2 INCOME, LABOR MARKET AND REGIONAL INEQUALITIES

2.1 INEQUALITY OF MORTALITY AND MORBIDITY BY INCOME

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Individuals of lower socio-economic status (less educated, lower-income individuals) have higher mortality rates and lower life expectancy than individuals of higher socio-economic status. Since mortality data has been collected for a long time in all countries, this robust relationship can be observed in data from many different countries.[1] This relationship is usually strong, though changes in its strength over time are informative about social processes and the situation of various groups. Life expectancy is one of the most important social indicators.

In this subchapter we use the comprehensive national individual-level mortality registers of the Hungarian Central Statistical Office (HCSO), the "admin3" administrative database of the Centre for Economic and Regional Studies (CERS), and settlement-level and microregion-level administrative data on population characteristics and income to examine inequalities in Hungary during the 2011–2016 period in mortality rates, life expectancy, and morbidity. We focus on life expectancy and morbidity inequalities among individuals aged 45 or older (middle-aged and older). Hungary is a high-income country[2] and as such it has successfully decreased mortality and morbidity among younger age groups, which remain problems in lower-income countries.

We are not the first ones to examine these questions. A series of demographic studies has examined the evolution of mortality and differences by socio-economic status (typically proxying with level of education) in the 2000s.[3] We contribute to this literature in several ways. First, we measure inequality using average income, a measure that is relatively universal in space and time. Second, we demonstrate that a large share of inequality by income can be attributed to avoidable (amenable and preventable) causes. This highlights that appropriately targeted health policy interventions could potentially decrease socio-economic inequality in mortality. Third, we show that there are substantial inequalities in income in a number of important health indicators that describe health behavior, access to care, and healthcare use. These differences are strongly associated with life expectancy inequality.

1 See for example *Chetty et al.* (2016), *Marmot* (2005), *Mackenbach et al.* (2018, 2019).

2 See: World Bank.

3 *Bálint–Németh* (2018), *Klinger* (2001), (2003) *Kovács–Bálint* (2014), (2018).

Mortality and life expectancy

Our study is based on the national mortality register of the HCSO. The mortality register contains the gender, age, settlement and cause of death for

each death in Hungary. Based on the cause of death and the age of the deceased, we can identify avoidable (amenable and preventable) and unavoidable deaths (*ONS,* 2011).

The source of settlement-level gender- and age-specific population data is the TSTAR database of the HCSO. We approximate the average income of each settlement using data on per capita domestic income. We view this as a proxy of per capita household income of the residents of the settlement. We calculate mortality rates, life expectancy and per capita income averaged over the 2011–2016 period in order to reduce noise in the data. Based on settlement-level average income, we form 20 ventiles, each of them containing approximately 5% of the population of Hungary. This means that the bottom ventile contains the poorest 5% of the population (by settlement-level income) and the top ventile contains the richest 5% of the population (by settlement-level income).

For each ventile, we first calculate the gender- and age-specific mortality rates based on averaged mortality and population data for the 2011–2016 period. Then we calculate life expectancy using a standard procedure (see *Arias et al*., 2019). To examine the role of avoidable (preventable and amenable) deaths in life expectancy differences across income groups, we calculate an adjusted version of life expectancy. In this exercise, we assume that the avoidable mortality rate of each income ventile is equal to the avoidable mortality rate observed in the richest income ventile, whereas the non-avoidable mortality rate is unchanged. We then recalculate life expectancy. Thus the adjusted life expectancy reflects a counterfactual state where we have removed for differences in age-specific avoidable mortality rates. For more details on life expectancy calculations, see *Bíró et al*. (2020). When calculating mortality rates and life expectancy, we focus on individuals 45 and older.

Figure 2.1.1 shows age-specific mortality rates by income ventile. There are large differences between poorer and richer settlements, among both women and men and in all age groups. At the same time, inequalities are substantially larger among men, both in absolute and relative terms. For example, in the oldest age group (75 and older) the mortality rate of those living in the poorest settlements is 35 percent higher among men than the mortality rate of those living in the richest settlements. The same difference is 18 percent among women. Moreover, for both genders, the income gradient of mortality is larger in younger age groups. In the 45–54 age group, the mortality rate of the poorest and wealthiest settlements differs by a factor of 2.5, in the 55–64 age group it differs by a factor of approximately 2. The difference narrows further in older age groups.

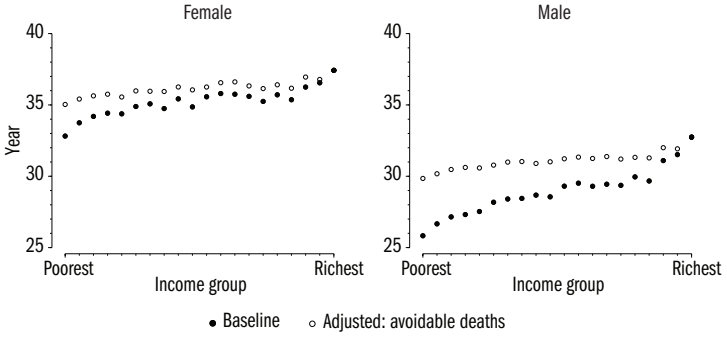
A simple summary of mortality rate inequalities is life expectancy at 45 (*Figure 2.1.2*). Like mortality inequality, life expectancy inequality is also larger among men than among women. Among women, the difference between the

top and bottom income groups is 4.6 years (37.4 years vs 32.8 years) or 14 percent. Among men the difference is 6.9 years (32.7 years vs 25.8 years) or 27 percent. Notably, in the middle of the distribution (between the 5th and the 15th ventiles) life expectancy does not change much: the difference is 0.8 years for women and 1.8 years among men.

Figure 2.1.1: Age-specific mortality rates by settlement-level income

Note: Mortality rates are deaths per 100,000.
Source: Authors' calculation based on *HCSO* mortality register and *TSTAR* database.

Figure 2.1.2: Life expectancy difference at age 45 by settlement-level income



Note: Adjusted life expectancy reflects a counterfactual state where age-specific avoidable death rates in each income ventile are set to the rates observed in the top income ventile. The remaining differences in life expectancy reflect differences in non-avoidable mortality.
Source: *Bíró et al.* (2020).

We examine the role of avoidable deaths with the adjusted life expectancy measure discussed above. If we remove life expectancy differences between the bottom and top income groups caused by avoidable causes of death, the difference decreases from 4.6 years to 2.4 years among women and from 6.9

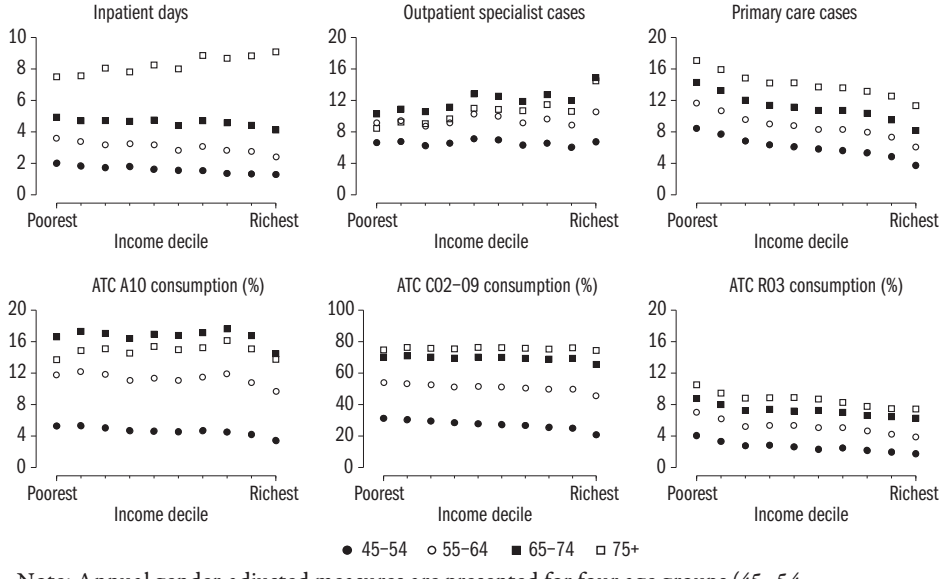
years to 2.9 years among men. This suggests that higher rates of mortality from avoidable causes among lower-income individuals can explain about half of life expectancy differences at age 45. Consequently, health and social policy may have substantial scope to decrease these inequalities.

Healthcare use and morbidity

We examine differences in healthcare use and prevalence of chronic conditions using administrative panel data produced by the CERS Databank ("admin3"). This database contains a quasi-random 50% sample of the Hungarian population.[4] Since this database does not contain settlement-level information, we carry out this analysis at the microregion level. We divide microregions into income deciles using per capita domestic income from the HCSO TSTAR database (each decile contains approximately 10% of the population), and examine inpatient days, outpatient specialist and primary care use, and prescription drug use (focusing on three important groups: insulins and other antidiabetics used to treat diabetes, blood pressure medications, and medications for obstructive pulmonary diseases) by decile.

4 For a short description of the database, see the Appendix of the *In Focus* section. For more details, see *Sebők* (2019).

Figure 2.1.3: Differences in healthcare use and prescription drug consumption by microregion-level income



Note: Annual gender-adjusted measures are presented for four age groups (45–54, 55–64, 65–74, and 75+) averaged over the 2011–2016 period. The bottom panels show the share of individuals who consume at least one prescription in at least three months in the medication group.
ATC groups: A10 – insulins and oral antidiabetics, C02-09: anti-hypertension medications, R03: obstructive pulmonary disease medications.
Source: Authors' calculations based on the admin3 and HCSO TSTAR databases.

The top panels of *Figure 2.1.3* show that primary care use decreases in each age group with increasing income, while outpatient specialist use shows a weakly increasing trend, suggesting that access may play an important role. Inpatient use shows an interesting relationship with income: while between ages 45 and 74 there is a clear negative relationship with the average income of the microregion, above age 75 this relationship is reversed. We observe a similar relationship for blood pressure medications (ATC C02-09 categories): the negative relationship for ages 45 to 64 disappears in the 65–74, and especially the 75+ age group. This may be explained by the finding above that in poorer microregions, mortality is much higher in the 45–64 age groups and the prevalence of chronic diseases (e.g., hypertension) is higher. A similar, though somewhat weaker, relationship can be observed in the consumption of antidiabetic medications (a proxy for the prevalence of diabetes diagnoses). At the same time, consumption of medications for obstructive pulmonary diseases shows a negative relationship with income in all age groups.

Health behaviors and access to care

Finally, we examine several measures of health behaviors, access to care and participation in preventive care to assess the role of these factors in mortality and morbidity inequalities. Our goal is not to uncover causal relationships but to examine the distribution of a large number of indicators by income in a unified framework. We would like to illustrate the scope of health and social policy to decrease inequalities. We examine income-related inequality using the same methods we used for mortality and life expectancy and divide settlements into 20 ventiles. *Table 2.1.1* shows the list and source of the indicators used.

Figure 2.1.4 shows for each indicator the difference between the top and bottom income ventile, standardized by the mean. The two health behavior indicators which exhibit the largest difference are heating with solid fuel only and time spent with sport. The former suggests that air pollution from heating poses a problem for individuals living in poorer settlements. The latter suggests that individuals living in wealthier settlements spend more time with sports than those living in poorer settlements. All other indicators also suggest that individuals in the bottom income ventile are more likely to engage in behaviors that are negatively associated with health (e.g., smoking, consumption of sugary drinks) and less likely to engage in behaviors that are positively associated with health (e.g., consumption of fish and vegetables).

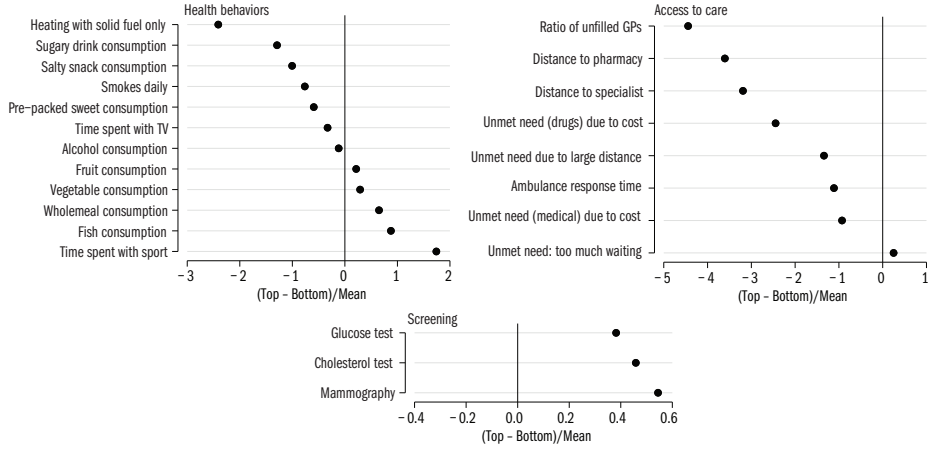
Indicators that characterize healthcare access also show substantial inequality between individuals living in poorer and wealthier settlements. In the settlements in the bottom ventile, unfilled general practices are more widespread, distance to pharmacies and specialist outpatient care units is larger, and wait time for ambulances are longer. Overall, nearly all indicators show that individuals living in poorer settlements have worse access to care.

Table 2.1.1: Indicators of health behavior and healthcare access

Indicator	Note	Data source
Using Solid Fuel	Measured at the household level	2011 Census
Average Daily Amount of Time Spent Watching TV	Measured in minutes among 25 and older	2009/2010 Time Use Survey
Average Daily Amount of Time Spend With Sports	Measured in minutes	2009/2010 Time Use Survey
Consumption of Fish*	Data from 2014 Consumed at least once a week	European Health Interview Survey
Consumption of Prepackaged Sweets*	Data from 2014 Consumed at least daily or almost daily	European Health Interview Survey
Consumption of Sugary Drinks*	Data from 2014 Consumed at least daily or almost daily	European Health Interview Survey
Consumption of Savory Snacks*	Data from 2014 Consumed at least daily or almost daily	European Health Interview Survey
Consumption of Wholemeal*	Data from 2014 Consumed at least daily or almost daily	European Health Interview Survey
Consumption of Vegetables*	Data from 2014 Consumed at least daily or almost daily	European Health Interview Survey
Consumption of Fruits*	Data from 2014 Consumed at least daily or almost daily	European Health Interview Survey
Consumption of Alcohol*	Data from 2014 Medium or high risk category	European Health Interview Survey
Smoking*	Data from 2014 Daily	European Health Interview Survey
Share of General Practices Unfilled	Data from 2016	European Health Interview Survey
Distance from Pharmacy	Data from 2014	T-STAR
Distance from Specialist Clinic	Data from 2014	T-STAR
Ambulance Response Time	Data from 2009 Measured in minutes	*Kemkers et al.,* (2010)
Unmet Need for Medical Care Due to Wait	Data from 2014	European Health Interview Survey
Unmet Need for Medical Care Due to Distance	Data from 2014	European Health Interview Survey
Unmet Need for Medical Care Due to Cost	Data from 2014	European Health Interview Survey
Unmeet Need for Drugs Due to Cost	Data from 2014	European Health Interview Survey
Mammography*	Data from 2014	European Health Interview Survey
Cholesterol Test*	Data from 2014	European Health Interview Survey
Glucose Test*	Data from 2014	European Health Interview Survey

* Data for population aged 25 and above.
For more details, see *Bíró et al.* (2020).

Figure 2.1.4: Inequalities in health behaviors and health care access



Source: *Bíró et al.* (2020).
Values of each indicator by income ventile are presented in *Bíró et al.* (2020).

We examined participation in preventive care using three indicators. For all three indicators, participation in preventive care is higher in the top income ventile. These indicators are co-determined by individual health behaviors and healthcare access.

Summary

This subchapter documented substantial inequalities in mortality rates and life expectancy by income in Hungary. We also showed that about half of this inequality is caused by avoidable causes of death. We found large inequalities in access to care, healthcare use, as well as health behaviors. These inequalities, combined with the role of avoidable deaths suggest that there is substantial scope to decrease these inequalities through health policy interventions. Other subchapters in the *In Focus* section examine further mechanisms that could explain the inequalities reported in this subchapter. Specifically, *Subchapter 2.2* examines morbidity and healthcare spending inequalities by labor market status, *Subchapter K2.1* examines the inequalities in the incidence and treatment of heart failure, and *Subchapter 3.2* examines inequalities by labor income.

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