ANALYSIS OF AVERTING AND MITIGATING BEHAVIOR OF PEOPLE REGARDING MEASLES OUTBREAK

***Muhammad Munwar Iqbal, [+]Hina Hanif,**
*Department of Computer Science, University of Engineering and Technology, Taxila, Pakistan
[+]Department of Environmental Science, Government College Univerity, Lahore, Pakistan
*munwariq@gmail.com

ABSTRACT: *This study analyzes the averting and mitigating behavior of people regarding the outbreak of measles. Measles, a respiratory infection, generally caused by a virus (paramyxovirus). According to expert's opinion, the cognitive disease is spreading due to ineffective vaccination and poor monitoring of the disease. It is tried to analyze the averting and mitigating behavior of people for measles disease and their willingness to pay for immunization. The averting behavior is the measures taken before the attack of disease. Averting behavior is checked through different questions about early immunization for the disease and the traditional methods used to avoid the disease before it spreads, from different respondents. The mitigating behavior are the measures taken after the occurrence of disease. For analysis survey different hospitals and households visited and a questionnaire is being conducted to collect the data. The overall data is analyzed through different statistical techniques using spss software. The study tried to find the relationship of willingness to pay of a household with a monthly income of a household through data using statistical techniques.*

Keywords: Measles, Willingness To Pay (WTP), Sick days, Immunization, Monthly Income,

Abbreviations and acronyms:
Willingness To Pay (WTP), Immunoglobulin G (IgG), Immunoglobulin M (IgM), Air Quality Index (AQI), Institut Na- tional de Veille Sanitaire (INVS), Polymerase Chain Reaction (PCR), World Health Organization (WHO), Harris Interactive (HI), Environment Protection Agency (EPA), Uttar Pardesh (UP), Measles Mumps Rubella (MMR), Emergency Department (ED).

INTRODUCTION:

Measles, a respiratory infection, generally caused by a virus (paramyxovirus). It is a highly contagious disease and spreads through respiration. People that share living space with the infected person can easily get the disease. The incubation period for measles ranges from 9-12 days after initial exposure. The most common symptoms of disease are cold, cough, redness of eyes and rashes. These rashes generally appear after 2-4 days after the initial symptoms and may last up to 8 days. Measles mostly affect children under the age of 15 years. It has no particular treatment, mostly, people recover within 2-3 weeks and mostly occur in malnourished children and people with weak immune system.
Lahore, the most populous city of the country, is nowadays suffering from the re-emergence of measles outbreak.18, 000 out of the 25,000 nationwide cases of measles are reported in Lahore. According to expert's opinion, the cognitive disease is spreading due to ineffective vaccination and poor monitoring of the disease. According to the world health organization the consecutive flooding for three years put the country's health in severe strain.
We conducted a survey to evaluate the averting and mitigating behavior of recent measles outbreak in Lahore. For survey, we visited different hospitals and households to conduct the questionnaire. Two hospitals that we selected as a sample were Mayo hospital and Services hospital and to avoid the overestimation in data, we also conducted questionnaire in households in different areas. The areas selected for this purpose were Mughal pura and Fleming road. It is tried to analyze the averting and mitigating behavior of people for measles disease and their willingness to pay for immunization. The averting behavior is the measures taken before the attack of disease. Averting behavior is checked through different questions about early immunization for the disease and the traditional methods used to avoid the disease before its spread, from different respondents. The mitigating behavior are the measures taken after the occurrence of disease. Some questions were designed to analyze the mitigating behavior of respondents which include medical treatment, willingness to pay for vaccination and awareness about the disease as it is a cognitive disease. The overall data is analyzed through different statistical techniques.

Literature review:

This survey was conducted for the analysis of the epidemic disease by serology. The investigation was done by national surveillance data to find out the causes and characteristics of the recent outbreak of the common disease i.e. measles in Taiyuan, Taiwan [1]. Measles were identified by the antibody tests, i.e. IgG and the IgM. The confirmation of the case of measles was described by being positive for the IgM test. But this case prevails for the patient who had not taken the measles vaccine for the last three months. In December 1993, the epidemic of measles occurred in the city, Taiyuan. And it continues to transmit to the kindergartens and the primary schools there, but it caused the infrequent cases in the neighboing towns. Statistical analysis was done using chi-square method to find the relation between the nominal and ordinal variables. According to the statistical analysis of this article, 42 cases were identified, which have equal ratio was of kindergartens and primary school. Mostly, were unvaccinated respondents. Measles is always a severe and the highly contagious virus disease. In the most of the developing countries measles is always a major killer of the infants due to illiteracy, poor health system and due to the low vaccination coverage. And it leads to the continuous outbreak in the developing countries despite of the fact that many countries use licensed attenuated measles vaccine that is quite efficient. The following reasons shows that by the theoretical studies and the epidemiologic studies measles can be eradicated for: because human beings are its ordinary host, its effective vaccines are now available its persistence

infection is less and can become a cause of its transmission, and also because the virus now attained antigenic stability of very high degree. WHO now targets to eradicate this acute and highly contagious disease Measles and its viral infections around the world, by the year 2005 to 2010, by making measles vaccination cost effective.

This paper deals with the averting behavior method for evaluation of quality of drinking water [2]. The study was about Korean drinking water quality. There is some contradiction between the perceived measures and objective measures for drinking water quality in Korea. Hence analysis is done in decision steps for averting behavior of people. A hypothesis was made that if we get started with perceived measures instead of objective one then there will be no contradiction. Major sources of tap water were deteriorated by increasing industrialization and urbanization in Korea. A questionnaire was conducted to check out the perceived pollution level and willingness to pay of Korean people for safe tap water. They used a model of conventional averting behavior to check the amount an individual should pay for improved water quality. The averting behavior adopted by people are boiling, using filters, using bottled water, drawing spring water and underground water, both boiling and filters combined use etc. In this model an equation is used which determine the cost reduction with lower pollution level that becomes the savings in income or results in reduction of averting activities. Another model used was the model of perceived averting behavior. In this model they replace the objective pollution measures with individual's perceived level followed by similar analysis as done in conventional model. Here willingness to pay was determined by the equation for perceived small change in pollution level. Survey was conducted in 256 households in Pusan. Only housewives of age 20-25 were selected to conduct the survey. Data thus collected contained detailed information about all the averting behaviors adopted by people. The averting cost is calculated by averting activities, their price in the market and value of time. Major variables determining the tap water quality are rust, sediment, bad taste or smell, presence of smell, suspended solid, trihalomethane and nitrates. Probit regression method was used to explain the determinants of averting behavior and factor affecting the decision to be opted for averting action. Statistical significance of coefficients was determined using two tailed test and the signs obtained were in expected directions. To check the contradiction between perceived measures and actual averting behavior, frequency analysis is done. The conclusion was made that perceived level an averting behavior has high consistent ratio. This justified that perception can be used for explaining the behaviors. The function of averting cost is the decisions of people who adopted averting behavior. Individual averting cost can only be calculated if the benefits obtained are much more than averting activity cost. Tobit models were made to find the reasons for the increase in averting cost. The objective measures were the part of conventional averting method whereas perceived measures are part of perception averting behavior method. Two tailed test's results revealed that living period coefficient, in the same area, is positive. This indicates that respondents, who lived in same area for longer period of time, have to bare more averting cost to avoid themselves from pollution levels. Same is the case with older citizens and smaller families. In the conventional averting method, the coefficient variables were related with suspended solid pollutant and were statistically significant whereas in perception method, its variables were positively related to the expenditures of averting behavior. There is a large difference of willingness to pay between conventional and perception method. The conventional method was used for estimating the value and quality of safe drinking water. It estimates the minimum value that people are willing to pay for better quality of drinking water. Whereas perception method represents a higher average minimum value that people are willing to pay for improved water quality. The results are important for the policy designers who can improve water quality to be drinkable; they should also consider the value of willingness to pay of people.

A study about the re-emergence of the measles outbreak [3]. The study describes that 1 million deaths occurred due to measles regardless its effective and safe vaccine. The world health organization of European regions targeted to eradicate the disease by the year 2007 through vaccination program. Recent increase in outbreak number of measles are due to the decline in vaccination coverage of the disease. In the study, France adopted the two-dose strategy to increase the coverage of measles vaccination. This increase in immunization leads to decrease in morbidity and mortality. Still there is transmission of disease, but now the cases mostly shift towards older people as they are more prone to the disease and its complicated form have weak immunity. The re-emergence is unusual so it needs further investigation by the institutions of epidemiology. Institut Na- tional de Veille Sanitaire (INVS) conducted the study for investigation, in which questionnaires were given to the major laboratories and also to the general practitioner. Laboratories include the serology and virology lab where IgM and IgG tests were performed. The hospitalized patient showed the symptoms of pneumonia, lymphopenia, high fever with the common rashes on skin, of measles. Biological material was taken from the patients to detect the virus of measles through Reverse Transcriptase PCR. By genotype sequencing they detected the sequences of strains, of patients of different areas, which belongs to D7 genotype. So this is concluded that virus of this strain is mostly responsible for the measles. The data of the study concluded that unvaccinated young adults are at higher risk of the infection and virus spread rapidly through unvaccinated people of society.

This paper measures the willingness to pay (WTP) of averting behavior for children exposure to ozone [4]. It includes stated-preferences surveys to calculate illness cost and approaches for averting behavior. The paper discusses the averting behavior related to change in air quality. An even low level of ozone causes a number of respiratory diseases. US EPA describes that two type of subpopulations are highly susceptible to air pollution i.e. children that are more physically active and the patients of asthma. Different organizations like EPA suggests local people to spend much of time indoors and do less energetic activities on days with

high ozone concentration, to avoid from the health effects of ozone. Air quality index (AQI) was designed to collect the information about the ozone levels creating five ranges of air quality from good to very unhealthy. Very few people had lessen the time spent outside in spite of the commendation. As it is difficult to measure children's WTP so researchers measure it by the objects parents bought to protect their children from the exposure such as helmets for car or a bicycle. It is difficult because children do not have a decision power and are not earning. A basic model was presented about health and pollution where utility is assumed as function of sick days and other variables. WTP for changes in pollution level is then calculated by an assumption that in case of averting behavior sick days as a function of pollution exposure and in case of mitigating behavior exposure as a function of pollution levels. There are some problems related to calculate WTP because it is hard to find the cost of time reduction and other values. The study provides an estimate of the alteration in time spent outdoors during the days of high ozone concentration using an SP survey in which data was collected from the activity diaries that were formed during high ozone season. The survey was conducted on Harris Interactive (HI) research panel of online market. T-test is applied to check the difference in means of two sub samples. In survey parents were asked about their education and income. And preferences of children were asked about playing indoor versus outdoors and the asthma status of children. Data of stated-preferences was analyzed through D-optimal experimental design. It contains attribute questions. Hierarchical Bayes estimation procedure was also used in the analysis to get the estimate of parameters of converged population. According to the coded models of study, the variable which have the significant effect on the utility function was number of days in which child took medication and the least significant variable was the time spent outdoor for playing while taking the medicines. Their estimate for WTP range was $20-$200. Results were calculated using regression model. Graphs were drawn to estimate the individual level of days and time (of exposure), cost and WTP (for medication and safety products). More awareness of AQI leads to decrease in cost of mitigating behavior while on the other hand it increases the cost of averting behavior.

Since 1999, the deaths from the measles have almost 60% fallen throughout the whole world. In the many member countries of south East Asia measles was one of the major reason of morbidity and mortality of large number of people [5]. By using restructured Performa in November 2006 a survey was done on the women that have children less than five year of age in the urban slum areas of Aligarh (UP).the survey was done by taking the interview from 90 mothers on the basis of their demographic profile, symptoms of measles and their awareness about the measles vaccine. The women that were studied were mostly from the Muslim community and most of that women were house wives. Among them almost 87 % women were uneducated about 84.4% were aware from the infectious disease like measles. And about 52.2% of mothers there were aware about the symptoms of measles. About this survey that was conducted in urban slim areas almost all the mothers had the knowledge that measles mostly involve the children. The attitude and information of measles was not favorable among that women. In that area only 56.6% women were able that knows that they can prevent their children from the measles disease by the proper vaccination. Only 13.5% children were being immunized against the measles vaccine there. The major reason behind the fact that most of the children there had low immunization, was the non-awareness regarding age & place of the vaccination. This analysis shows there poor attitude and information about the measles vaccine. As some countries are looking ahead to get rid from the disease like measles in near future. So it become very necessary to increase the knowledge about the measles diseases and also to improve the attitude of people about the measles vaccination. This study therefore brings out the health education in the goal of eradicating the diseases like the measles from the many countries of world. So, the major Averting behavior of people to get away from the measles disease is vaccination of measles.

This case study shows the challenges faced by the clinician's bout the disease that prevails in the memory and that is much important to know[6]. In Portuguese in spite of high community vaccination the chance of measles outbreak can be possible among the large cluster of under or no vaccinated population. Due to the potential threat of re-introduction of measles one of the case was in front. in January 2012,in the area of Portuguese's an unvaccinated old women of about 33 years of old, travelled from the United Kingdom to the Libson, became the major cause of the exposure of the measles disease in the community and in the 2 health care workers of the hospital. After the 24 hors most of the patients that had fever was returned to the ED, and most of them were with maculopopular rash were being hospitalized. After admission on ED the diagnosed of measles diseases was suspected about 10 hours later. That old women then transferred to the referred hospital. The statistical analysis shows that among the 44 potentially exposed workers; 25 had the previous measles; 15 were reported that have received immunization from the disease; 7 were reported that had taken only one dose of MMR; and 4 were referred not to be vaccinated. After the 10 days of this incident, no further secondary case was reported about measles. so after the analysis of this case study we can understand that the major cause of mortality ant the morbidity from the measles diseases that was often more increase after the disaster including movement of population from one place to the another, malnutrition among the population and due to the low vaccination coverage and also due to the poor health system in the most of the countries of the world.

METHODOLOGY:

The methodology used for the analysis of averting and mitigating behavior is conducting a questionnaire. Basic theory of averting and mitigating behaviors comes out of a function i.e. household production function. In general it is represented as

$$S=f(P, D, X)$$

Where S is time of sickness which depends upon P which is level of pollution and D which is the defense mechanism that

can be averting or mitigating behavior. X represents all other variables like gender, education etc. Sickness days depends upon the pollution exposure intensity and the damage cause by it.

In the survey, we tried to measure the averting and mitigating behavior of people for the recent outbreak of measles by questionnaire which include different variables. In our survey, 27.3% of the respondents were male and 71.7% were female. Number of females are more because measles mostly occur to the children under age 15, so mothers of children are keen in observing the measures more than the fathers and we mostly asked questions from mothers. 60% of the respondents are educated remaining 40% are uneducated. Educated people have more awareness about the disease and they adopt mostly the averting mechanism. It is assumed that families with more earning members will be more willing to pay for immunization like vaccines than families with single earning members. In our sample, 43.3% families have more than one earning member and 56.7% families have single earning members. Similarly, people with more monthly income are more willing to pay than people with less monthly income, as according to our data respondents with income ranging 1000-5000Rs/- are low income people they showed less willingness to pay than high income people of range more than 20,000Rs/-. Frequency of respondents who has zero willingness to pay is 45% and those who are willing to pay more than 500Rs/- is 55%. The mitigating measures taken by the government regarding disease is mass awareness through media, newspaper, hoarding boards and electronic media. The respondents with the positive response to awareness is 41.7 in percentage and remaining are with negative response.

The other main variables include the age of respondents, as mature respondents are more aware about the effects of disease. The other is the number of family members, with the increase in number of family members the willingness to pay decreases and the observation of mitigatory measures becomes a complex process as compared to households with less number of family members. Another variable is the reason for the cause of disease, mostly it spreads from one person to another as it is a cognitive disease, hence it can easily spread by direct or indirect contact and it also occurs due to pollution from air, land and water and many other reasons. The important variable showing averting behavior is the childhood immunization. According to our data, 78.3% respondents had taken the averting measure of early immunization and remaining 21.7% had not taken this measure. Another important mitigatory variable is the diagnosis of disease, most of respondents diagnosed by the symptoms of the disease in percentage of 73.3%, others were diagnosed by IgM positive test in percentage of 11.7 and some were diagnosed at severe stages of disease in percentage of 15.0. Major symptoms recorded were red, brown spotty rash and cold like symptoms. Other mitigatory behavior variables are the expenses of medicines and other expenses of the patient.

Statistical analysis of data:

A questionnaire is being conducted from 60 respondents which include people from two different hospitals and households of two different areas. All the questionnaires were selected for the analysis. Data was extracted from the questionnaires and then fed to the SPSS software version 16.0 for analysis through different statistical techniques. Following are the statistical techniques that are used for the analysis:

Cross tabs:

Cross tabulation is done to segregate data collected from the respondents. According to the case processing summary of cross tabulation, all the cases are valid and no one is missing and the total percentage is 100 for all. Cross tabulation of two variables shows their significant impact on each other. Output of cross tabulation describes that with the increase in rhe level of education of respondents, their willingness to pay (for vaccination) also increases. Educated respondents are willing to pay Rs 500/- and even more for vaccination whereas uneducated respondents generally seek options for free vaccination or in other words no money. Results also show that educated respondents tends to take more averting measures than the uneducated ones. Also the educated people are more aware of the complications of the disease.

However, another important variable days of sickness, does not have a more significant impact on the willingness to pay of a respondent. As it does not increase significantly with the increase in sick days of patient. Cross tabulation also describes that with the increase in earning members, trip expense also increases because respondents ready to bare more cost of their behaviors as they are financially strong.. Similarly, willingness to pay also increases with the increase in monthly income. Childhood immunization was mostly observed in the patients whose parents were more educated and also who have more awareness. Childhood vaccination also seems to increase with the increase in the level of education of a respondent. As already discussed, educated parents (respondents) are more aware and know which behavior is to be adopt at what time.

Respondents with high monthly income have more willingness to pay like respondents with income more than Rs20, 000/- are mostly willing to pay above Rs.1000/-. Whereas with the increase in monthly expense of a household their willingness to pay declines. And the monthly expense also increases with the increase in sick days. According to educated people scientific treatment did not fail to treat the disease, it can helps in the treatment and curing other complications related to measles.

Analysis by correlation:

Correlation among variables tell us about the degree of association in them. With the help of table of correlation we can interpret that which of the variables are strongly correlated, weakly correlated or moderately correlated. A correlation among are the variables has analyzed. The correlation between significant variables is discussed below.

In the first correlation it is observed that the education level of the respondent is strongly correlated with the awareness. This shows that an educated person is more aware of the complications of the disease than the uneducated one. This variable is also positively related to other variables like sick days, government vaccination schemes, effects of measles,

change in meal of the patient (the mitigating behavior) and the decision for immunization (the averting behavior).

The correlation of an important variable, willingness to pay, shows that it is strongly correlated with the monthly income of a household. As more will be the monthly income, respondents' shows more willingness to pay for the averting behaviors. But it is negatively correlated with other variables like awareness, sick days etc.

While checking the preference of variables that is awareness, it is significantly correlated with government vaccination.

Table 1. Correlation among different parameters

	Education	WTP	Awareness	Sick days	Gov. vaccine	Measles effects.	Monthly income	Change meal	Decision for vaccination
Education	1								
WTP	-.242	1							
Awareness	.259*	-.337**	1						
Sick days	.030	-.108	.158	1					
Gov. vaccine	.050	-.151	.479**	-.029	1				
Measles effects.	.179	-.188	.223	-.335**	.056	1			
Monthly income	-.276*	.489**	-.323*	-.364**	-.021	.020	1		
Change meal	.034	-.300	-.044	.027	-.250	.355**	-.272	1	
Decision for vacci-nation	.151	-.100	.188	.265'	-.037	-.167	-.365**	.109	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

This shows that respondents that are more aware of the effects of measles go for government vaccination schemes and trust them too. Besides this awareness is moderately correlated with sick days and the decision for immunization. Data reveals that educated people are more aware and mostly go for averting behavior.

When considering changes in meals as an important factor, it shows strong correlation with the measles effects. As people change their behavior according to the effects of the disease. Whereas it is moderately correlated with monthly income. Similarly, the table 1 shows the moderate correlation of change in meal habit (the mitigating behavior) and decision for vaccination (the averting behavior).

Table.2 coefficients

Independent variables	B value	t- value
Awareness	-1.75	-1.389
Measures to avoid measles spread	.246	.669
Per trip expense of doctor visit	.204	1.507
WTP	.232	1.804
Decision made for vaccination	-.068	-.460
Government vaccine	-.045	-.306
Sick days	-.307	-2.539
Change in meal after disease attack	-.093	-1.014
Immunization from the disease	-.321	-1.123
Cognitive measures	-.076	-.849
Immunity boosters taken after vaccine	.306	1.556
Times for doctor visit each day	.193	1.379
Education of Respondent	-.147	-1.708

Analysis by regression:

Regression tells about the direction, magnitude (rate of change) and the overall relationship of the system. It describes the direction of a relation between independent and dependent variable, i.e. either directly or inversely related to each other. Here we observe only three types of values in regression, i.e. value of R-square. B value, t- value.

Dependent Variable: *Monthly Income*

The dependent and independent variables which are selected for the regression analysis are described in the table. The value of R-square for tis model is .506, in percentage it is 50.6%, which is good for primary studies. Analyzing B value shows the rate of change. Analyzing b value shows rate of change and tells either the dependent variable is directly or inversely related to independent variables. The table above shows that monthly income has a direct relationship with measures to avoid measles, per trip expense of doctor, willingness to pay, immunity boosters taken after the vaccination and times for doctor visit each day. These independent variables are directly related to monthly income because they are directly being affected by it. As willingness to pay increases with the increase in monthly income of a household. Similarly, more trip expenses can be bared if the monthly income is higher.

Whereas the dependent variable is inversely related to awareness, decision made for vaccination, government vaccination schemes, sick days, change in meal of household after the disease attack, immunization from the disease, cognitive measures and the education of the respondent. Monthly income is inversely related to these independent variables because they are not being affected by it in any of the direct ways. As sick days are not increasing or decreasing with the monthly income.

B value if independent variable shows that if awareness of respondents about the disease change by one unit monthly income will change by 175%, if measures to avoid measles changes by one unit then monthly income changes by 24.6%, if per trip expense of doctor visit alters by one unit then monthly income changes by 20.4%, if willingness to pay changes by one unit then monthly income will change by 23.2%, if decision made for vaccination changes by one unit

then monthly income changes by 6.8%, if government vaccine varies by one unit then the dependent variable varies by 4.5%, if the sick days changes by one unit then dependent variable varies by 30%, if the change in meal changes by one unit dependent variable will change by one unit 9.3%, if immunization from the disease change by one unit monthly income changes by 32.1%, if the cognitive measures changes by one unit monthly income will change by 7.6%, if amount of immunity boosters taken after the vaccination varies by one unit dependent variable will change by 30.6%, if times for which the doctor visits changes by one unit monthly income will change by 19.3% and if the education of respondent changes by one unit monthly income changes by 14.7%.

T value tells about the existence of a significant relationship between dependent and independent variables, *i.e*. it should be greater than 1.8 to be good either positive or negative. Analysis of the above given table 1 shows that monthly income has strong relationship with willingness to *pay and sick days*. And a moderate relationship with awareness about the disease, per trip expense of doctor, education of respondents, number of doctors visit each day, immunity boosters taken after vaccine and immunization from the disease. It also shows weak relationship with measures to avoid measles, decision made for vaccination, government vaccine and cognitive measures.

RESULTS:

Statistical analysis shows that the most significant variable is monthly income and it is strongly being affected by willingness to pay of a household for vaccination and time of sickness or sick days. Other important variables are education of the respondent, awareness, cognitive measures, government vaccination, measures taken to avoid the spread of disease, per trip expense of doctor, times of doctor visits, immunity boosters taken after the vaccination, immunization from the disease, decision for vaccination and change in meal. Beside these some variables have moderate significance like gender, occupation, earning members etc. Fig. 1 shows the histogram for the detection of the patients at different stages.

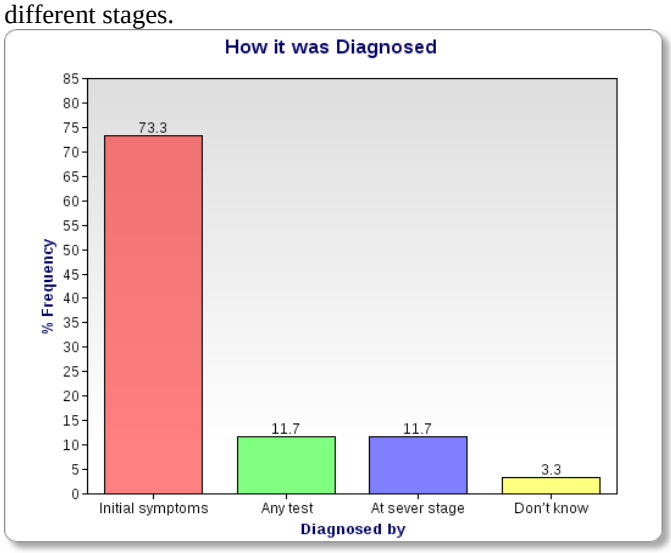

Figure 1: Measures detection stages Histogram

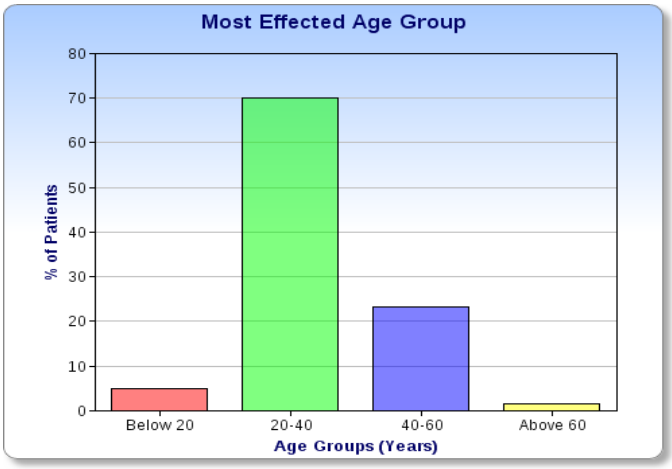

Figure 2: Age-group effected by Measules

The diferent age groups are represented in fig. 2 with perpective of they caugt by the measules. Whereas in fig. 3 show the most effected gender.

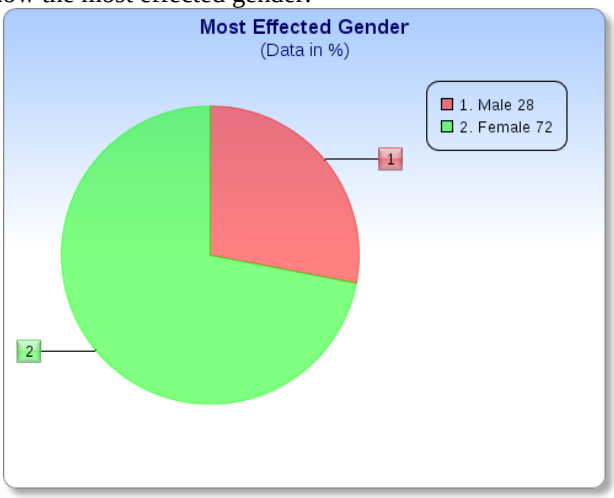

Fig. 3. Most effected gender by Measules

WTP and monthly income also shows a strong correlation with significance level of 0.01. As more will be the monthly income, respondents' shows more willingness to pay for the averting behaviors. Cross tabulation also shows that WTP changes with the change in monthly income. According to cross tabs results, WTP also varies with the level of education of respondent and number of earning members in a household. Childhood vaccination changes with the change in level of education. As educated people are more aware of the complications of the disease so they mostly go for averting behavior than mitigating. According to the statistics the value of R-square is .506 which shows that these variables selected for the analytical techniques represents 50% of the data. Generally, in primary studies the value of R- square ranges from 10-50% so our result falls in good category.

CONCLUSION AND RECOMMENDATIONS:

Analysis has been done on the averting and mitigating behavior of people regarding measles outbreak via questionnaire and statistics were analyzed using spss

software. Two different areas and two hospitals were surveyed for the analysis. As measles is re-emerging in Lahore so most of the educated people are aware of the complications and go for averting behavior. But still the uneducated households suffer from the disease this is due to the poor monitoring of the health sector. It is concluded that averting and mitigating behavior depends upon the level of education of the respondent, monthly income and willingness to pay. These variables are also strongly correlated to each other.

This study is to analyze the behavior of people for the recent outbreak of measles in Lahore and to demonstrate the willingness to pay of a household for the vaccination. This vaccination can be done before acquiring the disease and is also required for resolution. The analysis become difficult in the case of hospitals as, they were government hospitals where much of the material is provided by the government. So it is difficult to analyze the cost of medicines and other expenditures. We also selected two areas of households to avoid the overestimation or underestimation of the data. Analysis does have certain limitations, but an effort has been done to take into account the willingness to pay of respondents with respect to their monthly incomes. Some of our findings were consistent to the literature reviewed, hence the results are satisfactory.

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REFERENCES:

1. Lee, M.S., et al., Post mass-immunization measles outbreak in Taoyuan County, Taiwan: dynamics of transmission, vaccine effectiveness, and herd immunity. Int J Infect Dis, 1998. **3**(2): p. 64-9.
2. MI-JUNG UM, S.-J.K., and TAI-YOO KIM, Estimating Willingness to Pay for Improved Drinking Water Quality Using Averting Behavior Method with Perception Measure. Environmental and Resource Economics, 2002. 21: p. 287–302.
3. Zandotti, C., et al., Re-Emergence of Measles Among Young Adults in Marseilles, France. European Journal of Epidemiology, 2004. **19**(9): p. 891-893.
4. Carol Mansfield, F.R.J., George Van Houtven, The missing piece: Valuing averting behavior for children's ozone exposures. Resource and Energy Economics, 2006. 28: p. 215–228.
5. S. Singh, U.C., Knowledge, Attitudes and Practices About Measles Among Mothers in Urban Slum Area of District Aligarh, UP. 2008: p. 438.
6. A. Fior , V.M., I. Mendes, Y. Shigaeva, S. Rodrigues, E.Pinto, F. Borges, K. Mansinho, A measles case study in a traveller: an international challenge. International Journal of Infectious Diseases, 2012: p. 126-127.

QUESTIONNAIRE:

HOUSEHOLD QUESTIONNAIRE: Valuing the Impacts of Measles Outbreak in Lahore

District/Tehsil/Town _____

Village/Mohalla and address _____

Day/Month/Year of interview: _____

Name of head of household: _____

Head of Household: *(select one)* Male ……..1 Female…..2

After whole questionnaire for the household have been completed, fill in the following information:

Result of HH interview:

(select one)

Completed _____

Refused _____

Not at home _____

HH not found/destroyed/vacant _____

Incomplete _____

Other (*specify*)

Name of the respondent: _____

Total number of household members: _____

INTRODUCTION AND INFORMED CONSENT

Assam-u-Alaikum. My name is _____ and I am a student of B.Sc (H) Environmental Sciences, G.C. University, Lahore. We are conducting an academic survey about the impacts of measles outbreak in Lahore and its causes. We would very much appreciate the participation of your household in this survey.

I would like to ask you some questions about your household. The survey usually takes about 15 minutes to complete.

Whatever information you provide will be kept strictly confidential.

Participation in this survey is voluntary and you can choose not to answer any question or all of the questions. However, we hope that you will participate in this survey since your participation is important.

At this time, do you want to ask me anything about the survey?

ANSWER ANY QUESTIONS AND ADDRESS RESPONDENT'S CONCERNS.

May I begin the interview now?

Signature of interviewer:

_____

Date: _____

Scenario:

This survey is being conducted to check the averting and mitigating behavior of people regarding measles disease in Lahore. Measles is remerging disease in Lahore it comes as outbreak for the second time here. The area selected for the analysis were two hospitals i.e. mayo hospital and services hospital and the household areas were Mughal pura and Flemming road.

1. Gender a. Male b. Female
2. In which age group you fall? a. Below 20 b. 20- 40 c. 40-60 d. 60-80
3. What is your highest education? a. Intermediate b. Graduated c. Post-graduated d. Others
4. What is your occupation? a. Private job b. Government Job c. Business d. Other
5. How many family members do you have? a. 1-5 b. 5-10 c. 10-15 d. More than 15
6. How many earning members do you have? a. 1 b. 2 c. 3 d. More than 3
7. How many children under the age of 15 are in your household? a. 1-5 b. 5-10 c. more than 10
8. Do you know about the recent Measles Outbreak in the Lahore City? a. Yes b. No
9. Has any member of your household ever been diagnosed with Measles? a. Yes b. No c. Don't Know
10. How patient get measles? a. From any of your member b. From school or college fellow c. From pollution (e.g. water, air etc.) d. Any other reason.
11. Have all children been immunized against measles? a. Yes b. No

If **yes**, did they receive *MMR Triple Vaccine*

a. Yes b. No

Or

Individual Measles Vaccine

a. Yes b. No

If **no**, why didn't your children get vaccinated against measle
s? Worried about the side effects
a. Vaccination is expensive
b. Child is not old enough yet
c. Don't believe in vaccination
d. Other

12. Did your child receive other childhood immunizations?

a. Yes b. No

13. How patient diagnosed measles?
a. by symptoms
b. by any test like IgM positive
c. diagnosed at severe stage of disease
d. Don't know.

14. Which of these are symptoms of measles?
a) Red brown spotty rash
b) Cold like symptoms
c) Small white spots in the mouth
d) Tiredness & Irritability

15. Do you know what some of the possible effects of measles can
16. be? (More than one box can be ticked)
a. Febrile convulsions
b. Meningitis
c. Encephalitis (inflammation of the brain)
d. Optic nerve damage causing blindness

17. When making a decision about whether or not to allow your child to have the measles vaccine, what research, if any, did you carry out?
a. Did you speak to a health professional
b. Gather your own information on the subject?
c. Don't know

18. Did any government representative or official come to your house for Measles Rectification Awareness?
a. Yes b. No

19. Have you seen Measles Rectification Awareness Material in newspapers, hoardings, boards or electronic media?
a. Yes b. No

20. Do you think government has been successful in creating awareness amongst masses against measles epidemic?
(please tick one)

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

21. Do you know Government of Punjab has arranged free vaccinations for Measles?
a. Yes b. No

22. Would you trust free vaccination by government for your children?
a. Yes b. No

23. .Are there any measures you have taken to avoid or mitigate Measles spread in your household?

a. Yes b. No

If yes, then which type of measure you had taken?

a. Go to private clinic or hospital
b. Go to government hospital
c. Had taken any homeopathic treatment
d. Any other

24. How many sick days patient had with measles?
a. 3 days b. 1 week c. 2-3 weeks d. more than 3 week.

25. How many times patient had to visit to the doctor each day?
a. once
b. twice
c. three to four times
d. more than four times.

26. What is the expense of each trip?
a. 0- 100 Rs
b. 100-500Rs
c. 500-1000
d. more than 1000

27. What is your expense on patient other than medicines e.g food, clothes?
a. 0-1,000 PRs
b. 1,000-2,000 PRs
c. 2,000-3,000 PRs
d. More than 3,000 PRs

28. What are your monthly expenses?
a. PRs. 5,000- 10,000
b. PRs. 10,000- 20,000
c. PRs. 30,000- 40,000
d. Above PRs. 40,000

29. What is your total monthly income?
a. 1000-5000
b. 5000-10000
c.10000-20000
d. more than 20,000

30. How much money will you be willing to spend for measles vaccination for your household?
a. No money
b. PRs. 500 and below
c. PRs. 1000 and above
d. PRs. 5000 and above

31. Do you know that few diseases like Measles require immunity boosters after a vaccination?
a. Yes b. No

32. Would you go for immunity boosters after getting your children vaccinated for Measles once?
a. Yes b. No

33. Do you believe that allopathic science fails to treat measles completely?
a. Yes b. No

34. As this the cognitive disease, so when one of the member get affected by it. What measures you have taken to protect other family members?
a. put patient in isolation
b. take non affected family member to some other place like towards relatives
c. any other measure
d. no measure taken

35. Did you have made any change in your meal routine after one of the family member being affected by measles?
a. yes
b. no
c. partial change i.e. only changed the patient's meal
d. any other.

36. Do you use methods other than prescribed medicines, e.g. superstitious beliefs, for treating affected in the household?
a. Yes b. No

APPENDIX I:

Frequency tables discussed in methodology are given below:

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	17	28.3	28.3	28.3
	female	43	71.7	71.7	100.0
	Total	60	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	intermediate	15	25.0	25.0	25.0
	graduated	13	21.7	21.7	46.7
	post-graduated	8	13.3	13.3	60.0
	uneducated	24	40.0	40.0	100.0
	Total	60	100.0	100.0	

earning.members

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	34	56.7	56.7	56.7
	2	17	28.3	28.3	85.0
	3	6	10.0	10.0	95.0
	m0re than 3	3	5.0	5.0	100.0
	Total	60	100.0	100.0	

monthly.income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1000-5000	2	3.3	3.3	3.3
	5000-10,000	12	20.0	20.0	23.3
	10-20,000	17	28.3	28.3	51.7
	more than 20,000	29	48.3	48.3	100.0
	Total	60	100.0	100.0	

WTP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no money	27	45.0	45.0	45.0
	500 and above	15	25.0	25.0	70.0
	1000 and above	15	25.0	25.0	95.0
	5000 and above	3	5.0	5.0	100.0
	Total	60	100.0	100.0	

awareness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	6	10.0	10.0	10.0
	agree	23	38.3	38.3	48.3
	neither agree nor dis agree	16	26.7	26.7	75.0
	disgree	14	23.3	23.3	98.3
	strongly disagree	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

measures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	52	86.7	86.7	86.7
	no	8	13.3	13.3	100.0
	Total	60	100.0	100.0	

diagonosis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	by symptoms	44	73.3	73.3	73.3
	any test	7	11.7	11.7	85.0
	diagonosed at severe stage	7	11.7	11.7	96.7
	don't know	2	3.3	3.3	100.0
	Total	60	100.0	100.0	

Appendix II:

The table of cross tabulation interpreted in the cross tabs analysis are presented below:

WTP * Education Crosstabulation

Count

		Education				
		intermediate	graduated	post-graduated	uneducated	Total
WTP	no money	7	3	1	16	27
	500 and above	2	6	1	6	15
	1000 and above	5	4	4	2	15
	5000 and above	1	0	2	0	3
Total		15	13	8	24	60

WTP * monthly.income Crosstabulation

Count

		monthly.income				
		1000-5000	5000-10,000	10-20,000	more than 20,000	Total
WTP	no money	1	9	14	3	27
	500 and above	1	1	3	10	15
	1000 and above	0	1	0	14	15
	5000 and above	0	1	0	2	3
Total		2	12	17	29	60