expression play a prominent role. Even more interesting is that KH Bauer came to his conclusions via a probabilistic argument.

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References


Epidemiology vs epidemiology: the case of oil exploitation in the Amazon basin of Ecuador

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In a recent letter, Terracini raises several important issues concerning the development of environmental epidemiology in Latin America and adds to the debate around our research on the health effects of oil exploitation in the Amazon basin of Ecuador. Terracini argues that the tension between the two often used perspectives on the mission of epidemiology, ‘scientific’ or ‘action-oriented’, ignores the importance of the context in which epidemiology carries out its mission.
We would like to further elaborate on this theme and the danger of such ignorance. A pending trial against the Chevron Texaco Oil Company in the rainforest of Ecuador will serve to illustrate that the context of where and how we conduct and discuss epidemiological studies is far from being only of academic interest.

Oil exploitation in the Amazon basin of Ecuador

After oil deposits were found in the Oriente in the late 1960s, Texaco was the first international oil company invited into the country, to install the drilling technology and a 498 mile trans-Andean pipeline to bring the oil to the coast for export. On behalf of its partners (Gulf Oil and the national oil company Petroecuador, originally known as CEPE) Texaco designed, managed, and controlled all of the consortium operation from 1971 to 1992 in a 1 million hectare of mostly undisturbed rainforest. For >20 years of its operations in Ecuador, Texaco extracted ~1.5 billion barrels of crude oil. It has also been estimated that the company deliberately dumped tons of toxic drilling and maintenance wastes and >19 billion gallons of produced wastes into the environment without treatment or monitoring, despite oil industry standards that suggest reinjecting the wastes back into the ground. In addition to routine deliberate discharges, accidental spills were common. During the time that Texaco operated the main trans-Ecuadorian pipeline, spills from that line alone sent an estimated 16.8 million gallons of crude into the environment.\(^2,3\) By comparison, the Exxon Valdez spilled 10.8 million gallons into the Prince William Sound in the largest oil spill in the history of the United States.

When Texaco’s contract expired in June 1992, the assets and operations were turned over to Petroecuador. Hundreds of toxic waste pits, used by Texaco, scattered near local communities, rivers, and streams were abandoned. A recent report has shown that nearly 200 open waste pits from the Texaco period are still open.\(^4\)

In 1993 a lawsuit was filed in the United States against Texaco. The plaintiffs—some 30,000 indigenous persons and peasants—claimed that the oil company had caused irreparable damage to the rainforest and to the health of the people of the Amazon region of Ecuador. In 2002, Texaco was confronted with the decision to submit to jurisdiction in Ecuador or face trial in the United States. Texaco chose to submit to jurisdiction in Ecuador. This represents the first time an American oil company has been subject to jurisdiction in the courts of a Latin American country with any decision enforceable in an American court. In October 2003, the trial started at the Superior Court of the Province of Sucumbios in the Amazon region of Ecuador.\(^5\)

In 1997, a local research centre started a project to assess the potential health impact of oil pollution in communities near oil fields. Results from these studies showed that women living in communities near oil fields reported higher rates of various physical symptoms (skin mycosis, tiredness, itchy nose, sore throat, headache, red eyes, ear pain, diarrhoea, and gastritis) and a 2.5 higher risk of spontaneous abortion than did women in control areas.\(^6,7\) Research done in 1998 found an excess of cancers among males in a village located in an oil producing area in the Amazon region.\(^8\) In 2002, another study, found a significantly higher overall incidence of cancer in both men and women in the countries where oil exploitation had been going on for >20 years.\(^9\) An increase in haematopoietic cancers was later observed in children.\(^10\) This research was part of the material presented by the plaintiffs as a probe of the health allegations. The final decision of the case is still pending.

On February 2, 2005, during the ongoing court proceedings, Chevron Texaco organized a press conference in Quito to present the results of five reports by epidemiologists retained by Texaco who criticized our studies, which have suggested links between adverse health effects and oil development in the Amazon.\(^11\) On February 10, 2005, major newspapers in Ecuador ran a full-page advertisement from Texaco citing quotes of the consultants’ reports.

The epidemiologist as the ‘independent’ and ‘objective’ observer?

Texaco consultants were presented as ‘independent’ though interestingly in this particular case, two of the ‘independent’ consultants were present in the press conference organized by Texaco and one has a well-known relationship with the oil industry. The main message of the Texaco consultants was that our studies were weak and biased. Epidemiology, as an observational science, has inherent limitations. In our case, we were limited by the data available in a resource poor setting. The difficulties involved in exposure and outcome ascertainment in vulnerable populations has been discussed among other issues in a recent letter signed by over 60 scientists as a reflection on the work of Texaco’s consultants.\(^12\)

‘Researcher bias’ has in the last decade been a source of intense and vivid debate regarding the role of epidemiology and epidemiologists.\(^13\) The ‘researcher bias’ in this case resulting from the researchers living in the polluted area for many years meant a personal experience of the exposure and a working relationship with affected communities.\(^14\) However, according to the consultants, our ‘unbalanced assessment of the epidemiology made it appear more of an advocacy exercise than a scientific paper’.\(^11\) We have argued in a previous letter\(^15\) that despite the scarcity of epidemiological studies, it is necessary to give public health recommendations in the light of the history of the exposure. In doing so the scientific credibility of epidemiology is not compromised, rather the opposite.

Judging causality: the importance of context

We, as well as the consultants, are aware that a few epidemiological studies cannot lead to causal inference. However the complexity of cause-effect relationships cannot be reduced to a discussion of methodological issues such as P-values and potential confounders. The current dominant epidemiological paradigm, focused on biomedical processes of individuals rather than social organization of populations, constraining conceptualizations of causality, should not be overlooked. It is interesting to go back to the writing of Bradford
Hill\textsuperscript{16} whose criteria we, including Texaco’s consultants, rely on when we discuss causality: ‘‘. . . too often I suspect we waste a deal of time, we grasp the shadow and lose the substance, we weaken our capacity to interpret data and to take reasonable decisions whatever the value of \textit{P}. . . Finally, in passing from association to causation I believe in “real life” we shall have to consider what flows from that decision. The evidence is there to be judged on its merits and the judgment (in that sense) should be utterly independent on what hangs upon it—or who hangs because of it. But in another and more practical sense we may surely ask what is involved in our decision... All scientific work is incomplete—whether it is observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time.’’

Bradford Hill believed that often it is wise to restrict a substance to avoid potential danger, a strong call to the precautionary principle.\textsuperscript{17} He clearly warns us of the danger of ignoring context.

This takes us back to the core problem Terracini points at; how the context is a crucial ingredient in the construction of knowledge. None of us live in a vacuum and epidemiology, as a science, is a social process, never the application of objective value-free rules. In this case, Texaco’s consultants ignored the history of environmental pollution and human rights violations that communities of farmers and indigenous people have experienced.\textsuperscript{18} While focusing on specific chemicals and individual exposures, they also forgot to ask themselves where the exposures came from, why they have been produced and who benefited from them. The reductionist approach that the consultants took focusing just on a set of techniques and ignoring the broader issues of context, is unfortunate, leads to a lack of action and potentially transforms epidemiology into a tool of unfairness and oppression.

The main issue for public health and the inhabitants of the Amazon basin of Ecuador is not whether some studies show or do not show causality but about the need for preventing disease and promoting health. Our research, together with qualitative and environmental information from the region, has indicated that those residents are in a public health emergency requiring immediate action.

To do no harm!

While action might be a desirable way to show our responsibilities as epidemiologists,\textsuperscript{13} there should also be sensitiveness about the basic ethical rule of doing no harm. It is deceptively simple but a difficult art to master. It underlies our responsibility to be accountable and committed as epidemiologists.

We would all probably agree that the Amazon environment is worth preserving regardless of any impact on adverse health effects; however, does it take us to the conclusion that epidemiological studies do not serve any purpose where contamination takes place? And especially when it is very difficult to come up with ‘strong evidence’? Maybe the table presented by Terracini showing that few environmental epidemiological studies are conducted in Latin America is to be applauded.\textsuperscript{1} Maybe we should strive to make them even fewer as many of their findings are deemed to be regarded as ‘weak’ and will be easily dissected and be given no value. If this is how such studies will be treated by prestigious epidemiologists from resource-rich countries when the industry calls, they will lead to more harm than good. We need a moral conduct code, which guides us about when and how to use our professional skills. To do that we need to be trained in how to judge the context. If not we will face the danger of divorcing epidemiology from the practice of public health.

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