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Towards Inclusive Governance and Efficient Institutions for Sustainable Development

The Effects of Environmental Degradation on child Health: Evidence from SAARC countries

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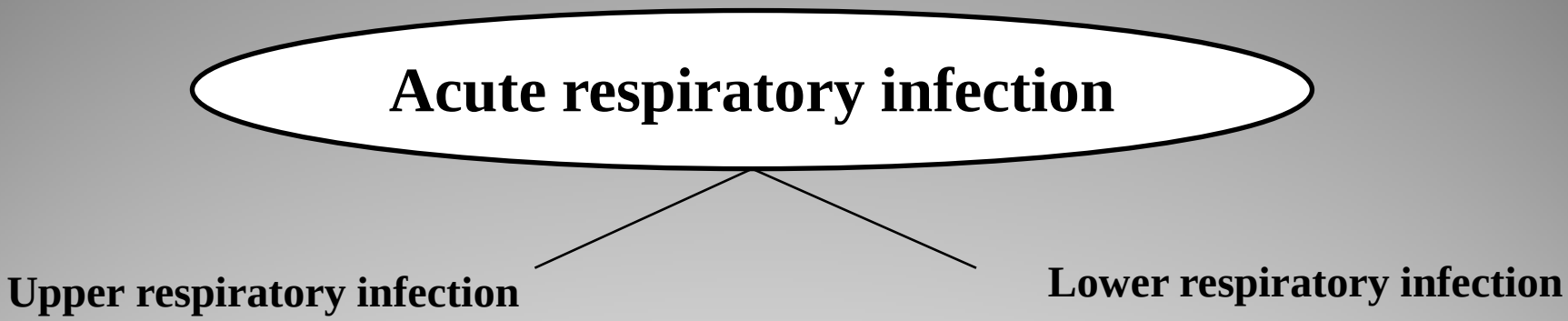
Objectives of the Study

- Children tend to be most vulnerable in their first five year of life when their health is influenced not only by their own physical condition but also by the social and environmental conditions.

- So the main purpose of this study is to increase the level of knowledge pertaining to child mortality due to acute lower respiratory infection in the age of under five years and to identifying the relative importance of socioeconomic and environmental factors which may have significant role in determining child mortality in SAARC countries.

- However, this study will provide the information that will contribute to critical needs in the development of policies focusing on environmental degradation and will look into the existing situation of air pollution and its effects on child health in the SAARC countries and specifically.

What is Acute Respiratory Infections



- Acute respiratory infection is a serious infection that prevents normal breathing function. It usually begins as a viral infection in the nose, trachea (windpipe).

- Acute Lower respiratory infection (ALRI), as a synonym for pneumonia, but can also be applied to other types of infection including lung abscess and acute bronchitis.

- Lower respiratory tract infections (LRTI) are generally more severe and are responsible for most of complications especially in children.

IMPORTANCE OF EARLY CHILDHOOD HEALTH

Good health raises

- Cognitive, physical, behavioral, and emotional development.
- Child learning and improved levels of education by increasing levels of schooling and learning performance.
- Individual productivity
- Levels of human capital
- Opportunities for obtaining better paid work
- Workforce productivity
- Economic growth
- Overall well-being.

Child Mortality in SAARC Countries

- Acute lower Respiratory infections (ALRI) is one of the most common human diseases, and the heaviest burden of viral respiratory illness is carried by children (wen kuanllu el al., 2014**).**

- ARI mainly of lower respiratory tract, are the leading cause of death among children in developing countries, resulting in nearly 1.9 million childhood deaths per year, of which 20 % are estimated to occur in India. Urban air pollution is estimated to cause around 700 deaths among children annually.

- In Bangladesh 21% of deaths of under five are associated with acute lower respiratory infection (2015).

- Acute Lower Respiratory Infections (ALRI) is one of the five leading diseases in Maldives. Moreover, as much as 60% of out-patient children are diagnosed with ALRI. [Institute of Health Sciences (IHS) 2011].

- In Bhutan, 39% percent of an estimated 110 child deaths due to acute lower respiratory infections is attributable to household air pollution (WHO, 2012).

- In Pakistan, 52% percent of an estimated child deaths due to acute lower respiratory infections is attributable to air pollution (WHO, 2012).

Mortality due to Environmental Degradation

- The most important consequence of environmental degradation in the developing world takes the form of damage to human health.

- Approximately 3 million children die each year due to air pollution in the world. With increasing urbanization and economic growth, air pollution is becoming an urgent concern in South Asian countries (WHO 2015).

- Nitrogen dioxide is a major air pollutant both indoors and outdoors and it is a strong respiratory irritant gas, main outdoor sources of NO_2 is motor vehicles and fossil-fuel power plants.

- NO_2 has also been positive associated with daily mortality in children which are less than five years old.

- Acute lower respiratory infections were attributed to have caused up to 4 million deaths worldwide. (WHO, 2012)

- A substantial fraction of the burden is experienced by populations in Asia and Africa, with 134 and 131 million cases of lower respiratory infections respectively, out of an overall global annual total of 429.2 million cases. (Sumi et al., 2011).

- According to estimates, every year about 120–156 million cases of ALRI occur globally with approximately 1.4 million resulting in death.

- Dangerous accumulations of nitrogen dioxide can occur in agricultural silos and in industrial processes and No_2 might contribute to exacerbation of respiratory disease.

Table 1

Acute Lower Respiratory Mortality In SAARC Countries %

Years	2001	2005	2010	2015
Afghanistan	27.3	25.3	20.2	16
Bhutan	14.1	10.1	6.3	4
Bangladesh	13.2	10.4	6	4.1
India	13.6	11	8.3	5.7
Maldives	4.5	2	0.9	0.5
Nepal	11.9	9.4	6.5	4.1
Pakistan	16.5	16	11.7	9.2
Sri lanka	1	0.8	0.5	0.4
World Wise Ratios	10.8	9	7.2	5.4

Table 2
Annual concentration of NO µg/m3

Country	No_2 micrograms per cubic meter
Afghanistan	46
Bangladesh	84
Bhutan	48
India	62
Maldives	16
Nepal	64
Pakistan	60
Sri lanka	27

Reason For Child Mortality

- Environmental Degradation
- Poverty
- Malnutrition
- Crowded living conditions
- Lack of Access to medical care
- Poor sanitation
- Low health Expenditure
- Lack of Access to clean water

MOTIVATION OF THE STUDY

- High levels of air pollution have a serious impact on the environmental quality that imposes economic costs associated with reduced quality of life, lost productivity, due to acidification impacts and health care costs.

- The environmental hazard is associated with various health problems among children and with an increased infant and child mortality due to Nitrogen Dioxide (NO_2).

- Environmental degradation remains a challenge faced by South Asian countries. With the projected increase in industrial activity, exponential growth in number of vehicles and population.

- Compared with adults, children take breathe more rapidly and more often play outdoors, leading to greater exposure to pollutants per unit mass and bear the largest environmental burden.

- Children may be more vulnerable to the health effects of ambient air pollution because of their higher rates of breathing, narrower airways, developing lungs and immune systems, and frequent exposure to outdoor air.

- Children constitute the largest part of the population that is susceptible to the adverse effects of environmental degradation.

Literature Review

- A negative correlation between access to water and child survival has been established [(Schultz, 1980); Esrey (1991)].
- GDP per capita, is accepted as a strong indicator of a country's overall welfare and there is negative relationship with child mortality (Pearce & Warford,1993).
- A severe ALRI among children and mothers with primary or less education is 8.1% compared to 5% among children of mothers with secondary education [Kazi Md. Et al., 2008].
- Air pollution is associated with increased risk of dying and strong relationship between long term exposure to traffic related air pollution and ALRI mortality [Andersen et al., (2010); brunekreef (2007); Wang et al., (2007) Hoek et al., (2002);].

- Child survival, like all population health outcomes, are clearly linked to the environment factors defined as air pollution. [Rainham and McDowell (2005)].

- A positive association between daily increases of NO2 and natural, cardiovascular, and respiratory mortality in Europe. [Samoli et al., (2006); (Saldiva et al., 1992).].

- Environmental health factors play an important role in child survival even when controlling for socio-economic variation [Anderson et al., (2002)].

Data Sources

- The data on child mortality and other socioeconomic variables used in this study are taken from WHO and World Bank.
- The study employed the data from 2001 to 2015 of SAARC Countries.
- The measurement of dependent variable (child mortality) chosen is the number of child deaths due to acute lower respiratory infection below the age of five out of 1000 children live born.

Empirical model and methodology

- **This study employed Panel data estimation Technique which is based on**

  Pooled OLS

  Fixed Effects

  Random Effects

- **Diagnostic Tests**

  Test of Heteroscedasticity

  Hausman Test for FE and RE

- The specification of equation is based on of child mortality model. The general form of the regression equation is given below.

$$\mathbf{Y_{it} = \eta_i + \delta_t + BX_{it} + \varepsilon_{it}}$$

Where

Y_{it} = dependent variable (Child Mortality)

η_t = Country specific, time invariant effect

δ_t = Time specific, country invariant effect

X_{it} = The vector of the explanatory variables

B = Scalar vector of coefficients of $\beta_1, \beta_2 \ldots\ldots\ldots \beta_N$

ε_{it} = Error term with E (ε_{it})

i denotes developing countries

t denotes times

Fixed Effects Panel Data Specification

- $ALRId_{it} = \beta o_{it} + \beta 1 lnNo_{it} + \beta 2 lnhexp_{it} + \beta 3 lnphy_{it} + \beta 4 w_{it} + \beta 5 gdp_{it} + \beta 6 lnurb\ pop_{it} + \beta 7 medu_{it} + \mu_{it} + v_{it}$

Table 3
Description of Variables

DEPENDENT VARIABLE	DESCRIPTION
Acute lower respiratory infections	Child death rate (%) (under five years)
Independent Variable	
Nitrous Oxides	Nitrous oxides (thousand metric tons of co2 equivalent)
Health expenditures	(total % of Gdp)
Physicians	per 1000 physicians
Access to Water	Improved water sources (% of population with access)
GDP per capita	Current (us $)
Urban Population	urban population % of total population
Female education	Female education % of female primary education

Table 4
Descriptive Statistics

Variables	Mean	Std .Dev
Deaths	10.615	7.825
No_2	30176.25	63718.92
Health Expenditure	5.216	2.367
physicians	.523	.390
Access to Water	83.676	16.178
GDP Per capita	1617.03	1732.07
Urban Population	28.033	7.864
Mother education	46.416	4.610

Table 5
POOLED OLS RESULT

Dependent Variable Child Mortality	**Pooled OLS**	
Independent variables	Coefficient	Z value
ln Nitrogen oxides	.5299***	3.01
ln Health expenditure	1.302	1.42
In physicians	-1.853***	-4.36
Access to Water	-.0036	-0.11
Gdp Per capita	-.0013***	-3.72
ln urban Population	5.956***	5.85
Female primary education	-1.139***	-11.41
Constant	38.206***	6.60
Number of Observation 120 Number of groups 08 Number of countries 15	Prob>chi2 0.0000 R^2 0.89	

Table 6

Dependent variable, child mortality	Fixed Effect		Random Effect	
Independent Variable	coefficients	t-value	coefficients	z-value
ln Nitrogen oxides	.7983***	5.61	.529***	3.01
ln Health expenditure	1.6640	2.70	1.302	1.42
In physician	-2.0486***	-4.66	-1.853***	-4.36
Access to water	-.02063	-0.59	-.00368	-0.11
Gdp Per capita	-.00085**	-2.59	-.00133***	-3.72
ln urban Population	6.3487***	7.84	5.956***	5.85
Female primary education	-1.0576***	-15.79	-1.139***	-11.41
Cons	30.811***	11.45	38.206***	6.60
Number of Observation		120		120
Number of groups		08		08
Number of countries		15		15
Prob > F		0.0000		0.0000
R^2		0.88		0.89

Summary of Diagnostic Tests

- This study employed a Hausman test to decide between fixed effects and random effects or which model is best for the analysis and found significant test at 1% significant level.

- The result of the Hausman test confirms that the Fixed Effects (FE) model is superior to Random Effects (RE) model for this study.

RESULTS OF INTEREST

- The results show expected relationship between the child acute lower respiratory infections' death and Nitrogen oxides. Even after controlling the variable of urban population physician, female schooling and GDP per capita.
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- The variable of environmental degradation has a positively and strongly impact on child deaths at the 1% level of significant.
- It has also found that estimated coefficient of level of urban population is positive and significant.

- The variable of GDP per capita has found negative and significant effects on child mortality which shows that as the increases in GDP by one % then child mortality will be reduced by 2.59%.

- The variable of female education is significant at the level of 1%. The reason less educated mothers have low knowledge of disease management and prevention so that improve the female education can also reduce the child deaths by 15.7%.

- It also showed in results that doubling the coverage ratio from one to two physicians per 1,000 of population will decreases mortality by about 4.66%.

- It has found that the variables of access to water and health expenditure has not found strongly and significant influence on child mortality in the poorest countries.

- The R^2 shows that the Fixed Effects (FE) model explains 88 percent of the variation in the dependent variable.

- There is no heterogeneity because this study applied robust test.

Policy Recommendation

These results have implications for a variety of policy issues.

- Environmental degradation has positively effects on child mortality which suggests that more attention should be given to the economics costs of poor health and mortality associated with environmental damage such as air pollution.
- Environmental pollution is very costly to eliminate but it must be done especially when it effects on people's health.
- Incidence of respiratory infections cannot be reduced without an overall increase in a social and economic development.

- GDP per capita and social policy initiatives should also be accompanied by wealth growth, that these policies will produce welfare improvements more quickly than wealth growth alone.

- Increase the number of physicians can be the most effective policy.

- In the similar context, If government maintained physician's density ratios by humanitarian aid and foreign health professionals so it can also improve child mortality.

- Increasing women's education could also significantly reduce child mortality rates. Not only would it increase the chances of her being knowledgeable but it would also increase her chances of being able to provide the best possible care for the children she does have.

- From a policy perspective female education enhancement, increase health expenditure and improved health facilities brought about by economics growth are all important for improving child health in developing countries.

THANK YOU