

Toward a Global Agenda for Research in Environmental Epidemiology

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This paper follows from the closing plenary session of the annual conference of the International Society for Environmental Epidemiology (ISEE), held in Johannesburg, South Africa, September 13-16, 2005.

Professor Colin L. Soskolne was charged with the summation lecture under the title of this paper. The purpose of the lecture was to set the stage for establishing a worldwide discussion among environmental epidemiologists to formulate a global agenda for environmental epidemiology research.

This paper has not previously been published in whole or in part; nor was anything similar under consideration for publication elsewhere at the time of submission.

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ABSTRACT

The global environment is in critical decline. Whether concerned about environmental epidemiology from the perspectives of environmental health, climate change, ecological collapse, or growing inequity, natural capital resources are being depleted; disregard for the integrity of ecosystems is entrenched in current business practices. Indeed, despite increasing rhetoric to the contrary, the disregard - from a policy perspective - for long-term sustainability and, thus, for the health and well-being of future generations, displayed by those who hold power globally could be described as wanton. Yet, only six years ago, the Millennium Development Goals were announced as a rallying point for action to achieve a sustainable future, particularly by reducing the gap between the “have mores” and “have nots”. Attainment of these goals is now endangered, as is, apparently, the spirit of optimism and idealism that gave birth to them at the Millennium Summit.

We call for a re-invigoration of both concern about and action on sustainability. In particular, we appeal at least to those engaged in the field of environmental epidemiology and those sub-specialties with whom they engage, to consider how they might help by incorporating sustainability issues (including global ecological integrity and global environmental justice) into their own research programs; a vital contribution would thus be made to protect both present and future generations and reduce resource and health gaps between North and South. Simply put, we propose that sustainability becomes integral to advancing the science of environmental epidemiology, as well as other disciplines. To effect this, our rationale and draft agenda are presented here for debate, revision and refinement.

INTRODUCTION

Nearly 190 countries have now pledged support for the eight Millennium Development Goals (MDGs) adopted at the United Nations Millennium Summit in September 2000.¹ The MDGs (Table 1) include halving global poverty and hunger, environmental protection and the ending of illiteracy and gender discrimination. It is widely recognized that attaining these goals will enhance human health and well-being.

Eighteen targets were set for the international community to measure progress towards these goals. Many of these goals and targets fall within the scope of environmental epidemiology, broadly defined.

Given the hope, effort and fanfare that accompanied the launch of these goals, it is lamentable that, despite some bright spots, implementation has faltered. For example, while some progress has been made in some areas in sub-Saharan Africa, the number of people currently living there in poverty still exceeds that of 1990.

Table 1. The Eight Millennium Development Goals

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV and AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

Poorly recognized by the wider community, and apparently even by the MDG framers, a failure to enhance environmental sustainability (Goal #7) is likely to invalidate attainment of most of the other goals.² Despite being criticized for their imprecision,³ their comparative timidity,⁴ and their selectivity, the MDGs represent an organizing principle for development, a principle reaffirmed at the World Summit on Sustainable Development⁵ (WSSD) held in Johannesburg in 2002. And while the spirit of these ideals and concerns permeated the 2005 International Society for Environmental Epidemiology (ISEE) conference held in South Africa, they also pertain to other epidemiologic sub-specialties, as well as to many other disciplines and professional organizations, including those concerned with environmental exposure assessment.

On the one hand, the MDG framework describes the gap in needs between rich and poor populations. On the other hand, it offers environmental epidemiologists in both developed and developing countries practical ways in which they can "... contribute to advancing our science in the context of reducing inequalities to better ensure global environmental sustainability." Through understanding the role of environmental epidemiology in addressing disparities in health, we expect overall improvements in indicators of health and well-being not only globally, but also within those countries where disparities remain extreme.

EXPANDING THE SCOPE OF ENVIRONMENTAL EPIDEMIOLOGY

The pursuit of global equity implies a substantial shift in the scope of the questions to be addressed in future environmental epidemiologic research. In outline, the following challenges need to be considered:

1. Sustainability and equity have to become a core component of environmental epidemiologic research programs.^{6,7} Population health and equity are central to “sustainability”, and *vice-versa*.
2. Better integration of environmental health research for both more and less affluent populations is needed.
3. Recognize the changing balance of local and global environmental hazards to health, especially in an era of a globalized economy with increasing scale of human activity and impact.⁸
4. Recognize the diminishing returns of etiologic health research in isolation from other policy-relevant sectors (e.g., urban planning, industry, agriculture, demography), each with its own determining influence on population health.
5. Trans-disciplinary approaches must be actively fostered to facilitate newer inter- and multi-disciplinary modes of research⁹ needed to address complex, interconnected, systems-based, environmental health topics of relevance to longer-term sustainability.
6. Capacity building and technology-transfer need to be explicitly addressed in research involving developing countries.

These six challenges underlie two key themes related to formulating a global agenda for environmental epidemiology research that emerged from the range of plenary presentations at ISEE 2005.

1. Beyond traditional environmental epidemiology

A combination of interlinked factors has resulted in a paucity of research into causes of inequality and a disproportionate focus of research on health problems within developed countries. Although this research has explored environmental health inequalities, such investigations are uncommon, largely confined to inequalities in developed countries. This comparatively limited focus derives from the deeply entrenched inequalities that characterize our world. Overcoming these systemic inequalities remains a formidable challenge. The first step must be to recognize the impact of inequalities on sustainability and, consequently, on health and well-being. These limits apply not only to the scope of environmental epidemiology, captured in the 90:10 problem,¹⁰ but also derive from lack of funding and the problems in sustaining genuinely multidisciplinary research.

As globalization proceeds, however, a contested global research agenda is emerging. Driven by the nascent realization by some that the most cost-effective approach to attaining sustainable population health requires a genuinely global dimension in health research, tentative steps are being taken to overcome the most egregious biases in funding and infrastructure. There is growing understanding that the health of affluent populations cannot be guaranteed if inequalities increase. As herd immunity protects unvaccinated individuals against communicable disease, so too sustainable global health is fostered by minimizing the exclusion of vulnerable groups. This calls for a truly large-scale effort to reduce poverty and ignorance, including more effective provision to poor populations of tools needed to advance their own health.

While this broader agenda may superficially appear beyond the scope of environmental epidemiology, it is, in fact, close to the central message of the MDGs. So, we in environmental epidemiology are not alone! At the same time, because those goals are themselves in peril, we call for the environmental epidemiologic community to engage with and to support their attainment. For all their limitations, the MDGs are *not* simply idealistic statements, but form a platform from which to advance sustainable global health.

2. What the developing world can offer in strengthened North-South collaboration

Progress in fostering sustainable global health clearly requires partners between the research communities in the developing and developed worlds.¹¹ Synergisms arising from such alliances can stimulate the environmental epidemiologic research paradigm. However, it is crucial to demonstrate that a wider environmental epidemiology agenda - one that includes developing-world interests - can directly benefit populations and research communities in developed countries. To this end, we examined three aspects:

First, recognizing the world as an interlinked community, we argue that harmful perturbations in one region can adversely affect geographically remote areas, for example, through the environmental carriage of pollutants, and even the spread of harmful policies, ideas, dogmas and behaviors. Traditionally, societies have relied on walls and quarantine for protection from invaders and disease. That this approach is failing, including for privileged populations, is well-illustrated by the accumulation of greenhouse gases.

For decades, the greenhouse gas, carbon dioxide (CO₂), has been disproportionately emitted by high income populations. Because CO₂ is distributed evenly within the atmosphere, this effectively means this pollutant has been dumped in the atmosphere over the oceans and developing countries. But this “strategy” is faltering: global CO₂ will soon reach a level beyond which its harmful effects will harm the affluent as well as the poor, such as from an increased frequency of severe storms.¹²

The study of these effects challenges conventional epidemiologic methods and concepts. Further, environmental variations in many developing countries in qualities such as population density, nutrition, genetics,¹³ and in water, air and soil, can create special vulnerabilities and exposures to both pollutants and protective factors. Some of these variations constitute natural experiments that could be ethically and cost-effectively researched to explicate dose-effect relationships. Of course, we recognize that such

exposure-effect relationships require adjustment for their cultural and historical context, such as colonial exploitation and gender disparities.

Developing world countries contain much of the world's remaining biodiversity and comparatively intact ecosystems, important for air purification, climate stabilization, wild foods, and as yet unknown pharmaceuticals.⁸ A rich - though diminishing - reservoir of indigenous knowledge persists in many developing countries. Such knowledge - more integrative and systems-based than the reductionism fundamental to most approaches in the industrialized world, could help catalyze a more sustainable society, if it could be coupled with fundamental changes to the culture and values of materially privileged populations.

Some forms of institutional governance in developing countries could be models for developed countries. For example, recent changes in constitutional governance in South Africa have incorporated innovative and substantive protections for the environment.¹⁴ These constitutional provisions find expression in a carefully constructed institutional framework for public participation in environmental decision-making. Though not yet operationalized in case law, the South African constitution has recognized the health needs of future generations, and provides evidence that legislative frameworks can facilitate primordial prevention.¹⁵

Despite the fact that much needed information about health effects resulting from environmental pollution exists in developed countries, the Precautionary Principle is heavily challenged there because of the influence of vested interests.^{16,17} This situation offers a potential contribution from strengthened North-South partnerships: given different vested interests, implementing the Precautionary Principle in the developing world might well be more readily achievable. For instance, African countries' resistance to using genetically modified crops as part of US aid illustrates that precautionary decisions in the South could be supported by data from the North.

Some environmental health realities in the developing world provide valuable research opportunities, but are under-used because of human and technological limitations. Even where trained people are found, their research capacity may be restricted by their scientific milieu. Exceptionally, modern communication technologies are fostering networks and overcoming distance, including by open-access journals.

A GLOBAL AGENDA FOR ENVIRONMENTAL EPIDEMIOLOGY

The rationale advanced above provides the nucleus for a new global agenda for environmental epidemiology. Elements discussed during the ISEE 2005 conference included:

The need for “systems thinking”:

Our scientific enquiry must embrace greater complexity, including long time scales, complex dynamics, and diverse causal pathways associated with disruptions in the natural systems underpinning health. Though traditionally used, the reductionist, linear approaches are inferior for understanding the interactive webs that are critical for sustainable development, and for the health and well-being of future generations.

Enhancing multi- and inter-disciplinarity:

Socio-ecological changes, already in train, have potentially catastrophic implications for the health and well-being of populations on a grand scale.^{6,18} Multi- and inter-disciplinary approaches, including collaboration by epidemiologists with ecologists, social and behavioral scientists, and human rights and law experts, are needed to recognize, prevent and mitigate these effects on communities worldwide. In the best case, pursuit of the MDGs will foster creative and rewarding inter-disciplinarity, including among the various specialties with whom environmental epidemiologists engage.

Surveillance and Monitoring:

“Old” epidemics are re-emerging in new populations, while “new” epidemics from novel biological and chemical hazards continue to arise. These challenge existing surveillance methods, which must increasingly consider new population settings and exposures, and provide systems to assess routes of contamination.

Infrastructure-wise, mechanisms to coordinate reporting systems at different levels and tiers of government must be developed, incorporating eco-regional considerations with traditional geo-political boundaries.¹⁸ Also needed are integrated databases on environmental exposures, development hazards, and health effects.

Promote partnerships with organized civil society:

To remain relevant and better equipped to engage policy makers we call for greater co-operation with Non-Governmental Organizations (NGOs) and existing associations of complex systems scientists.

Environmental health scientists have a rich history of partnership with communities, especially in developed countries. Environmental epidemiologic research adds value to such partnerships, honing tools to measure influences amenable to public policy intervention.¹⁹

Values, ethics and philosophy:

Epidemiologists need to be aware of the moral dimensions of their work. For example, Canada continues to export asbestos to many developing nations. While legally permissible, this is ethically unacceptable, not least because recipient countries largely lack the resources to eliminate personal asbestos exposure. Such double standards²⁰ illustrate forms of institutionalized violence and eco-crimes against humanity.²¹

Environmental justice^{22,23} and ethical considerations must be incorporated into our work and should underpin environmental epidemiologic research, guiding studies from problem identification and hypothesis formulation to conduct, analysis, reporting and

dissemination.²⁴ Yet, many disadvantaged communities, especially in developing countries, lack the educational and political capacity for genuine participation. The active involvement of leaders of disadvantaged communities will sometimes facilitate research communication, including of findings.

Environmental epidemiologists also need to consider their individual roles, morally and ethically, in the business of “manufacturing doubt”. Exposed by Michaels in 2005²⁵, this enterprise has been growing in the USA, working against the ability of regulatory control to protect public health interests over big business interests.

Given that human rights are essential for the new global health agenda, environmental epidemiology must tackle power structures that adversely affect environmental health. Avoidance of this is illustrated by the language surrounding health inequalities in the USA.²⁶ A discourse of “disparities” sanitizes and divorces inequities from their historical context, attenuating the recognition of the power inequalities at their root. To an “ethically-naïve” researcher, “disparities” suggest quasi-natural events rather than manifestations of value failure and social injustice. While recognition of the historical and political dimension of inequity will not instantly remedy the situation, it is more likely to be part of a lasting benefit than superficial analyses alone.

A new look at generating and translating knowledge:

What ways exist for creating new knowledge, and for translating existing knowledge? For instance, when we think of capacity building and knowledge creation, North-South collaboration in epidemiology tends to be uni-directional in terms of topic selection, funding, and staff selection, a situation akin to “cultural imperialism”. What can we learn from case studies – in environmental epidemiology and elsewhere – reflecting more equal partnerships? How was this accomplished? What knowledge is valued, translated and applied, and why?

Not to be forgotten is the need to value the wisdom of indigenous cultures and their ways of seeking consensus and action. Mainstreaming such methods could have profound impacts in cultures where research and interventions have been “compartmentalized”.

Strengthening inter-sectoral and inter-agency actions:

Integration of the three pillars of sustainable development’s social, economic and environmental goals will aid in aligning sectoral policies, which ought to include health. Foundational to this will be the strengthening of knowledge on health and environmental links.^{5,27} Consequent to these changes, environmental health services likely would require restructuring. This is also called for in the 2005 Paris Declaration on Aid Effectiveness, essentially calling on partners in development to align with country-set priorities and harmonize work among agencies.²⁸

WHAT ROLE CAN ISEE PLAY TO ADVANCE THIS AGENDA?

We hope this *initial* thinking stimulates the debate needed to clarify the widening roles and responsibilities of environmental epidemiology to promote global health and development objectives. The World Health Organization (WHO) should – of course - be capable of leading this debate. But ISEE can play a valuable role in stimulating WHO’s involvement, including by using its recently accorded status as an “NGO in official relations with the WHO”. Other groups and epidemiological sub-specialties as well as other disciplines may also engage in support of this collaboration.

In particular, specific representation from the South should also be sought. An effective way of moving the development of a global agenda for environmental epidemiology research forward would be the establishment of a Working Group to foster this project.

A well-articulated vision is urgently needed to enable us to focus actions for implementation, along with goals and indicators of progress. For this purpose, we frame a set of possible actions (Table 2) and invite the broader membership of ISEE to respond with specific issues, concerns and suggestions. Indeed, we invite other sub-specialty

organizations of epidemiologists and related disciplines to engage with us in this endeavor.

Table 2. Toward a Global Agenda for Research in Environmental Epidemiology: Action Points emerging from the ISEE 2005 annual conference.

| ACTIONS FOR THE NORTH | ACTIONS FOR THE SOUTH |
|--|---|
| Focus on more effective transfer of environmental epidemiology technology | Place environmental health and environmental epidemiology on the Health, Science & Technology agendas |
| Apply resources to environmental health problems of the South, as part of and in addition to those of interest to the North | Invoke human rights, social justice and global solidarity as complementary frameworks to the MDGs to justify strengthened collaboration with the North |
| Make more funding available for Northern researchers to work in the South | Research policy and priorities which ensure investments are consistent with national health and health research development |
| Increase funding allocations for North-South collaborations | A more precautionary approach based on knowledge and experience from the North |
| Strengthen North-South solidarity in the field of environmental epidemiology | Build on environmental health successes in the South, e.g., Wangari Maathai |
| Recognize the need for environmental justice to the practice and impact of environmental epidemiology | Build national research systems that include environmental epidemiology, monitoring and evaluation |
| Understand the role of vested interests in influencing research funding and agendas, and in the manufacture of doubt. Work to correct imbalances that serve to maintain disparities in health | As opposite |

| | |
|---|---|
| and well-being | |
| As opposite | Require funding applications to advance environmental justice |
| Work with related professions to develop inter- and trans-disciplinary approaches for the study of complex problems; team with complex systems organizations | As opposite |
| As opposite | Work with agencies to achieve greater flexibility in the provision of data, including on an eco-regional basis |
| Strengthen knowledge of health and environment links (i.e., the influence of ecological disintegrity – population growth, affluence [i.e., consumption and waste] and inappropriate uses of technology – on health and well-being) | As opposite |
| As opposite | Integrate databases on environmental exposures, development hazards, and health effects |

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