



## Life in a landfill slum, children's health, and the Millennium Development Goals



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### HIGHLIGHTS

- Waste-pickers and the health and well-being of their children are examined
- Landfill slum (LS) residents do not have a share in improving economies
- LSs illustrate the interrelationship of Millennium Development Goals
- LS mothers and children are exposed to toxic chemicals and pathogens
- MDGs directly and indirectly addresses issues affecting LS children's health
- Improved solid waste management will benefit LS resident health and well-being

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### ABSTRACT

People living in slums can be considered left behind with regard to national successes in achieving Millennium Development Goals (MDGs). The objective of this study was to evaluate the living and working conditions of waste pickers and their children in a landfill slum located in the largest city in eastern Indonesia. A total of 113 people from the landfill slum and 1184 people from the general population participated in face-to-face interviews. Municipal solid waste (MSW) was analyzed for metals, metalloids and fecal indicator bacteria. Ambient air quality including particulate matter was measured in the landfill. Households in the landfill slum were 5.73 ( $p = 0.04$ ) times more likely to be below the international poverty line (MDG 1: Poverty) and 15.6 times ( $p < 0.01$ ) more likely to have no one in the household possessing a primary education (MDG 2: Universal Education), and 107 times ( $p < 0.01$ ) more likely not to have improved sanitation facilities (MDG 7: Environmental Sustainability) when compared to the general population. Diarrhea is one of the leading causes of death in children under five in Indonesia. Young children living in the landfill slum were 2.87 times ( $p = 0.02$ ) more likely to develop diarrhea than their general population counterparts. Other survey results and environmental measurements suggest that landfill slum children have additional adverse health effects (e.g. infections and poisoning). Poverty underlies several MDG issues that directly or indirectly affect child health. Therefore, eradicating extreme poverty will continue to be the most critical challenge for the MDGs beyond 2015.

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### 1. Introduction

Eradicating extreme poverty and hunger is one of the most important human development goals and remains a challenge for the 21st century. Millennium Development Goals (MDGs) Target 1A aims to reduce by one-half the proportion of people living under the international

poverty line of \$1.25 per day between 1990 and 2015 (UN 2010). The global poverty headcount percentage has been reduced by 53% between the years 1990 (47%) and 2010 (22%) and is ahead of the 2015 deadline (World Bank, 2014). Although such a global success is laudable, there remains approximately one billion people living under the poverty line in the world with 863 million living in slums (Chen and Ravallion, 2008; UN-HABITAT, 2013). The majority of slums are located in rapidly growing cities in developing countries (Kungskulniti et al., 1991; Oyelola et al., 2001; UN-HABITAT, 2013). It has been estimated that up to 2% of the urban population in developing countries (approximately

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64 million people) engage in waste-picking for their livelihood (Medina, 2007). MDGs, particularly MDG 1 which focuses on poverty, have been well addressed in earlier studies on waste pickers (Wilson et al., 2006; Nzeadibe, 2009).

Waste pickers, sometimes referred to as scavengers, have occupied a unique niche in the informal economies of low and middle income countries (Sicular, 1992). While it is not usually a legal occupation in these countries, it does provide significant economic benefits to the local economy centered on the landfill, as well as provide larger societal benefits in terms of recycling and lessening the pressure on resources used in the production of material goods (Sicular, 1992; Torun et al., 2006; Wilson et al., 2006). Waste pickers do not necessarily live in the poorest slums, but they are still considered to be a vulnerable population in terms of poverty (Torun et al., 2006). Landfill slum residents are reported to lack education, access to improved sources of drinking water, and sanitation facilities (Oyelola et al., 2001; Rankokwane and Gwebu, 2006; Thirarattanasunthon et al., 2012).

The waste picker and his or her family's exposure to occupational and domestic hazards, health status, and well-being is an important dimension embedded in the political economic and environmental contexts in which they live and work. Several classes of illnesses and diseases have been identified as a result of actual and potential exposures to hazards, some of which are unique to the waste picker's occupation. For example, among waste pickers and their families, high incidences of communicable and infectious illnesses (e.g. diarrhea, malaria, dysentery, cholera, HIV, hepatitis B), allergic reactions and respiratory issues (e.g. cold, cough, and decremented lung function [shortness of breath] from asthma and pneumonia) and chronic conditions such as cancer have been reported. In addition to these conditions, there are injuries resulting from on the job exposures and accidents (e.g. fires, explosions, and slides from waste piles), which include joint and spinal cord damage, wounds, cuts, bruises, and damage to the eyes and ears (Kungskulniti et al., 1991; Oyelola et al., 2001; Thirarattanasunthon et al., 2012).

Several MDGs are directly related to the waste picker's well-being. MDG 1, focusing on the reduction of poverty, is at the forefront and functionally ties either directly or indirectly into the other goals (see Fig. 1). In turn, the reduction of poverty can result by working

towards the other MDGs. MDG 2, achieving universal primary education, addresses the lack of primary education reported for landfill slum residents and MDG 7, ensuring environmental sustainability, relates to access to improved drinking water sources and sanitation facilities (Oyelola et al., 2001; Rankokwane and Gwebu, 2006; Thirarattanasunthon et al., 2012), together these three MDGs link to the health related goals of MDG 4, reducing child mortality, and MDG 5, improving maternal health.

Although MDG 4 and MDG 5 address health issues that are assumed to be associated with living and working in unsanitary and unsafe environments, there have been limited numbers of studies that have investigated the sources or causes of hazardous exposures in landfill settings. MDG-related issues and indicators for landfill slum populations are easily hypothesized to be more severe, but quantitative comparisons between a landfill slum population and its general population counterpart have not been well documented.

To further promote MDGs beyond 2015, it is important to understand current baseline problems and inter-related issues as exemplified by the spirit of the MDGs among this vulnerable population. This case study's aim is to examine the well-being (e.g. income, education, and accessibility to improved sources of drinking water and sanitation facilities), human health (e.g. child and maternal health), and other relevant factors (e.g. indoor and ambient air, MSW contamination, occupational health and safety) for adult waste pickers and their families living in a landfill slum compared to the local general urban population of Indonesia, a lower middle income country.

## 2. Materials and methods

To examine the well-being and health status of waste pickers in relation to key MDGs and the general population, a combination of household survey data collection and environmental measurements was used. A cross-sectional study design was employed in order to make comparisons between the landfill slum population and the local general population in terms of disease status and exposures.

In support of MDG 8, Global Partnership for Development, Universitas Hasanuddin (UNHAS) and Northern Illinois University (NIU) signed memorandums of understanding and agreements in 2010 and 2011, respectively. The City of Makassar and NIU Institutional Review Board approved this study (HS11-0170: Evaluations of children's environmental health in Indonesian slum settings, prior to any data collection).

### 2.1. Study site

The study took place in Makassar, South Sulawesi, Indonesia. Makassar, possessed with a rapidly growing population of 1.3 million inhabitants, is both the capital of Indonesia's South Sulawesi province and the largest urban center (population of approximately 1.3 million) in eastern Indonesia (Shibata et al., 2014). Indonesia with more than 250 million people is the most populated country in Southeast Asia and fourth largest in the world. It is classified as a lower middle income country, but the proportion of Indonesians under the international poverty line has declined by 70% from 1996 to 2011 (Millennium Development Goals, MDG Indicators, 2014; World Bank, 2014).

### 2.2. Data collection

Two different types of data collection efforts were undertaken: face-to-face interviews and environmental measurements. The interviews were comprised of three assessment objectives: 1) assess demographic composition; 2) assess population characteristics with respect to selected MDG indicators (e.g. income, education, child health, drinking water, and sanitation); and 3) assess related factors in the landfill slum and in Makassar's general population. The environmental measurements were conducted to assess ambient air and MSW contamination in the landfill.

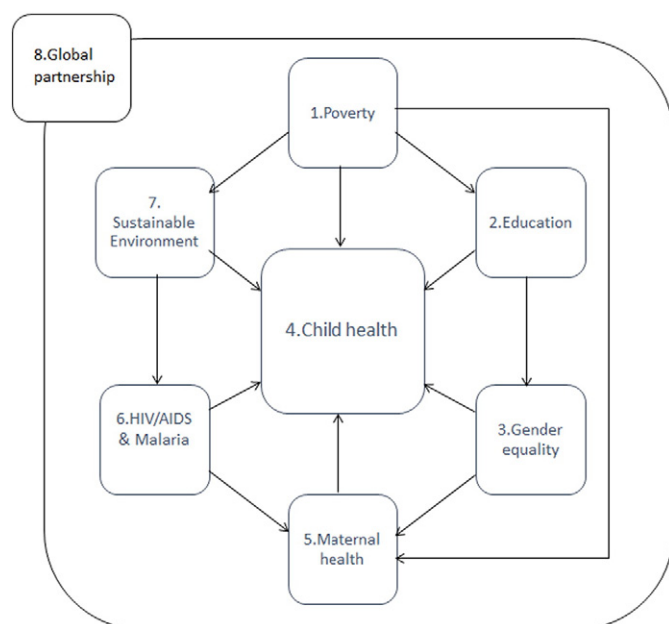


Fig. 1. Child health (Goal 4) centered MDGs beyond 2015. \*Accident & injuries during two weeks prior to the interviews.

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