



# Ineffective waste site closures in Brazil: A systematic review on continuing health conditions and occupational hazards of waste collectors



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## ARTICLE INFO

### Article history:

Received 21 May 2018

Revised 13 July 2018

Accepted 28 August 2018

### Keywords:

Waste  
Recyclable materials  
Recycling  
Wastes  
Occupational risks  
Exposures  
Hazards  
Recyclable collectors  
Brazil

## ABSTRACT

There are approximately 15 million people engaged in waste collection or recycling activities in the world. Some of these dump sites are informal and people work in environments that are labor-intensive, unregulated, unregistered, low-paid, unrecorded, and environmentally hazardous. A systematic review was conducted to assess consequential health conditions and occupational risks that affect waste collectors in Brazil. The search was limited to Brazil because although the government closed dump sites, open-air dumping—the worst type of waste disposal—still occurs in about half of the country; moreover, Brazil is the only country to systematically collect data on the occupation, with an estimated 229,568 recyclable collectors of all types country-wide, which offers relevant and pertinent data on the topic. The results of the search indicated that nearly every region has individuals that work as recyclable collectors. As expected, the sites are full of occupational hazards to the workers that can include: long working hours; exposures to physical, chemical, mechanical, biological, ergonomic and social agents; and frequent work accidents. Exposure to these risks can result both in physical and psychological illnesses. In view of these findings, public policies could be strengthened by supporting and providing incentives to municipalities, schools, universities, health professionals, and all others who will contribute to the closure of open-air waste or poor waste disposal systems. Moreover, an improved awareness should be provided to the general population about environmental education and correct disposal of garbage. The goal of healthy waste disposal conditions ultimately decreases environmental and public health effects, while improving the working conditions, quality of life, and health outcomes for recyclable collectors.

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## 1. Introduction

A significant challenge in modern society with increased population growth is the rising amount of solid waste, inadequate management, and lack of safe waste disposal areas. As a result, millions of people find themselves amidst the waste. In fact, there are approximately 15 million people engaged in waste collection, including recyclable collecting, activities worldwide (Medina, 2008). One group, called recyclable waste collectors (herein referred to as recyclable collectors), find and sell valuable materials in irregular landfills and open dumpsters as means of survival (Almeida et al., 2009). These individuals work in conditions, ranging from lack of labor rights to exposures to various hazards that can cause adverse health effects. This job is typically undertaken by a vulnerable population who have low levels of education and cannot find alternative work in more desirable or professional settings (Maciel et al., 2011; Guerrero et al., 2013).

Although the process of separation of recyclable material is essential for environmental sustainability, these activities usually take place in hazardous settings—both in terms of unsafe physical grounds and poor hygiene. Because of these conditions, workers are continually exposed to social, psychological, biological and environmental risks that can have adverse health effects associated with various exposures (Texeira, 2015; Zacarias and Bavaresco, 2009; Ziraba et al., 2016). Garbage collectors are constantly sorting through items and during this time, they can encounter hazardous exposures, such as heavy metals, sharp materials, or even infectious diseases. In addition to these health hazards, they face social stigma through discrimination, prejudice and rejection from society, who devalue them because of their profession (Alencar et al., 2009). As a result, recyclable collectors are at high risk for developing morbidity and mortality related to the occupation, including adverse mental health (e.g. stress, low self-esteem, fear, depression), injuries, respiratory diseases, ocular infections, stomach problems, typhoid fever, diarrhea, musculoskeletal disorders, communicable diseases, cancer, and even death (Alencar et al., 2009; Chokhandre et al., 2017; Mol et al., 2017).

Because of these negative outcomes, waste collector's occupation should require special attention from policy makers and researchers about occupational hazards and adverse health outcomes (Jesus, 2012). Solutions addressing the rising concerns of recyclable collectors in low-income countries have been implemented but have not managed to eliminate the informal industry and individuals who work in it. Until the formal sector supports informal waste recycling, it is likely that recyclable collectors will continue to recycle materials for economic revenue and as a result, be exposed to various hazards that encompass the occupation (Wilson et al., 2009; Chokhandre et al., 2017; Mol et al., 2017).

### 1.1. Waste and recyclable collection in Brazil

Of the 15 million waste workers in the world, there are 4 million in South America, with an estimated 229,568 people in Brazil (Medina, 2008; Dias et al., 2014). There are three types of recyclable collection activities in Brazil: (1) unorganized or autonomous workers who sort and find recyclable materials in waste dumps or on the streets, (2) organized collectors who work through asso-

ciations and cooperatives, and (3) recyclable collectors with contracts who primarily work in junk yards, the metallurgic industrial or public municipal sectors, or in associations and cooperatives (WEIGO, 2018). The largest of these sites was Estrutural, which had been the largest open-air dump in Latin America for approximately 60 years (International Solid Waste Association, 2018).

The government of Brazil created a National Policy for Solid Waste strategy plan in 2010 in order to establish guidelines country-wide regarding solid waste disposal (Brasil, 2017). Under this plan, dump sites were more or less dismantled as a way of moving forward with the plan to help minimize outcomes related to unsafe waste and to improve recycling techniques. This law was successful in that many sites were “closed” (e.g. Estrutural in 2018), but it was unsuccessful because many sites did not close and are now acting informally. Recyclable collectors continue to work at these sites, which are no longer functioning dumpsites, according to the law in Brazil. This is a problem because workers may now be subjected to even worse conditions than before because they are working in officially unrecognized and unregulated dump sites.

In addition to this information, Brazil is the only country that systematically collects statistical data on recyclable collectors and this data significantly contributes to the state of the knowledge regarding formal-to-informal waste and recyclable collection (WEIGO, 2018). Thus, the objective of this study was to conduct a systematic review to understand hazards and health outcomes that continue to effect recyclable collectors in Brazil—a country with a berth of knowledge associated with waste and recyclable collection during a transition period. This knowledge is important to inform government, public health practitioners, academics, and advocates of the state of health and safety for waste collectors. This information can also be used to inform the general public of proper disposal techniques to help the rights of these workers as well as protect the environment and public health.

## 2. Methods

A systematic review was conducted and included recent and relevant articles on the health and working conditions of waste collectors in Brazil that were published between 2009 and 2018 to retain current data within the last ten years. Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines were used for reporting the search and selection of results. The search was limited to Brazil, mainly because this country continues to have a large percentage of open-air waste and poor waste management practices involving recyclable collectors. The research was conducted through scholarly databases including Google Scholar, Virtual Health Library (BVS – Biblioteca Virtual de Saúde), Latin American and Caribbean Literature in Health Sciences (Lilacs – Literatura Latino-Americana e do Caribe em Ciências da Saúde), the thesis bank of the CAPES platform, and the Digital Library of Monographs of the Brasilia University (BDM/UnB – Biblioteca Digital de Monografias da Universidade de Brasília). Keyword searches included the terms: “occupation”, “recyclable”, “garbage”, “waste”, “recycling”, “collector” and “health.” Searches were conducted in both English and Portuguese to be as inclusive as possible.

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