# Preface[①]

***Jennifer Holdaway, Social Science Research Council***
***Wang Wuyi, Institute of Geographic Sciences and Natural Resources Research***

The impacts on health of environmental degradation associated with rapid industrialization and urbanization are becoming an issue of increasing concern in China, and the media now frequently reports on problems resulting from air, soil and water pollution. Because for most of us villages still conjure up images of a natural and healthy rural environment, the phenomenon of "cancer villages" seems particularly unexpected and disturbing.

Yet, although the government has acknowledged that "cancer villages" exist (Ministry of Environmental Protection 2013), remarkably little is known about them. In the aggregate, cancer rates in China have been rising for some time and data from the Ministry of Health shows that the disease is now the leading cause of death in rural as well as urban areas (Ministry of Health 2012). But to a certain extent, this is just part of a larger "epidemiological transition" resulting from lower mortality from communicable diseases associated with poverty as well as improved diagnosis and access to health care. It also reflects changes in diet and lifestyle that contribute to cancer, cardiovascular illnesses, and other "diseases of affluence" (Gong et al. 2012; van de Poel et al. 2012; World Bank 2011).

At the same time, there is little doubt that part of the increase in cancer is also due to environmental pollution. But how much, and the contribution of pollution to disease in any particular location, is hard to determine. The carcinogenic effect of certain chemicals is well understood on a biological level, and even without detailed information about specific pollutants, robust statistical correlations can be established between environmental quality and health for large populations. For example, the Five Year Study of Water Pollution and Cancer in the Huai River Valley has demonstrated a clear

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relationship between water pollution and high rates of digestive tract cancer at the county level using regular environmental monitoring data (Yang 2013).

But proving causality at the individual or village level is extremely hard. Even when there are good records of the number of cancer deaths, too many other factors can be involved in the onset of disease, including genetics, personal behaviors such as diet, exercise, smoking and alcohol use, and general health status and nutrition. Although the lack of good and/or publicly available data on many of these variables exacerbates the problem, this difficulty is not unique to China. Attempts to prove the health effects of pollution on small populations have been the subject of bitterly contested and protracted law suits in the United States, and a substantial literature has documented efforts by communities to gather evidence and gain acknowledgment of these contested illnesses (Brown 2007; Tesh 2000). As Chen Ajiang points out in the first essay in this collection, it is rare to find situations, like the Minimata case in Japan, where disease can be clearly linked to a particular pollution source; and even in that case, responsibility and compensation were contested for many years.

In China, the compressed nature of the industrial transition, and the multiple social changes that have accompanied it, often make it particularly challenging to prove environmental health effects at the village level. China's industrialization has been much more rapid than that of Europe, the United States, or even Japan. Furthermore, unlike many parts of the world, a lot of China's industry has historically been located in the countryside, and in many areas there has been rapid turnover in the type and scale of industrial activity. Even during the Mao era, Third Front and other policies promoted the establishment of industries in rural areas in China's interior, and from the early 1980s, in response to the policy incentives and market forces associated with reform and opening up, Town and Village Enterprises (TVEs) sprang up all over the country (Bramall 2007). These rural industries and the household workshops that accompanied them were generally small, used basic technologies and released their waste directly into the surrounding atmosphere, water and soil (Tilt 2007; Wang et al. 2007; Han and Zhang 2006). Many later closed or changed their product lines or form of ownership, with the result that many of China's rural areas have been affected by waves of pollution from different sources.

So while there are cases in which mines or individual industries are the clear source of health problems, there are also many situations in which complex sources and forms of pollution make it very hard to establish causality. Further complications arise from the fact that the populations affected by pollution have not been stable. Alongside changes in the distribution of industrial production, and partly in response to it, China's villagers have also been on the move. Rural-urban migration has profoundly changed patterns of residence and occupation, with many people who came of age in the reform era working and living in a number of places over the course of their lives, often in jobs that have exposed them to environmental health risks (Hu et al. 2008). Meanwhile, improved communications and media, along with financial and social remittances associated with migration, have in many places blurred the boundaries between formerly distinctive urban and rural lifestyles and the diseases associated with them (Holdaway 2012). These changes in place of residence, occupation and lifestyle make it difficult to isolate the impact of exposure to pollution on health, and even harder to attribute responsibility to a particular source.

The Chinese village is therefore a very difficult unit of analysis when it comes to studying patterns and trends in the burden of disease. But at the same time, despite all these complexities, it is clear that there are villages where mortality from cancer is much higher than the rural average and which also have a history of industrial pollution. Furthermore, as Chen and his colleagues rightly argue, the village remains a key social and administrative entity. Urbanization and demographic change may lead China's villages to lose their historical significance as the primary source of both social identity and economic security within a few decades, but for now, they remain an important unit of social life. And so, regardless of whether the relationship between pollution and cancer can be established at this level, these rural communities will continue to be the focus of claims and contestations for some time to come. For all these reasons, Chen Ajiang is right to insist that "cancer villages" are a phenomenon with which social science must engage.

But it is a brave social scientist who enters this highly charged and complex territory, and there are hard choices to be made in how to deal with the scientific uncertainty surrounding the relationship between pollution and cancer.

One option is to take media reports or citizens' claims about the causes of disease at face value and focus on their struggles to close factories or win compensation for health damages (for example, Deng and Yang 2013; van Rooij 2010). Another is to set the question of causality aside and study the landscape of risk perception and the ways in which different understandings shape behavior (Lora Wainwright et al. 2012; Lora Wainwright 2010; Jing 2000). Both of these are valid approaches from a social science perspective, and research along these lines has yielded valuable insights. But Chen Ajiang and his colleagues have taken the much bolder step of tackling the problem of uncertain causality and its implications head on. This was a decision for which Professor Chen received some criticism at an early stage of the project from epidemiologists who felt that assessing cause-effect relationships was not something that a social scientist should attempt. But he persisted, and his determination to understand and weigh the different sources of evidence regarding the relationship between pollution and disease has proved to be one of the most interesting aspects of the research.

Over a period of several years, Chen Ajiang and his team conducted extensive field research in villages in, Henan, Jiangsu, Zhejiang, Jiangxi and Guangdong, all of which had significant levels of industrial pollution and cancer rates at least twice the rural average, and sometimes much higher. In each case, though with different degrees of confidence and assertiveness, villagers attributed cancer to pollution from local industry or mining. Instead of shying away from the difficult question of whether these claims were justified, the researchers assembled the available evidence to determine what can be known about the relationship between pollution and cancer. In doing so, they examined all the information they could find on recent levels of pollution and health outcomes, including the results (where available) of tests conducted by government agencies, but also more informal data gathered by villagers. They did their best to understand the manufacturing processes used by local industries and the kinds of pollution they created. They also dug deep into the past, leading us through the history of these communities over the course of the last 30 years, tracing their different development trajectories and the implications of these for the environment, and for public health.

This multidimensional approach enabled them to distinguish between cases in

which a clear relationship between pollution from a particular source (usually a single factory or mine) and cancer could be clearly established; those in which the evidence was quite strong but not conclusive; and other cases in which the evidence for blaming a particular pollution source proved either weak or non-existent. In the last case, although there were polluting industries in the area, the particular pollutants involved were not known carcinogens or the pollution was too recent to be the cause of cancers with long latency periods. Examination of the history of these places complicated the search for a culprit because a series of industries have often come and gone over the years. And in some cases, such as the Huai River Basin, waves of pollution from industrial accidents upstream from the village must be considered in addition to local pollution sources. In these situations, although the pollution-disease relationship seems clear on a general level, no specific industry can be implicated as the responsible party.

In addition to carefully unpacking the evidence with regard to pollution, another major contribution of these case studies is that they integrate analysis of the available environmental data with attention to individual and social factors that may be contributing to the onset of cancer and other diseases. As he attempts to assess the contribution of pollution to cancer in Mengying village in Henan, Chen Ajiang thus analyses not only data on smoking and Hepatitis B in relation to the prevalence of lung and liver cancer among men, but also the ways in which local customs such as drinking "unboiled" water (*shengshui*) may be contributing factors. Pursuing a theme present in his earlier research, he also discusses how living with "external" pollution from industry can make villagers resigned to a dirty environment and less concerned about the impact of their own "internal" pollution from household waste or agricultural activities.

Building on this analysis of available information in each case, many of the essays document the factors that shape villagers' understandings of the relationship between pollution and illness. These include changes in the taste and smell of water and food, death or illness among animals, and observation of new types of illnesses among family and neighbors. As Anna Lora Wainwright has done elsewhere, the authors note the way in which rural people deploy quite sophisticated "lay epidemiologies" to understand the causes of disease (Lora Wainwright 2013), in the context of the "society of familiars" (*shuren*

*shehui*) of Chinese village life. But they also note how low levels of education limit villagers' ability to evaluate information from scientific tests, and their tendency to suspect current and local pollution sources that are visible to the senses, even in areas that have long and complex histories of industrialization or that suffer from regional pollution.

The book also explores the ways in which emotions, economic interests and social structure affect the attribution of responsibility for the impact of pollution on health and the way in which conflicts come to be framed and negotiated between villagers, industry and local governments. The authors note how cancer patients and their families struggle to construct a meaningful explanation for the occurrence of disease and how these emotions, especially in combination with limited scientific understanding and anger toward unresponsive government agencies, can lead them to become fixated on a certain interpretation of the cause of the disease in spite of evidence suggesting more a complex reality. Several of the analyses also explore the internal divisions that arise within villages as a result of the uneven distribution of the costs and benefits of pollution, as, for example, when some villagers own or are employed by polluting industries and others are not.

In doing so, these essays situate analysis of the impacts of pollution on health within the larger context of the new, but unevenly distributed, opportunities that industrialization has brought to various parts of China and the tradeoffs this has had in terms of environment and health impacts. In some cases, the benefits of industry have accrued mostly to outside investors, but in others villagers themselves have polluted the environment with small workshop-style factories or mines. Migration is also part of the story, as some industries draw workers in with them from other counties, while others employ at least some of the local population. The essays show that it is difficult to apply a simple environmental justice analysis to China, because although in some cases there is a clear victim, in many cases victims and beneficiaries overlap. As other studies (Deng and Yang 2013; van Rooij 2010) have found, conflict seems most likely to occur either in cases where locals are deriving little benefit from an existing polluting industry, or when the benefits derived from industry have disappeared, leaving health problems and a degraded environment in their wake.

In media reports and much of the social science literature on environmental

pollution in China, local government is either left out of the analysis or cast in a purely negative light, as failing to enforce environmental regulations or respond to villagers' concerns about the impact of pollution on health. The cases in this book also find instances of local government colluding with industry to disguise the effects of pollution, and ignoring villagers' calls for environmental testing or for action against polluting factories. But while not excusing this behavior, some of these studies also contextualize it with an analysis of the pressures that local government faces to attract investment and generate tax revenue. These include not only performance criteria imposed by higher levels of government, but also the pressure to generate revenue to support public services and policy mandates not covered by central funds. Like villagers, government officials are also not a homogeneous group, and village level cadres in particular face difficult dilemmas as both representatives of the state and members of communities suffering from pollution.

Chen Ajiang's decision not to evade the problem of causality considerably enriches the analysis. As social scientists, we are trained to understand that the aspects of "reality" we choose to investigate, the categories, methods, and instruments we use, and the kinds of information we privilege or ignore are all shaped by social factors as well as by the even more fundamental limitations of our human cognitive abilities. The virtue of Chen's analysis is that he enables us to see the value and limitations of multiple kinds of knowledge and the ways in which circumstances filter and color what different actors see. As a social scientist who comes himself from a rural background, and who also has some prior training in the natural sciences, Chen is in a particularly good position to give fair treatment to information from different sources, including villagers' lay epidemiologies as well as the limited data available from environmental and health tests. He notes the way in which powerful actors use their control over information to prevent villagers from finding out the risks to which they are exposed, and he understands that their experiential knowledge of the local environment and patterns of disease in the community can enable them to identify changes that may not be captured by formal data collection. But at the same time, he also shows the ways in which villagers' own understandings and use of information are loaded in various ways by emotional and social ties as well as by economic interests.

While alerting us to the different contexts in which knowledge is generated and

used, the authors also make it clear that exploring different answers to the question of causality is not merely an intellectual exercise. Even if we recognize the contingent nature of our understandings of the world, we still have to act, and this entails choosing one explanation over others as a guide to behavior. The problem of cancer villages puts this tension between uncertain knowledge and the need for action into particularly stark relief and Chen Ajiang does an admirable job in both illuminating and navigating it.

In one sense, it could be argued that there is no need to try to prove causality in individual cases. On a broader level it is painfully clear that the latent impacts of environmental degradation resulting from China's earlier waves of rural industrialization are now manifesting themselves. This is evident from the study of the Huai River Basin and other analysis of large scale data sets (Yang 2011; World Bank 2007). The case studies in this volume show the human suffering behind such impersonal statistics. And, as the authors point out, the experience of these villages is a warning call to other areas that may be seeking to follow the same development pathway, especially as industry is now relocating from coastal areas to the hinterland and west of China. If the stories in these pages are not to be repeated, regional development policy needs to be proactive in considering the possible environmental and health effects of industrialization and in seeking to reduce the perverse incentives that lead local governments and communities to tolerate pollution. Resources and capacity are limited and cannot be quickly scaled up across the board, but targeted investments could be made in increasing enforcement capacity in areas that are likely to be particularly vulnerable, while local government's fiscal dependence on revenue from industry could be reduced if more services were supported by the central level. Even without such measures, documenting and sharing information about the experiences of early industrializing areas can help to alert other jurisdictions to the long term consequences of unregulated industrialization and prompt them to assess the environmental and health implications of the development options open to them.

At the same time, though, something must be done in places in which problems have already surfaced, or soon will. And for this we do need to get to grips with the problem of causality in local contexts. This is first and foremost because without an understanding of possible pollution sources and pathways of exposure, interventions may be misguided and ineffective. It is important to

know whether people are being exposed to toxins from current or legacy pollution and through which environmental media. If current pollution is not a problem and previous contamination affected mostly air or surface water which is now of acceptable quality, providing medical care may be the primary need.But if soil or ground water are contaminated, ecological restoration may need to be considered and because this is a lengthy and expensive undertaking, it is important to target the problem correctly. In the meantime, understanding environmental media and exposure pathways can inform more immediate interventions to reduce health impacts by changing the supply of drinking water or food. But it is still important to identify the main source of exposure or such interventions will not be effective. In extreme cases, organized migration may be the only way to protect health.

Of course, it will not be possible to conduct extensive environmental testing in every case: it is too expensive and there are not enough experts who are trained to do it, especially at the local level. But this does not mean that basic environmental health assessments cannot be made, and because many rural communities will be facing these problems in coming years, it will be important to design tools for doing these. Although China now has a National Plan for Environment and Health Work which should be implemented at the county level (MEP 2007), not much progress has been made so far, partly because financial and technical resources have not been made available for local environmental and health agencies to conduct this work. As a result, most Centres for Disease Control and Environmental Protection Bureaus at the county level lack the necessary expertise and equipment to conduct environmental health risk assessments (Holdaway 2013; Su and Duan 2010). Providing these resources will be essential if localities are to respond better to these problems.

However, even then this will not be a simple process because the information generated by risk assessments will be used not just to inform interventions but to determine responsibility and provide the basis for claims for compensation for economic and health damages and clean-up costs. This, of course, is the reason why many local governments are not only unable but also reluctant to carry out these investigations. And it is the reason why, even when they do, villagers often do not accept results that do not substantiate their claims. In fact, although many of these cases are rejected by the courts, in principle, Chinese

law takes the position that in cases where polluting events occur, the polluting party must prove that damages to health have not occurred. But as the essays in this volume and other research shows, this law cannot be effective if information about production processes, emissions and environmental quality is not available. At the central level, the Ministry of Environment has recognized the role that the public can play in environmental enforcement, but unfortunately such recognition is far less common at the local level. Yet without better access to trustworthy public information, citizens can only fall back on their own observations. And without proper processes in place to adjudicate competing claims, more and more of these situations are likely to result in conflict.

As this volume shows, in some cases it is possible to establish causality, and in these situations polluting industries should be held responsible for health and other damages. In other cases, the search for a culprit will come up blank because the factories responsible for pollution will have moved or closed, or causality will just be too unclear to attribute responsibility. In these cases, government will have to bear the costs. In the saddest cases, communities may come to the realization that their own efforts to increase their incomes through small scale mining and industrial activities are the cause of disease. This will be especially distressing in situations where the long term costs of environmental health impacts far outweigh the short term benefits that industrialization has brought. It is to be hoped that greater public understanding of these long term tradeoffs will also help to generate support for a more cautious approach to development.

These studies therefore have important implications for policy. In closing, we would like to draw attention to the implications of this book for research. Several of these projects were carried out with support from the Social Science Research Council's (SSRC) China Environment and Health Initiative Collaborative Grants Program, and the team members have been active participants in the China-based Forum on Health, Environment and Development (FORHEAD). Both these programs were established with the goal of promoting interdisciplinary approaches to the study of environmental impacts on health in China with a view to providing a better evidence base for policy and civil society responses.

This book demonstrates very effectively the benefits of an interdisciplinary approach and the role that different kinds of expertise can play. It shows how important it is to draw on the natural and medical sciences to understand how pollution affects health, but at the same time, it highlights the ways in which social and cultural factors interact with physical processes to increase or diminish risk. When it comes to responses, knowledge from both the natural and social sciences is required in order to select interventions that will target the problem effectively and be understood and supported by local people. Over ver the longer term, it is also necessary in order to better integrate considerations of environmental and health impacts into local development strategies.

This short book presents a highly informative account, not only of the complex world that lies behind the headline "cancer village", but also of the larger social transformations at work in rural China. It offers no easy answers to the dilemmas they represent and it does not take refuge in simplistic attributions of blame. As a result, it sometimes makes for very painful reading. But in unpacking the tangled relationships between industrialization, environment and health in these different contexts, it is a path-breaking contribution to the social science of rural China.

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