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Perception of Air Pollution and Annoyance Linked to Physical Levels of Pollution

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ABSTRACT

The study investigates the extent of perception of air pollution and annoyance among participants in Obio/Akpor LGA. The research design adopted is correlation design. The participants were randomly selected from the populations aged 20 and above. Sample size is 123 which consist of selected participant in Obio-Akpor LGA. Annoyance due to air pollution was self-reported on a 4- point scale (1: no disturbance at all, 4: intolerable disturbance) through the following question: 'How much are you annoyed by outdoor air pollution (from traffic, industry, etc.) if you keep the windows open?' Perception of Air pollution is measured by a questionnaire comprising of smoking and exposure to environmental tobacco smoke (ETS), defined as regular exposure to tobacco smoke at home and/or at work. Finally, the questionnaire asked about general as well as heavy vehicle traffic intensity in front of the home. This information was collected from a four-option question, where the options were no traffic, infrequent, frequent and constant traffic. The statistical analysis was performed using Pearson product correlation at 0.05 level of significance. Annoyance was associated with estimation of individual exposure to NO2, a pollutant related to traffic. There should be adequate awareness of the risks of air pollution.

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Introduction

Air pollution is a risk factor for respiratory and cardiovascular diseases. It is now accepted that air pollution is an important issue in public health given its impact on long-term mortality (Brook et al, 2004).However, the assessment of exposure to air pollution is complicated. Most of the epidemiological studies that assess health effects of air pollution use central site measurements, in some cases weighted by the distance between participants' homes and a main road, or individual patterns of daily activity (Brunekreef& Holgate, 2002). Another type of measure incorporating broader scopes and domains (such as quality of life or community values) is annoyance due to air pollution. It is a subjective score, often used for measuring noise or odours, but rarely used for air pollution exposure. In Sweden, this measure has been incorporated in the National Environmental monitoring program and urban citizens' annoyance correlated with urban air pollution even if pollutant levels were well below thresholds. There is strong epidemiological evidence that outdoor air pollution contributes to morbidity and mortality (Brook et al, 2004). Noise is also associated with a variety of harmful health effects. Although relative risks related to air pollution and noise are rather small, the public health impact is substantial owing to the ubiquitous exposure distribution in the population.

The World Health Organization defines annoyance as "a feeling of displeasure associated with any agent or condition, known or believed by an individual or group to adversely affect them" (William, 2001). This definition implies an effect that may not be pathogenically demonstrable but that involves a negative factor for the individual's comfort and well-being. Additionally, this definition could allude to the impact of air pollution and noise on health. Thus, air pollution and noise could also have psychological effects on individuals because these factors are perceived as a nuisance and environmental stressors that limit quality of life and well-being (Rotko, 2002). Nonetheless, the health effects of perceived annoyance from air pollution and noise remain poorly understood. Recent evidence suggests potential stress-related modifications that are associated with a wide range of pollutant exposures on health outcomes. In this sense, stress, which can influence immune function and susceptibility to illness, may potentiate the effects of air pollution on respiratory disease development and exacerbation (William, 2001).

Oglesby et al. (2000) have shown across eight Swiss towns and neighborhoods within these areas that the aggregate group mean annoyance correlated with the air quality in the city or neighbourhood. In contrast, individual reporting of annoyance was only weakly associated with outdoor levels of air pollution. Rotko et al. (2002) have shown that at the population level, the mean annoyance was correlated with mean PM2.5 and NO2 concentrations across six European cities, but individual annoyance was not associated with individual PM2.5or NO2 concentrations. Besides air quality, individual characteristics affect there porting of annoyance, leading to substantial subjectivity of annoyance scores. In previous studies, several variables such as gender, age, education or respiratory symptoms have been associated with annoyance due to air pollution but not consistently.

The rate of respondents highly annoyed by air pollution at home also varied across different European cities. It is not possible to generalize these results across cultures and countries as the previous studies were restricted to few areas. Literature about the relationship between exposure to environmental stressors and annoyance responses is scarce. The aim of the present study is to describe the degree of annoyance caused by air pollution among participants in Obio/Akpor LGA.

Statement of the Problem

The scientific community has begun to pay more attention not only to the proven health hazards caused by factors such as air pollution and noise, but also to reactions that are important for human well-being

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and yet are rarely studied, including distress or annoyance in relation to sensory perception of harmful environmental agents, and possible subsequent adverse effects of a psychological (quality of life) as well as physiological (prenatal development) nature. Stress can be detrimental at any age. However, there may be critical periods, such as during early immune development, when stress is particularly influential in shaping future susceptibility and disease risk. With respect to noise, children represent a group that is particularly vulnerable to non-auditory health effects. Prospective studies have linked stress exposures during prenatal development with broad biological and psychological vulnerabilities, affecting neuroendocrine, immune, metabolic, and growth processes. Although not entirely immutable, these effects may have permanent and compounding consequences, especially if not addressed early. Annoyance, as a first negative reaction, could be an early warning of health impairment. Distress caused by air pollution and noise is frequent; such annoyance has been recently reported in Europe. It is important to assess several other characteristics that have a great impact on annoyance reporting as stated in a previous study of one cohort that is included in the present work. The fact that the association between exposure and annoyance is not always strong underscores the need for prospective studies to evaluate effects, and the necessity to explore the determinants of annoyance in each study area.

Purpose of the Study

The study investigates the extent of perception of air pollution and annoyance among participants in Obio/Akpor LGA. The objectives of the study are to;

1. Examine the extent perception of sooth relates with annoyance among participants in Obio/Akpor LGA.
2. Determine the extent perception of car traffic relates with annoyance among participants in Obio/Akpor LGA.

Research Questions

1. To what extent the perception of sooth relates with annoyance among participants in Obio/Akpor LGA?
2. What is the extent the perception of car traffic relates with annoyance among participants in Obio/Akpor LGA?

Hypotheses

1. There is no significant relationship between perception of sooth and annoyance among participants in Obio/Akpor LGA.
2. There is no significant relationship between perception of car traffic and annoyance among participants in Obio/Akpor LGA.

Scope of the Study

This study consists of degree of annoyance caused by air pollution. The geographical area covered was Obio/Akpor LGA. The demography data of the respondents include socio-economic status, gender, location, age and educational level.

Literature Review

Annoyance due to noise has been related to physical and psychological conditions. (William, 2001) Similar studies have not been done for air pollution annoyance. It represents the subjectivity of the participant and incorporates dimensions such as dread, fear in the face of the unknown or anxiety.

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Aggregate Public Health indicators which include air pollution and residential noise have been proposed to assess the health of a population. Also, some authors have shown that people are concerned with air pollution and have proposed that to fully evaluate the impact of air pollution on health, it is necessary to not only assess the chemical aspect but also the circumstances, including the social ones, of the subject. Many factors have to be taken into account when assessing the relationship between air pollution levels such as air pollution perception and beliefs on air pollution risks (Kim, 2005). Air pollution might trigger annoyance by physical or psychological mechanisms. The former would include acute symptoms directly caused by air pollution. It has been recognized that air pollution is associated with headache, rhinitis, cough, eye irritation.

Subjects might attribute these to air pollution and therefore report annoyance. On the other hand, people may be aware of the risks of air pollution from which they cannot usually escape. This may cause frustration and lead to higher annoyance. The individual's perception of air pollution is also a key issue in the development of new policies of risk assessment and management. Risk perception is a complex matter that includes social, political and cultural aspects and annoyance due to air pollution is only one of the aspects related to air pollution risk perception. Thus, we conclude that individuals' annoyance due to air pollution, although not valid as a measure of true air quality, may be a useful measure of perceived ambient quality. It can easily be monitored in surveys, across Europe, and may put environmental policies into perspective of people's perception and help locate populations with the biggest needs for environmental changes.

Determinants of annoyance

Annoyance was associated with reported traffic density at home, both for cars and heavy vehicles, but associations were heterogeneous. Southern centres tended to report higher levels of annoyance when reporting high traffic frequencies. Despite the fact that these individuals generally experience less traffic, they may be more sensitive to traffic, or they may be closer to streets or live in street canyons in some of the densely populated Southern cities of ECRHS. Although regional pollution was in general associated with average annoyance, we observed substantial scatter across these cities and countries. Annoyance at home most likely reflects local (traffic) pollution rather than the regional air quality. To test this hypothesis, we also adjusted for the reported traffic density at home, which may capture both local traffic density and the perception thereof. However, results changed only marginally with substantial cross-city variation. As a general pattern, people living in polluted cities reported, on average, a higher annoyance due to air pollution, but it is necessary to interpret that correlation cautiously as mean annoyance varied across communities with very similar ambient air quality.

Annoyance due to noise has been related to physical and psychological conditions. Similar studies have not been done for air pollution annoyance. Aggregate Public Health indicators which include air pollution and residential noise have been proposed to assess the health of a population (Johnson, 2002).Also, some authors have shown that people are concerned with air pollution and have proposed that to fully evaluate the impact of air pollution on health, it is necessary to not only assess the chemical aspect but also the circumstances, including the social ones, of the subject. Many factors have to be taken into account when assessing the relationship between air pollution levels such as air pollution perception and beliefs on air pollution risks (Graham and McCurdy, 2004).

Air pollution might trigger annoyance by physical or psychological mechanisms. The former would include acute symptoms directly caused by air pollution. It has been recognized that air pollution. Several studies observed higher annoyance scores among women and some have argued that women are in general more sensitive to environmental risks (Johnson, 2002). It has been proposed that women have more environmental conscience, and some authors have suggested that women in general have a better

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sense of smell than males. However, it is still unclear why women could be more affected by air pollution and our data reveal differences across cities with men reporting higher annoyance in some centres. We hypothesize that in some cities women may spend more time at home, thus having a better perception of the home environment.

Adult women in the EXPOLIS study spent more time at home although not surprising, the reason why subjects with respiratory indicators report higher scores of annoyance is unclear. It could be the fact that having respiratory symptoms makes them more sensitive and vulnerable to irritant substances such as air pollution (Graham and McCurdy, 2004). Another explanation could be that symptomatic subjects, in general, spend more time at home. Subjects with respiratory symptoms could also be more likely to associate air pollution with a risk of respiratory disease, or be more aware of the risks of air pollution and therefore overstate their actual personal level of annoyance.

Socio-economic status was only associated with annoyance in the crude analysis. Non-manual workers tended to report more annoyance but this association was only marginally significant. The non-classified subjects tended to report higher annoyance than the manual workers. This group consisted mainly of housewives and students, as they tend to spend more time at home during the day, when there is more traffic, it is expected that they become more annoyed by air pollution. The fact that smokers are less likely to report high levels of annoyance can be explained by the fact that smokers tend to have a lower perceived risk of health-related problems and are also less concerned about their health. Another explanation could be that they are used to high smoke exposures and are less aware of ambient air quality. As opposed to smokers, those exposed to ETS tended to report greater annoyance, which could be due to the fact that they are more sensitive to air quality (Graham and McCurdy, 2004). In general, annoyance was associated with reported traffic density at home, both for cars and heavy vehicles, but associations were heterogeneous. Southern centres tended to report higher levels of annoyance when reporting high traffic frequencies. Despite the fact that these individuals generally experience less traffic, they may be more sensitive to traffic, or they may be closer to streets or live in street canyons in some of the densely populated Southern cities of ECRHS. Although regional pollution was in general associated with average annoyance, we observed substantial scatter across these cities and countries. Annoyance at home most likely reflects local (traffic) pollution rather than the regional air quality. To test this hypothesis, we also adjusted for the reported traffic density at home, which may capture both local traffic density and the perception thereof. However, results changed only marginally with substantial cross-city variation. As a general pattern, people living in polluted cities reported, on average, a higher annoyance due to air pollution, but it is necessary to interpret that correlation cautiously as mean annoyance varied across communities with very similar ambient air quality.

More than half of our study subjects reported medium or high annoyance levels owing to noise, and almost half reported these levels owing to air pollution. Reported annoyance was higher in Sabadell, which is the only cohort located exclusively in an urban area. Our results suggest a relationship between perception (annoyance) of NO_2 pollution and exposure (individual estimated levels). Therefore, more pollution means more perception of pollution. However, the correlation was weak in our results. In terms of participant socio-demographic characteristics, only country of origin and residential building age were related to the degree of perceived discomfort from air pollution; only building age was related to noise annoyance. Otherwise, annoyance from air pollution and noise were related to the proximity of their residences to traffic and the frequency of vehicles near their homes.

Compared with other European studies evaluating similar data with the same 11-point scale, the prevalence of high annoyance owing to air pollution found here (11.2%) was lower than the 18.1% found in the SAPALDIA in Switzerland [Hunter,2003] and the average 14% reported in 25 centers

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across 12 European countries included in the ECRHS II study. However, the prevalence was clearly higher than the percentage reported by Rotko et al. (2002) for the five European cities in the EXPOLIS study (2.7%–7.1%), in which the score range for the high category of annoyance was 7–10 in these cities, but for Prague, where the prevalence of high annoyance level was 25.3%. If we were to consider values of 7–10 as high annoyance, the percentage in our study would be 18.3% (Chipps, 2004). The mean value of annoyance caused by air pollution (3.6) was consistently higher in our study compared with the other studies.

There are few studies reporting the prevalence of noise annoyance, but we found lower percentages of participants with high discomfort levels from noise than in other European (27.9%–35.8%) or American (32%–51%) (Oncken et al, 2005) studies. However, it should be borne in mind that in the European study, a questionnaire item referring to road traffic nuisance was used to create the annoyance variable; in the American study, the degree of discomfort was not queried but instead the population at risk of discomfort was estimated from exposure to noise levels. Therefore, it is very difficult to compare these measures of discomfort among the various geographic regions. The rather high correlation found here between air pollution and noise annoyance is in agreement with other international studies, as is the low correlation found between annoyance scores and individual estimations of air pollution exposure. Study found an association between perceived annoyance from air pollution and socio economic status, as shown in previous studies (Stansfeld et al, 2000). Nonetheless, here the associations were weak and were not included in the final models. This suggests that residence location and age had more influence on the perception of discomfort rather than the specific characteristics of study participants. The age of the residence would reflect the theoretical degree of housing insulation. In our study, lower socioeconomic status, lower education and younger age corresponded to older housing. Moreover, the results show that participants who live in less insulated buildings are more bothered by air pollution and noise.

Recent studies found an association between air pollution annoyance and participants' country of origin. This could indicate that the relationship between exposure and annoyance may depend on the study area and social acceptance of local environmental conditions. This is in line with higher reported air pollution annoyance in other countries compared with Spain [Johnson, 2002].The fact that we found an association with NO_2 (specific to traffic emissions) suggests that participants detected or were distressed by environmental pollution associated with traffic, which is consistent with findings reported in other European studies (Williams, 2001). However, proximity to traffic (the main source of both air pollution and noise) was assessed. Furthermore, we found an association between noise and NO_2 exposure, also coming from traffic, suggesting that noise annoyance is also a function of traffic noise. Other geographic measures of potential for noise, such as distance to certain establishments or amount of green-space would help us to estimate an individual measurement of noise exposure. Noise exposure assessment will be very useful in future works and will allow us to characterize the complex interaction between noise, annoyance and health.

Contrary to the argument of some authors that discomfort is a good indicator of exposure, the results of Atari et al. (2003) suggest that perception is a significant predictor of well-being. It is important to collect information about the relationship between environmental pollution and annoyance, not only because this can be considered an indicator of traffic air pollution or long term exposure but also because it takes into account the possible psychological (quality of life and well-being) and physiological (prenatal development) stress-related effects that may be caused by such discomfort. We must also keep in mind that these effects may act as effect modifiers on health problems of environmental origin (Rokyo, 2002). For this purpose, correlations between the measure of annoyance and the exposure variable need not be high, but should consistently be in the anticipated direction, as in

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the present study.

We also found that high levels of annoyance were reported even when the estimated air pollution levels complied with current WHO guidelines (Hunter et al, 2004). This is in accordance with other air pollution-related effects, which seem to appear even at lower pollution levels than those established by the guidelines, emphasizing the need to reduce air pollution even further. Therefore, air pollution sensitivity partly reflects a general environmental sensitivity but is also influenced by several individual factors, such as personality traits, living conditions and attitudes toward the pollutant source. The influence of prior exposure to environmental stressors is another possible modifier of annoyance.

The combined effect of exposure to air pollution and noise, as well as the annoyance from both, can have health consequences, both directly from exposure and indirectly from stress and psychological distress, including preterm delivery and deficient prenatal development of the respiratory or neuroendocrine system. This implies public health concerns and highlights the need to implement effective environmental policies and technical risk assessment.

Methodology

The research design adopted is correlation design. The participants were randomly selected from the populations aged 20 and above. Sample size is 123 which consist of selected participant in Obio-Akpor LGA. Annoyance due to air pollution was self-reported on a 4- point scale (1: no disturbance at all, 4: intolerable disturbance) through the following question: 'How much are you annoyed by outdoor air pollution (from traffic, industry, etc.) if you keep the windows open?' Perception of Air pollution is measured by a questionnaire comprising of smoking and exposure to environmental tobacco smoke (ETS), defined as regular exposure to tobacco smoke at home and/or at work. Finally, the questionnaire asked about general as well as heavy vehicle traffic intensity in front of the home. This information was collected from a four-option question, where the options were no traffic, infrequent, frequent and constant traffic.

Statistical analysis

The statistical analysis was performed using Pearson Product Correlation at 0.05 level of significance.

Results

Research Question 1: To what extent the perception of sooth relates with annoyance among participants in Obio/Akpor LGA?

Hypothesis 1: There is no significant relationship between perception of sooth and annoyance among participants in Obio/Akpor LGA.

Table 1: Pearson Correlation showing the Relationship between Perception of Sooth and Annoyance among Participants in Obio/Akpor LGA

VARIABLES		Perception of sooth	Annoyance	Decision
Perception of sooth	Pearson Correlation		.829**	
	Sig. (2-tailed)		.000	
	N	123	123	H01 Rejected
Annoyance	Pearson Correlation	.829**		
	Sig. (2-tailed)	.000		
	N	123	123	
**. Correlation is significant at the 0.01 level (2-tailed).				

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Table 1 shows that the correlation co-efficient (r) was 0.829, indicating a high positive relationship between perception of sooth and annoyance. Also, the p-value of 0.00 was less than 0.05 level of significance. We therefore reject the null hypothesis (HO_1) and conclude that there is a significant relationship between perception of sooth and annoyance among participants in Obio/Akpor LGA.

Research Question 2: What is the extent the perception of car traffic relates with annoyance among participants in Obio/Akpor LGA?

H_{02}: There is no significant relationship between perception of car traffic and annoyance among participants in Obio/Akpor LGA.

Table 2: Pearson Correlation table showing the Relationship between Perception of Car Traffic and Annoyance among Participants in Obio/Akpor LGA

VARIABLES		Perception of car traffic	Annoyance	Decision
Perception of car traffic	Pearson Correlation		.804**	
	Sig. (2-tailed)		.000	
	N	123	123	H02 Rejected
Annoyance	Pearson Correlation	.804**		
	Sig. (2-tailed)	.000		
	N	123	123	
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 2 revealed that there is a high positive correlation between perception of car traffic and annoyance t, r = 0.804, p<.05. In addition, the p-value (0.00) was less than 0.05 level of significance. Hence, the null hypothesis (HO_2) was rejected. As a result, there is a significant relationship between perception of car traffic and annoyance among participants in Obio/Akpor LGA.

Conclusions

In this study, annoyance was associated perception on sooth with the proximity of housing to traffic, residential building age and participants' country of origin. Likewise, annoyance was associated with estimation of individual exposure to NO_2, a pollutant related to traffic. The health burden of these exposures can be increased by stress caused by the perception of harmful environmental sources.

Recommendations

1. There should be adequate awareness of the risks of air pollution.
2. Government should regulate cars emitting toxic fumes from their exhaust
3. Gas flare should be regulated and recycled

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Appendix

Annoyance Scale

Items	Intolerable disturbance	Tolerable disturbance	Little disturbance	No disturbance at all
How much are you annoyed by outdoor air pollution from traffic.				

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I get annoyed by outdoor air pollution from industry.				
Exposure to tobacco smoke at home and/or at work make me feel stressed				
I keep the windows closed due to fumes				

Air Pollution

Items	VHE	HE	LE	VLE
The rate of air pollution from traffic.				
There is outdoor air pollution from industry.				
I get expose to environmental tobacco smoke (ETS				
I keep the windows closed due to fumes				
I get heavy vehicle traffic intensity in front of the home.				

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