Chapter 14
The Waste-Energy-Health Nexus:
The Social (In)Justice Dimension

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ABSTRACT

The main issues that pertain to the health burden from waste management and energy resource use are laid out highlighting the aspects that determine actual exposure and the socio-economic conditions that underlie them. Case studies covering biomass burning, acute and chronic exposure to urban and industrial waste are described. They refer to different areas in Europe and socio-economic strata focusing on susceptible population groups, which may be affected by enhanced exposure to environmental toxicants stemming from municipal and industrial waste management and domestic heating or cooking using biomass. These features make socio-economic status and the consequent social (in)justice a key determinant of overall exposure early in life. The latter results in a high probability of onset or exacerbation of adverse health outcomes both in the medium term and later in life. Additional factors that affect the health impacts of environmental exposures comprise choice of diet, education level of parents, access to green or blue space and housing condition.

INTRODUCTION

In recent years, it has been extensively recognized that sociodemographic inequalities formulate significant differences in exposure patterns, which are also reflected in health adversities (Gouveia, 2016). These inequalities, also described as environmental injustice, are observed at different levels of social organization, including differences among countries, within countries, within the urban envelope or even within communities. These differences describe both socioeconomic and demographic inequalities.

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Very characteristic examples on how sociodemographic inequalities among countries are related to environmental exposure, are provided by harmonized biomonitoring studies, i.e. biomonitoring studies, where samples have been taken at the same period of time, related to specific age groups and the samples have been analysed under similar SOPs. Analysis of the socioeconomic aspects of exposure based on human biomonitoring (HBM) data provides useful insights on the effect that socioeconomic disparities have on exposure to chemicals at the country level. As shown in Figure 1, DDT levels in human samples (for the years 2001-2002 when data were available for most of the countries) were negatively correlated to average gross domestic product (GDP) per capita for the same period.

In Balkan countries, this might be related to the fact that DDT was the main biocide used to "eradicate" malaria worldwide, beginning in 1955. Small quantities of DDT were sprayed inside dwellings, and the malarial parasite vectors were either killed or repelled by the chemical. The program was thus successful in essentially wiping out malaria. Reduced hygiene conditions in countries with lower income, had favored the development of malaria but DDT was proven to be an effective countermeasure. However, due to its persistence and bioaccumulation potential, DDT levels continue to be higher in these countries compared to the rest of the European Region. High levels of DDT in countries of the former Soviet Union (FSU) reflect the fact that from 1950 to 1970 more than 20,000 tonnes of DDT were used annually. Most DDT was applied in southern regions of the FSU where agricultural activity was the more pronounced, such as Moldova and Ukraine followed by the Northern Caucasus region of Russia and the Central Asian republics. Figure 1 shows that even in 2001-2002, DDT concentrations found in human milk in countries such as Russia and Ukraine were quite high compared to other countries in Europe. DDT levels in the Czech Republic are high as well. Even though the country stopped production of DDT, HCH and other pesticides listed in the Stockholm Convention, significant contamination has been found in soil around sites where tonnes of obsolete pesticides, especially DDT and HCB, were buried (Beránek, 2005). This could lead to enhanced levels of human exposure through a horde of possible pathways and consequently could explain the relatively higher values of DDT in breast milk in the Czech population.

Similarly, comparison of exposure to DEHP with average GDP per capita (for year 2012, when human biomonitoring (HBM) data were also collected) shows that exposure to the restricted phthalates is negatively correlated to affluence (see Figure 2). This is an interesting conclusion which has to be investigated more in detail, in terms of sources to DEHP exposure and socioeconomic determinants, whether these are related to building materials emissions (e.g. vinyl flooring) or exposure due to object-to-mouth behavior involving toys with high content in DEHP. In Western Europe, DEHP represented in 2008 only 18% of the overall consumption of plasticizers. In comparison, DEHP represents 50% of the total use of plasticizers in the world. A putative explanatory hypothesis is that in countries with lower GDP cheaper imported plastic materials are preferred compared to the ones produced in the European Union. Thus, policies for consumer protection might not be adequate for public health protection if related only to products manufactured in the EU.

On the contrary, blood levels of PCDDs/PCDFs are positively correlated to gross domestic product per capita (Figure 3). More than ninety percent (90–98%) of typical human uptake of PCDDs/PCDFs comes from diet and especially from food of animal origin: meat, dairy products, or fish predominate, depending on the country (Liem et al., 2000). These statistics exclude of course potential occupational exposure sources (Malisch and Kotz, 2014). In different studies uptake from ambient sources (ingestion of soil and water, inhalation of air or dust) and miscellaneous non-dietary sources (transfer from paper; cigarette smoking) was estimated to be only in the range of up to 10% of the total average adult exposure (Liem et al., 2000). These higher exposure levels in countries with higher GDP per capita might be at-