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9. PERSPECTIVE STUDY OF ENVIRONMENTAL EFFECTS ON PUBLIC HEALTH

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ABSTRACT

In this paper it is critically review the economic literature on the effects of environmental changes on public health ,in both the developed and the developing wolrd. The first focus on the economic methodologies that are available for the evaluation of the effects of environmental changes on public health .Then it explain how the monetary valuations of these effects can feed back in the construction of economic policy for creating agent specific incentives for more efficient public management,which is also equitable and environmentally sustainable. Every minute, five children in developing countries die from malaria or diarrhoea. Every hour, 100 children die as a result of exposure to indoor smoke from solid fuels. Every day, nearly 1,800 people in developing cities die as a result of exposure to urban air pollution. Every month, nearly 19,000 people in developing countries die from unintentional poisonings.

INTRODUCTION

The environment affects our health in a variety of ways. The interaction between human health and the environment has been extensively studied and environmental risks have been proven to significantly impact human health directly by exposing people to harmful agents by disrupting life-sustaining ecosystems . Although the exact contribution of environmental factors to the development of death and disease cannot be precisely determined, the World Health Organization (WHO) has estimated that thirteen million deaths annually are attributable to preventable environmental causes. The report also estimates that 24% of the global disease burden (healthy life years lost) and 23% of all deaths (premature mortality) are attributable to environmental factors, with the environmental burden of diseases being 15 times higher in developing countries than in developed countries, due to differences in exposure to environmental risks and access to health care.

The huge economic development and population growth result in continuing environmental degradation. Intensification of agriculture, industrialization and increasing energy use are the severe driving forces of environmental health problems. For countries in the early stages of development the major environmental hazards to health are associated with widespread poverty and severe lack of public infrastructure, such as access to drinking water, sanitation, and lack of health care as well as emerging problems of industrial pollution. The Occurrences of Asthma are rising dramatically throughout the developed countries, and environmental factors appear to be at least partly to blame . The Millennium Ecosystem Assessment synthesis report warns that the erosion of ecosystems could lead to an increase in existing diseases such as malaria and cholera, as well as a rising risk of new diseases emerging.

Climate change is also posing risks to human population health and well-being and thus is emerging as a serious concern worldwide [3–6]. In 2000 climate change was estimated to be responsible for approximately 2.4% of worldwide diarrhoea and 6% of malaria . According to the IPCC third assessment report the world temperature is expected to further rise during the century, implying increased health threats for human populations, especially in low-income countries. A study in Mexico revealed that lower greenhouse gases emissions would result in avoidance of some 64,000 premature deaths over a twenty year period.

ECONOMIC VALUATION TECHNIQUES

The impacts of environmental degradation on human health is essential for the development of well-informed policies by the health sector and consequently many valuation studies have been conducted worldwide the past decades addressing environmental risks to public health. The main approaches for health impact valuations can be broadly classified into revealed and stated preference techniques. The first take into account observable market information which can be adjusted and used for revealing an individual's valuation. Revealed preferences include cost of illness, human capital surveys, hedonic pricing and the Quality Adjusted Life Year studies. In stated preferences studies the market for the good is 'constructed' through the use of questionnaires. The two most-well-known stated preference methods are the Contingent Valuation Method (CVM) and the Choice Experiments (CE).

The Quality Adjusted Life Year (QALY) studies measure both the quality and quantity of life. The values for a Life Year range from 0, implying death, to 1, implying a year of perfect health.

Therefore, QALYs provide an indication of the benefits from a healthcare intervention in terms of health-related quality. Combined with the costs of providing different interventions, a cost-effectiveness analysis (cost per QALY) can follow to allow for comparisons of different interventions. A monetary value can also be placed on a QALY to estimate the dollar benefits of a health intervention or policy and allow for a subsequent cost-benefit analysis. Stated Willingness to Pay, elicited through a contingent valuation study or a discrete choice study, is often used, to monetize QALYs. Other methods to value a QALY include time-trade-offs, standard gamble and the visual analogue scale. Hedonic pricing methods assess differences in the price of housing in polluted or unpolluted areas, or the difference in wages between hazardous and non-hazardous jobs. Variations in housing prices and wages reflect the value of health damages avoided to those individuals and therefore reveal individual's willingness to pay to avoid damages.

ECONOMIC ASSESSMENT OF ENVIRONMENTAL HEALTH IMPACTS: EMPIRICAL EVIDENCE

There is increasing recognition that linked environment and health impacts require economic assessment in order to receive adequate consideration in policy. Consequently, a huge increase in the number of valuation studies trying to quantify the environmental impacts on human health in monetary terms and evoke public preferences for health and environmental policies that reduce the risk of illness or mortality has been experienced in recent years.In the subsequent sections important applications of the valuation techniques that have been conducted to estimate the social benefits associated with increased air and water quality dislike of climate change are reviewed.

AIR QUALITY

Air pollution is a major environmental risk to health and is estimated to cause approximately two million premature deaths worldwide per year [7] A reduction of air pollution is expected to reduce the global burden of disease from respiratory infections, heart disease, and lung cancer. As air quality is a major concern for both developed and developing countries, a large number of empirical studies attempting to monetize the benefits to health generated by improved air quality have appeared in the literature worldwide. Pearce [8] provides a summary of the main studies conducted to that day valuing health damages from air pollution in the developing world. In particular, valuation estimates for health symptoms and risks of mortality attributable to particulate matter, lead, nitrogen and sulphur oxides and low level ozone are reported. The main conclusion from the literature review is that some forms of air pollution, notably inhalable particulate matter and ambient lead, are serious matters for concern in the developing world since they are associated with severe health damages in monetary terms.

Since then a number of valuation studies have been conducted in developing countries estimating social benefits from air pollution reduction in terms of either averted mortality or averted morbidity due to air pollution mitigation strategies. To provide economic estimations of health risk reductions authors rely on existing epidemiological studies that establish the relationship between pollution concentrations and health hazards. Valuation studies are then conducted to monetize health outcomes given the number of exposures and the associated risk predicted from the dose-response functions.

WATER QUALITY

Contact with unsafe drinking or bathing water can impose serious risks to human health. Microbe contamination of groundwater due to sewage outfalls and high concentration of nutrients in marine and coastal waters due to agricultural runoff are among the most serious threats . According to the European Commission's (EC) recent statistics, 20 percent of all surface water in the EU is seriously threatened by pollution. In the infrastructurally disadvantaged developing world the water contamination problem is even more prominent.Although epidemiological studies have provided evidence of severe morbidity attributed to polluted water the issue has received limited attention in terms of valuation studies. Only few studies explicitly address health effects of drinking and bathing water quality to inform efficient water resources management policies mainly in high income countries.

In the developing world, health damages from drinking water contamination are examined by Dasgupta and Maddison et al. The former study estimates a health production function to derive the total cost of illness related to Diarrhoeal diseases in urban India,. Annual health costs are calculated and aggregated over the whole population are found to equal € 2,821,587. The latter estimates aggregate willingness to pay to avoid health risks, including various cancers, associated with consumption of arsenic contaminated groundwater in Bangladesh. Based on Value of Statistical Life estimation from studies in

India, authors report an aggregate WTP of $2.7 billion annually to avoid mortality and morbidity cases.

CLIMATE CHANGE

An understanding of the likely impacts of climate change on human welfare is crucial for making an informed decision about the best response strategy to the enhanced greenhouse effect. Consequently, a number of studies have attempted the evaluation of climate change-related health hazards.However the studies provide a total cost estimation of the climate change in $ per tonne of carbon and health effects are not distinguished. Based on the existing literature, Tol concludes that policy response to climate change should be dominated by adaptation, not by mitigation.

Welfare losses associated with health impacts induced by global warming are also estimated by Bosello et al.. Authors apply a general equilibrium macroeconomic model to infer costs estimates relating to cardiovascular and respiratory disorders, diarrhoea, malaria, dengue fever and schistosomiasis occurrences through changes in labour productivity and demand for health care. Consistent with the literature, results imply the welfare costs (or benefits) of health impacts contribute substantially to the total costs of climate change both in terms of GDP and investment.

Health effects from illnesses associated with climate change are also examined in the developing world by Tseng et al. using the dengue fever in Taiwan as a case study. The relationship between climate conditions and the number of people infected by dengue fever was first established and the monetary assessment was then attempted applying a contingent valuation study. Results indicate that people would pay € 15.78, € 70.35 and € 111.62 per year in order to reduce the probabilities of dengue fever inflection by 12%, 43%, and 87%, respectively.

THE USE OF VALUATION RESULTS IN POLICY DESIGN

Climate change and anthropogenic forcing threaten environmental stability and with it ecosystems' capacity to provide goods and services that can be translated to economic benefits for humans including values associated with health quality and death mitigation. Although environmental goods and services have value to society, are often neglected in policy-making as they are not traded in markets and as such are not priced. A primary cause for environmental degradation and consequent health hazards is failure to identify and internalize in decision-making the economic value of ecosystems. In the absence of markets, valuation studies can provide policy-makers with the necessary information to acknowledge the contribution of health benefits in the social welfare associated with environmental resources justifying the need for policy intervention to eliminate health effects from environmental hazards. Once aggregated over the full range of beneficiaries, monetary benefits estimated through valuation studies can be compared with the costs of the relevant environmental or health intervention policies through cost-benefit analysis to derive useful information on the efficiency of the planned policy. Welfare changes from alternative policy initiatives can be also assessed and the impact of social, economic and attitudinal characteristics on individual valuation can be examined. In this respect, valuation studies are significant for policy-making to guide the selection of economic instruments to allocate resources among socially valuable endeavours

CONCLUDING REMARKS

Environmental degradation poses a significant threat to human health worldwide. Because environment and health are so intimately linked for the environmental and health policies. However, health impacts are non-marketed and thus hard to quantify in monetary terms. The subsequent risk of being ignored in policy-making is a major concern worldwide. To address this challenge a number of valuation studies have been conducted in both developing and developed countries applying different methods to capture health benefits from improved environmental quality. Valuation results are crucial for the formulation of economic instruments to internalize the externalities created by the public nature of environmental resources. Enhancing air quality and securing adequate supplies of safe drinking water is associated with significant benefits for human health and well-being. Significant benefits are also found to be associated with bathing water quality socially justifying the costs for abatement policies. Climate change effects mitigation is also of great importance in terms of public health benefits. However, certain limitations of the existing literature have been identified.Further to provide accurate monetary estimates of the benefits of reduced health symptoms associated with environmental hazards, collaboration between economists and epidemiologists should be further enhanced to establish more informed dose-response functions and accordingly formulate the valuation scenarios. Finally, since health benefits from environmental improvements accrue in the long run their assessment should recognize their long-run nature.

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