Building Effective Health Strategies for Waste Workers

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Submitted to Prof. Al Berry and Prof Catherine Chalin
Submitted by Joey Herrington

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Dedication

To my parents, because all that I have seen they taught me to see. And to Bep.

Acknowledgements

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Chapter 1 – Introduction

Introduction

Like many third world cities, Danang is typified by an unreliable refuse collection system. In response to the municipal solid waste management system that does exist, poor labourers have found a niche of removing recyclable waste materials from the municipal waste stream and selling the materials for economic gain. Equipped in most cases with inadequate and insufficient protective gear, their work exposes them to an array of potential health threats. The danger to waste picker health could be reduced if public health workers had a better understanding of what the major health problems affecting waste pickers were. Unfortunately much of the research into the activities of waste pickers has avoided public health issues.

Objectives

From within this gap in knowledge about waste pickers health, fundamental questions have been raised regarding the causes and effects of waste picking on the health of the individuals involved and the ramifications their health status has on the community at large. Against this backdrop, this paper will investigate the health status of waste pickers at Khanh Son Landfill in Danang Vietnam. The focus is an epidemiological study conducted in Danang in February and March of 2001, which examined factors that influence the health of waste workers. The key objectives of this study were to:

1. Identify and understand the major health problems facing waste workers.
2. To establish goals, set priorities, and develop strategies to address health problems amongst waste workers.

Outline

This paper is divided into six chapters. Chapter 2 provides a theoretical framework for the research project. Concepts and language relating to public health are introduced and discussed in relation to the study conducted in Vietnam. Chapter 3 introduces research conducted in Danang on integrated waste management. This chapter provides a comprehensive overview of Danang, the motivation for designing and implementing the research project, and an in-depth description of the methodology used. Finally, limitations of the study are expounded. Chapter 4 is a quantitative presentation of factors associated with waste picker health. The chapter provides a comprehensive discussion that attempts to explain salient results with statistical evidence. Chapter 5 summarises the relevance of major findings of this study and suggest broad strategies and considerations to appropriately address waste picker health in Danang. Chapter 6 presents the conclusions of the study and identifies recommendations for future research based on the findings of this study.

Chapter 2 – Theoretical Framework

Introduction

Public health involves a series of core concepts and a language to describe these central ideas and practices. This chapter will introduce the concepts and language that will be used throughout subsequent chapters.

The Concept of Public Health

The World Health Organisation (WHO) has defined 'health' as 'a state of complete physical, mental, and social well-being, not merely the absence disease or infirmity'. This broad definition, however, is rather unhelpful operationally, because in this conception health includes everything, and hence nothing in particular (Evans, 1994). Therefore, it is important to be clear from this point forward about which particular notion of health we will proceed. R.G. Evans (1994) defines health simply as the absence of disability or disease. That is, when free of illness as experienced by patients, of disease as understood by clinicians, or of injury, one is healthier.

For many people, the history of public health is associated with the 'sanitary revolution' that established and applied the principles of modern hygiene and made dramatic progress against traditional infectious disease. However, the scope of public health stretches far beyond this historical definition. Public health can be defined as 'what we as a society do collectively to ensure the conditions in which people can be healthy' (IFRC, 1999).

From this definition it is clear that public health deals with society: groups of people and actions affecting many people (IFRC, 1999). Public health action seeks to promote the health of the community.

Determinants of Health

The modern view of health is broad. It goes beyond individual diseases or viruses and includes all of the aspects of life that can affect our physical, mental, or social well-being. There are thus many underlying conditions that can influence a persons well being. Evans (1994) presents an analytical framework that highlights the ways in which different types of factors and forces can interact to bear on different conceptualisations of health (Figure 2.1). By extension, these same factors also influence waste picker health. Many studies in many countries, over many years, have shown a correlation between life expectancy and various measures of social status – income, education, occupation, and place of residence. The correlation between social status and health is only one leading example of a much larger class of observations of large differences in health status not just among individuals, but among well defined groups: populations and subpopulations (Evans, 1994).

The precedent for this model is the Canadian governments white paper A New Perspective on the Health of Canadians (Evans, 1994). Key aspects of this model can, however, be adapted for use in developing countries and indeed serve as a foundation of primary health care. This framework assumes that its components are actually categories that could be expanded to show complex contents. It is thus important to avoid treating

such categories as if they could be represented by a single homogeneous variable. For example, in specific contexts it may be the interactions between factors from different categories or determinants, and their timing that are critical to the health of individuals and populations.

In this model, illness is influenced by three categorical factors: genetic endowment, physical environment and social environment. Inherent genetic influences will not be discussed here because this paper aims to focus on the changeable physical and social environments. The most significant over-arching impact on the factors immediately affecting health, illness, and health care is socio-economic status, or prosperity.

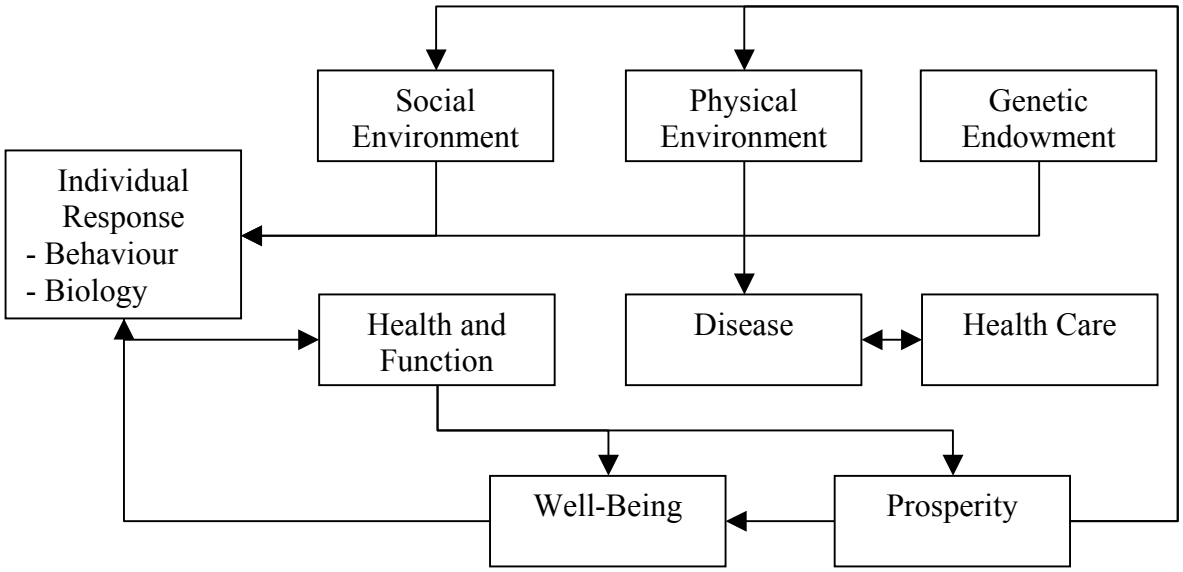

FIGURE 2.1 DETERMINANTS OF HEALTH MODEL (EVANS, 1994)

Health Promotion & Disease Prevention

Promoting health involves three levels of prevention (IFRC, 1999). The first level of prevention is primary prevention, or preventing health problems from happening at all. This is clearly the ideal, and also usually the most cost-effective, approach. While primary prevention can be accomplished in several ways, education and active participation of people are essential. Primary prevention is often referred to as 'Health Promotion', the process of "enabling people to increase control over, and improve their health" (Ottawa Charter for Health Promotion, 1986).

In many cases, despite efforts at primary prevention, a health condition occurs. Secondary prevention involves early detection and successful management or treatment of the health condition so as to avoid damage to the person's health.

Finally, if primary prevention and secondary prevention have both failed or are not possible, and a person's health has already been compromised, tertiary prevention seeks to limit impairment, increase quality of life, and/or prolong life

Generally speaking, in order to achieve its goals, modern public health efforts tend to focus on primary prevention, and to a lesser extent, on secondary or tertiary prevention approaches.

Public Health in Practice

The specific domain of public health is at the community, national or global level. It relies on measures that deal with small to large groups of people, rather than dealing with each individual. Public health is concerned with collective action and the health of populations and sub populations. For all of these reasons, a considerable portion of public health work is carried out by governmental agencies. This is especially true in Vietnam, where "the humanitarian nature and socialist orientation of health activities demand equity in the provision of health care"(Pham et. al., 2000). Since the liberalisation of the economy, however, an important amount of public health work has been provided by religious and other nongovernmental organisations.

The International Federation of Red Cross (1999) summarizes the work done by public health organisations under three headings:

- *Assessment* means collecting and analysing data to identify and understand major health problems facing a community. Recall objective one from Chapter 1.
- *Policy Development* establishes goals, sets priorities and develops strategies to address health problems. Recall objective two from Chapter 1.
- *Assurance of Services* involves the design, implementation, and evaluation of programs to address health problems in the community. The scope of this paper will not deal extensively with this topic, however it is this researchers opinion that there is need for further research into the health programming affecting waste workers not only in Danang, but also throughout Vietnam, and in developing countries in general.

Public Health & Human Behaviour

While the history of public health was closely related to the control of infectious diseases, modern public health is challenged mainly by problems resulting from human behaviour. Since efforts to change human behaviour are complex and difficult, many prefer to seek an environmental, technical, or engineering solution to public health.

In low-income countries, however, spending a few dollars per capita per annum for health, the appropriate technologies must of course be very different to those in rich countries spending thousands of dollars per capita per annum on health care. Assessments of medical technologies must thus be both scientifically based as regards health effects and country specific as regards cost norms.

Combined Approach

The major lesson from public health experience is that a combined strategy – using multiple approaches – generally works better than any single intervention (IFRC, 1999).

Public health seeks to influence the societal conditions in which people can be healthy. This work leads far beyond access to medical care. It includes efforts to ensure societal opportunities (such as education), a healthful physical environment (including housing, nutrition, and workplace safety), and prevention of threats to mental of social well-being (such as violence and/or political instability).

Therefore, it should be clear that any discussion of public health must always consider the societal context including its economic and social dimensions. Increasing attention is now being paid to community responsibility and participation in ensuring the conditions in which people can be healthy.

Primary Health Care

In 1978, an historic international conference on Primary Health Care took place at Alma-Ata in the former USSR. The goal "Health for All by the Year 2000" was set, and primary health care was identified as the strategy to achieve this goal (WHO, 1978). The two main concepts of primary health care can be summarised as follows:

- Satisfaction of basic human needs and the right to social justice and equity
- The attainment by all citizens of the world of a level of health that will permit them to lead socially and economically productive lives.

Primary health care is a concept that is applicable to all communities and nations. It requires that people become directly involved, as active participants, in promoting their health and preventing disease. The Declaration of Alma-Ata, urging all countries to develop a system of primary health care, calls for local participation, participatory decision-making, and constant involvement of community based organisations in all health matters (IFRC, 1999).

The Declaration of Alma-Ata defined eight elements of primary health care. These elements include:

- Education concerning prevailing health problems and methods for prevention and control
- Promotion of food supply and proper nutrition
- An adequate supply of safe water and basic sanitation
- Maternal and child health care, including family planning
- Immunisation against major infectious diseases
- Appropriate treatment of common diseases and injuries
- Provision of essential drugs

It is within this framework that problems associated with the health of waste pickers will be tackled. The Declaration of Alma-Ata, and the over-arching framework of Public Health provide the means to empower a desperate community that has been subjugated and left on the fringes of society. Using the concepts and language outlined above it is possible to begin to frame possible solutions, viable options and alternatives for waste pickers in Danang. Before making that step however, understanding the integrated waste management strategy in place in Danang is essential.

Chapter 3 – Waste Picking In Danang

Introduction

This chapter presents background information on the site of the study, with particular attention paid to the integrated solid waste management strategy in place in Danang, Vietnam. The methodology of the study is introduced and the limitations are presented.

Study Site

Vietnam is located in Southeast Asia, bordered in the north by China, in the west by Laos and Cambodia and in the east and south by the Gulf of Tonkin. The capital, Hanoi, is located in the north, on the shores of the Red River, and is the hub of Vietnamese culture and politics. Saigon, Vietnam's largest and most modern city, is located in the south, on the shores of the Mekong River, and is the economic heart of the country. The population of Vietnam in 1999 was over 76 million (Central Census Steering Committee, 1999), making it the 15th most populated country in the world.

Located at the mouth of the Han River, approximately half way between Hanoi and Saigon, Danang is the fourth largest city in Vietnam. This study was carried out at Khanh Son Landfill, approximately 8 km from Danang. The site was chosen because it is the only municipal landfill in operation by the Danang Urban Environment Company (URENCO). The details of the study will be discussed in detail in the methodology section.

The current population of Danang is 656 000 and it is estimated that approximately 460 000 are served by the sanitation components offered by the city. It is expected that by 2010, the population of Danang will reach 900 000 (URENCO, 1998).

The city is located on a coastal plain and is surrounded by the Truong Son Mountains in the north, the Phuoc Tuong mountains to the west and the South China Sea to the east. The topography is flat, with a mean elevation of 4 m above sea level. East Danang is separated from the rest of the city by the Han River.

Waste Management in Danang

Existing facilities in Danang comprise a drainage system, a solid waste system, and a limited wastewater collection and treatment system. Although there is need for research into all three waste systems, this discussion will be limited to solid waste. The solid waste system has limited vehicles and related collection capacity, and the disposal site has insufficient capacity for the projected growth of Danang. Many areas of Danang are not adequately served by the waste collection system and the revenue collection arrangements result in insufficient funds being available to provide an adequate service (URENCO, 1998).

Development in Danang is being targeted to attract tourism, but is also directed to significant industrial growth. The present limited sanitation facilities have an adverse impact on the health of the community and correspondingly could adversely affect visitors to Danang.

Householders typically discard solid waste onto the streets. This waste is swept into heaps and then shovelled into handcarts by sanitation workers for disposal. Up to half of the waste is not collected and ends up in combined sewers and drains where it results in blockages and adds to flooding problems.

The present solid waste management system in Danang is summarized in Figure 3.1.

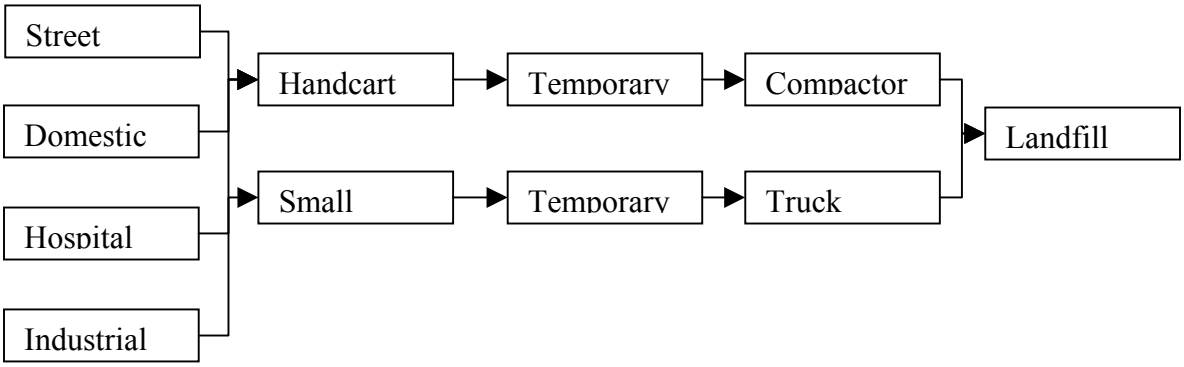

FIGURE 3.1 SOLID WASTE MANAGEMENT COLLECTION PATHS IN DANANG.

Solid Waste Collection and Street Sweeping

General

Solid waste is collected from domestic, commercial, industrial and institutional premises within those parts of Danang designated the Danang Peoples Committee (DNPC). Seven teams of URENCO workers undertake the collection.

Findings of a 1997 census indicate that there are about 100 000 households in the urban districts of Danang. Nearly 40% of those households currently pay for solid waste collection service. URENCO estimates that approximately 70% of urban households in

Danang presently have access to waste collection service (personal communication). The remaining 30% dispose of waste by open burning, or dumping in surface waters and drains, and on vacant land and roads.

Handcarts are used to collect waste from the households and commercial premises in the many narrow streets and lanes of Danang where vehicle access is limited. URENCO presently has approximately 100 handcarts, each having a capacity of about $0.8m^3$. The waste collector rings a bell to alert property owners on and off the street frontage that they should bring out their solid waste to the handcart for collection. The property owners themselves empty their solid waste containers into the handcart. Household waste storage containers are not standardized by URENCO, but typically comprise plastic bags and reusable buckets or baskets. The collection frequency for areas serviced by handcarts varies between one and three times per week.

Solid waste collection from properties fronting the wider roads of Danang is undertaken using small rear loading compactor trucks. URENCO has twelve small compactors ranging in capacity from $3m^3$ to $4.6m^3$. These trucks sound a well-recognized tune to alert property owners in a similar manner employed by the handcarts. A morning (between 7h30 and 11h00) and afternoon (between 13h30 and 17h00) pick up is typically provided to areas serviced by these small compactors.

Residents who are unable to use the collection service (because they are not home when either a handcart or compactor truck passes through their area) typically place their waste in a plastic bag in the gutter or on the curb, for collection by the street sweepers.

Hospital waste

Hospital waste is collected from the various hospital buildings using handcarts. While some hospitals segregate and separately bag their waste according to source, as there is no separate disposal of biomedical waste in Danang, all waste from hospitals is ultimately deposited into a compactor truck and mixed into the general waste stream at Khanh Son.

Street Sweeping

The Danang URENCO has seven Environmental Teams that are responsible for the manual sweeping of the sealed roads in Danang. Street sweeping commences in the evening once traffic volumes have declined and continues into the night. Waste is swept into small piles in the gutter or roadside from where it is shoveled into either a handcart or compactor truck.

Solid Waste Transfer

Waste collected by handcarts is transported to the city's disposal site either directly using a large compactor truck or indirectly via a waste transfer facility, depending upon the proximity of the waste collection area to a transfer facility.

For waste collection areas remote from the waste transfer facilities, the full handcarts are hauled to one of several designated central locations. At these locations the sanitary worker parks the full handcart on the side of the road, collects an empty handcart (a number of which are also parked at this location), and then continues on to the next waste collection area. The full handcarts are periodically emptied into an $8m^3$ rear loading compactor truck fitted with a lifting device.

All waste collected by the small compactor trucks is hauled to the Nguyen Tri Phuong transfer facility. This is the most sophisticated of the four sites and is used by both handcarts and small compactor trucks. As the waste collection vehicles enter the facility they proceed up a concrete ramp to an elevated platform. From here they discharge their load directly into a tip truck located at ground level.

Solid Waste Recycling

Waste Recycling

Separation of recyclable waste from the waste stream is carried out at four levels in Danang as follows;

- At source
- By URENCO workers
- At waste transfer facilities
- At the waste disposal site

At source

Separation at the household level is usually performed by householders or domestic servants to earn supplementary income. Householders or servants typically keep saleable items and sell them to door-to-door collectors.

Depending on the quantity of waste produced, industrial establishments typically sell their process waste to itinerant junk buyers, dealers, or reprocessors of waste.

By URENCO workers

Handcart pushers and street sweepers have the opportunity to remove materials from the waste they take to transfer stations. Whether this is regulated by URENCO is unknown, but the removal of small amounts of saleable waste materials is a common means by which URENCO workers augment their income.

At waste transfer facilities

Waste pickers or scavengers operate at the transfer facilities recovering recyclable materials from the waste dumped by handcarts.

At the disposal Site

About 180 waste pickers work at the city's landfill where they greatly assist in minimizing the quantity of waste requiring ultimate disposal. These waste pickers do not fall under the direct control of URENCO, but are tolerated because of the benefit they provide to the landfill operation. Commonly separated materials include glass and

porcelains, paper and paper products, plastic products, metals, textiles, rubber, leather, bone and wood. The recovered waste goes through several transactions before it ultimately reaches a reprocessor for the following reasons:

- The quantities are too small for direct sale to the reprocessing industry
- The wastes may need to be graded, cleaned and treated before reprocessing
- There may be along geographical distance between collectors and the reprocessor
- The collectors may not have the financial and physical means to clean, store and transport the wastes

These transactions may involve small and medium sized dealers who supply the user industry. Others may also be involved between these transactions. The dealers clean, weigh, and store the waste at their depot and then sell it to a wholesaler who deals in specific waste materials. The waste recycling and trading businesses have a strong presence in Danang and have large workforces associated with them.

Solid Waste Disposal

Since 1992, URENCO has operated Khanh Son landfill approximately 8 km west of central Danang. In 1996 the DNPC approved the extension of the landfill, bringing the total area of the site to 17 ha. Seven people staff the landfill.

The site is located at the base of the Khi Da Mountains and generally slopes in an approximately west to east direction. The main access road runs along the southern and western edges of the filled part of the landfill.

No covering of the waste is undertaken at the site. Despite this, the landfill was only slightly odourous. And no odour was detected beyond the boundary of the site. Numerous flies were observed at the landfill largely due to the amount of exposed waste. Waste at the active tipping face is periodically pushed up using a bulldozer, however minimal compaction of the waste is achieved.

A diversion channel has been constructed along the eastern boundary of the landfill to route runoff from the mountains to the north. The bed and banks of the channel are lined with rocks to reduce scouring. A rock wall has been constructed at the head of the diversion channel (base of mountains) to control the release of runoff into the channel.

Leachate can be observed leaving the base of the landfill at several points.

Legal Background

The eighth congress of the Vietnamese communist party adopted the industrialization and modernization strategy in 1996 (GoV, 1996). The strategy objectives guided Vietnams development path over the period 1996-2000. The strategy dealt with macro-economic and social direction and provided a basis for development of the sanitation sector. The strategy focused on changing the structure of the economy in favour of industry and services. The strategy sought to continue the liberalization of productive forces to enable maximum mobilization of both domestic and international resources; and to make full use of the market mechanism while mitigating negative effects of market operation.

The Vietnam Socio-Economic Stabilisation and Development Strategy adopted in 1990 includes (among many others) the following objectives for the sanitation sector relevant to Danang:

- Achieve a better balance between development and environmental protection
- Give priority attention to community health through safe water supply and proper sanitation

In general, laws and standards governing environmental protection and water resources management are supported by more detailed regulations. However, the level of knowledge and application of the legal framework may be limited (URENCO 1998). Significant relevant legislation includes the Public Health Protection Law (1989) accompanied by regulations from the Decision of Council Ministers No. 23/HBDT, 1991 (URENCO, 1998). The objectives for the sanitation sector (relevant to Danang) are:

- Factories are to be gradually concentrated in separated industrial zones
- Toxic wastes, and hospital wastes containing disease causing bacteria, must be treated before discharge to urban sewerage
- Night soil must be carried properly, and stabilized before use
- Waste must be disposed of and collected daily, including street sweeping

Motivation

Much good work has been done to more clearly define the roles of different organizations within the sanitation sector in Vietnam, however there are still a large number of different

ministries involved (for example Health, Environment, Water Resources, Construction) and complicated overlaps of responsibility (URENCO, 1998).

As well, there is a wealth of literature on the role of the informal sector in waste management, especially in developing countries. At Khanh Son, there are approximately 180 waste pickers involved in waste picking, as well as countless others throughout the city who work in the informal waste economy as itinerant junk buyers, collectors or in reprocessing. At all levels of this informal network, human health is being compromised. This study aimed to qualitatively and quantitatively identify factors affecting the health of waste pickers at Khanh Son Landfill in Danang.

One key objective of this study, like similar studies undertaken by other University of Toronto researchers, was to identify the obstacles that prevent waste pickers from being healthy in the broadest sense. This objective is rooted in the Determinants of Health Model (discussed in Chapter 2).

From the determinants model we know that a range of factors influence health, including but not limited to: health care resources, individual health behaviour, the social environment, and the physical environment. The Fourth International Conference on Health Promotion stated in the Jakarta Declaration that "health is essential for social and economic development of a country" (WHO1997).

The impact of waste recovery on the health and social needs of waste pickers is often overlooked and replaced instead by concerns about the environmental and economic aspects of waste management (Nguyen et al, 2000).

Previous studies have indicated that a relationship exists between solid waste handling and increased health risk. Studies of waste pickers in other countries in Asia have identified waste pickers as a high-risk group for poor individual and public health (Nguyen et al, 2000; Cointreau-Levine, 1998). Health surveys show that health status among pickers in low and their life expectancy falls below national averages. The risk is greatest in developing countries where the contact between the waste and the waste worker is greatest and the level of protection is the least.

Methodology

Sample and Design

A five week study was conducted at Khanh Son landfill in Danang. An estimated 180 pickers work at the landfill. The study sample consisted of both males and females in all age ranges who worked as waste pickers at Khanh Son at the time of the study. The study was conducted as part of the Canadian International Development Agency (CIDA) funded project on waste management called WASTE-ECON directed by Dr. Virginia Maclaren of the Department of Geography and Program in Planning, University of Toronto, and Dr. Nguyen Danh Son of the National Institute of Science and Technology Policy and Strategy Studies (NISTPASS), Ministry of Science, Technology and Environment, Government of Vietnam.

Procedure

Development and Ethical Review

Subjective data was collected in the form of a survey (see Appendix A), which had been used in slightly different forms by other University of Toronto researchers in Haiphong and Ho Chi Minh City. The two surveys were combined and duplicate questions were deleted. No additional questions were added. The Department of Geography Internal Ethical Review Committee reviewed the survey that had been administered in Haiphong and the University of Toronto International Health Program Ethics Committee reviewed the survey that had been administered in Ho Chi Minh City. The survey for this study collected descriptive information about demographics, personal opinions and perceived health status, as well as socio-economic information.

Permission

Before any work took place at Khanh Son, permission was sought from the Danang URENCO. Over the course of several months in Danang, research was conducted in conjunction with the Danang URENCO and the familiarity and trust that developed during that time helped in the permission process. A letter of intent, including research objectives, and the purpose of the study were sent to the director of Danang URENCO along with a proposed work plan. This plan outlined the scope of the research, and accounted for all hours that the research team would spend at Khanh Son. With this plan in hand, URENCO approved the research project and the team moved into the next phase of the project, pre-testing the survey.

Pre-testing

For approximately one week, the two members of the research team[1], visited the landfill with the intention of gaining familiarity with the URENCO staff, the pickers and collectors, and the drivers who delivered the waste. The first day a letter of permission from the Danang URENCO was presented to the URENCO staff at the landfill, and the researchers were given a tour of the facility. The staff were willing to answer questions about daily operations. Extensive field notes were recorded. For the following four days the research team spent one morning, two afternoons and one evening (night) at the landfill talking with pickers. During this time the researchers waited for the picker to initiate contact. Slowly, the community of pickers learned that the team would be working at the landfill for several weeks and that their intention was to collect socio-economic and health information. During the pre-test period several survey questions were asked during casual conversation (usually a cigarette break, or a brief rest) to test if they would yield appropriate responses. Some small clarifications were made between the researcher and the interpreter as to the meaning of some questions. After four days the research team was ready to begin data collection.

Data Collection

The survey, was translated into Vietnamese (see Appendix B), and administered orally by a Vietnamese-speaking interviewer. After the respondent had replied the interpreter translated the response into English for this researcher to record. In total, 140 waste

[1] The research team comprised the author and the interpreter.

pickers were interviewed, however, for the purposes of analysis, four individuals were dropped from the sample. The field testing lasted approximately four weeks.

Analysis

The results were analysed using SPSS statistical software. The frequencies of various variables, cross tabulations of different combinations of variables, and regression analysis aided in interpreting the data. The results are discussed in Chapter 4.

The Interview

The inclusion criteria for the study included the following. The participant must:

- Be at least a part time waste picker at Khanh Son Landfill
- Have provided oral informed consent

All 140 interviews were conducted by the research team in Vietnamese. The interview collected demographic and socio-economic information as well as information on waste pickers health. The participating pickers were compensated 10 000 VND ($1.00 CND) for their time. This amount was equivalent to the compensation given during the Ho Chi Minh City study.

Limitations

This study has several key limitations which need to be carefully considered when conclusions are drawn from the results presented in subsequent chapters. First and foremost is my perspective as a young, western, student. Clearly my perspectives

influence how I interpret answers and explanations of waste picking. Also of importance is how participants viewed me. Knowing that I was at the landfill could have influenced how pickers worked or dressed (protective clothing). Also, in their responses to questions, I could have been afforded the expected answer in the hope that as a foreigner I was there to help, and could possibly affect change.

A second limitation is that the study focused on pickers, and ignored other waste workers (formal or informal sector). These include all of the URENCO staff who have direct contact with waste on a daily basis as well as the informal sector waste workers such as collectors, and reprocessors, where it is known that occupational health hazards are common.

A third limitation is one that exists across the spectrum of public health research. The major lesson from public health research is that a combined strategy, using multiple approaches, generally works better than any single intervention. In fact, precise identification of which factor, or combination of interventions, will make the critical difference for improving health in a community is extremely difficult to determine.

A fourth limitation that needs to be discussed is the fact that the subjects were volunteers. Normally a voluntary response sample would show bias because people with strong opinions, especially negative ones, are the most likely to respond. This limitation is overcome by the fact that nearly the entire census was captured as almost all of the pickers at the landfill were interviewed.

Having a complete census would eliminate voluntary response bias, but unfortunately time and economic constraints limited the sampling to 140 individuals. Although only part of the total population of pickers at Khanh Son was sampled, the excluded group did not exhibit any noticeable atypical characteristics. The excluded individuals were within the age ranges captured in the study, and did not appear to share an average age greater or less than that of those sampled. Also, the percentage of males in the excluded group was similar to that in the study. Between the two groups there was a great deal of interaction. They worked together, ate together, and in some cases were likely neighbors. No reasons were seen why some, or all, of the excluded group would not have volunteered if the study had continued. Not having captured the entire population could have led to a situation whereby, due to being fairly close to having a complete census, the results would be cast into doubt if the excluded people were quite atypical in relevant respects vis a vis the average. Their being a little atypical could also distort the results, but only slightly given their small number, however; in this case, the excluded group did not seem in any way atypical.

Chapter 4 – Results and Discussion

Introduction

In the previous chapter, the methodology and process used to implement this study on waste picker health was described in detail. This chapter will present and expound the results of the analysis. The first section will address the statistical results, including associations between several variables and each individual's subjective summary statement of their own health status. This section will be divided into two subsections, the first dealing with the levels of health discovered during regression analysis, and the second dealing with change in health over time.

Study Results

General Findings

A total of 140 waste pickers were included in this study. The entire population comprises, by best estimate, approximately 180 waste pickers. The maximum number of variables in the analysis never exceeds 10, meaning that there are sufficient degrees of freedom to have statistical confidence in the results.

All 140 individuals were asked a series of questions and the results were recorded in English. Four individuals who met the inclusion criteria were dropped from the analysis because they did not constitute a large enough group to have statistical significance, and their inclusion complicated the regression analysis without contributing any additional information. SPSS was used to determine study results.

The sample comprised 29 men and 107 women. Amongst men, the distribution of ages was approximately normal, but skewed slightly to the right. The mean age was 26.00 and the standard deviation was 9.98. Male waste pickers ranged in age from 14 to 51. Amongst women, the distribution of ages was normal, with a mean considerably higher than that of men, at 38.88, and a standard deviation of 11.19. The ages of female waste pickers ranged from 12 to 65.

TABLE 4.1 AGE DISTRIBUTION

Sex	**N**	**Mean Age**	**Standard Deviation**	**Minimum Age**	**Maximum Age**
Male	29	26.00	9.98	14	51
Female	107	38.88	11.14	12	65

Of the entire sample, 41 per cent (n=12) of the males were married, compared to 87 per cent (n=93) females. This is most likely due to the relatively younger average age among the males. It should also be noted that some of the individuals were married to each other.

For information on the number of children born to individuals in the sample see Appendix C.

On average, males in the sample were better educated than females. Information about years of education is summarized in Table 4.2 below.

TABLE 4.2 YEARS OF EDUCATION BY SEX

Years of Education			Sex		Total
			Male	Female	
	0 to 3	Count	3	33	36
		%	10.3%	30.8%	26.5%
	3 years	Count	3	10	13
		%	10.3%	9.3%	9.6%
	4-7 years	Count	17	51	68
		%	58.6%	47.7%	50.0%
	8 or more years	Count	6	13	19
		%	20.7%	12.1%	14.0%
Total		Count	29	107	136
		%	100.0%	100.0%	100.0%

Waste picking is often a last resort. People who are involved in waste picking have chosen their career because they face extremely limited options. One advantage to waste picking, which was listed by many people was that after a day of picking the individual could return home with cash in hand. In general waste pickers work long hours and long weeks. This study was administered immediately following the rainy season. It is possible that some pickers are involved in agriculture during this or other seasons of the year, but to quantify this would require further study.

65.4 per cent of waste pickers work seven days a week. An additional 17.6 percent work six days, and 11.8 per cent work five days. Less than 5 per cent work less than five days per week. The distribution of hours worked per day is approximately normal with a mean of 12.00 and standard deviation of 3.56 among males, and mean of 10.8 and standard deviation of 2.39 among females. Further information regarding hours of work per week is available in Appendix C.

The average income achieved by waste pickers was ~12000VND ($1.20CND) for males and ~11000VND ($1.10CND) for females. The range of daily income earned stretched from 2000VND ($0.20CND) to 30000VND ($3.00CND). For more detailed information regarding income, the interested reader is directed to Appendix C.

Analysis of Levels of Health Status

In order to understand the present health status of waste pickers at Khanh Son Landfill, three methods were used. The first involved asking each individual how frequently they come in contact with different disease vectors. The vectors are listed in Table 4.3.

TABLE 4.3 FREQUENCY OF INDIVIDUAL EXPOSURE TO DISEASE VECTORS

	Frequency				
Substance	**3x/day**	**1x/day**	**Weekly**	**Monthly**	**Never**
Blood	37	61	16	1	21
Feces	126	10			
Air born Dust	76	58	2		
Run-off	42	67	27		
Chemical Fumes	20	52	38	14	5
Mice/Rats	136				
Stray Animals	136				
Mosquitoes	136				
Flies	136				
Sharp Metal Edges		30	16	51	39
Broken Glass	1	28	20	43	44
Needles		12	9	27	87

The second technique involved asking each individual whether he or she had experienced any of the health problems listed in Table 4.4.

TABLE 4.4 COUNTS OF SYMPTOMS EXPERIENCED BY INDIVIDUALS

Symptom	**Yes**	**No**	**Missing**

Joint Pain	83	53	
Back Pain	100	36	
Rash	27	109	
Hot Irritated Skin	2	134	
Scabies	13	123	
Cut	72	64	
Bruise	25	111	
Cough	63	73	
Shortness of breath	32	104	
Stomach Ache	26	109	1
Diarrhoea	25	110	1
Vision	70	66	
Hearing	6	130	
Parasites	25	111	
Head Lice	13	123	
Dental Problems	54	82	
Animal Bites	8	128	

The third technique used was to ask each respondent to rate his or her health status at the time of the interview. This subjective summary statement was used as a health indicator and cross tabulation was used to ensure that the statement individuals made regarding their health corresponded to the vectors to which they were regularly exposed, and to the symptoms from which they complained of suffering.

The first step in quantifying the level of health that pickers reported involved looking at the frequencies of the variables outlined above. The second step was to begin cross tabulating variables and sets of variables. To do this, each of the symptoms for which information was available was cross tabulated with the health statement that individuals provided.

Although there appear to be some relationships between some sets of variables, in some cases this could be attributable to nothing more than random variation. As such, a number of tests are available to determine if the relationship between two cross-tabulated variables is significant. One of the more common tests is chi-square. One of the advantages of chi-square is that it is appropriate for almost any kind of data.

Pearson chi-square tests the hypothesis that the row and column variables are independent. The actual value of the statistic isn't very informative. The significance value (*Asymp. Sig.*) has the information of interest. The lower the significance value, the less likely it is that the two variables are independent (unrelated).

The cross tabulation of data collected in the survey revolved around a set of hypotheses as follows:

- H_o1 - Health is related to Age
- H_o2 - Health is related to Sex
- H_o3 - Health is related to Income level

In order to perform any analysis using cross tabulation it is necessary to create categorical variables. Because age is a normally distributed continuous variable it was simple to divide the range of ages into categories of 10 year blocks, starting with 0-20 (all the individuals in this category are in fact teenagers) and ending with 51 years old or older.

TABLE 4.5 HEALTH STATUS CROSS TABULATED WITH AGE

	Age Categories	

Health status			0-20	21-30	31-40	41-50	51+	Total
	Fair	Count	19	17	22	12	5	75
		%	25.3%	22.7%	29.3%	16.0%	6.7%	100.0%
	Poor	Count	1	7	26	15	12	61
		%	1.6%	11.5%	42.6%	24.6%	19.7%	100.0%
Total		Count	20	24	48	27	17	136
		%	14.7%	17.6%	35.3%	19.9%	12.5%	100.0%

Obviously sex is a categorical variable and the two options available amongst the waste pickers in Danang were male and female, hence no further transformation.

TABLE 4.6 HEALTH STATUS CROSS TABULATED WITH SEX

			Sex		
Health status			Male	Female	Total
	Fair	Count	21	54	75
		%	28.0%	72.0%	100.0%
	Poor	Count	8	53	61
		%	13.1%	86.9%	100.0%
Total		Count	29	107	136
		%	21.3%	78.7%	100.0%

Income was a continuous variable and it was divided into 5 categories.

TABLE 4.7 HEALTH STATUS CROSS TABULATED WITH INCOME

			Income categories					
Health status			1	2	3	4	5	Total
	Fair	Count	8	14	36	12	5	75
		%	10.7%	18.7%	48.0%	16.0%	6.7%	100.0%
	poor	Count	1	13	24	16	7	61
		%	1.6%	21.3%	39.3%	26.2%	11.5%	100.0%
Total		Count	9	27	60	28	12	136
		%	6.6%	19.9%	44.1%	20.6%	8.8%	100.0%

Income Categories are divided as follows: 1=0-5000VND, 2=5001-9000VND, 3=9001-12000VND, 4=12001-16000VND, 5=16001+

The result of the various cross tabulations indicated that for shortness of breath (for example), relatively more individuals who complain of the symptom rate their health as poor, while relatively more of those who do not suffer from shortness of breath rate themselves as having fair health. As can be seen in Table 4.8, 36.1% of those who rate

themselves as having poor health complain of shortness of breath, while only 13.3% of people in fair health complain of the same problem.

TABLE 4.8 HEALTH STATUS CROSS TABULATED WITH SHORTNESS OF BREATH

Health Status			Shortness of Breath		Total
			Yes	No	
	Fair	Count	10	65	75
		%	13.3%	86.7%	100.0%
	Poor	Count	22	39	61
		%	36.1%	63.9%	100.0%
Total		Count	32	104	136
		%	23.5%	76.5%	100.0%

This same relationship holds true for all of the symptoms listed in Table 4.4 above, except Cut and Bruise, which may not be considered health problems, but rather accidental occurrences that heal easily and quickly. Rash, Hot Irritated Skin, and Hearing problems show very weak relationships with health status. Very few individuals complained about Scabies or Pinworm making it difficult to have statistical confidence in the results. It is this researchers opinion that this is due to cultural reasons and the number of people who gathered to listen during the interview process.

One anomaly in the cross tabulations was found between Health status and Parasites. In this example, the relationship described above was in fact reversed. The data indicate that the presence of parasites actually leaves an individual relatively healthier, while absence of parasites results in relatively poorer health. This is clearly counter intuitive and requires further explanation.

There are four possible explanations for the parasite anomaly. The first explanation revolves around non-reporting, or reluctance to comment on the part of the individual respondents. This may be related to poor education, or poor health. If this explanation is true, then *unreported* parasite incidence would be correlated with bad health. Therefore, if the incidence of parasites had been fully measured, the relationship would be reverted and the anomalous sign would be changed (from having a positive effect on health to having the expected negative effect). The second explanation is that parasites aren't considered a health problem. Communications with Vietnamese students pursuing graduate studies in Canada further enforce this idea. It is possible that like Cuts and Bruises, Parasites are treated as common problems that are easily dealt with. A third possibility is the omitted variable explanation. In this scenario, parasites are related to a variable that was omitted from the survey design, but that is positively correlated with health. Finally, there is the possibility that parasites are a problem that is cured quickly. If this were the case, the adverse health effects would not be felt for long, and unless a person was suffering from parasites at the time of the survey, they would not incorporate the adverse effects in their subjective summary statement of health status. In other words, there is a delay between when the symptoms of parasites affect a person and when the survey was administered. If these periods do not overlap, the effects of parasites would not factor.

During the cross tabulations, additional questions arose regarding the relationships between some of the variables. When age was crossed with back pain the chi-square value came out to 0.001 indicating a strong correlation. This raised the further question

of what effect working as a waste picker has on back pain. To explore this relationship another cross was set up between 'years worked' and 'back pain'. When assigning the variable 'years worked' to categories, a significant amount of data is lost however. There is a large spread in the number of years spent as a picker, from less than one full year, to longer than 25 years. The creation of categories group all those who have worked for longer than 5 years together, which we can intuitively state changes the results of the analysis. It is not possible to perform this analysis using the continuous variable however because the low number of counts in each cell of the matrix would only cast doubt on the validity of the results. Back pain appears to be constant the longer one spends picking. This could be because of the occupational hazard of repetitive stress, however, the number of years picking was not extensive (mean = 4.57 years), or attributable to age of the individual. In order to further resolve this issue further study is required.

Regression

Once cross tabulation had been exhausted as a means of interpreting the data, regression analysis was used. The first step in the regression analysis of these data was to choose the independent variables expected to explain health status. This choice was facilitated by the results of the cross tabulations described above. Two approaches can be adopted for this measure. The first involves selecting all variables thought to have any influence on health status and then selectively eliminating variables with low explanatory power. The second method is the opposite approach, whereby only the 'key' variables identified in the cross tabulations are selected at first, and slowly variables are added. For this analysis the first approach was adopted.

The second step in the regression analysis was to determine whether the relationship was expected to be linear or quadratic. To do this each variable was analyzed independently of each other. Age was expected, intuitively, to show a quadratic relationship, however the relationship turned out to be linear. This is likely the result of the sample not being excessively old (i.e. the sample captured a fairly linear portion of a quadratic relationship).

Third, a correlation matrix was constructed to investigate the possibility of highly correlated pairs that were missed in the cross tabulation analysis. For pairs that were highly correlated an attempt was made to determine which was the explanatory variable. Where this was simple, the response variable was dropped. Where this was more complicated (e.g. in the case of parasites and stomach ache) and/or where there was a plausible story for each variable, then both variables were kept.

The fourth step in the regression analysis was to return each of the eliminated variables, one at a time, to the regression after it had been 'cleaned'. This did not reveal any nuances in the data.

The subjective summary statement was used as the dependent variable. The fifth step in the regression analysis was to investigate the 'fairness' of the quantification of this variable. The question in the survey asked "In general, would you say your health is: excellent; very good; good; fair; or poor." These data were recorded where excellent was

given a value of 5 and poor was given a value of 1. Because no respondents rated their health as excellent, and only four respondents rated their health as good or very good those individuals were dropped from the analysis. As was already mentioned above, this low number of counts is insufficient to make claims with any statistical confidence. As well, analysis by regression would assign equal weight to the four individuals who rated their health as good or very good as to the other 136 individuals in the fair and poor categories. The result of dropping the four individuals in the good and very good health categories was that all remaining respondents fell into either the fair or poor category. Quantification is now much more easily justified. When there were more than two categories it may have been difficult to explain a difference of only one between each category, however, with only two categories, a difference of one is sufficient to indicate relatively more healthy, or relatively less healthy, quantifiably, as one moves from poor to fair, or fair to poor respectively.

The regression analysis included 10 variables in total. Of particular interest in this sort of analysis were:

- The Adjusted R-Square statistic, which quantifies how much of the dependent variable is explained by the combination of independent variables in the regression.
- The Durbin-Watson statistic, which tests for autocorrelation in the residuals of a regression equation. One of the assumptions of regression analysis is that the residuals for consecutive observations are uncorrelated. If this is true, the expected value of the Durbin-Watson statistic is 2. Values less than 2 indicate positive autocorrelation while values greater than 2 indicate negative autocorrelation.

- Student's t which is a measure of statistical confidence,
- The Standardised Coefficient Beta, which provides a range of plus or minus one standard deviation of the variable in question.

The results of the Regression analysis are tabulated in Table 4.9 and 4.10

TABLE 4.9 MODEL SUMMARY FOR REGRESSION ANALYSIS

Model[a]	R[b]	R Square	Adjusted R Square	Durbin-Watson
1	.514	.265	.205	2.129

a Dependent Variable: health status

b Predictors: (Constant), average daily income, years of education, freq. of contact with needles, bruise, back pain, stomach ache, eat at work, parasites (e.g. worms), sex, age of individual

TABLE 4.10 COEFFICIENTS FROM REGRESSION ANALYSIS

Model[a]		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	1.839	0.481		3.82	0.00
	Age of individual	-0.0182	0.004	-0.446	-4.215	0.00
	Sex	-0.06476	0.109	-0.054	-0.594	0.554
	Years of education	-0.04161	0.042	-0.086	-0.981	0.329
	Eat at work	-0.09383	0.122	-0.067	-0.771	0.442
	Freq. of contact with needles	0.03362	0.042	0.065	0.792	0.43
	Back pain	0.148	0.096	0.132	1.548	0.124
	Bruise	0.112	0.111	0.086	1.004	0.317
	Stomach ache	0.277	0.102	0.217	2.705	0.008
	Parasites (e.g. worms)	-0.142	0.107	-0.109	-1.321	0.189
	Average daily income	-0.00741	0.009	-0.07	-0.86	0.392

a Dependent Variable: health status

In Table 4.10, the sign of the Standardized Coefficient Beta and Student's t requires some explanation. Health status was recorded such that a high value (in this case 5) represented excellent health status, and a low value (1) indicated poor health status. Recall that all respondents rated their health as fair (2) or poor (1).

In the regression, Age was a continuous variable. The regression states that an increase in Age will result in a significantly negative effect on health status.

The results for sex indicate that the health of women is less than that of men. This could be due to their numerical preponderance.

The results for Education are negative, however the significance is not great. This result is opposite to the expected result that increased education would have a positive effect on health status. There is always the possibility that the error is the result of an omitted variable, however no further explanations can be offered.

Frequency of contact with needles was recorded such that frequent contact was assigned a value of 1, and little or no contact was assigned a value of 5. This meant that less contact leads to generally better health, and hence the positive sign.

Back pain, Bruise and Stomach Ache were recorded as categorical variables where respondents could answer either yes (value=1) or no (value=2). The results of the regression on these variables are positive because of the way that health status was recorded. At this point it is perhaps useful to expound on how the results should be interpreted. The interpretation is most simple with these three symptoms because they are 'yes/no' questions. In Table 4.10 the t score for back pain is 0.132. This means that for back pain, changing the response from yes to no changes the individual's health status by effectively 13.2%. This is only true because the maximum range is a change from poor health status (1) to fair health status (2). This does not explain 13% of the move toward best possible health, but rather from poor to fair. The reader is advised not to

exaggerate the meaning of this 13%, or the results of any of the other variables. What this study was ultimately interested in, is the difference between poor and fair, thus it is importance not to over emphasize the significance of the regression results, but at the same time, in practical terms, the individuals under study are in fair to poor health, therefore, within that practical range each of variables in this analysis has a significant impact.

The last variable, income, shows a negative result. This is an unexpected result, and like education, could be attributable to an omitted variable. There are, however, other possible explanations. First, it is possible that the increased income comes from overworking. In this scenario, exposure to risk and disease vectors and the occupational hazards of picking would explain the negative effect on health, while the long work hours would explain the increased income. Additionally, between a sick and a well person, the sick person would be less likely to work unless she was assured a high income. Therefore, this study would only capture the high income people who are also sick. A third possible explanation is that the landfill is more productive during certain parts of the year. In fact, many pickers proffered that they were more productive during the dry season because the waste dried more easily. Whether the landfill had better waste, or the pickers were more efficient at recovering waste materials is essentially the same situation, making this perhaps the most likely of the explanations.

Analysis of Change in Health Status

Thus far in the analysis, the discussion has revolved around the health status of waste pickers in the study. However, according to the pickers themselves, there has been a net movement toward poorer health status over time. Of all the symptoms described by pickers, it is perhaps this information that is most interesting, and which raises the question of how strongly picking contributes to the net shift.

Table 4.11 is a cross tabulation of health status (at the time of the survey) and health status compared to one year ago.

TABLE 4.11CHANGES IN HEALTH STATUS OVER TIME

Health Status			Health Rating Compared to One Year Ago					
			Much better	**Somewhat better**	**About the same**	**Somewhat worse**	**Much worse**	**Total**
	fair	Count	5	1	44	20	5	75
		%	6.7%	1.3%	58.7%	26.7%	6.7%	100.0%
	poor	Count	1		7	28	25	61
		%	1.6%		11.5%	45.9%	41.0%	100.0%
Total		Count	6	1	51	48	30	136
		%	4.4%	0.7%	37.5%	35.3%	22.1%	100.0%

There are several possible explanations of this change in health status. Of the 25 people in poor health who claim to be much worse off than one year ago, there are two plausible explanations. The first is psychological. If the individuals happen to be particularly pessimistic they would rate their health as poor and claim that it is much worse than it was in the past. The scope of this paper does not allow for the exploration of the psychology of sickness, but this type of further study would enlighten us as to how people think of their health. To further this point, it is well accepted that self-definition

of health is very difficult to calibrate. If the explanation does not come from psychological mis-statement, then this situation becomes very interesting from a physical health perspective.

The second possibility is that the results can be explained by expected answer bias. It is well established that people in very diplomatic cultures would provide the expected answer. This researcher would argue that Vietnamese, like many other cultures in Asia, would classify as being a very diplomatic culture. As well, the expected answer would be that working on the landfill leads to decreased health status.

The third explanation regards the socio-economic status of waste pickers. Many had only been picking for 2-3 years at the time of the study. This period coincides with a devastating monsoon season in 1998 in Vietnam when many farmers lost their harvest and had to declare bankruptcy. Many of the pickers indicated that they had been farmers before becoming pickers, but that the floods of 1998 caused economic difficulties forcing them to change careers. If this explanation is true, the pickers were in dire straights before they started picking. Therefore, picking is not the cause of the change in health. Picking may however be exacerbating the already desperate situation. The individuals may be consuming less (food, medical care, etc.), working harder, and doing more dangerous work than they had been before.

The fourth explanation that can be offered for the net change toward poor health is that working as a picker actually impinges on an individual's health very negatively (i.e. it does not have a marginal effect on health).

The next step in the analysis was to determine what the data say about the relative force of explanation three over explanation four, and to try to uncover the mechanisms underlying worsening health. There are three possibilities:

1. The worsening is related to age in a more marked way than would be expected in a randomly chosen subset of the population. This would mean that picking together with age constitutes the source of the problem. This possibility was explored by cross tabulating age categories with change in health status. The results of this cross tabulation are found in Table 4.12. If the problem were picking alone, we would see worsening equally in each age category.

TABLE 4.12 AGE CROSS TABULATED WITH HEALTH STATUS COMPARED TO ONE YEAR AGO

			Health Rating Compared to One Year Ago					
Age Categories			**Much better**	**Somewhat better**	**About the same**	**Somewhat worse**	**Much worse**	**Total**
	0-20	Count	2	1	10	5	2	20
		%	10.0%	5.0%	50.0%	25.0%	10.0%	100.0%
	21-30	Count	1		12	8	3	24
		%	4.2%		50.0%	33.3%	12.5%	100.0%
	31-40	Count	1		19	18	10	48
		%	2.1%		39.6%	37.5%	20.8%	100.0%
	41-50	Count	1		6	11	9	27
		%	3.7%		22.2%	40.7%	33.3%	100.0%
	51+	Count	1		4	6	6	17
		%	5.9%		23.5%	35.3%	35.3%	100.0%
Total		Count	6	1	51	48	30	136
		%	4.4%	0.7%	37.5%	35.3%	22.1%	100.0%

2. Given their numerical preponderance, the data tell us more about women than men. Therefore, by extension, it is possible that the worsening is related to sex. To test this, sex was cross tabulated with health status compared to one year ago. No new information appeared, and no contrasting pattern emerged. The results are available in Table 4.13

TABLE 4.13 SEX CROSS TABULATED WITH HEALTH STATUS COMPARED TO ONE YEAR AGO

			Health Rating Compared to One Year Ago					
Sex			**Much better**	**Somewhat better**	**About the same**	**Somewhat worse**	**Much worse**	**Total**
	Male	Count	1	1	11	11	5	29
		%	3.4%	3.4%	37.9%	37.9%	17.2%	100.0%
	Female	Count	5		40	37	25	107
		%	4.7%		37.4%	34.6%	23.4%	100.0%
Total		Count	6	1	51	48	30	136
		%	4.4%	0.7%	37.5%	35.3%	22.1%	100.0%

3. Some of the symptoms of poor health from the regression are related to the change. This is a logical extension of the fact that they already explain the level of health of the individuals. Upon inspection however, there is little evidence that these same factors have led to changes in health status. By cross tabulating all the symptoms and vectors listed at the beginning of this chapter against 'health status compare to one year ago' several new potential causes of the change in health status were discovered. These data are summarized below in Table 4.14.

TABLE 4.14 POSSIBLE EXPLANATIONS FOR CHANGE IN HEALTH STATUS

			Health Rating Compared to One Year Ago		
			Somewhat Worse	Much Worse	Total
freq. of contact with blood	>1x/day	Count	31	20	51
		%	22.8%	15.4%	37.5%
freq. of contact with feces	>1x/day	Count	48	30	78
		%	35.3%	22.1%	57.4%
freq. of contact with dust	>1x/day	Count	48	29	77
		%	35.3%	21.3%	56.6%
freq. of contact with mice/rats	>3x/day	Count	48	30	78
		%	35.3%	22.1%	57.4%
freq. of contact with stray animals	>3x/day	Count	48	30	78
		%	35.3%	22.1%	57.4%
freq. of contact with mosquitoes	>3x/day	Count	48	30	78
		%	35.3	22.1	57.4%
freq. of contact with flies	>3x/day	Count	48	30	78
		%	35.3%	22.1%	57.4%
joint pain	yes	Count	33	24	57
		%	24.3%	17.6%	41.9%
	no	Count	15	6	21
		%	11.0%	4.4%	15.4%
back pain	yes	Count	37	28	65
		%	27.2%	20.6%	47.8%
	no	Count	11	2	13
		%	8.1%	1.5%	9.5%
cut	yes	Count	28	15	43
		%	20.6%	11.0%	31.6%
	no	Count	20	15	35
		%	14.7%	11.0%	25.7%
cough	yes	Count	27	14	41
		%	19.9%	10.3%	30.0%
	no	Count	21	16	37
		%	15.4%	11.8%	27.2%
vision problems	yes	Count	24	21	45
		%	17.6%	15.4%	33.1%
	no	Count	24	9	33
		%	17.6%	6.6%	24.3%

Chapter 5 – Solutions, Viable Options and Alternatives

Introduction

This chapter will attempt to provide some broad solutions, viable options and alternatives. Although it is beyond the scope of this paper to discuss health promotion programs in detail, suggestions will be made as to how waste picker health can be targeted in future research and possibly within the framework of the WASTE-ECON program in Vietnam.

Goals

Outlined in Table 5.1 are a series of goals which roughly outline the broad recommendations that can be drawn from this research. Each will be discussed in more detail, and where possible recommended courses of action will be suggested. This list is by no means exhaustive. The reader is directed to the two side panels of the table. The left hand side panel reads 'Feasibility increases'. This could be described in development jargon as executability, and basically describes how possible it would be to implement one of these interventions relative to another. On the right hand side panel the label reads 'Impact increases'. This is intended to describe how great the impact would be of one listed intervention over another. The center columns 'How' and 'Constraints and Benefits' describe how the goal could be achieved and what the implications would be, both positive and negative.

TABLE 5.1 SOLUTIONS, VIABLE OPTIONS, AND ALTERNATIVES

Feasibility increases	Goal	What	How	Constraints and Benefits	Domain or Discipline	Impact increases
	Goal 1	Health • Treatment • Hygiene (health promotion)	• Clinician visits • Health Education	• Lost time • Increased Health	Publich Health; Health Promotion	

	Goal 2	Waste (small scale)
		• Hazardous waste
		• Recycling
		• Composting
		• Other waste
		• Environmental health indicators
		  • Vector control
		  • Housing
		  • Water
			• Separate part of dump
			• Use pickers
			• Use pickers
			• Dump
				• Pickers are still contacting the waste
				• Pickers still have work
				• Less occupational hazards
					Waste Management	

	Goal 3	Waste (Large scale) • Hazardous waste • Recycling • Composting • Other waste	• Incineration • Source separation • Source separation or mechanized • Sanitary landfill / incineration	• Chosing appropriate technology • Loss of jobs • Addressing root causes • Also solves environmental problems, not just for pickers	Waste Management	
	Goal 4	Poverty • Reduction	• Microfinance		Poverty; Political Ecology	

Goal 1 – Health Options and Alternatives

Of all the options available to development programmers at Khanh Son, affecting positive change in health is perhaps the easiest. This goal includes improving the health status of pickers and could be extended to include waste workers in general. Simple solutions such as installing standpipes where pickers would be able access clean water for washing could have dramatic impacts. As well, selecting a number of pickers and educating them about basic hygiene, and basic first aid could have a significant impact on the health status of the population at large. If each of the women who participated in the workshop returned to picking as a health officer for her team of pickers then the women she worked with would benefit as well. Another suggestion listed in Table 5.1 is the use of visits by clinicians. This could have two benefits, the provision of health care, and the collection of more in depth epidemiological data on waste pickers, which could be used in more effective health programming for this population.

Goal 2 – Small Scale Waste Management Solutions

At Khanh Son, industrial waste, sewage waste, and hospital waste are all included in the general waste stream. Although this is unlikely to change until there is sufficient demand and sufficient means for the construction of more appropriate methods of disposal (such as a hazardous waste incinerator, or an engineered and well managed landfill) there are options available that could have a positive effect on waste picker health. The most simple, and easiest to implement and enforce would be the use of a separate part of the landfill for hospital and hazardous industrial waste. Because sewage waste arrives in a

(very odorous) liquid sludge, it is already disposed in a separate area (and waste pickers wouldn't find anything of value in it anyway).

Recycling and Composting are alternatives that could re-employ waste pickers. With proper research, effective management, and pay structures that reflect what a picker would make on the landfill, this researcher feels that it would be relatively easy to entice picker to take employment in one of these two types of operations. Due to the composition of the waste stream, well-sorted waste (with plastics, glass and ceramic carefully removed) could easily be made into excellent compost. The limitations to this operation would be finding and keeping staff, and finding a domestic market for the product. The downfall of this alternative is that waste pickers are still in contact with the waste, however, one requirement of them being employed as part of the overall waste management strategy, should be that they are equipped with proper protective equipment.

Goal 3 – Large scale Waste Management Solutions

This option is very unlikely to be implemented in the near future. At the top of the list of constraints to anything 'large-scale' is cost. In addition, the question of appropriate technology proposes many problems. Providing large scale waste management solutions could mean job losses for pickers. A very interesting aspect of policy choice in this area involves alternative technologies and multiple goals. In this situation, one has to juggle the goal of picker health with that of pickers having jobs and income. Mechanizing pickers out of a job in order to prevent their having health problems is not a viable solution. Governments are usually weak in the pursuit of twin or triple goals, often

because different goals are assigned to different ministries or agencies, which diminishes the likelihood of getting a sensible overall solution.

Related to this point is the distinction between economic efficiency and what can be called engineering efficiency. The latter can be more or less equated to labour productivity, and economists blame engineers for the idea that what maximizes labour productivity is "efficient". Economists argue instead that efficiency is the ratio of outputs to all inputs (weighted by their prices or something like that), and often conclude that a really modern machine which costs a lot is just the opposite of efficient economically in a poor country where capital is scarce and could be put to so many other productive uses. Anything that can be done using just labour should be, until the labour is no longer in surplus supply. Generally, however, this economic principle tends not to be understood by engineers, who like modern, mechanical things and don't understand why they are economically inappropriate in poor countries. This is also true for most politicians, who often like modern things as a symbol of progress even when those things may be socially damaging.

This is perhaps not the best solution for a country like Vietnam. Although engineers would argue that technical solutions may be more efficient, the labour-intensive technology (the pickers) is not only more equitable (gives them a job) but also economically more efficient. Since the overall concern should be with equity: equity in health care provision, protection from dangers etc. as described above; and equity in

overall economic outcomes; then maintaining the pickers jobs rather than replacing them with machines is crucial.

Goal 4 – Poverty Reduction

The use of micro-credit schemes to increase the wealth of pickers and possibly train them in small business management, animal husbandry, or other sustainable income generating projects is an option that may require massive amounts of research, relatively large capital (for lending) and very careful management, but also one that could be very empowering at the same time. Attention must be paid to the lending model chosen, as socio-cultural norms have been shown to affect the success of micro-credit schemes in other countries in Asia (Patel, 2002).

Chapter 6 - Conclusion

Future Research

Although this study has examined many critical factors affecting waste picker health, it has also opened up many avenues for further exploration. The following areas were either not within the scope of this project or were elucidated in the analysis but could not be explored in depth. Because of the restricted focus of this project, this section aims to identify key research questions excavated from this study that require investigation in order to piece together a more comprehensive understanding of waste picker health and how to make improvements.

- This study was conducted over a five week period immediately following the rainy season. A more comprehensive study, spanning both the rainy season and the dry season is warranted. This would provide information on temporal variations in waste picker health, income and activity levels. Some pickers claim that they earn more and are more willing to work during the dry season, while others are involved in agriculture for part of the year. A longer-term study would assist in quantifying these variations.
- This study uncovered some anomalous results based on the responses provided by waste pickers. In order to understand better the way that pickers respond, some research is necessary into the psychology of sickness in Vietnam.
- Research into the health programming that affects waste pickers in Vietnam and in the developing world in general will be of crucial importance as development money goes into waste management. Equity is very important from a health perspective and unfortunately engineers and environmental scientists, who have a different

perspective on equity than economists or other social scientists, are administering much of the work pertaining to waste management. Research into health promotion programmes directed toward waste pickers would allow for Health Promotion specialists and development workers to build sound health strategies, based on the strengths and weaknesses of programmes that have been implemented in other countries and regions.

Conclusion

Much research has gone into the role of waste pickers in the overall integrated waste management strategy in cities in developing countries around the world, however attention has generally been paid only to the physical and environmental benefits of this vital operation. The health impacts of picking, have not been ignored, but are seriously underrepresented in the literature. This project identified the principle health problems facing waste workers in Danang, and provided some guidance towards the establishment of goals, priorities, and strategies to address health problems amongst this vulnerable population. This study addressed arguably the most important aspect of waste picker health, the socio-economic environment. As projects are developed and administered at Khanh Son, and other havens of waste picker activity throughout the developing world attention must continue to be paid to this crucial component of public health, both for the sake of waste pickers health and that of their families, and for the health of the population at large.

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Appendix A – Health Survey: English

Health

1. Age:

2. Sex:
   - Male
   - Female

3. Are you married?
   - Yes
   - No

4. How many children do you have?

5. Who do you live with

6. Where do you live?

7. What do you live in?

8. What do/did your parents do for a living?

9. How many years of formal education do you have?
   - none
   - 1-3 years
   - 4- 7 years
   - 8 or more years

10. Describe a typical day in your life.

11. How old were you when you began collecting waste?

12. How many days per week do you work?

13. What are your hours of work?

14. How often do you take breaks?

15. What do you do during your breaks?

16. Do you eat while at work?
   - Yes
   - No

17. Where do you work?
location:

type of site:

18. How do you get to work?

19. How far must you travel?

20. What do you wear to work?

21. Where are your dirty work clothes stored?

22. How often are they washed?

23. Do you wear any of the following items when you are collecting waste?
    - ❑ Gloves
    - ❑ Scarf
    - ❑ Mask
    - ❑ Sandals
    - ❑ Shoes
    - ❑ Hat
    - ❑ Others

24. Do you use any tools while working?

25. Do you lift heavy objects while working? How heavy are they?

26. When you work do you come into contact with any of the following?

	Substance	frequency			
		>3x/day	1x/day	weekly	monthly
	blood				
	feces				
	airborne dust				
	run-off				
	chemical fumes				
	mice/rats				
	stray animals				
	mosquitoes				
	flies				
	sharp metal edges				
	broken glass				
	needles				

27. Under what weather conditions do you work?

28. Does it bother you? Why?

29. In general would you say your health is: (check one)

- ❑ Excellent
- ❑ Very good
- ❑ Good
- ❑ Fair
- ❑ Poor

30. Compared to one year ago, how would you rate your health in general now?

- ❑ Much better now than one year ago
- ❑ Somewhat better now than one year ago
- ❑ About the same now as one year ago
- ❑ Somewhat worse now than one year ago
- ❑ Much worse now than one year ago

31. In the past 6 months, have you experienced any of the following problems:

joints/musculoskeletal

- ❑ joint pain
- ❑ back pain
- ❑ other (please specify)

skin

- ❑ rash
- ❑ hot; irritated skin
- ❑ scabies; pinworm
- ❑ cut
- ❑ bruise
- ❑ other (please specify)

respiratory

- ❑ cough
- ❑ coughing with blood
- ❑ shortness of breath
- ❑ other (please specify)

gastrointestinal

- ❑ stomach ache
- ❑ diarrhoea
- ❑ bloody stool
- ❑ other (please specify)

other

- ❑ urinary problems
- ❑ sexually transmitted diseases (e.g. HIV/AIDS)
- ❑ vision problems
- ❑ hearing problems
- ❑ parasites (i.e. worms)
- ❑ head lice
- ❑ bone fractures
- ❑ dental problems (i.e. bleeding gums, loss of teeth)
- ❑ animal bite

- other (please specify)

32. Do you believe that any of the above were work-related? Please explain.

33. In the past 6 months, did you ever visit a doctor or healthcare worker? If so, for what? Have you ever been admitted to a hospital? When? For what?

34. Have you ever been injured at work? Please describe.

35. Do you feel safe at work? Why or why not?

36. Do you have any suggestions for making your job safer?

37. What do you like about your job?

38. What do you dislike about your job?

39. Have you ever been subject to any physical or mental abuse from your peers because of your line of work? Please describe.

Income

40. What is your average daily income?

41. Do you have any other source of income?

42. What is it? What percentage comes from other sources?

43. If you were given a small loan of 1,000,000VND (100CND) what would you do with it?
    - Start a small business
    - Pay for your childrens education
    - Buy equipment for your job
    - Become a junk buyer/middleman

44. Of the people in your household, who earns the most income?

Appendix B – Health Survey: Vietnamese

BẢNG THU THẬP THÔNG TIN

SỨC KHỎE

1. Tuổi: _____ ☐ nam ☐ nữ

2. Anh/chị đã lập gia đình chưa? ☐ có ☐ chưa

3. Anh/chị có mấy con?

4. Anh/chị đang sống với bố mẹ phải không? Ở đâu?

5. Gần nhà anh/chị đang ở đâu?

6. Gần nhà anh/chị sống những nhà nghề gì, ngày tập thể?

7. Bố mẹ anh/chị đã làm nghề gì? Hiện nay đang làm nghề gì?

8. Trình độ học vấn của anh/chị:
   - ☐ Không đi học
   - ☐ Học tiểu học
   - ☐ Học phổ thông cơ sở
   - ☐ Học phổ thông trung học
   - ☐ Học dạy nghề

9. Anh/chị hãy nêu một ngày làm việc của mình:

10. Khi anh/chị bắt đầu làm công việc này thì anh/chị bao nhiêu tuổi?

11. Anh/chị làm bao nhiêu giờ trong một tuần?

12. Anh/chị làm vào giờ nào? Từ giờ nào?

13. Bao nhiêu tiền lời trong ngày?

14. Anh/chị nghỉ giải lao như thế nào?

15. Anh/chị có ăn uống trong khi làm việc không? Có Không

16. Nơi anh/chị làm việc: Vị trí làm?

Hình thức làm?

17. Anh/chị đi làm bằng phương tiện gì?

18. Từ nơi cư ngụ anh/chị đến nơi làm việc bao nhiêu cây số?

19. Anh/chị mặc trang phục gì khi làm việc?

20. Anh/Chị cất giữ quần áo bẩn ở đâu?

21. Quần áo bẩn thường được giặt giũ?

22. Khi làm việc, anh/chị có mặc những loại quần aó bảo hộ lao động sau không:

❑ Găng tay ❑ khăn quàng ❑ khẩu trang ❑ dép quai hậu ❑ giầy ❑ mũ
Những trang phục khác:

23. Anh/Chị sử dụng những công cụ gì trong khi làm việc?

24. Anh/chị có phải di chuyển các vật nặng trong khi nhặt rác không? Các vật này có nặng lắm không?

25. Trong khi nhặt rác anh/chị đã tiếp xúc hay bắt gặp:

Hiện tượng	Số lần (tần suất)			
	Hơn 3 lần trong 1 ngày	Một lần trong một ngày	Hàng tuần	Hàng tháng
Máu				
Phân				
Buis				
Mưa				
Hơi hóa chất				
Chuột				
Chó hoang				
Muỗi				
Ruồi				
Các mảnh kim loại có				
cạnh nhọn				
Mảnh thủy tinh vỡ				
Kim tiêm, ống chích				

26. Anh/chị làm việc trong điều kiện thời tiết như thế nào?

27. Anh/chị có thích làm việc trong những điều kiện thời tiết như vậy không? Tại sao?

28. Tóm lại, anh/chị nói nhận xét về sức khỏe của mình như thế nào?: (Đánh dấu)
- ❑ Tuyệt vời
- ❑ Rất tốt
- ❑ Tốt
- ❑ Bình thường
- ❑ Xấu

29. *So sánh với năm ngoái*, Anh/chị có thể đánh giá sức khỏe của mình vào thời điểm hiện nay như thế nào ? (Đánh dấu)
- ❑ Tốt hơn nhiều so với năm ngoái.
- ❑ Tốt hơn một ít so với năm ngoái.
- ❑ Giống như năm ngoái.
- ❑ Tệ hơn năm ngoái một ít.
- ❑ Xấu hơn nhiều so với năm ngoái.

30. Trong 6 tháng qua, anh/chị có vấn đề nào về sức khỏe không:

Khớp xương
- ❑ Khủy tay, khủy chân
- ❑ Đau lưng
- ❑ Các triệu chứng khác:

Da
- ❑ Ngứa
- ❑ Kích thích da
- ❑ Ghẻ lở
- ❑ Đứt tay chân
- ❑ Vết thâm vết bầm
- ❑ Triệu chứng khác:

Bệnh hô hấp
- ❑ ho
- ❑ ho ra máu
- ❑ khó thở
- ❑ Triệu chứng khác:

Bệnh tiêu hóa
- ❑ Đau bao tử
- ❑ Tiêu chảy
- ❑ Đi tiêu ra máu
- ❑ Triệu chứng khác:

Các bệnh khác

- ❑ Bệnh
- ❑ Bệnh về thị giác
- ❑ Bệnh về thính giác
- ❑ Bệnh giun sán
- ❑ Chí rận
- ❑ Gẫy xương
- ❑ Bệnh nha khoa (gãy răng, chảy máu răng)
- ❑ Bệnh dại do các con vật gây ra (chuột, muỗi, chó cắn)
- ❑ Bệnh khác:

31. Anh/chị có nghĩ rằng các bệnh trên do nghề nhặt rác gây ra không? Tại sao?

32. Trong 6 tháng qua, anh/chị đã đi khám sức khoẻ chưa? Khi nào? Khám bệnh gì?

33. Anh/chị đã bao giờ gặp tai nạn khi đang làm việc chưa? Nếu có, xin anh/chị hãy nói rõ.

34. Anh/chị có thấy an toàn trong khi đang làm việc không? Tại sao có hoặc tại sao không?

35. Anh/chị đã bao giờ đề nghị những biện pháp để đảm bảo an toàn lao động trong công việc của mình chưa?

36. Anh/chị thích công việc mình đang làm ở điểm nào?

37. Anh/chị không thích công việc mình làm ở điểm nào?

38. Anh/chị có bị những người cùng trang lứa với anh/chị nói xấu về nghề nhặt rác của anh/chị không? Họ noí xấu những gì?

THU NHẬP

39. Mức thu nhập bình quân hàng ngày của anh/chị làm công việc này là bao nhiêu?

40. Anh/chị có nguồn thu nhập nào khác không?

41. (Nếu có) Đó là những nguồn nào? Nó chiếm bao nhiêu phần trăm so với tổng thu nhập?

42. Nếu anh/chị được cho vay 1.000.000 đồng, anh/chị sẽ làm gì với số tiền đó?
    - ❑ Buôn bán nhỏ?
    - ❑ Trả tiền học cho con của mình?
    - ❑ Mua công cụ cho công việc của mình?
    - ❑ Sẽ mua thuyền đánh cá/Người môi giới (trung gian mua bán)?

43. Trong gia đình anh/chị, ai là người có thu nhập chính?

Appendix C – Statistical Tables