

What Level of "Proof" Do We Need for Evidence-Based Practices in Environmental Preservation and Improvement? - Examples and Practical Considerations

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ABSTRACT

There is disagreement about what defines the levels of effectiveness and efficiency for "evidence-based practices" where environmental issues are concerned. Using an evidence-based public health (EBPH) model of assessing evidence, audiences, and competencies, this paper applies case studies to highlight efforts at obtaining a synchronized definition of evidence-based practices for environmental preservation. Through a review of current environmental practices, history of evidence-based research, and assimilation of recommended practices by those in affected communities, a better understanding of a necessary level of "proof" will arise. Recommendations on how to tailor evidence-based practices to various stakeholders are included.

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Background of Evidence-based Practices

There is no agreed upon, all-encompassing definition, set of preferred implementation strategies, or tried-and-true assessments of evidence-based practices where environmental issues are concerned. Moreover, the specific fields of environmental preservation and improvement are further complicated due to variations in interpretation of the necessary individual, community and global efforts required in practice. Due to these disagreements, it is difficult to ascertain what levels of proof are necessary to deem practices as evidence-based.

Evidence has been defined as the "facts or testimony, in support of a conclusion, statement or belief" and "something serving as proof" (Rychetnik, Hawe, Waters, Barratt, & Frommer, 2006, p. 538); however, these definitions lack context, an identified vehicle of transmission, and most importantly, the *when, where, why, and how* necessary for complete understanding, application, and replication (Rychetnik et al., 2006). Within the context of public health, both environmental preservation and improvement play pivotal roles in ensuring necessary conditions for healthy living (Waters, 2004). The field of public health has long viewed the importance of using clear, thoughtful, and informed evidence that is derived from research and evaluation to guide its efforts (Fielding & Briss, 2006). Often referred to as evidence-based public health (EBPH), there is a focus placed on ensuring that there is consensus among practitioners and investigators as to what factors contribute to

informed decision making for the "care of communities and populations in the domain of health protection, disease prevention, health maintenance and improvement" (Brownson, Fielding, & Maylahn, 2009, p. 177).

Consensus about what constitutes evidence in EBPH is typically delineated by three levels: (1) Type I, suggests "something should be done" about a certain disease or risk factor and is often based upon information collected from a clinical or controlled setting; (2) Type II, suggests "specifically, this should be done" and is often based upon information collected from an intervention; and (3) Type III, shows "how and under what contextual conditions interventions were implemented, how they were received, and *how* something should be done" (Rychetnik et al., 2006, p. 540) and are based from the adaptation and translation of an effective intervention (Brownson, Baker, Leet, Gillespie, & True, 2011; Rychetnik et al., 2006). Theoretically, one should always choose Type III evidence when available. However, understanding the varying levels of evidence helps to address the complexity in choosing appropriate measures. Knowing whether or not data are evidence-based is often a more complicated process.

Data are often derived from the following sources: research, clinical experiences, local context, and environment (Aro, Van den Broucke, & Raty, 2004; Rycroft-Malone, Seers, Tichen, Harvey, Kitson, & McCormack, 2004). Scientific research data sources have become the *gold standard* in defining whether or not data are considered

evidence-based. Due to the scientific process for guaranteeing objectivity, conducting repeated measures, and replicating findings, many research to yield the only type of evidence-based data (Rycroft-Malone et al., 2004). However, scientific research is often interpreted differently by various stakeholders, individuals, and professionals, thereby making it more *subjective* than *objective* in its uptake and dissemination (Moore & Kempton, 2009). Moreover, the necessary level of proof, i.e., data validity, depends on the context of how the data will be used.

Data may come in various forms, with certain types having resulted from more stringent methods than others. There are six main types of research evidence: (1) descriptive, (2) taxonomic, (3) analytic, (4) interpretive, (5) explanatory, and (6) evaluative (Rychetnik et al., 2004). Each type of data serves a specific purpose for different stakeholders, such as funding agencies, policy developers, and the general public. Funding agencies are often concerned with the bottom line of research, what the cost benefit analysis shows and how it impacts financial gains or losses. Therefore, analytic and evaluative data would be the most beneficial to answering those questions (Rychetnik et al., 2004). The general public, and those who are most likely to be impacted by research practices, are more likely to benefit from explanatory research data (Rychetnik et al., 2004). Unfortunately, explanatory data are often filled with jargon, less likely to be user friendly, and typically do not trickle down to the general public. The goal of explanatory data is to make "observations intelligible and understandable (Rychetnik et al., 2004, p. 538). Most data that get reported, however, are convoluted and complex making it difficult to ascertain whether or not the research conducted was evidence-based; as can be seen in the discrepancies of most environmental warnings, reports, and procedural guidelines provided to the public (Neuhauser, Richardson, Mackenzie & Minkler, 2007; Wagner, 2004). Lay knowledge or the understanding of the general public, will be greater when framed in a narrative or visual presentation style; however, most data reports and recommendations are often heavily statistical and complexly quantitative in their presentation (McMichael, Waters, & Volmink, 2005). Therefore, it is imperative that a translation approach is used when disseminating research data and findings to the general public.

Translational research is defined as a method for conducting research that ensures results are applicable to those who are impacted, directly or indirectly, by that research (Fazey, Fazey, Salisbury, Lindenmayer, & Dovers, 2006). Findings from research, data from studies, and dissemination methods all should have the consumer in mind. Moreover, collaboration between researchers and

the public must be considered and integrated into practice. Through collaboration there is an assurance that materials and information presented will be done in a useful manner. Translational research also has been referred to as *research-to-practice*. Regarding environmental issues, the positive impact of translational research can be seen in grassroots policy development, non-profit consumer program development, general practices, and public advocacy for more effective and efficient environmental practices (Fitzpatrick-Lewis, Yost, Ciliska & Krishnaratne, 2010). However, it is difficult to determine whether or not translational research can be considered an evidence-based practice due to the vast variations in definition, practice, and implementation. Regardless, when working with the general public it is important to use translational research when disseminating all types of data.

To stress the need for translational research, as well as the discrepancies between evidence and practice, the following case examples of environmental destruction in Ecuador and Peru are highlighted. To contrast these examples of environmental destruction, the movement toward sustainable environmental policy development and the innovative environmental preservation practice of renewable energy are also described.

Environmental Destruction Cases

Ecuador

Ecuador ranks 77th among 169 countries for its Human Development Index (HDI) and belongs to the high human development group. (HDI, 2010), meaning that in comparison with other Latin American countries, it is a less developed country. The per capita income is just above half the regional average, resulting in a depressed economy (HDI, 2010). Petroleum is the most important product of the economy, accounting for 54% of total exports in the last decade (Larrea, 2009). Additionally, petroleum revenues made up approximately 26% of government revenues between 2000 and 2007 (Larrea, 2009). Since 1972, following discovery of large petroleum reserves in the Amazon region, Ecuador has become a significant petroleum exporter (Larrea, 2009). In the beginning, petroleum exports were beneficial for economic growth and social improvement; but, since 1982, economic growth has ceased, social conditions have barely improved, and economic disparities have risen. A clear indicator is that the per capita income grew at only 0.7% per year between 1982 and 2007 (Larrea, 2009). Obviously, environmental impacts of petroleum extraction have been detrimental. One of the many consequences for Ecuador is having one of the highest rates of deforestation in South America, with about 198,000 half acres per year (Larrea,

2009). Over the last 27 years, rates of deforestation have not significantly improved. Perhaps, this lack of improvement is due to a small percentage of investment in renewable energy (Larrea, 2009). Consequently, the dependence on petroleum derivatives has increased along with addition in the energy import (Larrea, 2009). A recent positive step is public investment in hydroelectric projects. Moreover, future expansion of other renewable sources is being actively promoted (Larrea, 2009).

To highlight the problematic environmental past of Ecuador, on February 16, 2011 an Ecuadorian court reached a judgment relevant to numerous powerful companies in the world which, historically, tended not to be liable for the negative environmental effects they have left behind (The Independent, 2011). A judge in the northern Ecuadorian city of Lago Agrio found Chevron guilty for the environmental damage it caused in the Amazon rainforest by dumping billions of gallons of toxic waste in the rivers between 1972 and 1992 (The Independent, 2011).

When Texaco left Ecuador in 1992, the company abandoned nearly 1000 unlined toxic waste pits which continue to pollute the water in the region (Before Its News, 2010). In 2001 Chevron merged with Texaco, leaving Chevron held liable for an \$8.6 billion fine. Moreover, for the past 18 years Chevron has sought to evade responsibility for the above mentioned environmental crime. The oil company has tried various strategies to avoid trial or to undermine the Ecuadorian legal system (The Independent, 2011). Interestingly, on the official web site of Texaco, regarding the History of Texaco and Chevron in Ecuador, the company denies almost every responsibility about the matter. The version of the events on their site distorts the claims made by others about the occurrences in Amazon region.

Peru

Similar to other indigenous groups living in the southern hemisphere, the Achuar people of Rio Corrientes, Peru are witnessing their lands being destroyed due to oil exploration. Orta-Martinez (2010) describes direct relations between devastation of the natural area of these people and overall biodiversity loss. The Achuar maintain a balance in this fragile natural habitat within the rainforest. Unlike the modern western methods of mass fishing and overuse of food resources, these people have a harmonized relation to their environment, one which has been disturbed by the presence of oil companies. Their health, food supplies, medicine, and all other essential resources for their daily needs have been put at risk. Moreover, their social practices and customs are based on the aforementioned essential resources. As a result, their entire communities are disturbed and destroyed leading to an increase in early death (Orta-Martinez, 2010).

The oil companies have been in Peru for a century, but the Peruvian Amazon became desired source only recently due to the growing world demand for oil (Orta-Martinez, 2010). Policies, which do not respect the rights of the indigenous people, have led to destruction of their lands, biodiversity loss, desertification of whole areas in the rain forest, and early deaths among the native people due to sexually transmitted and other types of disease brought into their lives by “outsiders” associated with oil companies (Orta-Martinez, 2010). The Achuar used to be a voluntarily isolated group and intentionally avoided contact with external people. Increases in outside contact, mostly with representatives and workers of the oil companies, has led to health risks, including alcoholism, corruption and segregation among their leaders, and other detrimental consequences (Orta-Martinez, 2010). The government of Peru continues to give large parts of the Peruvian Amazon to oil and gas companies under concession and claims entitlement of the subsurface resources, despite a land title for the given territory (Orta-Martinez, 2010). Regardless of these policies, the State is commonly absent in such remote regions due to lack of interest, resources and technology (Orta-Martinez, 2010). Consequently, the only contact is with the oil companies which cannot be seen as fair supporters of the indigenous groups. Even if the oil companies do offer some community support, such as construction of a hospital or other infrastructure, their ultimate goal appears to be profit (Orta-Martinez, 2010). Thus, empowerment of local people becomes the essential factor in achieving some tangible results in terms of implementation of improved regulations.

Evidence-Based Practices for Environmental Preservation and Sustainable Policy Development

Not all international environmental practices are negative. Perhaps due to Ecuador’s dubious past environmental experiences, they have now amended their constitution. Article 395 states that if a doubt exists about legal matters which involve environmental affairs, they are to be applied in the most favourable manner regarding nature protection (Constitution of Ecuador, 2008). Moreover, Section 4 from the Ecuadorian constitution about the natural resources consisting of Article 408 states that all natural resources whatsoever can be exploited only if their exploitation is in accordance with the environmental principles established in the constitution (Constitution of Ecuador, 2008). The State will guarantee that the mechanisms of production, consumption, and use of natural resources and energy will preserve and restore the natural cycles, and will permit conditions of a decent life. Additionally, Section 6 emphasizes the

importance of water and its planned use and Section 7 involves the biosphere, the urban ecology and the alternative energies (Constitution of Ecuador, 2008). For example, Article 413 indicates that the State promotes energy efficiency, development and use of clean and healthy environmental practices and technologies, as well as various renewable energies with low environmental impact which put at risk neither the ecological balance of the ecosystems nor the right to water (Constitution of Ecuador, 2008).

Ecuador has begun to develop environmentally friendly initiatives for combating global warming, protecting biodiversity and supporting the voluntary isolation of indigenous cultures living in the Yasuni Park, as well as, encouraging social development, nature conservation and implementing the use of renewable energy sources. Large reserves of heavy crude oil have been newly confirmed in the ITT (Ishpingo-Tambococha-Tiputini) field, located in the Yasuni National Park, one of the most important and diverse biological reserves in the world. President Rafael Correa of Ecuador announced to the United Nations that Ecuador had decided to maintain the crude petroleum in the ITT field indefinitely underground, to put social and environmental values first, and instead, are exploring other ways to benefit the country economically (Larrea, 2009). The President's announcement clearly shows how Ecuador would like to implement its environmental policies. Thus, the government appears to be making efforts to substitute the production of fossil fuel, especially in significant sensitive environmental and cultural areas in developing countries, with promotion of renewable energy production (Larrea, 2009). By promoting this initiative Ecuador has the opportunity to become the first developing country to offer an effective and measurable carbon reducing model (Ecuador's Yasuni Trust Fund, 2010).

The progressive measures that Ecuador has been taking, such as efforts at reducing production of fossil fuels and innovative environmental policies, are examples of evidence-based environmental practices. By employing Type III evidence (Rychetnik et al., 2006) the Ecuadorian government has learned over time which interventions work for them, how those interventions are received by the individuals who are most affected by their implementation, and continuous assessment of their progress (Ecuador's Yasuni Trust Fund, 2010).

Renewable Energy

The implementation of energies from renewable sources has a positive effect on environmental preservation by reducing environmental impact when compared with fossil fuel combustion. Energy consumption is an issue for every country and it affects societies on a political and economic level as

well as on a social and environmental one (Rifkin, 2009). Energy produced from renewable sources has potential advantages for all societies if their implementation is effectively put into practice. Thus far, Germany has been at the forefront of this movement.

The "Erneuerbare-Energie-Gesetz" (EEG; Renewable Energy Source Act) came into practice April 1, 2000 after receiving approval from the German Parliament. The main novelty was the introduction of the "Feed-in tariff" inside German energy supply systems. According to this tariff, every German citizen can become a producer of renewable energy and it is mandatory for grid system operators to buy this form of energy at a fixed price which is stated in the Act (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2007). In addition, the Act does not state any limits to the amount of electricity which citizens are allowed to offer to the system. The price depends on the type of electricity generated, on the year the plant began operating, and on the size of the plant. The fixed price is modified every year in accordance with the technical learning curve, which means that every year the price will be less due to the increasing in knowledge and decreasing of production price (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2007).

The main consequence the EEG has had is that Germany's share of energy produced from renewable sources increased from 4.5% in 2000 to 16% in 2010. Since the implementation of EEG in 2000, Germany has created an autonomous, highly dynamic and efficient industry around renewable energies (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2007). This industry offers secure jobs for several professions: from components production to installation and research to project planning. In 2009 the number of people employed in the renewable energy production was 340,000, which represents almost twice the number of the people employed in the same field in 2004 (UNFCCC, 2008). According to Dr. Norbert Röttgen, Federal Minister for the Environment, Nature Conservation and Nuclear Safety, this is a direct consequence of the EEGs. In addition to that the UNFCCC stated that Germany has reduced greenhouse gases emissions in 2008 by 18% from the level of 1990 (UNFCCC, 2008). This reduction has decreased damages to the environment by 3.4 billion Euros until 2006 and it saved Germany one billion Euros in energy imports (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2007). The EEG also made possible the saving of 5 billion Euros on wholesale electricity price until 2006. The digressive tariff paid every year for each kWh produced by each renewable

energy source also has had a strong increase in the field of research and development. Due to the digressive tariff, the technologies used to produce electricity have to be cheaper every year to allow industries to invest in this field. Technologies can become cheaper only when industries finance universities and research centers to develop cheaper production processes or increase technological efficiency (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2007).

Additionally, the use of renewable energy constitutes an environmental preservation evidence-based practice due to the fact that it emanates from research that has been translated into a useful practice, can be replicated, and is easily assimilated. Unlike policy development, renewable energy practices can produce tangible products that various stakeholders can implement and use day-to-day.

Recommendations

Examples of renewable energy Acts in Ecuador and Germany and creation of sustainable policies all highlight the importance of ensuring adequate data collection, timely data dissemination, and information dissemination that reaches those individuals vital to the process (Stavins, 2003). Future policy recommendations may include 'degrowth' and the utilization of an international legal framework. Both can be achieved only on an international level where key stakeholders are included. The concept of degrowth refers to a tendency for decent living standards for every human, as opposed to permanent growth in already developed countries. An international legal framework already exists to some extent, e.g., the adoption of the United Nations Declaration on the Rights of Indigenous Peoples on September 13, 2007 (Human Development Reports, 2011). However, a joint effort of numerous NGOs, international organizations and states is required to tackle the complex issue of environmental preservation and improvement.

Additional recommendations for the establishment of legal instruments that would prevent the merger and takeover of companies as means of evading responsibility for environmental crimes, especially in less developed countries, is paramount. The strengthening of the implementation of an environmental legal framework is another alternative for change. Another policy recommendation would be to encourage world governments to initiate endeavors to prevent exploitation of natural resources and detrimental consequences for the environment. These endeavors need not be altruistic in nature, and instead, could be driven by monetary or notoriety but could simultaneously emphasize renewable energy stimulation. These efforts should be driven

by evidence-based practices that have been shown to be effective in other countries.

Conclusion

Even though Rychetnik et al. (2006) have operationalized the definition of evidence, improvements in contextual application, transmission, and translation of evidence into practice are still needed. The level of proof necessary to translate information from evidence-based practice into day-to-day practice requires initial information to be collected in a manner sufficiently understandable to the populous. Additionally, levels of proof are dependent on the type of public health intervention, the burden of disease and illness, availability of resources, characteristics of health and political systems, cultural and economic settings, and the physical environment (McMichael et al., 2005; Moore & Kempton, 2009). To increase the likelihood of environmental preservation and improvement practices data must be evidence-based, translated into usable knowledge and practical skills for multiple skill levels, and work within current cultural and environmental contexts to ensure appropriate adaptation and acquisition.

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