



FIGURE 10. In Roman times, the wealthy classes were “privileged” in being able to sweeten their food with *defrutum*, a costly grape syrup cooked in a lead container that released lead acetate, a potentially deadly sweetener.

SOURCE: Image by HerrBudlanski in *Wikimedia Commons*, https://commons.wikimedia.org/wiki/File:Beuverie_Latine.jpg, under Creative Commons Licence Attribution-ShareAlike 4.0 International, <https://creativecommons.org/licenses/by-sa/4.0/>.

3.3. THE EXPOSOME AND HEALTH INEQUALITIES

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Health inequalities are commonplace and can be found virtually anywhere, occurring in low- and middle-income countries as well as in their high-income counterparts. Such inequalities are not only manifest across a range of medical factors, including genetic predisposition, access to health care, and health service quality, but they also occur in association with a slew of non-medical factors, including gender, race, education, income, housing, and food security, the so-called *social determinants of health* (Neufcourt et al., 2022). Health inequalities are an outcome of the conditions in which people live, work, and age, which are in turn shaped by broader political, social, and economic forces (World Health Organization & UN-Habitat, 2010). Moreover, health inequalities are not distributed randomly across the population but show consistent patterns according to socio-economic standing. In 2010, Sir Michael Marmot and colleagues published a seminal report on health inequalities in England entitled “Fair Society, Healthy Lives”, and, in so doing, created awareness for an issue often overlooked by policy

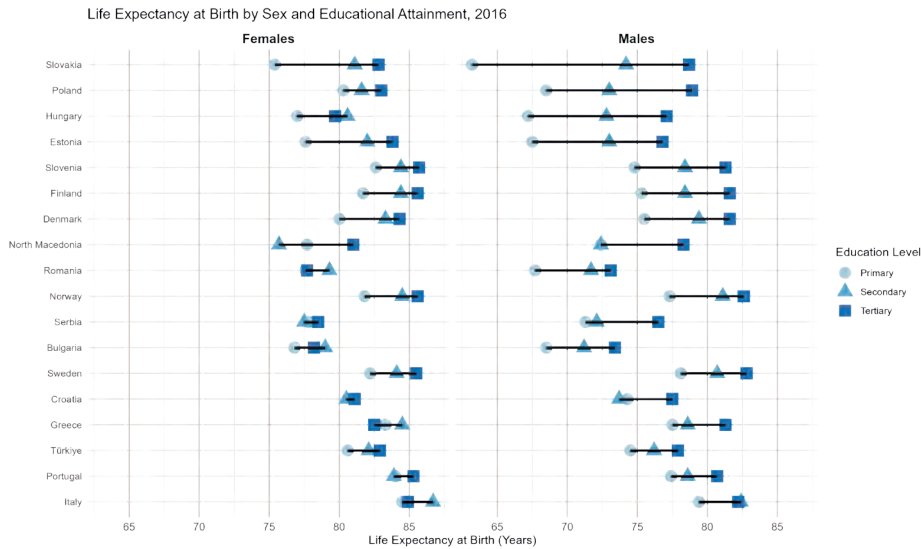


FIGURE 11. Life expectancy at birth, by education level, 2016.

SOURCE: Creation of Stefan Sieber using data from “Life expectancy by age, sex and educational attainment level”, *Eurostat*, https://ec.europa.eu/eurostat/databrowser/product/page/DEMO_MLEXPECEDU.

makers and the public at large (Marmot, 2010). The report concludes that each year between 1.3 and 2.5 million years of life are lost in England due to premature death as a consequence of health inequalities. These health inequalities result from social inequalities, something that becomes patent when examining the “social gradient in health”: the lower a person’s social position, the worse his or her health, a finding applicable to almost every country and context around the world (World Health Organization, 2008).

While the literature on the social determinants of health has grown substantially in recent decades, scientists investigating the exposome have only recently taken an interest in the non-medical factors influencing health outcomes, well-being, and quality of life. Increasingly, these scientists are interested in how the social determinants of health may be integrated in their research into the exposome and how, more specifically, they might be incorporated as part of the external exposome (Vineis et al., 2020). Traditional health risk factors, such as tobacco use, excessive alcohol consumption, sedentary lifestyle etc., partly explain the social health inequalities and tend to follow a social pattern, with unhealthy behaviours being more prevalent among lower social positions (Gallo et al., 2012). Nevertheless, a substantial part of these inequalities remains unexplained.

The exposome framework has great potential for investigating other pathways that might link social factors with health inequalities. The hypothesis of a biological embodiment of the social environment seeks to explain how social factors may lead to biological alterations (Blane et al., 2013), which makes it particularly interesting for exposome research. The social-to-biological transition suggests that the social environment may have an impact on health through exposures either of exogenous or endogenous origin (Neufcourt et al., 2022). Those of exogenous origin emerge from the specific external exposome and include pollution, pesticides, tobacco, alcohol, diet, etc.; those of endogenous origin influence the internal exposome via psychosocial factors involving the subjective interpretation of conditions, such as challenges, interpersonal relationships, etc., that trigger the response of internal biological mechanisms linked in the main to stress perception and stress response systems. This link between the social factors in the general external exposome and the biological responses that form the internal exposome makes the exposome framework a powerful tool to explore how social inequalities translate into health inequalities.