

Incidence of Respiratory Diseases as Related to the Environmental Hazards in Region I

Mercita Q. Queddeng

ABSTRACT

The study investigated the environmental hazards as related to the incidence of respiratory diseases in Region 1. The four provinces involved were Ilocos Sur, Ilocos Norte, La Union, and Pangasinan.

Findings revealed that majority of the respondents are young adults, female, married, and secondary graduates. A greater percentage of the respondents were semi-skilled and their weight ranges between 45-47 kilograms.

Most of the environmental hazards from the different localities under study were man-made with chemical and mechanical type. Only Zone III Bantay, Ilocos Sur had a physical type because the hazards caused by the construction materials are physical in nature. Quirino, Bacnotan, La Union has the highest incidence rate which is probably due to the exhaust of particulate molecules and dust or airborne pollution from the cement company.

The place of residence showed significant relationship to the incidence of respiratory diseases. The incidence of respiratory diseases is influenced by health-related factors in terms of height and weight which means that the respondents' height and weight were indicators of health conditions. Significant relationships also existed between the health-related variables in terms of height and weight and the incidence of respiratory diseases.

Keywords: respiratory diseases, hazards, chemical, cement, Bacnotan, pollution, incidence

INTRODUCTION

Being healthy is a major concern of any individual. The main consideration to the portal of being healthy is the environment where people exist. There are many concerns arising from the niche where humans live. The escalating problems of pollution in all settings which can be in water air and land greatly affects human health. Many other potential factors in the environment either mechanical, chemical, physical or psychosocial post danger in the maintenance of human health and the activities of daily living thereby become great threats to health and to the entire existence of humanity.

Environmental hazard is a generic term for any situation or state of events which poses a threat to the surrounding environment. This term incorporates topics like pollution and natural hazards such as storms and earthquakes. Environmental hazard is the risk of damage to the environment, for example, air pollution, water pollution, and others. It is a generic term for any situation or state of events which poses a threat.

Nothing is more important than health and it should not be taken for granted. One should not wait for the worse before acting on it. Thereby, these threats surrounding and inhibiting the healthy conditions of the human body should be spelled out and identified so as to protect and maintain its normal functioning. Accordingly, hazardous products are becoming a major issue of the modern times.

Environment is greatly at risk with the drawbacks of our modern technological society that made use of large number of substances to maintain the comforts of modern living. The benefits gained from using these materials must be weighed against the risks associated with their use. Pollution can take many forms. The air that is inhaled, the water that is drunk, the ground where food is grown, and even the increasing noise that is heard every day—all contribute to health problems and a lower quality of life (West, 2012).

Studies have associated some indoor environmental conditions with increased risks of nonspecific symptoms, respiratory disease (including asthma), and impaired performance.

Much has been said about these environmental hazards and it is timely to focus on these aspects and identify which among these highly affect the health condition of the people.

These were only several ailments that affect the human race that are associated with the presence of industries and modernized facilities.

According to the research report published in the FASEB Journal, what one eats and does are not the problem, but what's in what one eats could be the culprit. This study adds evidences for rethinking about the way of addressing risk assessment especially when considering that, "the human population is widely exposed to low levels of thousands of chemicals, and that the health impact of realistic mixtures of pollutants will have to be tested as well," said Brigitte Le Magueresse-Battistoni, a researcher involved in the work from the French National Institute of Health and Medical Research (INSERM). She further said that "indeed, one pollutant could have a different effect when in mixture with other pollutants. Thus, our study may have strong implications in terms of recommendations for food security, and our data also bring new light to the understanding of the impact of environmental food contaminants in the development of metabolic diseases" (Jones, 2012).

Region I is composed of four provinces, namely, Ilocos Norte, Ilocos Sur, La Union, and Pangasinan. They are fast catching in progress and advancement and probably along with them are some technological hazards.

The economy of Ilocos Sur is based on agriculture, producing a wide variety of vegetables, animals, and fish. Principal products are rice, corn, tobacco, garlic, sugarcane, and cassava. They are expanding into a variety of food-processing industries, and also practice a number of crafts and cottage industries. An airport is available and there are many construction firms. Moreover, the large scale redrying plant of Fortune tobacco emits smoke that can be inhaled in nearby municipalities and schools.

In La Union, the economy is diversified with service, manufacturing, and agricultural industries spread throughout the province. One of the biggest manufacturers of cement is located in Bacnotan, La Union. In Ilocos Norte, agro-industrial development with industrial competitiveness is equitably growing.

In Pangasinan there are several large technological sites like the Roque Multi-Purpose Dam, Northern Cement Corporation, and the 1200 megawattt Sual Coal-Fired Power Plant.

Increasingly, modern technological society bolsters a stronger force to encourage greater industrial growth and development which could mean more potential hazardous substances to arise.

Thereby, the reason for this research is to look into the relationship between the environmental hazards currently present in Region I and the incidence of respiratory diseases.

The modern technological society carries with it highly potential health risk. Both the human lives and environment suffer from these impending consequences of industrialization. Respiratory diseases are one of the major illnesses that arise from the modernization of our society. Permissive smoke from factories, release of particulate by products, and others contribute largely in the existence and aggravation of respiratory diseases. The study of Yang, Wei and Omaye, Stanley (2009) mentioned that air pollutants have been and continue to be the major contributing factors to chronic diseases and mortality, subsequently affecting public health. Chronic diseases include chronic obstructive pulmonary diseases (COPD), cardiovascular diseases (CVD), asthma, and cancer. By products of oxidative stress found in air pollutants are common initiators or promoters of the damage produced in such chronic diseases. Such air pollutants include ozone, sulfur oxides, carbon monoxide, nitrogen oxides, and particulate matter.

Results of the study could be used as baseline data for the officials concerned in the improvement of the health conditions of the people. Findings of this study could help officials to restructure a more efficient measure to evaluate these potential health hazards; intervene and come up with a more sustainable environmental co-existence. With this study, the awareness of the people would be increased specifically regarding the harmful effects of the potential environmental hazards and they would help plan, improve, and prevent the further exacerbation of the effects of environmental hazards in collaboration with the agencies concerned and the entire community.

This study generally aimed to determine the environmental hazards as related to the incidence of respiratory diseases in Region I. Specifically, this study sought to describe the socio-demographic characteristics of the respondents of the four provinces in Region I, namely, Ilocos Sur, Ilocos Norte, La Union and Pangasinan; the health-related profile of the respondents such as height and weight; the type of environmental hazards that exist in the localities under study; and determine the incidence rate of respiratory diseases among the selected localities under study; and find out any relationship between the incidence of respiratory diseases and the socio-demographic characteristics and health-related factors.

Air pollution can be broadly defined as the presence in the atmosphere of substances or energy in such quantities and of such duration liable to cause harm to human, plant, or animal life. Air pollution has traditionally been studied by geographers and others in countries of urban and industrial growth, where it has been seen as a phenomenon concomitant with economic development. Atmospheric pollution within the country is caused mainly by transport, industries, and fossil burning as well as contributions by minor industries like cement, mining, and quarrying where large particulate emissions are observed. However, the air pollution was heavily felt in the major cities (Yalegama and Senanayake, 2004).

Cigarettes contain tobacco, nicotine, and more than 4,000 other chemicals, most which are harmful to the health. Tobacco smoke contains benzene, a hydrocarbon found in coal and petroleum. Also found in the smoke is formaldehyde, ammonia, acetone, and tar. Formaldehyde is a highly poisonous chemical that is used in the preservation of dead bodies. Ammonia is actually used as a flavoring in cigarettes as it releases the nicotine from the tobacco. It is also used in cleaning products. Acetone is a chemical solvent, mostly used as nail polish remover. Finally, tar is used for roofing and other construction products. This tar is deposited and stays in the smoker's lungs. All of these chemicals are found in toxic household items and, once inhaled, cause major breathing problems. A major disease caused by smoking is chronic obstructive pulmonary disease (COPD). It is made up of chronic bronchitis and emphysema, which together block the airflow into the lungs and make it difficult for the patient to breathe. The symptoms of COPD do not begin to occur until massive lung damage has already occurred. Emphysema is a condition in which the air sacs at the end of small air passages are gradually destroyed. The sickness is characterized by a shortness of breath, wheezing, chest tightness, reduced capacity for physical activity, loss of appetite and weight, and fatigue. The other half of COPD is chronic bronchitis. Chronic bronchitis occurs when there is a constant irritation of the lungs, usually from chemicals in cigarette smoke. The symptoms of this sickness include a cough that gets worse in the morning or in damp weather, production of yellow mucus, shortness of breath, fatigue, and frequent respiratory infections (Cultrona, 2012).

Based on 1996 data, it was estimated that approximately 9,000-10,000 men and 900-1,900 women developed lung cancer annually in the U.S. due to past exposure to occupational carcinogens. More than half of these lung cancers were attributed to asbestos. It is a fact the smoke from tobacco and cigarettes is often associated also to lung cancer. In addition, smoking produces carbon monoxide, which decreases the amount of oxygen in the blood. When cigarette smoke is inhaled, the chemicals contained in it are quickly absorbed by the lungs and released

into the bloodstream. From the blood, these chemicals pass into the brain, heart, kidneys, liver, lungs, gastrointestinal tract, muscle, and fat tissue. In pregnant women, cigarette smoke crosses the placenta and may affect development of the fetus.

According to Saunders (2008), acute respiratory tract infection represents a major hazard that has become increasingly significant in the past few decades. The incidence has already increased markedly during the 20th century up to the present. Cigarette smoking by both male and female is related to the increase in deaths from this disease and a major cause of chronic bronchitis and lung cancer in United States.

According to Greb, et al. (2006), the coal-fired power plants release solid and liquid particles that remain suspended in the air and appear in the form of smog (combination of smoke and fog). These suspended particulates are dangerous for human health and may cause respiratory illnesses. The airborne nitrogen oxide emissions associated with coal burning cause urban smog which is a respiratory irritant. Moreover, increased ground level ozone due to nitrogen oxides reduces agricultural and commercial forest yields.

Exposures to pollutants such as dust, irritants, and fumes are also involved in the development of the disease called chronic obstructive pulmonary disease (COPD) which is characterized by an abnormal inflammatory response in the lungs and restricted airflow (documented by spirometry). The disease typically occurs after age 35.

Another respiratory problem is acute bronchitis which is generally caused by lung infections, 90% of which are viral in origin. Repeated attacks of acute bronchitis weaken and irritate bronchial airway. Industrial pollution is another culprit. Chronic bronchitis is found in higher-than-normal rates among coal miners, grain handlers, metal molders, and other people who are continually exposed to dust and fumes. But the chief cause is heavy, long-term cigarette smoking, which irritates the bronchial tubes and causes them to produce excess mucus. The symptoms of chronic bronchitis are also worsened by high concentrations of sulfur dioxide and other pollutants in the atmosphere (Ratini, 2012).

The findings of Dumlao (1994) revealed that although occupation is not related, the body's resistance is affected by the type of work, leading the individual to be more susceptible to a certain infection.

Even in the 21st century, millions of people are working daily in a dusty environment. They are exposed to different types of health hazards i.e., fume, gases, and dust, which are risk factors in developing occupational disease. Cement industry is involved in the development of structure of this advanced and modern world but generates dust during its production. Cement dust causes lung function impairment, chronic obstructive lung disease, restrictive lung disease, pneumoconiosis, and carcinoma of the lungs, stomach, and colon. Other studies have shown that cement dust may enter into the systemic circulation and thereby, reaches essentially all the organs of the body and affects the different tissues including heart, liver, spleen, bone, muscles, and hair and, ultimately, affects their micro-structure and physiological performance. Most of the studies have been previously attempted to evaluate the effects of cement dust exposure on the basis of spirometry and/or radiology. However, collective effort describing the general effects of cement dust on different organ and systems in humans and/or animals has not been published. Therefore, the aim is to gather the potential toxic effects of cement dust and to minimize the health risks in cement mill workers by providing them with information about the hazards of cement dust (Meo and Sultan, 2004).

METHODOLOGY

This study is descriptive-correlational in nature. Descriptive was employed to measure the environmental hazards and incidence of respiratory diseases in Region 1. The relationship of the respondents' socio-demographic characteristics was correlated with the incidence of respiratory diseases.

The population of this study are the 378 residents strategically living along the areas under study, namely, Paoa (50), Vigan City, Zone III, Bantay, Ilocos Sur (53), Quirino, Bacnotan, La Union (69), Pangascasan, Sual, Pangasinan (131) and Brgy, 22, San Nicolas, Ilocos Norte (75) where the identified environmental hazards are located. The respondents were chosen with the help of the Barangay Officials and the elders.

Permission from the Municipal Mayor and the Barangay Captains was obtained prior to data gathering. Data gathering was facilitated by questionnaire checklist duly translated to Iluko coupled with informal interview. Notification letters were also given prior to the conduct of the informal interview.

The study made use of the questionnaire of Uyeg (2008) with regards to the respiratory diseases. The personal information sheet and the checklist on environmental hazards was constructed by the researcher and content validated by a pool of experts.

The statistical tools used in the study are frequency and percentage, to describe the profile of the respondents; the mean, to describe the health-related factors of the respondents, namely height and weight; and simple correlation analysis through the Statistical Package for Social Sciences (SPSS) to determine any relationship between the incidence of respiratory diseases and the socio-demographic characteristics and health-related factors. The incidence rate was calculated using the formula below:

$$\text{Incidence Rate} = \frac{\text{no. of new cases of a disease in a specified time period}}{\text{no. of persons exposed to the disease in a specified time period}}$$

RESULTS AND DISCUSSION

Socio-Demographic Profile of the Respondents

The socio-demographic profile of the respondents in terms of sex, civil status, educational attainment, and place of residence is presented in Table 1.

Age. One-third (126 or 33.33%) of the respondents belong to the age bracket of 31-40. One hundred fifteen (30.42%) belong to the age bracket of 51-60 but only 21 (5.56%) belong to 60 and above.

Sex. Majority (212 or 56%) of the respondents are female. Only 166 (44%) are male.

Civil Status. More than half (197 or 52.12%) of the respondents are married. One hundred forty (37.03%) are single and only 41 (10.85) are widow/er.

Table 1. The Socio-demographic profile of the respondents.

Variables	f	%
Age		
20-30	24	6.35
31-40	126	33.33
41-50	92	24.34
51-60	115	30.42
60 and above	21	5.56
Total	378	100.0
Sex		
Male	166	44
Female	212	56
Total	378	100.0
Civil Status		
Single	140	37.03
Married	197	52.12
Widow/er	41	10.85
Total	378	100.0
Educational Attainment		
No Schooling	3	.79
Elementary Undergraduate	10	2.65
Elementary Graduate	82	21.69
Secondary Undergraduate	131	34.65
Secondary Graduate	35	9.26
College Undergraduate	58	15.34
College Graduate	41	10.85
Post-Graduate	18	4.76
Total	378	100.0
Occupation		
Professional	35	9.25
Skilled	90	23.81
Semi-Skilled	212	56.08
No Job	41	10.85
Total	378	100.0
Place of Residence		
Town Proper	168	44.44
Riverside	0	0
Farmland	10	2.65
Seaside	200	52.91
Total	378	100.0

Educational Attainment. Out of the 378 respondents, 131 (34.65%) are secondary graduates, 82 (21.69%) are elementary graduates, and 18 (4.76%) are post graduates.

Occupation. Most (212 or 56.08%) of the respondents are semi-skilled; 90 (23.81%) are skilled; and only 35 (9.25) are professionals.

Place of Residence. Majority (200 or 52.91%) of the respondents live along the seaside. A great percentage (44.44%) live in the town proper and only 10 (2.65%) live in the farmland.

Health Profile of the Respondents

Height. As shown in Table 2, majority (215 or 56.87%) of the respondents have the height ranging from 1.41-1.60 meters. Only 131 (34.66%) have the height ranging from 1.61-1.81meters and only three (0.79%) reach the scale above 2.00 meters.

Weight. Less than half (152 or 40.21%) of the respondents weigh between 45-47 kilograms; 136 (35.98%) of the respondents weigh between 48-50 kilograms. Only fifteen (3.97%) weigh 71 kilograms and above.

Table 2. Distribution of the respondents in terms of health-related factors.

Variables	f	%
Height (m)		
Above 2.00	3	0.79
1.081-2.00	5	1.32
1.61-1.81	131	34.66
1.41-1.60	215	56.87
1.40 and below	24	6.35
Total	378	100.0
Weight (kg)		
71 & above	15	3.97
61-70	27	7.14
51-60	136	35.98
41-50	152	40.21
31-40	48	12.69
Total	378	100.0

Type of Environmental Hazards

As a whole most of the environmental hazards from the different localities under study are all man-made with chemical and mechanical type (Table 3). Only Zone III Bantay, Ilocos Sur has a physical type because the hazards caused by the construction materials are physical in nature.

Table 3. Identified sources and types of environmental hazards per area.

Area	Source of Major Environmental Hazards	Type
Paoa, Vigan City	Northern Tobacco Redrying Corporation	Chemical
Zone III, Bantay, Ilocos Sur	Vigan Fortune Lumber and Hardware Construction Supply	Physical and Mechanical
Quirino, Bacnotan, La Union	HOLCIM Phils. Inc.- La Union Plant Cement Manufacturing	Mechanical and Chemical
Pangascasan, Sual, Pangasinan	1200 Megawattt Sual Coal-Fired Power Plant	Mechanical and Chemical
Brgy, 22, San Nicolas, Ilocos Norte	Coca Cola San Nicolas Plant (Combustion of delivery trucks)	Mechanical and Chemical

Incidence of Respiratory Diseases

It is revealed in Table 4 that among the areas under study, Quirino, Bacnotan, La Union has the highest incidence rate (440.68), followed by Zone III, Bantay, Ilocos Sur with an incidence rate of 221,88. The high incidence rate in Quirino, La Union is probably due to the continuous exhaust of particulate molecules and dust or airborne pollution caused by the production of cement in the place.

Table 4. Incidence rate of respiratory diseases in the selected areas in Region 1.

Area	Population at Risk	Cases	IR (Per 1,000 Pop)
Paoa, Vigan City	896	145	161.83
Zone III, Bantay, Ilocos Sur	960	213	221.88
Quirino, Bacnotan, La Union	1239	546	440.68
Pangascasan, Sual, Pangasinan	2360	230	97.46
Brgy, 22, San Nicolas, Ilocos Norte	1341	69	51.45
Total	6796	1203	973.30

Relationship Between Incidence of Respiratory Diseases and Socio-Demographic Factors

It can be seen in Table 5 that a significant relationship is observed between incidence of respiratory diseases and two socio-demographic variables, namely, age and place of residence as evidenced by the r-value of 0.1945 and 0.1956, respectively.

The results may be due to the influence of the existing establishments that have been a contributory factor in the incidence of respiratory diseases.

Table 5. Correlation coefficients showing the relationship between the incidence of respiratory diseases and socio-demographic factors of the respondents.

Variable	r-value	r-prob	Decision
Age	0.1945	P<.05	Reject H ₀
Sex	0.0496	p>.05	Do not reject H ₀
Civil Status	0.0325	p>.05	Do not reject H ₀
Educational Attainment	0.0151	p>.05	Do not reject H ₀
Occupation	0.032	p>.05	Do not reject H ₀
Place of Residence	0.1956	P<.05	Reject H ₀

– Significant at .05 level

Relationship Between Incidence of Respiratory Diseases and Health-Related Factors

It is noted in Table 6 that there exists a significant relationship between the incidence of respiratory diseases and health-related factors in terms of height and weight as shown by the r-value of 0.1752 and 0.1183, respectively.

The findings imply that height and weight are affected by the incidence of respiratory diseases, that is, significant change of the height and weight of a person are indicators of health condition. This finding is relative to the fact that weight loss is a symptom in the occurrence of major respiratory disease like the COPD.

Table 6. Correlation coefficients showing the relationship between the incidence of respiratory diseases and health-related factors of the respondents.

Variables	r-value	r-prob	Decision
Height	0.1752	P<.05	Reject Ho
Weight	0.1183	P<.05	Reject Ho

– Significant at .05 level

CONCLUSIONS

Based on the findings, the researcher concluded that the socio-demographic profile of the respondents in terms of age and place of residence are significantly related to the incidence of respiratory disease. Further, incidence of respiratory diseases affect the height and weight of the respondents.

RECOMMENDATIONS

Seminar-workshop must be conducted to the community especially to the areas with identified environmental hazards to increase their knowledge and awareness on the exposure of health hazards considering the majority of the respondents only finished basic type of education. Practical physical fitness program must be organized as a part of the extension activities of the agencies or higher institutions concerned to promote, maintain, or improve the fitness of the residents, thereby, meet the ideal height and weight. Collaborative regional fora should be organized to address problems and issues that arise from environmental aspects. Environmental educational programs should be set up by the local government with activities dedicated to and develop an appreciation for the importance of preserving the environment. An active non-government body should be created to monitor and evaluate the long-term and immediate effects of environmental hazards particularly those with high incidence of respiratory diseases. Findings of the research should be disseminated to serve as baseline information in the formulation of policies and guidelines in preserving the environment. Further studies should be conducted to further affirm the results of the study.

LITERATURE CITED

- Dumlao, M. L (1994). *The increase and severity of leprosy in selected municipalities of the first district of Ilocos Sur: its relation to selected variables*. Unpublished Master's Thesis, University of Northern Philippines, Vigan City, Ilocos Sur.
- Eldon, E. D. and Smith, B. F. (2008). *Environmental science: a study of interrelationships*. 11th edition McGraw-Hill International. C.
- Enger, H. (2008). Phys. Med. Biol. 53 1909. Related articles microdosimetry and radio curability.
- Jones, K.(2012) *Health consequences of 'safe' levels of environmental pollution*.
- Ratini, M. (2012). *Understanding bronchitis – the basics*.
- Realin, C. R. (2005). *The incidence of acute respiratory tract infection in Metro Vigan, Ilocos Sur*, Unpublished Master's Thesis, University of Northern Philippines, Vigan City, Ilocos Sur.
- Stanley, T. (2009). *A school of community health sciences and environmental sciences*. Graduate program, University of Nevada, Reno, NV 89557, United States.
- Uyeg, Lorma Angeli J. (2008). *The incidence of acute respiratory tract infection in upland municipalities of Ilocos Sur*. Unpublished Master's Thesis, University of Northern Philippines, Vigan City, Ilocos Sur.
- West, L. *The top 10 worst polluted places on earth: Report raises alarm about global pollution and points to solutions*.

Online Resources

- American Journal of Preventative Medicine. (2005). *Tooth loss and heart disease: findings from the behavioral risk factor surveillance system*. Retrieved on June 21,2011 from <http://www.journals.elsevier.com/american-journal-of-preventive-medicine/>
- Air pollution and contributions of particulate matter from different types of diesel vehicles in Sri Lanka*. (2008). Retrieved on March 21, 2010 from http://environment.about.com/od/pollution/Environmental_Issues_Pollution.html

Brown, L. F. (1999). *Research In dental health education and health promotion*. Retrieved on April 12, 2011 from www.dental.umaryland.edu/dentaidepts/hsr/faculty/manski.html

Chronic Obstructive Pulmonary Disease. Retrieved on February 2, 2012 from <http://ummm.edu/health/medical/reports/articles/chronic-obstructive-pulmonary-disease#xzz2jAttnsFb>

Health Consequences. Retrieved on February 6, 2011 from <http://www.medindia.net/news/safe-levels-of-environmental-pollution-may-have-long-term-health-consequences-124395-1.htm>



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