BUILDING ILLNESS INDICES BASED ON QUESTIONNAIRE RESPONSES

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ABSTRACT

A self-completed questionnaire developed from a number of building studies was distributed to employees working in three air-conditioned offices and two naturally ventilated offices. Question items included a wide variety of aspects of people's work, ambient conditions, personal health, and biographical details. Significant differences in perceived ambient conditions and in the prevalence of work-related health problems between the two types of buildings were found. Factor analysis of the health data showed a good fit and orthogonal solution, although a difference in the significant factors was found for each building type. Based on these solutions, two health indices were constructed (general health, mucous membrane). These discriminated between the air-conditioned and the naturally ventilated offices, and ventilation factors were found to be the best predictors of the health indices. The results tentatively suggest two separate syndromes: "building-related illness," a symptom cluster common to all types of office buildings but varying in prevalence, and "building-specific illness," a symptom cluster unique to air-conditioned office buildings.

INTRODUCTION

Several recent studies have found a higher prevalence of headache, eye problems (eye irritation, sore, dry, itching, or watering eyes), nasal problems (stuffy, runny, or irritated nose), throat problems (dry, sore, or irritated throat), fatigue and lathargy (including sleepiness and weakness), chest problems (chest tightness, difficulty breathing), skin problems (dry, itching, or irritated skin), and problems maintaining concentration at work among office employees working in air-conditioned buildings compared with their counterparts working in naturally ventilated offices. These symtoms have been variously termed "building illness" (Sterling and Sterling 1983; Hedge 1984a, b) or the "sick building" syndrome (Finnegan et al. 1984; Robertson et al. 1985). In four studies, the incidence of "building illness" in air-conditioned buildings was found to be at least twice that in naturally ventilated buildings (Turiel et al. 1983; Hedge 1984a, b; Finnegan et al. 1984; Robertson et al. 1985). The various combinations of symptoms found to be of significance in these studies are summarized in Table 1. and this comparison suggests that complaints of headache, eye, nose, and throat problems, and lethargy and fatigue may be those most consistently reported by workers in "sick" buildings. It has also been suggested that other symptoms, such as skin rashes/irritation/dryness, nausea, dizziness, and respiratory problems (wheeze, shortness of breath, chest tightness), are characteristically more prevalent in "sick" buildings (WHO 1983; Stolwijk and Pierce 1984; Hawkins 1985), although empirical evidence to support this view has not been presented in these publications.

From the research conducted to date, no clear picture of the causal agent or agents has yet emerged. Studies comparing ambient conditions in air-conditioned and naturally ventilated buildings have typically found little difference in any of the environmental parameters measured (Turiel et al. 1983; Robertson et al. 1985). However, in an experimental study of an air-conditioned office building, Sterling and Sterling (1983) have shown that increasing the fresh air

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volume of the air-conditioning (constant air volume system) and changing the fluorescent luminaries to ones emitting minimal ultraviolet light significantly reduces the incidence of certain symptoms, e.g., headache. It has also been suggested that using subjective measures of the environment as actually experienced by the workers may yield more meaningful comparative results (Vischer 1985).

One difficulty with comparing much of this work is the lack of any clear consensus on both the defining symptoms of the "sick building syndrome" and the rate of prevalence at which such symptoms become indicative of a "sick" building. In one recent study, Robertson et al. (1985) have grouped "building illness" symptoms on an a priori basis into four categories:

dry symptoms - dry throat, stuffy nose, dry skin, difficulty wearing contact lenses
allergic symptoms - blocked, runny, or itchy nose, watering or itching eyes
asthma symptoms - chest tightness, wheeze, shortness of breath
uncertain cause - lethargy, headache

Although such groupings may appear intuitively sensible, no statistical analysis was undertaken to validate these. Thus, at present, it is not at all clear that the diverse range of symptoms reported in the literature as indicative of a "sick" building together constitute a legitimate syndrome or whether one or more subsets of these symptoms may form unique clusters in such buildings.

To further investigate the nature of the "sick" building syndrome," the present study describes some of the results from five office surveys in which, using a self-report questionnaire, data were collected on a wide range of office environmental problems including those of ambient conditions and of symptoms. These data were subjected to multivariate statistical analyses to explore whether or not clusters of symptoms can be defined, to assess the extent to which these may differ between workers in naturally ventilated or air-conditioned offices, and to test whether reported symptoms correlate with subjective assessment of ambient conditions in the buildings.

METHOD

The Offices

Three organizations occupying five office buildings participated in this survey. Two of the organizations were in Canada and one in the UK. Of the three buildings in Canada, two were air-conditioned and one was an adjoining, naturally ventilated building. The office layout in all of the air-conditioned buildings was predominantly open-plan, and the naturally ventilated buildings mainly comprised small group and private cellular offices.

The Survey Questionnaire

The same survey questionnaire was administered to all of the organizations. This questionnaire, the "Work Environment Survey", was compiled from earlier questionnaires used by the authors to evaluate office environements (Hedge 1982; Sterling et al. 1983). The Work Environment Survey comprised 151 precoded questions asking for a broad range of information on the respondent and the office environment. For all of the environmental and health questions, responses were made using a four-point rating scale (never; rarely; sometimes; always).

Of particular interest here are responses to the 19 questions that asked about the employee's reactions to the ambient environment at work and the 22 questions asking about work-related symptoms. The range of health symptoms included those most frequently mentioned in the literature as characterizing building illness (Sterling and Sterling 1983; WHO 1983; Finnegan et al. 1985). Certain additional symptoms were added, such as muscular aches, neckache, and backache, to enable a check to be made of whether the reported differences in the prevalence of a typical symptom, such as headache, might be attributable to poor work posture. A full list of the symptoms being investigated, their prevalence, and the significant differences between naturally ventilated and air-conditioned offices is presented in Table 5.

Other questions on the questionnaire asked for information including personal details such as smoking and drinking habits, organizational information, e.g., department, floor, job type, and work equipment such as VDTs, photocopiers, etc.

The Environmental Indices

Responses to the questions on ambient conditions were aggregated into a series of environ-

mental indices based on the a priori grouping of questions, most of which were organized into triads of the form "too much," "too little," "just right." In this way, six indices were constructed (ventilation, air quality, temperature, humidity, lighting, and noise). Individual responses to each of these indices were scored as either "good," "average," or "bad." A "good" score indicates the absence of any problems with the associated environmental parameter, an "average" score indicates the presence of intermittent problems, and a "bad" score indicates a persistent problem.

The questions asked are summarized in Table 2. For the Ventilation Index (VI), Humidity Index (HI), Temperature Index (TI), and Noise Index (NI), the criterion for a "good" score was that the response to the "just right" questions should be "always" and responses to the other two questions in each index should be "never." The criterion for a "bad" score was the exact reverse of this, and all other combinations of responses were classified as "average." For the Air Quality Index (AQI), the criterion for a "good" score was that all responses to the questions should be "never"; for a "bad" score, responses to any of these questions should be "always"; and other combinations were scored as "average". The criterion for a "good" score on the Lighting Index (LI) was that responses to the "just right" question should be "always" and those to the other three questions should be "never". The criterion for a "bad" score was the exact reverse of this, and all other combinations were scored as "average".

The Survey Sample

A total of 1010 employees returned completed questionnaires for analysis. Of these, 796 were received from those working in the air-conditioned offices and 214 from those working in the naturally ventilated offices. The composition of the survey sample in each of the office buildings is presented in Table 9. This clearly shows that in each sample the managerial and professional/technical staff were predominantly men whereas the clerical and supervisory staff were predominantly women, however, the profile appears similar for each building. Tables 10 and 11 summarize the percentages of smokers and those exposed to passive smoking in the offices. These tables show a similar pattern of smoking behavior and passive smoking exposure in each of the offices. The distributions of men and women, type of job, and active and passive smokers were comparable across the buildings surveyed and it is unlikely that any possible confounding effects of these factors alone might account for the differences in symptom prevalence reported in this paper.

RESULTS

Environmental Indices

Comparison of the air-conditioned and naturally ventilated buildings showed significant differences in the VI, AQI, HI, and LI (Table 3). Analysis of responses to individual questions in each of the indices showed that for the VI, eighty-eight percent of those in air-conditioned offices reported too little ventilation compared with sixty percent of those in naturally ventilated offices. For the AQI, eighty-eight percent of workers in air-conditioned offices compared with sixty-three percent of those in naturally ventilated offices, reported that the indoor atmosphere was usually "too stuffy.". Interestingly, there were no differences in reports that the indoor air was either usually "too smokey" (air-conditioned - thirty-nine percent; naturally ventilated - forty percent) or that it usually contained unpleasant odours (air-conditioned - forty-four percent; naturally ventilated - forty-two percent). The difference in the HI arose primarily from more reports that the air was "too dry" in the air-conditioned offices (eighty-four percent) compared with the naturally ventilated offices (fifty-four percent). Finally, more workers in the air-conditioned offices reported that the office lighting was usually "too bright" (air-conditioned - fifty percent; naturally ventilated - thirty-seven percent) and that they often experienced problems of reflected glare (air conditioned - fifty-six percent; naturally ventilated - forty-six percent).

In spite of the significant differences that were found in these environmental indices between the buildings, a physical survey of climatic conditions in one of the air-conditioned buildings and a corresponding naturally ventilated building failed to reveal any substantial differences in mean air temperature (22.7°C and 22.5°C, respectively), though mean relative humidity was higher for the naturally ventilated building (fifty-five versus forty-six percent; $t=5.21$, $p<0.001$), mean illumination level (750 lux versus 640 lux; $t-6.58$, $p<0.001$), mean noise level (54 dB versus 46 dB), and mean carbon dioxide levels (0.059% versus 0.046%; $t-5.06$, $p<0.001$). With the exception of relative humidity, these data would suggest that, if anything, the na-

turally ventilated environment should have had more problems but this was clarly not the case from the worker's viewpoint.

Intercorrelations of the environmental indices showed a similar pattern of significant relationships for each building type, and ventilation-related indices (VI, AQI and HI) consistently emerged as those most highly correlated irrespective of the actual type of ventilation (Table 4).

Health Indices

Many of the symptoms studied were significantly more prevalent in the air-conditioned buildings (Table 5). In keeping with previous studies of the "sick building" syndrome, the symptoms showing the strongest relationship with the type of building ventilation were headache, fatigue, sleepiness, sore throat, nose irritation, cold/flu symptoms, eye focusing problems, skin dryness, weakness, nausea, and fever. The incidence of respiratory problems, concentration problems, and reported cold extremities was significant between building types, though as indicated by their Phi coefficients, this relationship was weak. No significant differences between buildings were found for reports of muscular aches, backache, neckache, chest tightness, tension, or depression. Thus the profile of health complaints that emerges for the air-conditioned offices appears to follow that characteristic of "sick" buildings.

To investigate the possiblity that symptom clusters may exist, the data on health complaints in the offices were analyzed separately for the air-conditioned and naturally ventilated buildings by factor analysis (Principal Components Analysis with rotation) using the Statistical Package for the Social Sciences (Nie et al. 1975). The results of these analyses are summarized in Table 6. For the air-conditioned offices, two general factors emerged that together accounted for 79.1% of the common factor variance. Only items with a factor loading greater than 0.35 were considered of significance (Child 1970). Following from this, the first general factor to emerge, which we term "General Health," comprised weakness, nausea, dizziness, sleepiness, headache, fatigue, eye irritation, and eye focusing problems. The second factor, which we term "Mucous Membrane," consisted of the cluster of symptoms of nose and throat irritation and cold/flu symptoms. For the naturally ventilated offices, two general factors again emerged, and between them they accounted for 81.2 percent of the common factor variance. The first general factor appears to be very similar to the "General Health" factor found for the air-conditioned offices, except for a few minor differences in the significant factor loadings of items (weakness and nausea do not load significantly, but sore throat does load significantly on this factor). This suggests that a similar cluster of health symptoms may be present in both naturally ventilated offices and air-conditioned offices. However, the second factor to emerge for the naturally ventilated offices, which we term "Musculature," comprised of a cluster of musculoskeletal symptoms possibley associated with poor posture and cramped working conditions. No equivalent to the "Mucous Membrane" factor was found for the naturally ventilated offices, and this suggests that this symptom cluster may, in fact, be unique to air-conditioned buildings. These results also suggest that certain symptoms reportedly linked to working in "sick" buildings, e.g., skin dryness, fever, and respiratory problems, may not form significant clusters even within air-conditioned offices.

On the basis of these results, both a General Health Index (GHI) and a Mucous Membrane Index (MMI) were subsequently created using those items that loaded significantly with each of the two health factors for the air-conditioned offices. As with the environmental indices, each of these could take the value "good," "average," or "bad." For both of these indices, the criterion for a "good" score was that all responses to the associated questions should be "never" and the criterion for a "bad" score was that any response should be "always." All other combinations of responses were classified as "average." Statistical comparison of these two indices between the air-conditioned and naturally ventilated offices showed significant differences for each index (Table 7), and thus the indices appear to discriminate between "sick" and relatively healthy buildings.

It is possible that the differences in reported ill health may be attributable to differences in perceived environmental conditions in the two types of buildings. To explore this hypothesis, separate stepwise multiple regression analyses were performed for each health index as the dependent variable with the environmental indices as independent variables (Table 8). A consistent pattern clearly emerged with the AQI consistently being the single best predictor of both the GHI and MMI scores. However, as shown in Table 3, all of the environmental indices are significantly intercorrelated, with the correlations between the AQI and VI being particularly pronounced. Although the results of the regression analyses appear to support a link between perceived adequacy of the indoor air and self-reported illness, because of the intercorrelations, this suggestion must be treated with caution.

DISCUSSION

A major difference in self-reports of environmental comfort and health was demonstrated between air-conditioned and naturally ventilated offices. Many more workers in air-conditioned offices reported problems of perceived inadequacy of the ventilation (too little air movement, air too stuffy, air too dry) and unsatisfactory lighting (too bright, frequent glare problems) than do those in naturally ventilated offices, although such problems are still reported by a sizable proportion of the employees in those buildings as well. No significant differences emerged in subjective assessments of either levels of thermal comfort or noise for the two building types. Thus it would seem that, at least for the five buildings surveyed in this study, there is no subjective evidence to support the view that sealing and air conditioning an office building necessarily raises the level of perceived environmental comfort for the office workers. In fact, here the reverse appears to be the case. Physical measures of temperature, humidity, illuminance, noise level, and carbon dioxide concentration showed differences in the ambient conditions between the air-conditioned and the naturally ventilated buildings that were studied in detail, which generally suggest a more favorable climate in the air-conditioned offices; but this was not paralleled by subjective assessments of environmental conditions. It seems that subjective assessments of ambient conditions in these buildings are influenced by more than just the prevailing climatic conditions, and the possible role of mediating socio-psychological variables merits further study.

From self-reports of worker's health, major differences were found for particular symptoms between the types of office buildings and these results generally agree with those previously reported (Turiel et al. 1983; Sterling and Sterling 1983; Hedge 1984a; Finnegan et al. 1984; Robertson et al. 1985). From factor analysis of these data for the air-conditioned offices, two orthogonal factors emerged. The first of these, which we term "General Health," includes many of the symptoms that have previously been subsumed under the term "building illness," such as weakness, nausea, sleepiness, fatigue, dizziness, headache, eye irritation, eye focusing problems. The fact that a similar General Health factor also emerged for the naturally ventilated offices suggests that this symptom cluster may be reflecting what might more accurately be termed "building-related illness," i.e., a cluster of symptoms common to all office buildings. One effect of sealing and air-conditioning a building may be to exacerbate these building-related problems, thereby producing the increased prevalence rates typically reported in air-conditioned offices. The second factor to emerge for the air-conditioned offices, which we term "Mucous Membrane," includes a cluster of symptoms associated with mucous membrane problems such as nose irritation, throat irritation, and cold/flu like symptoms. The absence of this factor from analysis of the results for workers in the naturally ventilated offices suggests that these symptoms may comprise a unique cluster only in air-conditioned buildings and thus may be indicative of what might be termed "building-specific illness," i.e., a cluster of symptoms found only for air-conditioned buildings. The presence of such a cluster may also prove of use in discriminating "sick" buildings. The two health indices constructed on the basis of these results both showed significant differences between the two building types. The results from exploratory multiple regression analyses further suggest that perceived ventilation factors may be the single most potent predictor of reported health problems. Also, it is of interest to note that other symptoms, such as skin dryness/irritation, chest tightness, and respiratory problems, do not appear in these two factors, and this suggests that these may be specific symptoms whose prevalence is influenced by more than just the ventilation system of the building.

We recognize that it may be unwise to generalize from this survey of health problems in just five buildings to all types of buildings, but we believe that the findings reported here suggest that looking at a range of symptoms only at the level of the building may present an incomplete picture because important differences in symptom clusters between buildings may be overlooked. More extensive research into health symptoms for a larger number of buildings with a wider range of ventilation systems is needed to establish the validity of the symptom clusters that have been described. Investigation of the symptom profiles of the workers in different types of office buildings may yield important clues in the search for the causal factors of the "sick building" syndrome, and such research may also prove useful in the development of a standardized diagnostic questionnaire for identifying "sick" buildings.

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TABLE 1

Symptoms Reported As Significantly More Prevalent In Air-Conditioned Offices Than In Naturally Ventilated Offices

	Typical Symptoms of Building Illness						
Study	Headache	Eye	Nose	Throat	Skin	Lethargy	Concentration Problems
Turiel et al. (1983)		Yes	Yes	Yes			
Sterling & Sterling (1983)	Yes	Yes				Yes	Yes
Hedge (1984a, b)	Yes	Yes	Yes	Yes			
Finnegan et al. (1984)	Yes	Yes	Yes		Yes	Yes	
Robertson et al. (1985)	Yes	Yes	Yes	Yes	Yes	Yes	

TABLE 2

Composition of the Environmental Indices

INDEX	QUESTIONS
Ventilation Index (VI)	- too little air movement - too much air movement - just the right air movement
Air Quality Index (AQI)	- air too smokey - air too stuffy - unpleasant odours in the air
Humidity Index (HI)	- air too dry - air too moist - humidity just right
Temperature Index (TI)	- temperature too hot - temperature too cold - temperature just right
Noise Index (NI)	- too noisy - too quiet - noise level just right
Lighting Index (LI)	- lighting too bright - lighting too dim - too much glare on work surface - lighting just right

TABLE 3

Comparison of the Environmental Indices for the Two Types of Buildings

Index	Value	Air-Conditioned Offices	Naturally Ventilated Offices	Chi Square	Phi
VI	Good	8.8%	31.3%	80.35***	.28
	Bad	39.5%	20.6%		
AQI	Good	10.2%	27.6%	52.21***	.23
	Bad	38.4%	20.6%		
HI	Good	14.2%	39.3%	89.85***	.30
	Bad	44.2%	15.9%		
LI	Good	30.3%	42.5%	33.24***	.18
	Bad	32.2%	12.6%		
TI	Good	12.3%	17.3%	3.71	ns
	Bad	9.2%	9.3%		
NI	Good	26.9%	25.2%	4.56	ns
	Bad	17.4%	12.1%		

*** $p<0.001$

TABLE 4

Matrix of the Significant Correlations (Pearson's 'r') for the Environmental Indices For Both Building Types

	Air-Conditioned Offices					Naturally Ventilated Offices				
	AQI	HI	TI	LI	NI	AQI	HI	TI	LI	NI
VI	.56	.52	.36	.33	.17	.55	.61	.34	.35	.17
AQI		.49	.34	.32	.26		.49	.30	.34	.14
HI			.33	.31	.22			.26	.38	ns
TI				.24	.17				.28	ns
LI					.32					.17

TABLE 5

Comparison of the Health Complaints For The Two Types of Office Buildings

Symptom	Air-Conditioned Offices (% usually)	Naturally Ventilated Offices (% usually)	Chi Square	Phi
Sleepiness	69.2	44.5	49.92***	.22
Fatigue	68.0	52.4	18.69***	.14
Headache	67.2	50.5	21.82***	.15
Eye Irritation	52.1	45.9	8.15*	.09
Concentration Problems	50.9	41.2	6.70	
Cold/Flu Symptoms	50.2	32.4	24.00***	.16
Sore Throat	47.9	28.3	26.92***	.16
Nose Irritation	45.5	26.5	28.90***	.17
Focussing Problems	42.9	28.8	14.66***	.12
Backache	41.8	41.4	1.36	
Neckache	41.2	39.5	0.22	
Cold Extremities	40.7	38.8	8.37*	.09
Tension	36.1	33.1	0.60	
Skin Dryness	29.9	16.7	17.94***	.13
Depression	25.1	25.2	0.02	
Dizziness	23.6	15.5	6.63*	.08
Muscular Aches	21.1	17.2	5.78	
Weakness	20.3	9.1	13.94***	.12
Nausea	19.4	7.8	18.00***	.13
Respiratory Problems	12.2	5.7	9.85*	.10
Chest Tightness	9.8	6.8	3.36	
Fever	8.1	2.0	19.70***	.14

* $p<0.05$

*** $p<0.001$

(% usually = % sometimes + % always)

TABLE 6

Comparison of the Factor Analysis Results for the Two Types of Office Buildings

	Air-Conditioned Offices		Naturally Ventilated Offices	
Symptom	Factor 1	Factor 2	Factor 1	Factor 2
Weakness*	.583*	.151	.305	.120
Nausea*	.560*	.230	.172	.254
Fatigue*	.559*	.131	.546*	.120
Dizziness*	.531*	.129	.355*	.202
Sleepiness*	.518*	.191	.646*	.181
Eye Irritation*	.374*	.329	.643*	.257
Focussing Problems*	.360*	.212	.515*	.253
Headache*	.395*	.264	.482*	.247
Sore Throat*	.230	.689*	.351*	.295
Nose Irritation*	.140	.683*	.338	.149
Cold/Flu*	.213	.588*	.122	.073
Backache*	.222	.119	.230	.763*
Neckache*	.200	.207	.245	.761*
Muscular Aches*	.178	.096	.242	.521*
Fever	.338	.180	.079	.260
Depression	.313	.130	.317	.151
Concentration Problems	.145	.208	.307	.220
Tension	.211	.137	.173	.193
Chest Tightness	.143	.041	.056	.253
Respiratory Problems	.201	.216	.128	.024
Skin Dryness	.271	.266	.218	.272
Cold Extremities	.305	.304	.312	.282
Eigenvalue	6.943	0.997	7.682	1.027
% Common Factor Variance	69.2	9.9	71.6	9.6

* Indicates significant items and factor loadings

TABLE 7

Comparison of the Health Indices for the Two Types of Buildings

Index	Value	Air-Conditioned Offices	Naturally Ventilated Offices	Chi Square	Phi
General Health	Good	11.5%	27.6%		
Index	Bad	18.1%	10.8%	35.25***	.19
Mucous Membrane	Good	34.5%	54.7%		
Index	Bad	8.6%	3.4%	24.72***	.16

*** p<0.001

TABLE 8

Summary of the Multiple Regression Analyses of the Environmental and Health Indices For The Air-Conditioned Buildings

Air-Conditioned Offices

Dependent Variable = General Health Index

Significant Variables	R Square Change	Beta	T	P
Air Quality Index	0.173	284	7.54	<0.001
Humidity Index	0.024	.138	3.69	<0.001
Lighting Index	0.013	.111	3.24	<0.001
Temperature Index	0.006	.083	2.41	<0.01
Multiple R = .464	R Square = .216	F = 53.93	df 4,785	p<0.001

Dependent Variable = Mucous Membrane Index

Significant Variables	R Square Change	Beta	T	P
Air Quality Index	0.084	.157	3.97	<0.001
Humidity Index	0.025	.144	3.69	<0.001
Noise Index	0.012	.108	3.11	<0.002
Temperature Index	0.009	.102	2.81	<0.006
Multiple R = .361	R Square = .130	F = 29.39	df 4,785	p<0.001

TABLE 9

Composition Of The Survey Sample In Each Office Building By Job Type And Gender
(Those Not Indicating A Job Category Are Omitted)

		Manager		Professional/ Technical		Clerical/ Supervisory	
		Men	Women	Men	Women	Men	Women
Air Conditioned Offices	1	83% (39)	17% (8)	72% (148)	28% (58)	13% (26)	87% (177)
	2	91% (20)	9% (2)	97% (28)	3% (1)	16% (9)	84% (47)
	3	89% (33)	11% (4)	60% (31)	40% (21)	9% (8)	91% (78)
Naturally Ventilated Offices	1	100% (6)	0 (0)	69% (25)	31% (11)	6% (3)	94% (49)
	2	93% (14)	7% (1)	73% (40)	27% (15)	20% (8)	80% (31)

TABLE 10

Percentage Of Smokers In Each Of The Office Buildings

		% Smoke At Work		
		Yes	No	N
Air Conditioned Offices	1	18	82	484
	2	17	83	127
	3	20	80	178
Naturally Ventilated Offices	1	12	88	96
	2	21	79	117

TABLE 11

Percentage Of Workers At Locations Near To Smokers In The Offices

		% Work Near Smokers		
		Yes	No	N
Air Conditioned Offices	1	61	39	485
	2	59	41	127
	3	51	49	177
Naturally Ventilated Offices	1	53	47	97
	2	55	45	117