	1271.478	.
SC	1571.099	1599.073	.
-2 LOG L	1563.639	1151.478	412.161 with 59 DF (p=0.0001)
Score	.	.	435.701 with 59 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.3469	0.5175	20.5688	0.0001	0.09567	0.02522	0.3628
Used Chemicals	0.1622	0.2414	0.4516	0.5016	1.17610	0.63151	2.1903
New Carpet/Drapes	1.4285	0.1930	54.8079	0.0001	4.17244	2.53789	6.8597
Walls Painted	0.6643	0.2103	9.9729	0.0016	1.94313	1.13040	3.3402
Walls Rearranged	0.1033	0.2203	0.2201	0.6390	1.10882	0.62864	1.9558
Water Leaks Nearby	0.3583	0.2161	2.7503	0.0972	1.43089	0.82006	2.4967
Dust	0.9110	0.1607	32.1476	0.0001	2.48681	1.64384	3.7620
Role Conflict	0.2297	0.1205	3.6356	0.0566	1.25822	0.92246	1.7162
Role Clarity	-0.2612	0.0914	8.1609	0.0043	0.77013	0.60857	0.9746
Wear Glasses	-0.3148	0.1602	3.8609	0.0494	0.72993	0.48313	1.1028
Asthma	0.4227	0.2566	2.7131	0.0995	1.52608	0.78797	2.9556
Allergy to Pollen	-0.4085	0.1770	5.3278	0.0210	0.66465	0.42128	1.0486
Allergy to Molds	0.3843	0.1889	4.1381	0.0419	1.46859	0.90275	2.3891
Chem. Sensitivity	0.3271	0.1787	3.3499	0.0672	1.38694	0.87526	2.1977
Under 30	0.1830	0.2873	0.4056	0.5242	1.20081	0.57288	2.5170
AHU12	1.2461	0.6768	3.3896	0.0656	3.47676	0.60815	19.8765
AHU14	-1.3271	0.8872	2.2373	0.1347	0.26525	0.02698	2.6073
AHU2	0.2369	0.9749	0.0591	0.8080	1.26731	0.10285	15.6152
AHU20	-0.4487	0.7214	0.3868	0.5340	0.63846	0.09956	4.0944
AHU3	-0.0889	0.8182	0.0118	0.9135	0.91494	0.11118	7.5292
AHU8	-37.4838 #	.	.	.	.	.	.
ETB	0.9810	0.8396	1.3651	0.2426	2.66712	0.30672	23.1921
NEG3	-1.7105	1.1054	2.3944	0.1218	0.18078	0.01048	3.1174
NEG4	-1.0364	0.7260	2.0382	0.1534	0.35473	0.05466	2.3020
NEG1NEG2	-2.2830	0.8614	7.0239	0.0080	0.10198	0.01109	0.9380
CM FL2	-1.8022	1.0407	2.9989	0.0833	0.16494	0.01130	2.4076
CM FL7	-1.6112	0.7670	4.4132	0.0357	0.19965	0.02768	1.4399
CM FL8	-1.8370	0.7494	6.0083	0.0142	0.15929	0.02311	1.0980
FCFL2	-2.0122	1.1065	3.3073	0.0690	0.13369	0.00773	2.3121
FCFL3	-0.8181	0.8720	0.8802	0.3481	0.44127	0.04668	4.1711
FCFL7	-0.9342	0.6053	2.3822	0.1227	0.39290	0.08262	1.8683
FCFL8	-1.1102	0.8679	1.6364	0.2008	0.32949	0.03523	3.0818
ET1FL13	0.5874	0.5769	1.0366	0.3086	1.79930	0.40710	7.9526
ET1FL45	-1.2500	0.8863	1.9891	0.1584	0.28650	0.02921	2.8098
ET1FL67	-1.2130	0.8363	2.1035	0.1470	0.29730	0.03448	2.5633
ET1FL89	-0.8427	0.7656	1.2116	0.2710	0.43055	0.05991	3.0941
ET1F1011	-0.5990	0.5328	1.2640	0.2609	0.54936	0.13925	2.1673
ET2FL13	-1.1539	0.7512	2.3597	0.1245	0.31540	0.04555	2.1841
ET2FL45	-1.5905	1.1127	2.0434	0.1529	0.20382	0.01160	3.5816
ET2FL67	-1.2846	0.9053	2.0136	0.1559	0.27676	0.02687	2.8504
ET2F1011	-0.6971	0.6174	1.2746	0.2589	0.49803	0.10152	2.4432
WT1FL13	-0.7541	0.9202	0.6716	0.4125	0.47043	0.04396	5.0346
WT1FL45	-0.0774	0.7556	0.0105	0.9184	0.92552	0.13215	6.4820
WT1FL67	-1.7925	1.1026	2.6430	0.1040	0.16654	0.00973	2.8514

WT1FL89	-1.3743	1.1157	1.5174	0.2180	0.25302	0.01429	4.4805
WT1F1011	-0.6081	0.7869	0.5972	0.4396	0.54438	0.07171	4.1328
WT2FL45	-0.5680	0.7876	0.5200	0.4708	0.56666	0.07451	4.3097
WT2FL67	-0.8590	0.7332	1.3726	0.2414	0.42359	0.06407	2.8003
WT2FL89	-1.0770	1.1343	0.9016	0.3424	0.34062	0.01833	6.3278
WT2F1011	0.0847	0.6908	0.0150	0.9024	1.08839	0.18364	6.4508
ET3FL47	-1.1335	0.6640	2.9138	0.0878	0.32190	0.05819	1.7806
ET3FL811	-1.4484	0.6198	5.4617	0.0194	0.23495	0.04760	1.1598
WT3FL47	-1.1528	0.7631	2.2823	0.1309	0.31575	0.04422	2.2545
WT3FL811	-1.1459	1.1775	0.9471	0.3305	0.31794	0.01531	6.6018
Glued Carpet, Room	1.1074	0.3072	12.9987	0.0003	3.02648	1.37170	6.67752
Glued Carpet, Hall	0.1463	0.4203	0.1212	0.7278	1.15754	0.39204	3.41779
Tackd Carpet, Room	1.2915	0.3050	17.9310	0.0001	3.63824	1.65834	7.98193
Tackd Carpet, Hall	1.0557	0.4376	5.8202	0.0158	2.87399	0.93094	8.87251
Private Office	0.4434	0.2636	2.8294	0.0926	1.55800	0.79007	3.07232
Cubicle or Shared	0.3452	0.2602	1.7602	0.1846	1.41227	0.72247	2.76067

Association of Predicted Probabilities and Observed Responses

Concordant = 83.7%	Somers' D = 0.676
Discordant = 16.0%	Gamma = 0.678
Tied = 0.3%	Tau-a = 0.188
(418472 pairs)	c = 0.838

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Response Variable: Musty/Damp Odor, Diesel Exhaust
Number of Observations: 1760
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1952.340	1812.263	.
SC	1957.813	1965.509	.
-2 LOG L	1950.340	1756.263	194.077 with 27 DF (p=0.0001)
Score	.	.	196.612 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.80520	0.3551	62.4101	0.0001	0.0605	0.02424	0.151
Hours at Work	0.00277	0.0396	0.0049	0.9442	1.0028	0.90553	1.110
Use Lamp	0.33310	0.1204	7.6588	0.0056	1.3953	1.02321	1.903
Water Leaks Nearby	0.30220	0.1719	3.0911	0.0787	1.3528	0.86882	2.106
Glare	0.39360	0.1250	9.9122	0.0016	1.4823	1.07423	2.045
Dust	0.76470	0.1330	33.0498	0.0001	2.1483	1.52515	3.026
Role Conflict	0.22130	0.0851	6.7677	0.0093	1.2477	1.00208	1.554
Underutilization	-0.00678	0.0577	0.0138	0.9065	0.9932	0.85606	1.152
College Grad	-0.27050	0.1334	4.1108	0.0426	0.7630	0.54111	1.076
Allergy to Molds	0.39460	0.1325	8.8662	0.0029	1.4838	1.05472	2.087
Chem. Sensitivity	0.19060	0.1275	2.2336	0.1350	1.2100	0.87124	1.680
Eczema	0.50440	0.1983	6.4719	0.0110	1.6560	0.99360	2.760
AHU16	1.28930	0.5647	5.2122	0.0224	3.6302	0.84758	15.549
AHU2	0.65910	0.5021	1.7233	0.1893	1.9331	0.53030	7.046
AHU20	0.60790	0.6342	0.9187	0.3378	1.8366	0.35851	9.408
AHU21	0.00537	0.8153	0.0000	0.9947	1.0054	0.12309	8.212
AHU5	0.80020	0.3560	5.0515	0.0246	2.2260	0.88971	5.569
AHU9	0.72910	0.3888	3.5159	0.0608	2.0732	0.76151	5.644
ETB	1.40460	0.5590	6.3125	0.0120	4.0739	0.96523	17.194
AWU15SW2	2.04980	0.4229	23.4914	0.0001	7.7663	2.61277	23.085
G1LG1	2.79520	1.1431	5.9795	0.0145	16.3659	0.86120	311.010
NEG1NEG2	1.47090	0.6653	4.8885	0.0270	4.3532	0.78434	24.160
ET1FL67	-0.41250	0.4665	0.7819	0.3766	0.6620	0.19905	2.202
ET1F1011	-0.31200	0.4420	0.4983	0.4802	0.7320	0.23443	2.286
UGHAHU19	-0.05940	0.5947	0.0100	0.9205	0.9423	0.20365	4.360
Tackd Carpet, Room	0.41820	0.2310	3.2772	0.0703	1.5192	0.83790	2.755
Private Office	0.16260	0.1759	0.8545	0.3553	1.1766	0.74788	1.851
Cubicle or Shared	0.15940	0.1441	1.2235	0.2687	1.1728	0.80913	1.700

Association of Predicted Probabilities and Observed Responses

Concordant - 70.2%	Somers' D = 0.408
Discordant = 29.4%	Gamma = 0.410
Tied = 0.4%	Tau-a = 0.150
(569191 pairs)	c = 0.704

Response Variable: Musty/Damp Odor, Diesel Exhaust
Number of Observations: 1734
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1784.031	1574.255	.
SC	1789.489	1727.084	.
-2 LOG L	1782.031	1518.255	263.776 with 27 DF (p=0.0001)
Score	.	.	276.906 with 27 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.5554	0.4530	61.6016	0.0001	0.0286	0.00889	0.0918
Hours at Work	0.0511	0.0406	1.5815	0.2085	1.0524	0.94792	1.1685
Use Lamp	0.3599	0.1343	7.1854	0.0073	1.4332	1.0i404	2.0256
Water Leaks Nearby	1.0398	0.1704	37.2177	0.0001	2.8287	1.82367	4.3875
Glare	0.3207	0.1333	5.7890	0.0161	1.3781	0.97757	1.9427
Dust	0.8282	0.1348	37.7537	0.0001	2.2892	1.61762	3.2396
Role Conflict	0.3877	0.0977	15.7602	0.0001	1.4736	1.14571	1.8953
Underutilization	0.1788	0.0656	7.4251	0.0064	1.1958	1.00986	1.4159
College Grad	-0.1330	0.2720	0.2391	0.6249	0.8755	0.43445	1.7642
Allergy to Molds	0.1736	0.1425	1.4832	0.2233	1.1896	0.82409	1.7172
Chem. Sensitivity	-0.0281	0.1513	0.0346	0.8525	0.9723	0.65846	1.4357
Eczema	-0.1199	0.2303	0.2711	0.6026	0.8870	0.49010	1.6054
AHU16	2.1596	0.5250	16.9189	0.0001	8.6677	2.24162	33.5152
AHU2	2.4240	0.7417	10.6826	0.0011	11.2909	1.67093	76.2959
AHU20	0.7696	0.6306	1.4894	0.2223	2.1589	0.42536	10.9575
AHU21	0.9694	0.6415	2.2832	0.1308	2.6364	0.50505	13.7619
AHU5	-0.2613	0.4286	0.3717	0.5421	0.7700	0.25529	2.3228
AHU9	0.6764	0.4549	2.2108	0.1370	1.9668	0.60931	6.3485
ETB	1.2630	0.6834	3.4157	0.0646	3.5360	0.60809	20.5619
AWU15SW2	1.8906	0.3896	23.5436	0.0001	6.6233	2.42781	18.0692
G1LG1	1.7257	0.8897	3.7617	0.0524	5.6165	0.56770	55.5658
NEG1NEG2	0.7950	0.6006	1.7523	0.1856	2.2144	0.47135	10.4035
ET1FL67	-0.8392	0.7589	1.2230	0.2688	0.4321	0.06117	3.0518
ET1F1011	-2.2904	1.0377	4.8721	0.0273	0.1012	0.00699	1.4663
UGHAHU19	1.0143	0.5756	3.1052	0.0780	2.7574	0.62597	12.1466
Tackd Carpet, Room	0.5307	0.2647	4.0195	0.0450	1.7001	0.85970	3.3621
Private Office	-0.1070	0.2083	0.2638	0.6075	0.8985	0.52541	1.5366
Cubicle or Shared	-0.0685	0.2039	0.1128	0.7369	0.9338	0.55225	1.5789

Association of Predicted Probabilities and Observed Responses

Concordant = 75.3%	Somers' D = 0.511
Discordant = 24.3%	Gamma = 0.513
Tied = 0.4%	Tau-a = 0.170
(498680 pairs)	c = 0.755

Response Variable: Tobacco Smoke Odor
Number of Observations: 1813
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1517.464	1414.921	.
SC	1522.967	1557.993	.
-2 LOG L	1515.464	1362.921	152.543 with 25 DF (p=0.0001)
Score	.	.	165.224 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.8434	0.3562	16.4545	0.0001	0.02142	0.00856	0.0536
Shelf Index	0.0634	0.0493	1.6567	0.1980	1.06545	0.93838	1.2097
Photocopier Nearby	0.4613	0.1852	6.2005	0.0128	1.58613	0.98435	2.5558
Water Leaks Nearby	0.6123	0.1867	10.7594	0.0010	1.84467	1.14038	2.9839
Dust	0.5216	0.1561	11.1636	0.0008	1.68472	1.12692	2.5186
Role Conflict	0.2933	0.0969	9.1526	0.0025	1.34084	1.04465	1.7210
Allergy to Pollen	-0.5335	0.1632	10.6785	0.0011	0.58655	0.38523	0.8931
Allergy to Molds	0.1809	0.1679	1.1607	0.2813	1.19830	0.77755	1.8467
Chem. Sensitivity	0.8755	0.1515	33.3923	0.0001	2.40008	1.62456	3.5458
Live Alone	-0.0584	0.1643	0.1262	0.7224	0.94327	0.61777	1.4403
Nonsmoker	0.3309	0.2052	2.5993	0.1069	1.39222	0.82062	2.3620
AHU13	0.9868	0.5209	3.5891	0.0582	2.68264	0.70115	10.2640
AHU14	0.9735	0.6339	2.3584	0.1246	2.64719	0.51715	13.5505
AHU3	1.7330	0.7387	5.5040	0.0190	5.65760	0.84376	37.9356
G1LG1	2.1850	0.9284	5.5389	0.0186	8.89065	0.81338	97.1794
NEG1NEG2	1.7342	0.6890	6.3360	0.0118	5.66439	0.96015	33.4170
CM FL11	0.6542	0.4828	1.8365	0.1754	1.92360	0.55461	6.6718
FCFL7	0.0759	0.5504	0.0190	0.8904	1.07885	0.26134	4.4537
CM2NOFL	1.6179	0.5692	8.0789	0.0045	5.04249	1.16374	21.8491
ET2FL67	1.0699	0.5365	3.9770	0.0461	2.91509	0.73189	11.6107
ET2F1011	0.4791	0.4766	1.0105	0.3148	1.61462	0.47302	5.5114
WT1FL13	1.7105	0.4772	12.8468	0.0003	5.53173	1.61807	18.9114
WT2FL13	0.7541	0.4190	3.2386	0.0719	2.12570	0.72235	6.2554
UGHAHU19	-1.2292	1.0686	1.3232	0.2500	0.29253	0.01865	4.5883
Private Office	0.2946	0.1904	2.3927	0.1219	1.34259	0.82212	2.1926
Cubicle or Shared	0.1995	0.1626	1.5057	0.2198	1.22079	0.80303	1.8559

Association of Predicted Probabilities and Observed Responses

Concordant = 71.2%	Somers' D = 0.429
Discordant = 28.3%	Gamma = 0.431
Tied = 0.6%	Tau-a = 0.108
(412782 pairs)	c = 0.714

Response Variable: Tobacco Smoke Odor
Number of Observations: 1809
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1368.556	1284.153	.
SC	1374.056	1427.167	.
-2 LOG L	1366.556	1232.153	134.403 with 25 DF (p=0.0001)
Score	.	.	156.850 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-3.5818	0.4278	70.1065	0.0001	0.0278	0.00924	0.0838
Shelf Index	0.0759	0.0525	2.0880	0.1485	1.0789	0.94239	1.2351
Photocopier Nearby	0.0450	0.2417	0.0347	0.8523	1.0460	0.56123	1.9496
Water Leaks Nearby	0.4175	0.1971	4.4860	0.0342	1.5182	0.91372	2.5224
Dust	0.5741	0.1543	13.8441	0.0002	1.7755	1.19318	2.6421
Role Conflict	0.3111	0.1078	8.3316	0.0039	1.3649	1.03397	1.8018
Allergy to Pollen	-0.1991	0.1701	1.3693	0.2419	0.8195	0.52873	1.2701
Allergy to Molds	0.2213	0.1767	1.5675	0.2106	1.2477	0.79146	1.9669
Chem. Sensitivity	0.7523	0.1639	21.0742	0.0001	2.1219	1.39110	3.2365
Live Alone	0.3422	0.1976	2.9989	0.0833	1.4080	0.84635	2.3425
Nonsmoker	0.2594	0.2509	1.0687	0.3012	1.2962	0.67915	2.4737
AHU13	1.4085	0.4908	8.2360	0.0041	4.0898	1.15511	14.4805
AHU14	1.4073	0.6020	5.4642	0.0194	4.0849	0.86636	19.2604
AHU3	-0.1731	1.0636	0.0265	0.8707	0.8411	0.05432	13.0232
G1LG1	1.7852	0.9061	3.8819	0.0488	5.9608	0.57758	61.5170
NEG1NEG2	1.5990	0.5598	8.1585	0.0043	4.9481	1.16994	20.9271
CM FL11	1.3358	0.4679	8.1493	0.0043	3.8030	1.13939	12.6938
FCFL7	0.8395	0.4616	3.3082	0.0689	2.3152	0.70498	7.6033
CM2NOFL	0.7937	0.6734	1.3894	0.2385	2.2116	0.39025	12.5332
ET2FL67	-0.3809	1.0582	0.1296	0.7189	0.6832	0.04474	10.4335
ET2F1011	-0.7000	0.7511	0.8685	0.3514	0.4966	0.07173	3.4378
WT1FL13	2.8070	0.5604	25.0882	0.0001	16.5602	3.90950	70.1468
WT2FL13	0.5423	0.6755	0.6445	0.4221	1.7200	0.30186	9.8001
UGHAHU19	0.8552	0.5889	2.1091	0.1464	2.3518	0.51592	10.7210
Private Office	-0.3613	0.2212	2.6685	0.1024	0.6968	0.39412	1.2318
Cubicle or Shared	-0.2955	0.2213	1.7839	0.1817	0.7442	0.42081	1.3160

Association of Predicted Probabilities and Observed Responses

Concordant = 70.9%	Somers' D = 0.425
Discordant = 28.4%	Gamma = 0.428
Tied = 0.7%	Tau-a = 0.093
(359114 pairs)	c = 0.713

APPENDIX F

RESULTS OF LOGISTIC REGRESSIONS USING ALTERNATIVE CRITERION

Appendix F. Results of Logistic Regressions Using Alternative Criterion

This appendix presents the results of a set of logistic regressions carried out on a single health factor (eye irritation) as a test of the effects of employing a different criterion for identifying a "positive" response. In the first set of logistic regressions, the criterion to be counted as a positive response was a sufficiently high score on an index composed of the sum of scores based on responses to individual symptoms. Previous studies have used different criteria (e.g., requiring that at least one symptom in a group be experienced "often" or "always.") Therefore we ran a test set of regressions to determine whether very different results might be obtained from different criteria for defining positive responses.

Somewhat surprisingly, we found that this approach, which seemed potentially more stringent, actually counted many more people as having eye irritation symptoms than our index-based criterion: more than 400 men and more than 500 women, compared to 232 men and 456 women. The set of four regressions using the "often or always" criteria resulted in only one variable (glare) being identified as significant ($p < 0.01$) for both men and women with and without the comfort variables included. The reduced ability to identify significant variables may be due to the increased number of responders identified as "positive"; if some of these should have been classified as negative, the misclassification would have reduced the ability to detect associations.

Using "often" or "always" Criterion

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision
Number of Observations: 1762
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1869.798	1690.610	.
SC	1875.272	1871.258	.
-2 LOG L	1867.798	1624.610	243.188 with 32 DF (p=0.0001)
Score	.	.	230.186 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.8188	0.4630	15.4320	0.0001	0.16222	0.04922	0.53467
Laser Printer Nearby	0.0985	0.1179	0.6980	0.4035	1.10351	0.81448	1.49513
Plants Nearby	0.0115	0.1127	0.0104	0.9187	1.01157	0.75668	1.35231
Hours at VDT	-0.0039	0.0253	0.0234	0.8785	0.99614	0.93329	1.06322
1 Hour at Copier	0.0814	0.1265	0.4140	0.5200	1.08480	0.78312	1.50270
Use Heater	0.0918	0.1316	0.4865	0.4855	1.09615	0.78098	1.53849
Walls Painted	0.0434	0.1315	0.1090	0.7413	1.04436	0.74428	1.46542
Water Leaks Nearby	-0.3382	0.1746	3.7517	0.0528	0.71305	0.45477	1.11803
Window Nearby	-0.0572	0.1169	0.2395	0.6246	0.94441	0.69884	1.27626
Lights Too Dim	0.2356	0.1964	1.4383	0.2304	1.26567	0.76313	2.09914
Glare	0.4812	0.1146	17.6377	0.0001	1.61801	1.20441	2.17365
Noise	0.1635	0.1172	1.9458	0.1630	1.17763	0.87074	1.59266
Dust	0.5987	0.1208	24.5556	0.0001	1.81975	1.33312	2.48403
Workload	-0.0614	0.0598	1.0564	0.3040	0.94045	0.80618	1.09707
External Stress	0.0239	0.0468	0.2612	0.6093	1.02419	0.90787	1.15541
Wear Contact Lens	-0.0085	0.1303	0.0043	0.9478	0.99150	0.70879	1.38696
Wear Glasses	0.1524	0.1119	1.8546	0.1732	1.16463	0.87297	1.55372
College Grad	0.2290	0.1333	2.9519	0.0858	1.25734	0.89192	1.77248
Allergy to Animals	-0.2805	0.1607	3.0449	0.0810	0.75541	0.49934	1.14278
Allergy to Molds	0.0058	0.1323	0.0020	0.9648	1.00586	0.71536	1.41431
Chem. Sensitivity	0.0742	0.1188	0.3895	0.5326	1.07702	0.79308	1.46262
Sole Provider	-0.0897	0.1748	0.2635	0.6078	0.91421	0.58276	1.43417
AHU12	-0.6139	0.5130	1.4320	0.2314	0.54124	0.14437	2.02909
AHU16	-0.9719	0.6390	2.3132	0.1283	0.37836	0.07295	1.96239
SE31	0.0421	0.4721	0.0080	0.9289	1.04300	0.30912	3.51919
G1LG1	-37.3537 #	.	.	.	.	.	.
FCFL2	-0.5768	0.5729	1.0134	0.3141	0.56169	0.12840	2.45712
ET1FL67	-0.0921	0.4167	0.0488	0.8251	0.91201	0.31176	2.66797
ET1F1011	-0.6463	0.4569	2.0008	0.1572	0.52398	0.16150	1.70008
ET2F1011	-0.2283	0.4440	0.2645	0.6071	0.79589	0.25359	2.49788
Tackd Carpet, Hall	0.1037	0.2422	0.1835	0.6684	1.10927	0.59440	2.07012
Private Office	-0.1227	0.1652	0.5519	0.4575	0.88453	0.57796	1.35372
Cubicle or Shared	-0.1253	0.1341	0.8730	0.3501	0.88223	0.62454	1.24625

Association of Predicted Probabilities and Observed Responses

Concordant = 74.4%	Somers' D = 0.491
Discordant = 25.3%	Gamma = 0.493
Tied = 0.3%	Tau-a = 0.170
(537040 pairs)	c = 0.746

NOTE: Parameter estimates marked with '#' are regarded to be infinite.

Using "often" or "always" Criterion

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision (Including Comfort and Odor Variables)
Number of Observations: 1746
Sex: Female

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	2072.820	2057.932	.
SC	2078.285	2200.024	.
-2 LOG L	2070.820	2005.932	64.888 with 25 DF (p=0.0001)
Score	.	.	63.978 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.66240	0.2659	39.0963	0.0001	0.18968	0.09562	0.3763
Hours at VDT	0.00157	0.0249	0.0040	0.9496	1.00157	0.93935	1.0679
1 Hour at Copier	0.08940	0.1260	0.5029	0.4782	1.09352	0.79043	1.5128
Use Heater	0.07970	0.1315	0.3676	0.5443	1.08296	0.77179	1.5196
Walls Painted	0.05320	0.1312	0.1645	0.6850	1.05464	0.75219	1.4787
Glare	0.39040	0.1143	11.6596	0.0006	1.47757	1.10072	1.9834
Workload	-0.05950	0.0597	0.9931	0.3190	0.94224	0.80792	1.0989
Wear Contact Lens	0.01590	0.1294	0.0151	0.9023	1.01603	0.72801	1.4180
Wear Glasses	0.11770	0.1114	1.1151	0.2910	1.12491	0.84428	1.4988
Allergy to Animals	-0.05420	0.1571	0.1191	0.7300	0.94724	0.63199	1.4198
Allergy to Molds	0.01850	0.1325	0.0194	0.8892	1.01867	0.72410	1.4331
Chem. Sensitivity	0.03380	0.1202	0.0790	0.7787	1.03438	0.75894	1.4098
Hot Stuffy Air	0.04850	0.0190	6.5326	0.0106	1.04970	0.99956	1.1023
Dry Air	0.06220	0.0333	3.4791	0.0621	1.06418	0.97670	1.1595
Cosmetic, Body Odor	0.03480	0.0358	0.9438	0.3313	1.03541	0.94420	1.1354
Photocopies Odor	-0.06920	0.0883	0.6139	0.4333	0.93314	0.74330	1.1715
AHU10	1.46710	0.7477	3.8496	0.0498	4.33664	0.63193	29.7603
AHU12	-0.55610	0.5125	1.1772	0.2779	0.57344	0.15316	2.1471
AHU16	-0.56850	0.5717	0.9887	0.3201	0.56637	0.12987	2.4700
AHU21	-1.27910	1.0566	1.4654	0.2261	0.27829	0.01830	4.2321
NE1	0.02910	0.3372	0.0075	0.9312	1.02953	0.43191	2.4540
SE32	0.27060	0.3655	0.5482	0.4591	1.31075	0.51123	3.3606
FCFL2	-0.47900	0.5638	0.7219	0.3955	0.61940	0.14495	2.6468
FCFL6	0.60820	0.4167	2.1297	0.1445	1.83712	0.62800	5.3743
Private Office	-0.12770	0.1603	0.6347	0.4256	0.88012	0.58238	1.3301
Cubicle or Shared	-0.10340	0.1288	0.6445	0.4221	0.90177	0.64714	1.2566

Association of Predicted Probabilities and Observed Responses

Concordant = 61.7%	Somers' D = 0.241
Discordant = 37.7%	Gamma = 0.242
Tied = 0.6%	Tau-a = 0.097
(614673 pairs)	c = 0.620

Using "often" or "always" Criterion

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision
Number of Observations: 1758
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1964.760	1919.749	.
SC	1970.232	2100.323	.
-2 LOG L	1962.760	1853.749	109.011 with 32 DF (p=0.0001)
Score	.	.	107.132 with 32 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-1.70510	0.5172	10.8693	0.0010	0.18175	0.04796	0.6888
Laser Printer Nearby	0.20740	0.1266	2.6844	0.1013	1.23047	0.88806	1.7049
Plants Nearby	-0.09330	0.1225	0.5801	0.4463	0.91092	0.66441	1.2489
Hours at VDT	0.02720	0.0289	0.8876	0.3461	1.02757	0.95385	1.1070
1 Hour at Copier	0.23880	0.1377	3.0065	0.0829	1.26972	0.89055	1.8103
Use Heater	0.26540	0.1887	1.9782	0.1596	1.30395	0.80196	2.1202
Walls Painted	-0.04470	0.1515	0.0872	0.7678	0.95628	0.64729	1.4128
Water Leaks Nearby	0.06150	0.1714	0.1287	0.7198	1.06343	0.68384	1.6537
Window Nearby	-0.01870	0.1235	0.0230	0.8796	0.98147	0.71403	1.3491
Lights Too Dim	-0.12580	0.2574	0.2389	0.6250	0.88179	0.45436	1.7113
Glare	0.61920	0.1200	26.6159	0.0001	1.85744	1.36353	2.5303
Noise	0.33410	0.1251	7.1358	0.0076	1.39668	1.01191	1.9278
Dust	0.17730	0.1228	2.0845	0.1488	1.19399	0.87020	1.6383
Workload	0.10170	0.0680	2.2396	0.1345	1.10705	0.92917	1.3190
External Stress	-0.08380	0.0523	2.5710	0.1088	0.91962	0.80370	1.0522
Wear Contact Lens	-0.21320	0.1623	1.7251	0.1890	0.80799	0.53191	1.2274
Wear Glasses	0.10940	0.1234	0.7857	0.3754	1.11561	0.81182	1.5331
College Grad	-0.06740	0.2502	0.0725	0.7878	0.93482	0.49070	1.7809
Allergy to Animals	0.06160	0.1603	0.1474	0.7010	1.06354	0.70375	1.6073
Allergy to Molds	0.17450	0.1332	1.7159	0.1902	1.19065	0.84483	1.6780
Chem. Sensitivity	0.32260	0.1317	6.0036	0.0143	1.38071	0.98348	1.9384
Sole Provider	0.12560	0.1313	0.9156	0.3386	1.13383	0.80846	1.5902
AHU12	-0.45280	0.6718	0.4542	0.5003	0.63585	0.11266	3.5886
AHU16	-0.38650	0.5322	0.5273	0.4677	0.67943	0.17248	2.6763
SE31	-0.74510	0.7986	0.8703	0.3509	0.47469	0.06067	3.7139
G1LG1	0.99690	0.8275	1.4514	0.2283	2.70987	0.32151	22.8406
FCFL2	0.50100	0.3884	1.6638	0.1971	1.65037	0.60682	4.4885
ET1FL67	-0.35300	0.5745	0.3776	0.5389	0.70258	0.15995	3.0861
ET1F1011	-0.11170	0.4489	0.0619	0.8035	0.89431	0.28138	2.8425
ET2F1011	0.09330	0.4501	0.0430	0.8357	1.09779	0.34433	3.5000
Tackd Carpet, Hall	-0.00533	0.2321	0.0005	0.9817	0.99468	0.54705	1.8086
Private Office	-0.34510	0.1862	3.4353	0.0638	0.70815	0.43834	1.1440
Cubicle or Shared	0.00420	0.1782	0.0006	0.9812	1.00421	0.63455	1.5892

Association of Predicted Probabilities and Observed Responses

Concordant = 66.1%	Somers' D = 0.326
Discordant = 33.5%	Gamma = 0.328
Tied = 0.5%	Tau-a = 0.121
(573725 pairs)	c = 0.663

Using "often" or "always" Criterion

Response Variable: Dry, Itching or Tearing Eyes, Sore Eyes, Burning Eyes, Blurry Vision (Including Comfort and Odor Variables)
Number of Observations: 1749
Sex: Male

The LOGISTIC Procedure

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1952.958	1881.602	.
SC	1958.424	2023.738	.
-2 LOG L	1950.958	1829.602	121.356 with 25 DF (p=0.0001)
Score	.	.	120.185 with 25 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	Parameter Estimate	Standard Error	Wald Chi-Sq	Pr > Chi-Sq	Odds Ratios	99 Percent Confidence Intervals Low Limit	Upper Limit
Intercept	-2.5367	0.3398	55.7292	0.0001	0.07913	0.03297	0.1899
Hours at VDT	0.0129	0.0292	0.1961	0.6579	1.01298	0.93958	1.0921
1 Hour at Copier	0.2457	0.1393	3.1126	0.0777	1.27852	0.89303	1.8304
Use Heater	0.1687	0.1878	0.8072	0.3689	1.18376	0.72974	1.9203
Walls Painted	-0.0336	0.1518	0.0489	0.8251	0.96696	0.65401	1.4297
Glare	0.4433	0.1200	13.6579	0.0002	1.55784	1.14360	2.1221
Workload	0.0687	0.0678	1.0278	0.3107	1.07111	0.89947	1.2755
Wear Contact Lens	-0.1621	0.1613	1.0097	0.3150	0.85036	0.56124	1.2884
Wear Glasses	0.0731	0.1241	0.3476	0.5555	1.07584	0.78147	1.4811
Allergy to Animals	0.0327	0.1587	0.0423	0.8370	1.03324	0.68653	1.5551
Allergy to Molds	0.1259	0.1330	0.8961	0.3438	1.13417	0.80517	1.5976
Chem. Sensitivity	0.2524	0.1326	3.6225	0.0570	1.28711	0.91468	1.8112
Hot Stuffy Air	0.0462	0.0192	5.7736	0.0163	1.04728	0.99675	1.1004
Dry Air	0.1141	0.0370	9.4975	0.0021	1.12086	1.01897	1.2330
Cosmetic, Body Odor	0.0565	0.0457	1.5256	0.2168	1.05813	0.94061	1.1903
Photocopies Odor	0.1261	0.1214	1.0786	0.2990	1.13440	0.82975	1.5509
AHU10	0.8171	0.6353	1.6540	0.1984	2.26392	0.44068	11.6305
AHU12	-0.7357	0.7912	0.8647	0.3524	0.47917	0.06242	3.6782
AHU16	-0.1695	0.4813	0.1240	0.7247	0.84409	0.24431	2.9163
AHU21	0.9069	0.5747	2.4903	0.1145	2.47663	0.56353	10.8844
NE1	-0.1955	0.3869	0.2553	0.6134	0.82242	0.30357	2.2281
SE32	0.1205	0.5523	0.0476	0.8273	1.12806	0.27193	4.6797
FCFL2	0.6335	0.3955	2.5659	0.1092	1.88419	0.68024	5.2190
FCFL6	0.5761	0.4176	1.9027	0.1678	1.77909	0.60675	5.2166
Private Office	-0.2824	0.1876	2.2655	0.1323	0.75397	0.46503	1.2225
Cubicle or Shared	0.1036	0.1781	0.3383	0.5608	1.10916	0.70104	1.7549

Association of Predicted Probabilities and Observed Responses

Concordant = 67.2%	Somers' D = 0.349
Discordant = 32.3%	Gamma = 0.351
Tied = 0.5%	Tau-a = 0.130
(567170 pairs)	c = 0.675

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