WORKING PAPER 25-01

Subnational Life Expectancy Disparities in Low and Middle-Income Countries: Measurement and Determinants

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Abstract

This article constructs new indicators of subnational disparities in life expectancy for up to 101 low- and middle-income countries (LMICs) from 2000 to 2021, offering critical insights into health inequalities within countries. The findings reveal that subnational disparities in life expectancy are markedly higher in Sub-Saharan Africa compared to other LMIC world regions throughout the period. Moreover, while subnational disparities in life expectancy have decreased in most regions, Sub-Saharan Africa stands out as an exception, with persistently high disparities alongside rising average life expectancy. A country-level analysis indicates that subnational disparities in life expectancy declined in 61 countries, increased in 30, and remained unchanged in 10. A gender-specific analysis highlights that, while women generally live longer than men across all countries studied, subnational life expectancy disparities are greater for women. Sub-Saharan Africa exhibits the largest disparities in female life expectancy and the widest gap in disparities between men and women.

Regression analysis identifies factors influencing life expectancy disparities. Variables such as good governance and public health spending help reduce disparities, while decentralization, larger country size, geographic diversity and ethnic fractionalization tend to increase them. Subnational disparities in income and education emerge as the most significant drivers of life expectancy inequalities, with disparities in female education playing a particularly critical role. These findings emphasize the need for targeted policies aimed at reducing subnational education inequalities, particularly for women, as a key strategy for addressing life expectancy disparities.

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1. Introduction

Life expectancy is an important dimension of human development (UNDP, 2017). Based on evidence on the evolution of life expectancy at the country level, life expectancy in the 21st century has been increasing around the world, only to fall somewhat in the period 2020-21 due to the impact of the COVID-19 pandemic (WHO, 2024). Less is known about how life expectancy, or health outcomes more generally, have evolved at subnational levels in the last two decades or so. Mapping and explaining disparities in life expectancy among a country's regions is crucial if we are to reduce health inequalities within countries. Those studies that have taken a subnational perspective, have focused on the evolution of subnational differences in health outcomes – including life expectancy – in high-income countries namely, Australia, Canada, Ireland, the Netherlands, New Zealand, the United States and the United Kingdom (Ellis and Fry, 2010; Bennett et al., 2015; Janssen et al., 2016; Wilson et al., 2020; Brown et al., 2023; Munford et al., 2023; Wilkie and Ho, 2024).

There are two exceptions. Timonin et al. (2017) track trends in life expectancy across Russian regions between 2003 and 2014 and report that life expectancy has improved markedly across regions, while regional disparities in life expectancy, as measured by way of a population weighted coefficient of variation, have fallen only slightly. The second exception is Permanyer and Smits (2020) who exploit data for 1625 subnational regions within 161 high, medium and low-income countries from the Subnational Human Development Index (SHDI) database, to explore the evolution of subnational inequality of the Human Development Index (HDI) and its three subcomponents – mean years of schooling, income per capita and life expectancy at birth – over the period 2000 to 2015. To measure inequality across subnational regions, they turn to a Gini index. They find that inequality in life expectancy has declined across these regions, except for a small increase in 2005 which they suggest may be due to the HIV/AIDS epidemic in Sub-Saharan Africa.

In this article, we combine the current version of the SHDI from the Global Data Lab (GDL) with subnational population data from the Area Database (also from the GDL) to track subnational inequalities within less developed countries over the period 2000 to 2021. Our approach is similar to that taken by Timonin et al. (2017) since we measure the subnational disparity in life expectancy within a country by way of a population weighted coefficient of variation which is commonly used to track within country spatial disparities across various dimensions – most notably income per capita (for example, Williamson, 1965; Kyriacou et al., 2017). Our sample consists of 101 low and middle-income countries, and we focus on these countries given the relative scarcity of evidence about the size and evolution of subnational health disparities in less developed countries.

By way of illustration, consider the evolution of life expectancy at birth in three countries – Colombia, Bangladesh and Nigeria – based on the available data. As can be seen in Map 1 (Maps A, B, C, respectively), a comparison of life expectancy between the early 2000s and 2018, indicates that in all three countries life expectancy has improved across most regions. The figure also shows subnational differences in life expectancy between the worst performing and best performing region in each country ranging from 4.4 years in Colombia

in the year to 2002, to 20.5 years in Nigeria in 2003. Almost two decades later, in 2018, the gap between the worst and best performers has increased in Colombia (going from 4.4 to 8.9 years) and fallen in both Bangladesh (from 11 to 5.2) and to a lesser extent in Nigeria (from 20.5 to 18.7). As will be shown more fully in Section 2 below, a similar picture emerges from the vantage point offered by the population weighted coefficient of variation: spatial disparities in life expectancy have increased in Colombia, fallen in Bangladesh and fallen slightly in Nigeria. Several questions follow. How large are spatial disparities in LMICs and how have they evolved in the first two decades of the 21st century? What explains cross-country and over time differences in subnational life expectancy in less developed countries? We will take a first step towards answering these questions in this article.

Map 1. Subnational life expectancy in selected countries
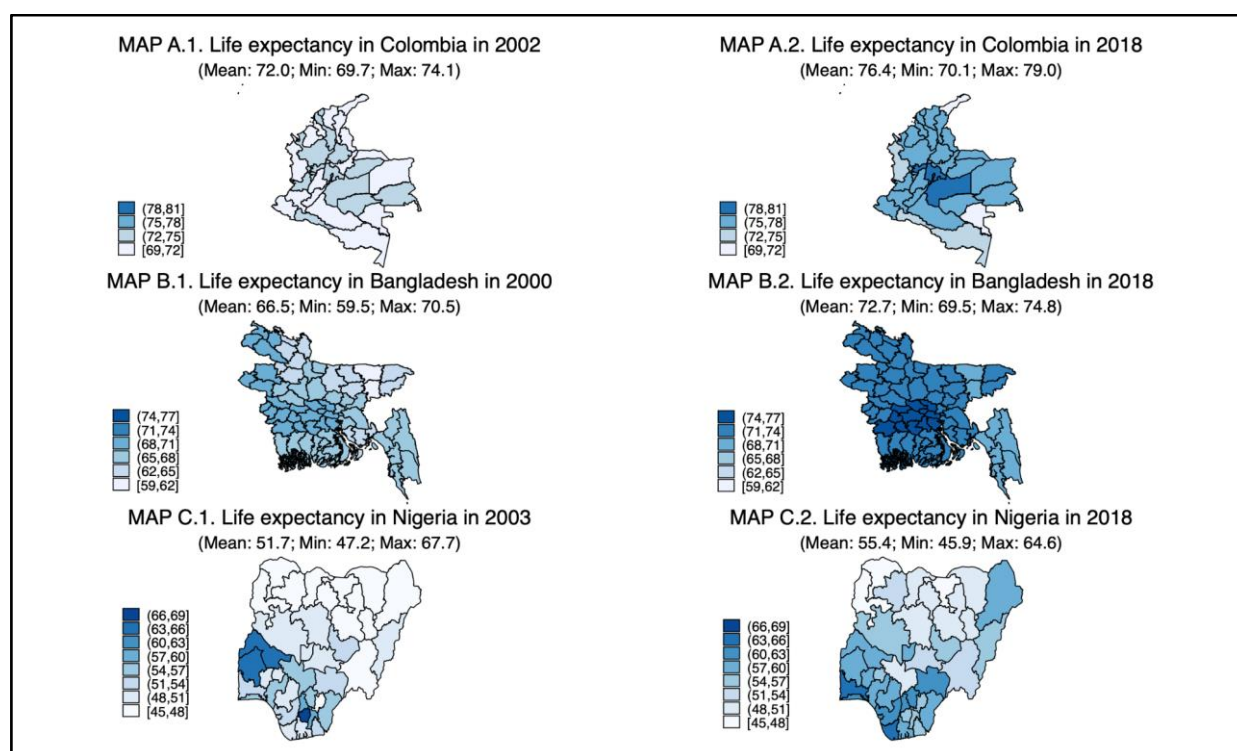
Source: Prepared by the authors based on SHDI from GDL.

We find that overall subnational disparities in life expectancy at birth have generally been decreasing in all LMIC world regions except Sub-Saharan Africa where they are and have remained notably higher. Furthermore, we find that in all the world regions considered, subnational disparities in life expectancy within countries are larger for women than for men and that, moreover, over the whole period, the gap between women and men in subnational disparities in life expectancy is greatest in Sub-Saharan Africa. Our exploration of the drivers of overall, male, and female life expectancy disparities highlights the importance of income and especially education disparities, and in the case of the latter, particularly, subnational education disparities in women.

The article is structured as follows. In Section 2, we present the data we employ as well as the corresponding spatial disparity indicators we generate, before mapping subnational life

expectancy disparities across countries and over time. In Section 3, we present the empirical method that we use to identify the key determinants of these inequalities, as well as the corresponding empirical results. Section 4 concludes the article with the main findings and tentative policy implications.

2. Measuring and tracking subnational health disparities

2.1 Subnational life expectancy data

Our data is drawn from the Global Data Lab (v7.0)[1]. Specifically, we employ subnational data on life expectancy at birth provided by the SHDI database of the GDL. As explained by Smits and Permanyer (2019), because LMIC household surveys and censuses generally do not contain information on life expectancy, subnational values of this indicator are estimated using data on under-five-year mortality (U5M) as provided by the Area Database (AD) of the GDL. This requires the use of interpolation and extrapolation techniques to address missing values of U5M, the fitting of a regression model that predicts life expectancy based on U5M and an additional set of covariates, and the scaling of the subnational values so that their population weighted mean for a given year aligns with the known national United Nations Development Program (UNDP) value for that year, as drawn from the UNDP-HDI database.[2] As detailed in sub-section 2.2, the construction of our chosen indicator for spatial disparities requires subnational population data, which we obtain from the GDL-AD. The resultant sample of 101 LMICs emerges when countries are dropped because they either do not have subnational population data and/or the GDL-SHDI assigns the same life expectancy value to all the subnational regions of a country due to data limitations.

Whenever possible, the GDL uses first-level administrative units based on the official administrative subdivisions used in each country. For example, in the case of Colombia, the existing administrative division of the country is adopted, consisting of 33 regions corresponding to the 32 "departments" plus the capital. For Nigeria, the GDL similarly follows the existing administrative division of the country, considering 37 regions corresponding to the 36 "states" plus the federal capital. However, the GDL occasionally diverges from this norm. In Bangladesh for instance, the existing administrative division divides the country into 8 regions (divisions), which are further subdivided into a total of 64 "districts". The GDL however, defines 23 regions, with each potentially including several of the 64 districts within the same divisions. Finally, if administrative subdivisions change over the period, the GDL adjusts for this to allow for comparability over time.

The GDL-SHDI also provides country level data on life expectancy at birth taken from the UNDP. We plot this data in Figure 1 which illustrates life expectancy across politico-geographic LMIC regions over the period 2000-2021, taking average values from the 101 countries consider in our analysis (see Appendix Table A.2 for the countries and years

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[1] https://globaldatalab.org/ See appendix Table A.1 for the definition and sources of all the variables employed in the article. All the data generated and employed in this article is available upon request.

[2] See Smits and Permanyer (2019) and the Online appendix of Permanyer and Smits (2020) for a full account as well as an extensive discussion of the technical validation of the data.

included in each world region). Like the WHO (2024), it shows that in the last two decades, all LMIC regions of the world, and especially Sub-Saharan Africa, have experienced progress in life expectancy at birth. Figure 1 also suggests some convergence in life expectancy at birth across regions, something that has been previously documented (see, Aksan and Chakraborty, 2023). Nonetheless, significant differences in life expectancy can be appreciated across regions - mostly between Sub-Saharan Africa, with relatively lower life expectancy, and the rest. For most of the period, life expectancy is highest in Middle Eastern and North African countries. The data also highlight a common negative impact on life expectancy in all five regions during the COVID-19 pandemic in 2020 and 2021. Although not shown in the figure, average life expectancy in the whole sample increased from 61.63 in 2000 to 66.32 in 2021.

Figure 1. Life expectancy across LMIC world regions 2000-21
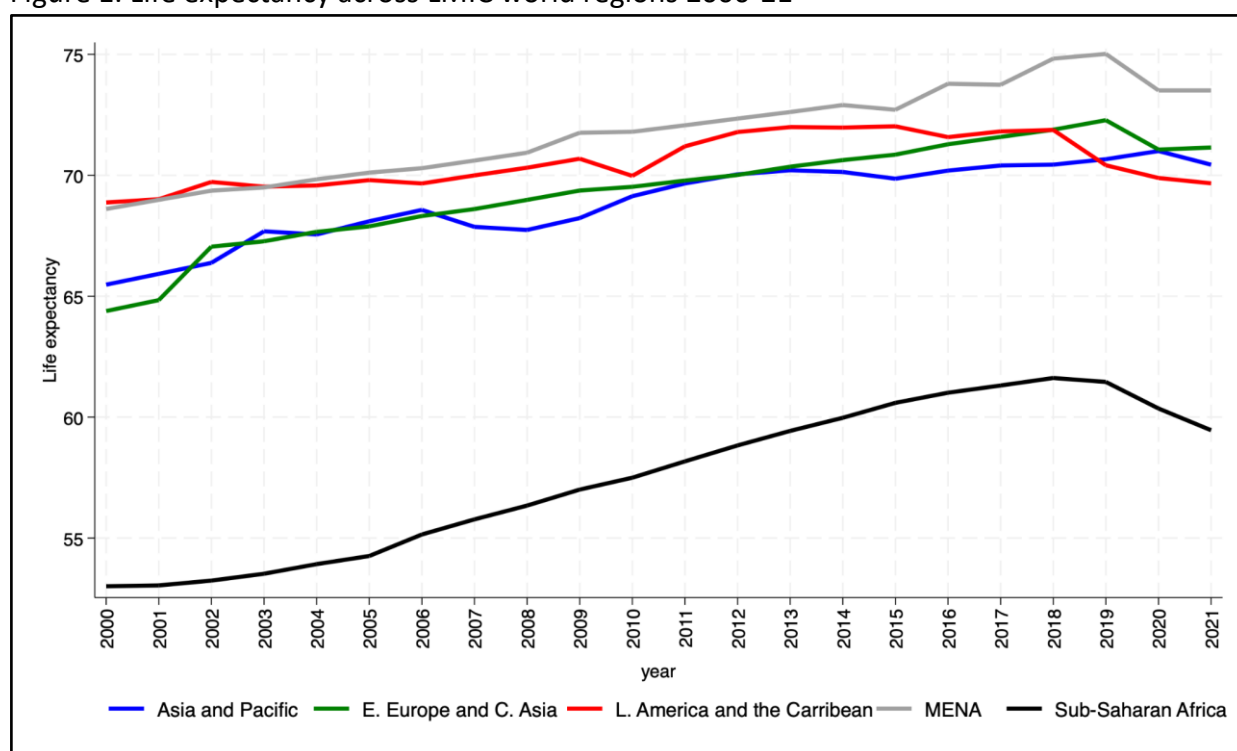
Source: Prepared by the authors based on SHDI from the GDL.

In Figure 2, we again show the evolution of life expectancy at birth but now differentiating between men and women. Again, consistent with WHO (2024), while life expectancy has been rising for both sexes up to the incidence of COVID-19, it is higher for women than for men in all the LMIC regions, and in each one of the countries considered (see Tables OA.1 and OA.2 in the online appendix). The largest gaps between men and women occur in Eastern Europe and Central Asia and in Latin America and the Caribbean. The figure also indicates that the gap between males and females has generally been maintained over time in each world region with the exception of Sub-Saharan Africa, where it seems to have increased somewhat since the second decade of the century.
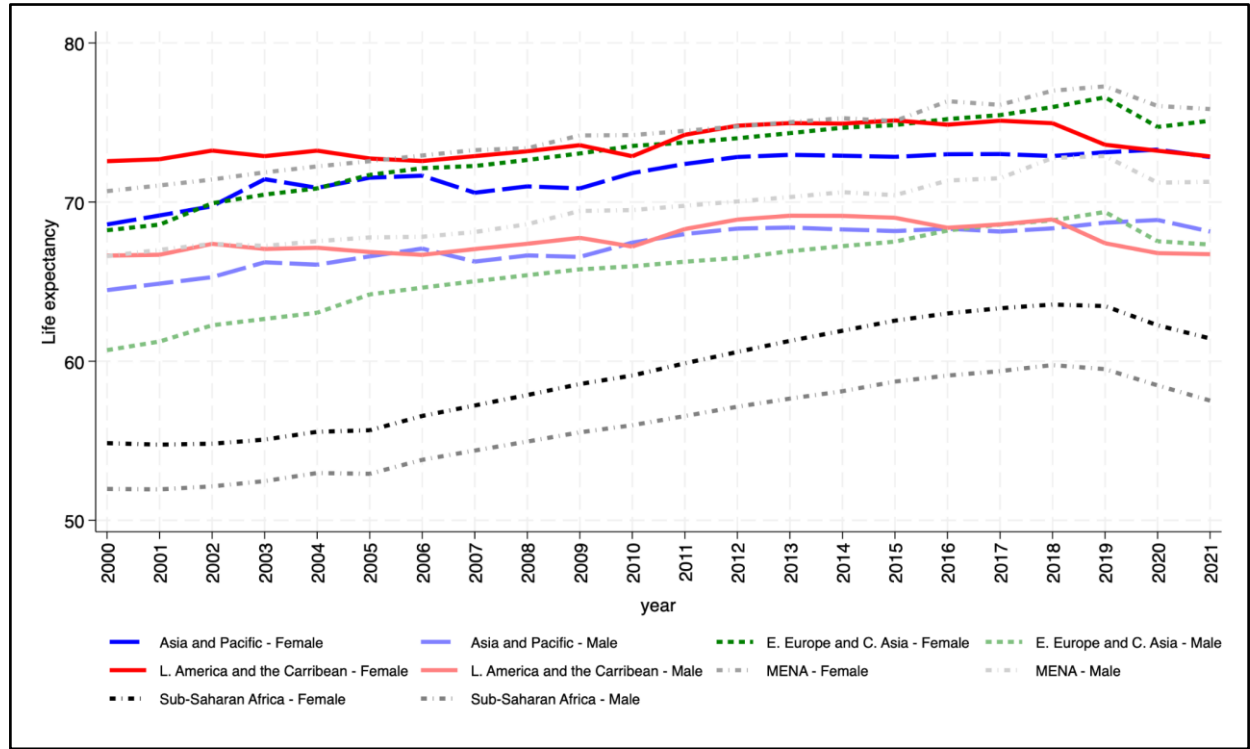
Figure 2. Life expectancy across LMIC world regions, by sex, 2000-21

Source: Prepared by the authors based on SHDI from the GDL.

2.2 Subnational life expectancy disparity indicators

To measure subnational disparities in life expectancy, we turn to the population weighted coefficient of variation (PW-CV-LEXP) which is widely used in the literature of regional disparities (Ezcurra and Rodríguez-Pose, 2010), defined as:

$$PW - CV - LEXP_{it} = \frac{1}{\overline{LEXP}_{it}}\left[\sum_{j=1}^{n_i} p_{jt}\left(LEXP_{jt} - \overline{LEXP}_{it}\right)^2\right]^{1/2} *100 \qquad (1)$$

where $LEXP_{jt}$ and p_{jt} are the life expectancy and population share, respectively, for region j in country i during year t, with n denoting the total number of regions. $\overline{LEXP}$ is the country's average life expectancy, calculated as $\sum_{j=1}^{n_i} p_{jt} * LEXP_{jt}$, with $\sum_{j=1}^{n_i} p_j = 1$.

The PW-CV-LEXP measure basically depicts disparities between a country's regions, taking into consideration their relative size (population weights), and theoretically can range from 0 (equality) to 100 (maximum disparities). Thus, higher values imply higher subnational disparities. Because it measures variability relative to the mean, this indicator of disparities is independent of the level of life expectancy.

The population weighted coefficient of variation accurately reflects true disparities because more populated regions contribute more to the overall disparity measurement than smaller, less populated ones. Without population weighting, small regions with large variances could exaggerate disparities, while large regions might be underrepresented (Williamson, 1965; Lessmann, 2014). From the perspective of regional policy, the population weighted measure

is appropriate since regional outcomes are population weighted in the welfare function of the policymaker (Van Rompuy, 2020).

Using a population weighted index is particularly suitable for our sample, given the significant differences in the size of regions within countries. By way of illustration, consider the three countries mentioned in the Introduction. Based on population data in 2021, Colombia has regions ranging in population size from around 50,000 inhabitants (e.g. Vaupis and Guainja) to the nearly 8 million of inhabitants of the capital region (Bogota D.C.). In Bangladesh the region of Daka has more than 12 million inhabitants while Khagrachhari-Rangamati has 1.4 million. Similarly, in Nigeria, the Lagos region has 14 million inhabitants compared to the capital region of Abuja with just 1.35 million. Another notable example is India that includes one region with nearly 243 million inhabitants (Uttar Pradesh), and regions with less than 1 million inhabitants (e.g. Sikkim). In this context, it seems more appropriate to use population-weighted measures of subnational disparities since they account for the fact that what happens in larger regions (such as Uttar Pradesh) affects more people than those in smaller regions (such as Sikkim). Accordingly, the PW-CV indicators are largely shaped by trends in larger regions.

Our second measure of subnational disparities is the population weighted standard deviation of the logarithm of subnational life expectancy (PW-LOG-LEXP), which, in its unweighted version, is widely used in the income convergence literature to capture sigma convergence (Ezcurra and Pascual, 2008):

$$PW - LOG - LEXP_{it} = \left[\sum_{j=1}^{n_i} p_{jt} \left(log\left(LEXP_{jt} \right) - \bar{\mu}_{it} \right)^2 \right]^{1/2} *100 \qquad (2)$$

where $\bar{\mu}_{it} = \sum_{j=1}^{n_i} p_{jt} log(LEXP_{jt})$.

Like the PW-CV-LEXP, this logarithmic measure is scale invariant, but it is more sensitive to the bottom part of the distribution (Trapeznikova, 2019).

2.3 Subnational life expectancy disparities in LMICs

Figure 3 shows the evolution of subnational life expectancies in the 21st century across LMIC world regions based on the PW-CV-LEXP. Immediately obvious are the important differences between Sub-Saharan Africa and the rest of LMIC regions. Subnational disparities in life expectancy are notably higher in the former during the whole period. Moreover, the figure reveals that, while subnational disparities in life expectancy have been generally decreasing in all LMIC world regions, they have remained persistently high in Sub-Saharan Africa. The figure also indicates an increase in life expectancy disparities in Sub-Saharan African countries in 2020, something that is suggestive of the unequal subnational incidence of COVID-19. In contrast, the figure does not indicate that COVID-19 may have increased subnational life expectancy disparities in other LMIC world regions, except perhaps for the case of the Middle Eastern and North African countries, where disparities increase somewhat in 2021. Additionally, Figure 3 indicates several noteworthy trends: disparities in Sub-Saharan Africa started to rise in 2015, and disparities increased in the Asia and Pacific region in the period 2006-09 and in Latin America over the period 2015-2019.

Figure 3. Subnational disparities in life expectancy across LMIC world regions 2000-21
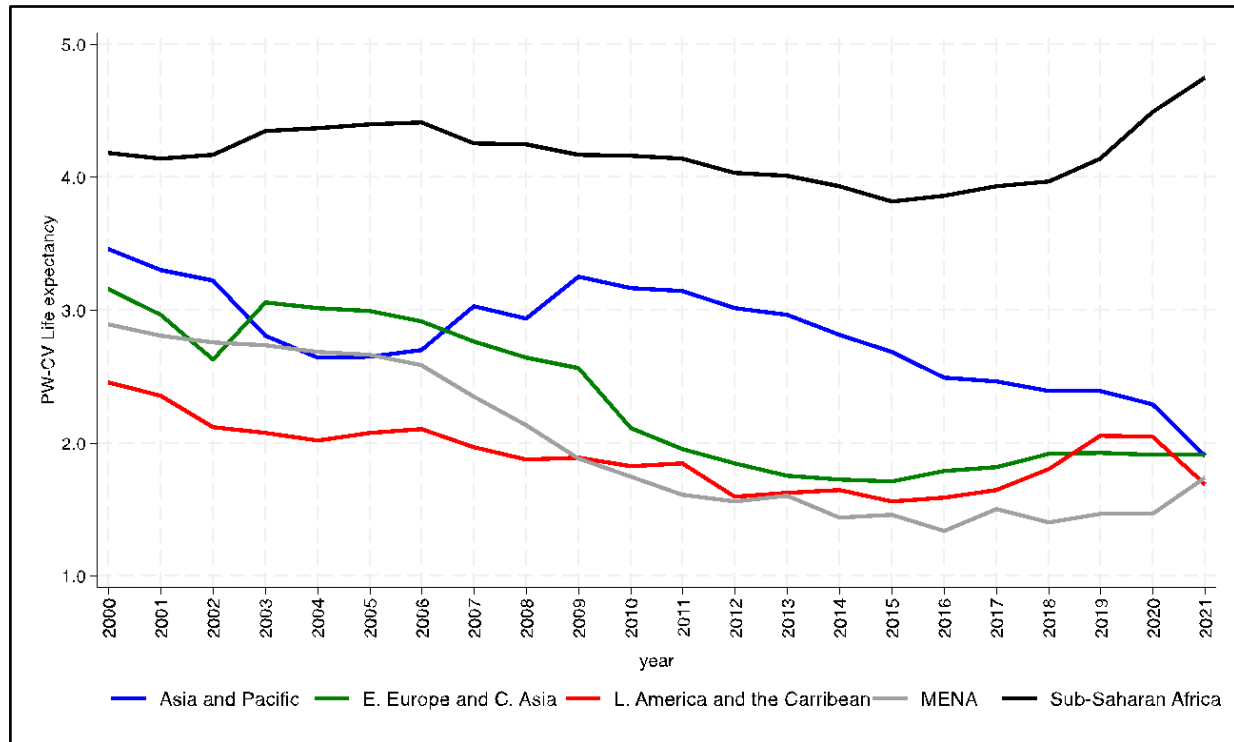
Source: Prepared by the authors based on SHDI and AD from the GDL.

Essentially, from Figures 1 and 3 we can infer that although life expectancy in Sub-Saharan Africa has improved in the past two decades or so, it remains consistently below the levels enjoyed by other LMIC regions (Figure 1). Moreover, subnational disparities in life expectancy in Sub-Saharan Africa have been consistently greater compared to the other world regions considered (Figure 3). However, world region averages can mask very different country performances. For a more precise view of the evolution of subnational disparities in life expectancy within countries, Map 2 shows the full list of countries that we consider and the changes in life expectancy disparities based on initial and final period values (see Table A.2 in the Appendix for full details). Now we can see that disparities have increased in 16 out of 43 Sub-Saharan African countries, but they have fallen in 24 of them and are unchanged in the remaining 3. In the other LMIC world regions the distribution is as follows: among 20 Asian and Pacific countries, increase in 3, fall in 13 and remained unchanged in 4; among 10 East European and Central Asian countries, disparities increase in 3, decreased in 6 and remained unchanged in 1; among 18 Latin American and Caribbean countries, disparities increase in 7, fall in 9 and remained unchanged in 2; and finally, in the 10 Middle Eastern and North African countries, disparities increased in 1 and decreased in the rest.

Overall, in the 101 countries considered over the period 2000 to 2021, subnational disparities in life expectancy fell in 61, increased in 30 and they remained unchanged in 10. The group of countries with falling subnational disparities includes some of the most populous countries in the world including India, China, Indonesia, Pakistan, Brazil and Bangladesh. The unequal evolution of subnational disparities across countries contrasts with the increase in life expectancy observed in almost all the LMICs considered (the exceptions

are Tunisia, India and Nepal – countries for which the sample is shorter and includes the COVID-19 pandemic shock).

Map 2. Subnational disparities in life expectancy across LMICs. Evolution over time
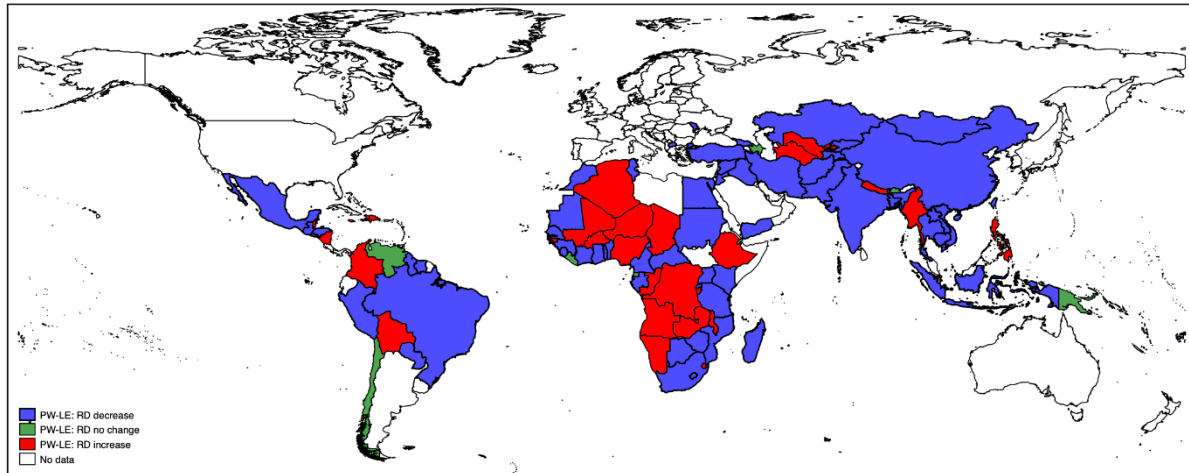
Source: Prepared by the authors based on SHDI and AD from the GDL.

Figure 4. Subnational disparities in life expectancy across LMIC world regions, by sex, 2000-21
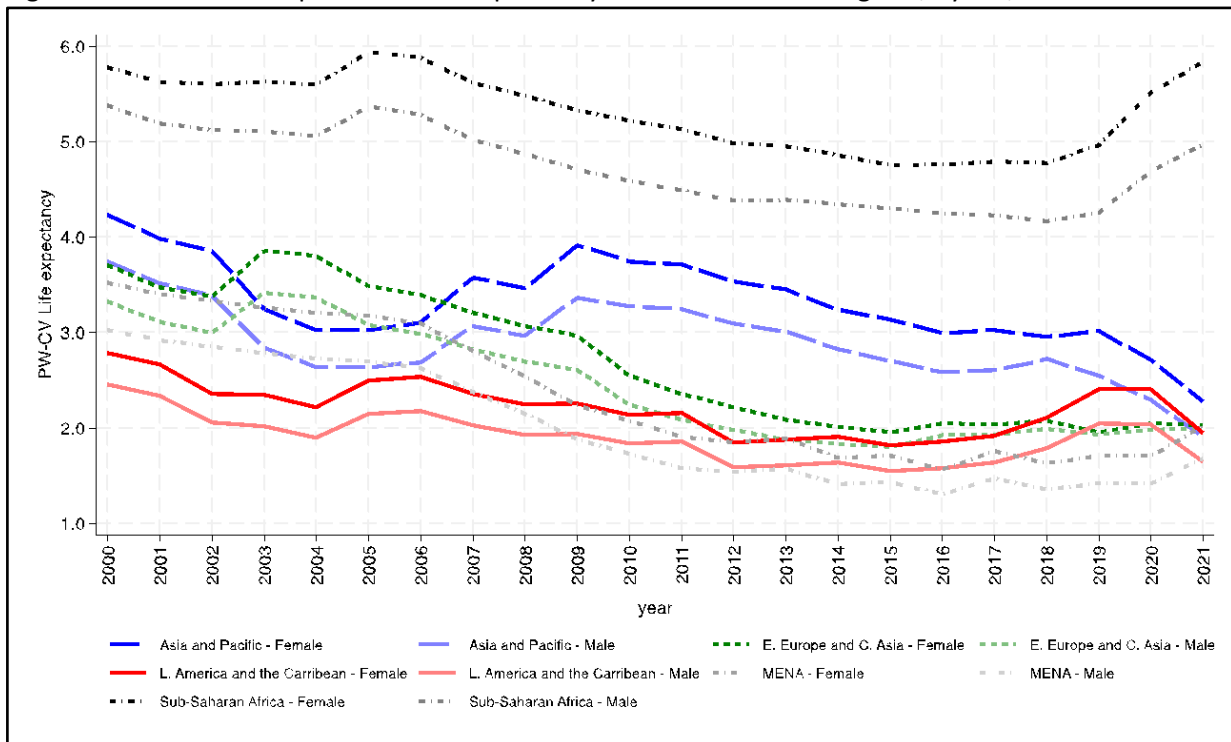
Source: Prepared by the authors based on SHDI and AD from the GDL.

We next turn, in Figure 4, to the evolution of subnational disparities across LMIC world regions but now separating males and females. The figure reveals that in all the world regions considered, subnational disparities in life expectancy within countries are larger for women than for men. This result is, perhaps, striking given the fact that we also saw that life expectancy is, on average, higher for women than for men (figure 2). The figure also shows

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that, over the whole period, the gap between women and men in subnational disparities in life expectancy is greatest in Sub-Saharan Africa. So, while women in Sub-Saharan Africa may, on average, live longer than men (see Figure 2), this continent also has both the greatest subnational disparity in female life expectancy and the largest gender gap in life expectancy disparities. This said, we again observe notable differences at the country level. For instance, in Nigeria and Congo Democratic Republic – the two most populous Sub-Saharan African countries – the gap between female and male life expectancy disparities has increased over time while in Kenya and Uganda this gap has fallen (see Tables OA.1 and OA.2 in the online appendix).

3. Explaining subnational health disparities

3.1 Empirical method

Having traced subnational disparities in less developed countries since the beginning of the 21st century, we will now turn to the potential determinants of cross-country and over time variation. To do so, we employ an unbalanced panel of up to 1626 observations from 101 less developed countries over the period 2000 to 2021, to estimate the following empirical model:

$$Subnational\ disparities\ in\ LEXP_{it} = \beta_0 + \beta_1 X_{it} + dt_t + dr_i + \varepsilon_{it} \qquad (3)$$

where $i = 1, … ,101$ refers to countries and $t = 2000, … ,2021$ refers to years. Subnational disparities in life expectancy are measured through the PW-CV-LEXP, and for robustness purposes, the PW-LOG-LEXP is also used. X is a vector of explanatory variables, dt_t denotes period fixed effects, dr_i represents politico-geographical region fixed effects, and ε is the error term. We estimate equation (3) using OLS based on panel-corrected standard errors (PCSE), which are robust to heteroskedasticity and serial correlation between the residuals of a given cross-section (Period SUR). We include period fixed effects, to control for the impact of time varying factors common to all countries (e.g. COVID-19 pandemic), and to account for the influence of time constant factors specific to each region we have included five regional dummies corresponding to the classification of politico-geographical regions provided by the V-Dem Institute (2023). However, we do not include country fixed effects because of the limited within-country variation compared to the cross-section variance in our key variables of interest (see Table A.3 in the Appendix).

The choice of explanatory variables is guided by the desire to uncover observable time varying and time constant factors driving subnational disparities in life expectancy. Two potentially important factors are subnational disparities in GDP per capita and education. Higher economic development has been found to increase life expectancy arguably because households with higher incomes can better cover health needs and richer countries can afford more advanced health technologies (see, for example, Pritchett and Summers, 1996; Jetter et al., 2019). The same is true for higher education levels because education implies a greater ability to process information and utilize resources efficiently to promote health (e.g., Balaj et al., 2024). Thus, subnational disparities in income and education are potential determinants of subnational disparities in life expectancy. To calculate these indicators, we employ subnational data on income per capita and human capital from GDL and apply the

PW-CV formula shown in sub-section 2.2 to calculate population weighted measures of regional disparities in income and education for each LMIC in our sample.

We also account for average income per capita in each country since the level of development may be associated with a host of unobservable factors that may impact on life expectancy disparities. Additionally, we include governance quality since it may be that better governed countries may be more successful in reducing socio-economic disparities — including life expectancy disparities — between subnational units (see, Kyriacou et al., 2017 for the general argument and relevant citations). Finally, we account for public and private spending on health given that previous work has identified both these variables as potentially drivers of better health outcomes in less developed countries (e.g., Anyanwu and Erhijakpor 2009; Novignon et al., 2012).

3.2 Empirical results

In Column 1 of Table 1, we report the estimates of Equation 3 incorporating the group of variables described in the previous section. Immediately obvious is the positive association between subnational income and educational disparities on the one hand, and disparities in life expectancy. This is consistent with prior work that has shown that life expectancy increases with income and education levels. Also consistent with prior work is the negative relationship between better governance and subnational disparities in life expectancy. Less robustly, we find some evidence that public health expenditure reduces subnational life expectancy disparities. In contrast, private health expenditure does not have any effect.

The relative importance of each variable can be gauged from the standardized beta coefficients reported in Table 1 for the continuous explanatory variables. The most important determinants of life expectancy disparities are income and education disparities. Column 1 shows that a one standard deviation increase in these variables leads to an increase in life expectancy disparities by 19.8% and 21.1% of one standard deviation, respectively. By comparison, the impact of better governance and public health spending is smaller: a one standard deviation increase in each reduces life expectancy disparities by 6.7% and 2.4% of one standard deviation respectively. The regional fixed effects confirm what we observed in Figure 3 above. Taking Sub-Saharan Africa as the reference category, we see that life expectancy disparities are greatest in that region followed, in decreasing order, by the Asia and Pacific region, Eastern Europe and Central Asia, Middle Eastern and North African countries, and Latin America and the Caribbean.

Table 1. Determinants of Subnational Disparities in Life Expectancy (PW_CV_LEXP).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subnational Disparities in Income per capita PPP	0.021*** [0.198] (0.004)	0.018*** [0.173] (0.004)	0.020*** [0.189] (0.004)	0.019*** [0.179] (0.004)	0.019*** [0.179] (0.004)	0.024*** [0.229] (0.004)	0.051*** [0.486] (0.006)	0.019*** [0.175] (0.004)
Subnational Disparities in Education	0.033*** [0.221] (0.007)	0.026*** [0.172] (0.007)	0.032*** [0.215] (0.007)	0.029*** [0.194] (0.007)	0.034*** [0.228] (0.006)	0.040*** [0.266] (0.007)	0.015 [0.100] (0.011)	0.027*** [0.178] (0.007)
Income per capita PPP (in logs)	-0.141 [-0.068] (0.089)	-0.114 [-0.055] (0.096)	-0.137 [-0.066] (0.087)	-0.198** [-0.096] (0.086)	3.422*** [-0.073] (1.039)	-0.105 [-0.051] (0.102)	-0.376*** [-0.182] (0.138)	0.159* [-0.077] (0.117)
Governance Quality	-0.230*** [-0.067] (0.083)	-0.226*** [-0.065] (0.086)	-0.185** [-0.054] (0.083)	-0.177** [-0.051] (0.082)	-0.243*** [-0.070] (0.083)	-0.296*** [-0.086] (0.094)	-0.085 [0.024] (0.139)	-0.228*** [-0.066] (0.088)
Public Health Expenditure	-0.030* [-0.024] (0.017)	-0.019 [-0.016] (-0.002)	-0.018 [-0.014] (0.016)	-0.016 [-0.013] (0.016)	-0.027* [-0.022] (0.017)	-0.037* [-0.030] (0.020)	-0.058** [-0.047] (0.026)	-0.025 [-0.020] (0.022)
Private Health Expenditure	-0.007 [-0.005] (0.026)	-0.003 [0.002] (0.028)	-0.011 [-0.008] (0.026)	-0.009 [-0.007] (0.026)	-0.009 [-0.007] (0.027)	-0.002 [0.002] (0.031)	-0.024 [-0.018] (0.042)	-0.010 [-0.008] (0.028)
Ethnic fractionalization		1.169*** [0.154] (0.290)						
Population (in logs)			0.140*** [0.133] (0.033)					
Surface (in logs)				0.188*** [0.200] (0.027)				
Income per cap PPP (squared)					-0.212*** [-0.087] (0.060)			
Federalism						0.168*** [0.115] (0.054)		
Tax decentralization							2.132*** [0.238] (0.455)	
Geographic diversity								0.202*** [0.169] (0.049)
Asia and Pacific	-0.607*** (0.168)	-0.367* (0.205)	-0.740*** (0.176)	-0.574*** (0.165)	-0.689*** (0.173)	-0.568*** (0.173)	-0.265 (0.277)	-0.855*** (0.196)
Eastern Europe and Central Asia	-0.665*** (0.204)	-0.705*** (0.231)	-0.640*** (0.202)	-0.715*** (0.198)	-0.703*** (0.207)	-0.376* (0.228)	-0.352 (0.362)	-0.952*** (0.206)
Latin America and the Caribbean	-1.263*** (0.178)	-1.257*** (0.210)	-1.315*** (0.177)	-1.318*** (0.172)	-1.294*** (0.181)	-1.275*** (0.181)	-0.993*** (0.275)	-1.581*** (0.179)
North Africa and the Middle East	-0.999*** (0.235)	-1.000*** (0.282)	-1.206*** (0.235)	-1.202*** (0.228)	-1.047*** (0.238)	-0.636** (0.264)	0.045 (0.334)	-1.744*** (0.291)
Constant	3.889*** (0.758)	3.232*** (0.809)	1.703* (0.889)	2.215*** (0.751)	-10.836*** (4.400)	2.895*** (0.875)	5.123*** (1.248)	4.417*** (0.855)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.529	0.540	0.533	0.541	0.532	0.535	0.691	0.539
Wald Chi2	432.92	455.11	463.37	559.71	454.89	395.88	373.08	472.98
Countries	101	95	101	101	101	86	41	95
Observations	1626	1525	1626	1626	1626	1402	459	1532

Notes: All regressions report PCSE (in parentheses) and standardized betas [in brackets] and include period fixed effects. Annual data. Level of significance: 10% (*), 5% (**), and 1% (***).

These findings are maintained in the remaining columns of Table 1, where we aim to uncover additional covariates of subnational life expectancy disparities. In Column 2, we account for ethnic fractionalization since it could be that subnational health disparities are greater in more ethnically heterogeneous countries, partly because agreement over public policy in general, and health policy in particular, may be more difficult (Alesina et al., 1999). Columns 3 and 4 include population and country size based on the expectation that larger countries may have larger subnational disparities on many dimensions, including life expectancy.

In Column 5, we include a quadratic income per capita term to allow for the possibility that, like subnational income disparities (Williamson, 1965; Lessmann, 2014), life expectancy disparities may initially increase, and then fall with economic development. Because we also account for income disparities in the regressions, this could be due to unobserved factors related to development and that, moreover, are quadratically linked to subnational disparities in life expectancy. In Columns 6 and 7 we consider if the degree of political or fiscal decentralization affects disparities in life expectancy on the strength of the argument that in more decentralized systems the central government may have fewer resources at its disposable to reduce spatial disparities (Rodríguez-Pose and Ezcurra, 2010), including disparities in life expectancy.

Finally, in column 8 we consider the possibility that subnational disparities in life expectancy could be due to different geographic endowments across subnational units (such as elevation, precipitation, temperature, distance to coast and land quality). These different endowments could impact on disparities in life expectancy through their effect on the incidence of the local disease environment.

The results in Table 1 confirm the positive association between ethnic heterogeneity, country size, decentralization and geographic diversity on the one hand, and life expectancy disparities on the other. It also indicates an inverted quadratic relationship between life expectancy disparities and GDP per capita. In terms of the economic impact of each variable, the results reveal the importance, from largest to smallest driver, of fiscal decentralization, country area, geographic diversity, ethnic fractionalization, population size and political decentralization. However, the estimated effect of fiscal decentralization should be qualified because it emerges from a reduced sample of 41 countries. In general, the beta coefficients confirm the relative importance of income and education disparities as primary determinants of life expectancy disparities.

Table 2. Determinants of Subnational Disparities in Life Expectancy (PW_CV_LEXP). Robustness.

	Annual					5 year means		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Number of lags=>	1 lag	2 lags	3 lags	4 lags	5 lags	0 lags	1 lag	1st period
Subnational Disparities in Income per cap. PPP (lagged)	0.026*** [0.248] (0.003)	0 .022*** [0.206] (0.003)	0.024*** [0.226] (0.003)	0.022*** [0.205] (0.003)	0.013*** [0.119] (0.004)	0.037*** [0.347] (0.005)	0.029*** [0.272] (0.005)	0.034*** [0.320] (0.005)
Subnational Disparities in Education (lagged)	0.023*** [0.154] (0.006)	0.027*** [0.181] (0.006)	0.028*** [0.190] (0.006)	0 .032*** [0.217] (0.007)	0.045*** [0.302] (0.007)	0.029*** [0.185] (0.011)	0.043*** [0.280] (0.010)	0.029*** [0.197] (0.011)
Income per capita PPP (in logs)	-0.177* [-0.086] (0.093)	-0.181* [-0.087] (0.097)	-0.179* [-0.087] (0.108)	-0.129 [-0.063] (0.103)	-0.079 [-0.038] (0.107)	-0.128 [-0.061] (0.159)	-0.013 [-0.007] (0.152)	-0.122 [-0.059] (0.160)
Governance Quality	-0.254*** [-0.073] (0.086)	-0.273*** [-0.079] (0.092)	-0.317*** [-0.092] (0.101)	-0.340*** [-0.098] (0.103)	-0.355*** [-0.103] (0.112)	-0.276* [-0.081] (0.168)	-0.580*** [-0.169] (0.187)	-0.312*** [-0.091] (0.180)
Public Health Expenditure	-0.027 [-0.021] (0.017)	-0.036* [-0.029] (0.019)	-0.038* [-0.031] (0.019)	-0.041** [-0.033] (0.020)	-0.039* [-0.031] (0.020)	-0.093** [-0.076] (0.044)	-0.054 [-0.044] 0.050	-0.094** [-0.077] 0.045
Private Health Expenditure	-0.013 [-0.010] [0.058]	-0.027 [-0.020] (0.030)	-0.025 [-0.019] (0.033)	-0.031 [-0.024] (0.034)	-0.041 [-0.031] (0.035)	-0.036 [-0.027] (0.046)	-0.099** [-0.074] (0.050)	-0.064 [-0.048] (0.046)
Asia and Pacific	-0.676*** (0.171)	-0.655*** (0.175)	-0.645*** (0.186509)	-0.723*** (0.191)	-0.721*** (0.203)	-0.578** (0.235)	-0.684*** (0.266)	-0.668*** (0.245)
Eastern Europe and Central Asia	-0.748*** (0.203)	-0.731*** (0.205)	-0.702*** (0.217)	-0.763*** (0.225)	-0.734*** (0.237)	-0.538* (0.315)	-0.575* (0.342)	-0.585* (0.321)
Latin America and the Caribbean	-1.277*** (0.178)	-1.260*** (0.180)	-1.217*** (0.190)	-1.276*** (0.197)	-1.253*** (0.202)	-1.051*** (0.270)	-1.051*** (0.294)	-1.007*** (0.273)
North Africa and the Middle East	-0.981*** (0.221)	-1.026*** (0.230)	-0.965*** (0.241)	-1.100*** (0.249)	-1.227*** (0.264)	-0.691** (0.329)	-0.983*** (0.358)	-0.755*** (0.335)
Constant	3.823*** (0.824)	3.970*** (0.855)	3.838*** (0.951)	3.471*** (0.907)	3.160*** (0.938)	3.327** (1.352)	2.143* (1.330)	3.327** (1.386)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.529	0.550	0.564	0.558	0.566	0.611	0.637	0.602
Wald Chi2	432.919	457.06	465.79	429.23	380.45	349.76	350.59	325.43
Countries	101	101	101	100	99	101	99	101
Observations	1525	1424	1323	1222	1122	392	291	354

Notes: All regressions report PCSE (in parentheses) and standardized betas [in brackets] and include period fixed effects. Level of significance: 10% (*), 5% (**), and 1% (***).

In Table 2, we pursue the robustness of the estimates of Equation 3 reported above. In particular, we allow for the real possibility that subnational disparities in life expectancy can, in turn, determine disparities in both income and educational attainment. This is especially relevant given the relative importance of these variables when explaining life expectancy disparities. Ideally, to deal with such reverse causality, we would adopt an identification

strategy based on instrumental variables, difference-in-difference, regression discontinuity or similar methods. In the absence of valid instruments or quasi experimental designs, we re-estimate Equation 3 taking lagged values of the subnational income and education disparity variables. We use one to five-year lags in the first five columns of the table that employ annual data. In Columns 6 to 8, we turn instead to five year means of all the time variant variables. In Column 6, we estimated Equation 3 but now using five-year averages. This can help attenuate measurement error derived from the interpolation and extrapolation techniques employed to generate the annual data. This approach also helps focus on the long-term or structural relationships between the dependent and independent variables. To address reverse causality, we employ the lagged value of the five-year average of subnational income and education disparities (Column 7) and also the first-year value of each five-year period (Column 8). Through all this, the substantive empirical results reported in Column 1 of Table 1 are maintained.

Table 3. Determinants of Subnational Disparities in Life Expectancy (PW_CV_LEXP). Gender differences.

Subnational Disparities in Life Expectancy (total and by gender)					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	Total	**Men**	**Women**	**Total**	**Total**
Subnational Disparities in Income per cap. PPP (total)	0.021*** [0.198] (0.004)			0.021*** [0.197] (0.004)	0.021*** [0.202] (0.004)
Subnational Disparities in Education (total)	0.042*** [0.282] (0.007)				
Subnational Disparities in Income per cap. PPP (men)		0 .022*** [0.175] (0.004)			
Subnational Disparities in Education (men)		0.063*** [0.300] (0.008)		0 .038*** [0.218] (0.007)	
Subnational Disparities in Income per cap. PPP (Women)			0.028*** [0.190] (0.004)		
Subnational Disparities in Education (Women)			0.070*** [0.383] (0.007)		0.040*** [0.298] (0.006)
Additional controls	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes
Continent effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.560	0.539	0.590	0.557	0.560
Wald Chi2	468.58	613.12	615.63	461.14	471.89
Countries	98	98	98	98	98
Observations	1502	1502	1502	1502	1502

Finally, in Table 3 we re-estimate Equation 3 exploiting data on gender differences in available variables which basically refers to those measuring subnational disparities in life expectancy, income, and education. In the first column of the table, we re-estimate the (overall life expectancy, income and education disparities) model but now corresponding to the slightly reduced sample that emerges when using gender variables. In this reduced sample, subnational education disparities seem to be more important drivers of life expectancy disparities than income disparities. This result is confirmed in Columns 2 and 3 where we associate subnational disparities in life expectancy for men (Column 2) and women (Column 3) with income and education disparities for men and women respectively in the presence of the other variables included in Equation 3. Previous research suggests that female education may be especially important for reducing child mortality (e.g. Grépin and Bharadwaj, 2015; Wang, 2021) and, by extension, improving life expectancy at birth. To explore this, in the last two columns of Table 3 we consider the possible variation of overall subnational life expectancy disparities due to subnational education disparities for men and women respectively. In line with the relative importance of female education, the standardized beta coefficients suggest that education disparities for women are relatively more important determinants of overall subnational life expectancy disparities than education disparities in men.

In Tables OA.3 to OA.5 in the online appendix we reproduce all these estimates using the population-weighted standard deviation of the logarithm of subnational life expectancy (PW-LOG-LEXP) indicator to calculate overall and gendered life expectancy, income and education disparities. We confirm the importance of income and education disparities as key determinants of life expectancy disparities. The relative importance of education disparities as drivers of life expectancy disparities emerges more strongly. By way of comparison, the estimation of Equation 3 displayed in column 1 of Table OA.3 in the online appendix, indicates that a one standard deviation increase in income and education disparities leads to an increase in life expectancy disparities by, respectively, 12.5% and 31.3% of one standard deviation. In all three tables and almost all regressions, education disparities have a stronger impact on life expectancy disparities than income disparities do. And Columns 4 and 5 of Table OA.5 confirm the especially important role of female education disparities when explaining overall subnational disparities in life expectancy.

4. Conclusion

The United Nations' Sustainable Development Goals (SDGs) seek to ensure healthy lives, promote wellbeing (Goal 3) and reduce inequalities (Goal 10), especially in low- and middle-income countries. In line with these objectives, in this paper, we construct new indicators of subnational inequalities on life expectancy in up to 101 LMICs from 2000 up to 2021. Measuring such disparities is a necessary step towards ensuring that all people, regardless of where they live within a country, have the opportunity to live longer, healthier lives. Based on this data, we show that subnational disparities in life expectancy are substantially higher

in Sub-Saharan Africa compared to the other LMIC regions during the whole period. Moreover, we find that subnational disparities in life expectancy have generally been decreasing in all LMIC world regions except Sub-Saharan Africa where they have remained high. This evolution has occurred at the same time as average life expectancy has increased across LMICs, including Sub-Saharan Africa. A more precise picture emerges when we look at each country separately. In the 101 countries considered over the period, subnational disparities in life expectancy fell in 61 (including Sub-Saharan African countries), increased in 30, and remained unchanged in 10. We also track the evolution of subnational disparities in life expectancy across LMIC regions and countries by gender. We find that while on average women live longer than men in all the countries considered, subnational disparities in life expectancy within countries are larger for women than for men and Sub-Saharan Africa has both the greatest subnational disparity in female life expectancy and the largest gap in life expectancy disparities between men and women.

After tracking subnational disparities in life expectancy across LMIC regions and countries, we then employ regression analysis in an attempt to identify the important drivers of these disparities. We identify a host of variables that can reduce disparities (good governance, public health spending) or potentially increase them (fiscal and political decentralization, larger country size, geographic diversity and ethnic fractionalization). Most importantly, we identify subnational disparities in income and, especially education, as the most crucial drivers of life expectancy disparities. Finally, while both male and female education disparities emerge as relevant, female education disparities tend to play a larger role when explaining overall subnational disparities in life expectancy. From this, the key policy implication that emerges is that disparities in life expectancy can be reduced through policies that reduce subnational education disparities, particularly among women.

Acknowledgements

References

Aksan, A., Chakraborty, S. (2023). Life expectancy across countries: Convergence, divergence and fluctuations. *World Development* 168, 106263.

Alesina, A., Baqir, R., Easterly, W. (1999). Public Goods and Ethnic Divisions. *Quarterly Journal of Economics* 114, 1243–1284.

Alesina, A., Devleeschauwer, A., Easterly, W., Kurlat, S. and Wacziarg, R. (2003). Fractionalization. *Journal of Economic Growth* 8, 155–194.

Alesina, A., Michalopoulos, S., Papaioannou., E. (2016). Ethnic Inequality. *Journal of Political Economy* 124(2), 428-488.

Anyanwu, J., Erhijakpor, A. (2009). Health expenditures and health outcomes in Africa. *African Development Review* 21 (2), 400–433.

Balaj, M., et al. (2024). Effects of education on adult mortality: a global systematic review and meta-analysis. *The Lancet Public Health* 9(3), e155 - e165

Bennett, J., Li G., Foreman K., et al. (2015). The future of life expectancy and life expectancy inequalities in England and Wales: Bayesian spatiotemporal forecasting. *Lancet* 386, 163–70.

Brown, D., Lariscy, J., Walker, B. (2023). State-level trends in lifespan variability in the United States, 1960–2019: A Research Note. *Demography* 60 (1), 1–14.

Ellis, A., Fry, R. (2010). Regional health inequalities in England. *Regional Trends* 42, 60–79.

Ezcurra, R., Pascual, P. (2008). Fiscal decentralization and regional disparities: evidence from several European Union countries. *Environment and Planning,* 40, 1185-1201.

Gerring, J., Thacker, S. (2004). Political institutions and corruption: The role of unitarism and parliamentarism. *British Journal of Political Science* 34, 295–330.

Grépin, A., and P. Bharadwaj, P. (2015). Maternal education and child mortality in Zimbabwe*. Journal of Health Economics* 44: 97–117.

Janssen, F., van den Hende, A., de Beer, J., & van Wissen, L. (2016). Sigma and beta convergence in regional mortality: A case Study of the Netherlands. *Demographic Research* 35(4), 81–116.

Jetter M., Laudage S., Stadelmann D. (2019). The intimate link between income levels and life expectancy: global evidence from 213 years. *Social Science Quarterly*. 100, 1387–403.

Kaufmann, D., Kraay, A., Mastruzzi, M. (2011). The Worldwide Governance Indicators: Methodology and Analytical Issues. *Hague Journal on the Rule of Law* 3, 220–246.

Kyriacou, A., Muinelo-Gallo, L., Roca-Sagalés, O. (2017). Regional inequalities, fiscal decentralization and government quality. *Regional Studies* 51, 945–957.

Lessmann, C. (2014). Spatial inequality and development—is there an inverted-U relationship? *Journal of Development Economics* 106, 35-51

Munford, L., Bambra, C., Davies, H., Pickett, K., Taylor-Robinson, D. (2023)*, Health Equity North: 2023*, Health Equity North, Newcastle.

Novignon, J., Olakojo, S., Nonvignon, J. (2012). The effects of public and private health care expenditure on health status in sub-Saharan Africa: New evidence from panel data analysis. *Health Economics Review* 2 (1), 22.

Permanyer, I., Smits, J. (2020). Inequality in human development across the globe. *Population and Development Review* 46(3), 583-601.

Pritchett, L., Summers, L. (1996). Wealthier is healthier. *Journal of Human Resources* 31 (4), 841–868.

Rodríguez-Pose, A., Ezcurra, R. (2010). Does decentralization matter for regional disparities? A cross-country analysis. J*ournal of Economic Geography* 10, 619–644

Smits. J., Permanyer, I. (2019). The subnational human development database. *(Nature) Scientific Data* 6, 190038.

Timonin, S., Danilova, I., Andreev, E., Shkolnikov, V. (2017). Recent mortality trend reversal in Russia: are regions following the same tempo? *European Journal of Population* 33, 733–63.

Trapeznikova, I. (2019). Measuring income inequality. IZA World of Labor, Institute of Labor Economics (IZA), 462.

UNDP. (2017). Human Development Report 2016: Human Development for Everyone (Vol. 2016). United Nations.

Van Rompuy, P. (2020). Does subnational tax autonomy promote regional convergence? Evidence from OECD countries, 1995–2011. *Regional Studies* 55(2), 234–244.

V-Dem Institute. (2023). *V-Dem Codebook V13*. Varieties of Democracy (V-Dem) Project.

Wang, T. (2021). The effect of female education on child mortality: evidence from Indonesia, *Applied Economics* 53(27), 3207-3222.

WHO. (2024). *World health statistics 2024: monitoring health for the SDGs, Sustainable Development Goals*. Geneva: World Health Organization.

Wilkie, R., Ho, J. (2024). Life expectancy and geographic variation in mortality: an observational comparison study of six high-income Anglophone countries. *BMJ Open* 14, e079365

Williamson, J. (1965). Regional inequality and the process of national development: A description of the patterns. *Economic Development and Cultural Change*, 13, 1–84.

Wilson, B., Drefahl, S., Sasson, I., Henery, P., Uggla, C. (2020). Regional trajectories in life expectancy and lifespan variation: Persistent inequality in two Nordic welfare states. *Population Space Place*. 26, e2378.

Appendix

Table A.1 – Definition of variables and sources

Variable	Definition	Sources
Life Expectancy	Life expectancy at birth.	Global Data Lab (GDL)
Subnational Disparities in Life Expectancy	Population weighted index of variation of life expectancy through subnational units of the country.	Own calculation using data from Subnational Human Development Indicators (SHDI) and GDL-Area Database
Subnational Disparities in Income per capita PPP	Population weighted index of variation of income per capita PPP through subnational units of the country.	Own calculation using data from SHDI and GDL-Area Database
Subnational Disparities in Education	Population weighted index of variation of education level through subnational units of the country. Education level is a combination of the average of the number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout the child's life, and the average number of years of education received by people ages 25 and older, converted from educational attainment using official durations of each level.	Own calculation using data SHDI and GDL-Area Database
Income per capita PPP	Gross National Income (GNI) per capita adjusted for the price level of the country (2017 PPP USD) in logs.	GDL
Governance Quality	Average of the following dimensions: government effectiveness, rule of law, regulatory quality, control of corruption, voice and accountability and political stability and absence of violence/terrorism. With higher values indicating more quality of governance.	World Governance Indicators (WGI) (Kaufmann et al. 2011)
Public Health Expenditure	Domestic General Government Health Expenditure as % of GDP.	Global Health Expenditure Database (GHED)
Private Health Expenditure	Domestic Private Health Expenditure as % of GDP.	GHED
Ethnic Fractionalization	The probability that two randomly selected individuals belong to different ethnical groups, and so increases with the number of groups. Complete ethnic homogeneity (an index of 0) to complete heterogeneity (an index of 1).	Alesina et al. (2003)
Population	Population, total (in logs).	GDL-Area Database.
Surface	Country's total area (sq. Km), including areas under inland bodies of water and some coastal waterways (in logs).	World Development Indicators (WDI)
Federalism	Federalism involves 5 categories: 1, non-federal; 2, semi-federal (elective regional legislatures/ constitutional sovereignty at national level); 3, federal (elective regional legislatures and constitutional recognition of subnational authority); add 1 if weak bicameral; add 2 if strong bicameral. Total range = 1–5, with higher values indicating more federal. Data from 1997.	Gerring and Thaker (2004)
Tax Decentralization	Tax revenue decentralization (subnational taxes / general government taxes).	Fiscal Decentralization database from IMF
Geographic diversity	Inequality in geography across administrative units: 1st principal component of inequality (Gini coefficients) in geographic endowments namely, elevation, precipitation, temperature, distance to coast, and land quality.	Alesina et al. (2016)

Table A.2 – Life expectancy and subnational disparities in life expectancy (PW_CV_LEXP) by country.

List of countries ordered by region (first-last available year)	Life expectancy (country average)		Subnational disparities in life expectancy	
	First period	Last period	First period	Last period
Asia and Pacific (20)				
Afghanistan (2007-2018)	59.11	63.08	4.38	2.25
Bangladesh (2000-2021)	65.78	72.38	3.53	1.65
Bhutan (2007-2013)	66.95	69.71	*5.52*	*5.52*
Cambodia (2000-2017)	58.63	70.52	5.64	3.59
China (2010-2018)	75.60	77.74	3.09	2.80
Fiji (2004-2010)	66.42	67.33	1.57	1.14
India (2012-2021)	67.89	67.24	4.32	4.17
Indonesia (2000-2020)	66.43	68.81	3.01	1.97
Kiribati (2015-2021)	66.06	67.42	*2.20*	*2.20*
Lao (2009-2020)	63.27	68.50	8.03	4.95
Maldives (2006-2020)	75.13	79.88	1.40	0.64
Myanmar (2000-2019)	60.16	66.61	**3.47**	**3.52**
Nepal (2016-2021)	68.78	68.45	**1.81**	**1.87**
Pakistan (2016-2021)	65.88	66.1 0	2.30	2.15
Papua New Guinea (2014-2020)	64.26	65.79	*4.12*	*4.12*
Philippines (2000-2020)	69.41	72.12	**2.36**	**2.63**
Samoa (2016-2021)	72.54	72.77	*0.82*	*0.82*
Thailand (2003-2021)	73.16	78.72	0.59	0.43
Timor Leste (2006-2019)	63.07	68.27	4.14	2.59
Vietnam (2000-2017)	72.46	73.96	2.75	1.61
Latin America and the Caribbean (18)				
Belize (2003-2014)	68.91	73.31	**0.99**	**2.44**
Bolivia (2000-2011)	62.35	66.53	**4.02**	**4.64**
Brazil (2000-2013)	69.74	73.92	3.98	1.55
Chile (2000-2005)	76.87	78.02	*0.82*	*0.82*
Colombia (2002-2018)	71.94	76.75	**0.77**	**1.77**
Dominican Rep. (2000-2021)	69.42	72.62	**1.90**	**2.02**
El Salvador (2004-2017)	70.34	72.31	0.82	0.74
Guatemala (2000-2018)	67.45	72.73	2.04	1.59
Guyana (2003-2021)	64.60	65.67	3.27	2.09
Haiti (2000-2020)	58.37	64.05	**2.84**	**3.46**
Honduras (2002-2021)	69.37	70.12	1.92	1.10
Jamaica (2002-2014)	70.89	72.98	**2.00**	**2.08**
Mexico (2000-2018)	73.57	74.02	2.69	1.15
Nicaragua (2000-2015)	67.23	72.98	**1.94**	**1.96**
Paraguay (2000-2015)	69.75	73.19	1.23	1.21
Peru (2000-2015)	70.42	75.62	4.44	1.57
Suriname (2004-2021)	66.42	70.27	2.75	1.56
Venezuela (2000-2004)	72.48	72.51	*1.07*	*1.07*
Eastern Europe and Central Asia (10)				

Azerbaijan (2003-2009)	66.76	69.36	*3.91*	*3.91*
Georgia (2002-2021)	70.02	71.69	3.19	2.19
Kazakhstan (2000-2018)	64.18	71.47	4.07	2.39
Kyrgyzstan (2003-2021)	66.19	69.98	5.71	1.24
Moldova (2002-2015)	66.94	69.24	1.58	0.74
Mongolia (2002-2021)	63.52	70.98	4.22	2.09
North Macedonia (2002-2021)	73.15	73.84	**1.06**	**1.70**
Tajikistan (2000-2020)	63.26	67.99	2.63	1.90
Turkmenistan (2010-2021)	68.29	69.26	**1.38**	**2.31**
Uzbekistan (2000-2009)	65.72	68.87	**2.78**	**3.24**
Sub-Saharan Africa (43)				
Angola (2008-2019)	54.63	62.45	**6.58**	**6.92**
Benin (2000-2021)	56.58	59.82	3.17	2.20
Botswana (2000-2016)	51.01	65.46	3.95	1.10
Burkina Faso (2000-2013)	50.85	57.82	**3.26**	**6.25**
Burundi (2002-2020)	49.89	61.57	**2.58**	**4.09**
Cameroon (2000-2021)	52.93	60.33	6.76	5.71
Central African Rep. (2000-2021)	45.41	53.90	5.08	4.03
Chad (2000-2021)	47.44	52.53	**2.51**	**7.14**
Comoros (2000-2015)	58.76	62.90	1.76	1.68
Congo Brazzaville (2002-2018)	55.09	64.05	**4.94**	**5.21**
Congo Democrat. Rep. (2004-2021)	53.43	59.19	**4.40**	**4.88**
Cote d'Ivoire (2000-2019)	50.84	59.32	3.78	1.23
Djibouti (2003-2009)	57.60	59.67	*4.20*	*4.20*
Equatorial Guinea (2000-2003)	53.23	54.58	*2.92*	*2.92*
Eswatini (2000-2017)	47.26	57.90	**1.39**	**4.72**
Ethiopia (2000-2019)	50.54	65.84	**2.49**	**2.74**
Gabon (2000-2015)	61.07	65.46	4.73	2.70
Gambia (2000-2021)	56.94	62.08	7.32	1.30
Ghana (2000-2020)	58.20	64.11	4.85	3.03
Guinea (2002-2021)	53.28	58.89	6.16	5.87
Guinea Bissau (2005-2021)	52.25	59.65	**4.91**	**7.06**
Kenya (2000-2017)	54.41	62.48	9.40	3.20
Lesotho (2001-2021)	46.85	53.06	4.50	4.14
Liberia (2010-2016)	59.43	60.42	*3.63*	*3.63*
Madagascar (2006-2021)	61.32	64.49	6.17	4.72
Malawi (2000-2019)	44.52	64.12	**1.92**	**2.04**
Mali (2000-2021)	50.54	58.94	**4.30**	**5.81**
Mauritania (2000-2019)	61.03	65.31	5.17	1.96
Mozambique (2000-2014)	49.49	57.27	5.97	5.61
Namibia (2000-2015)	51.99	61.68	**4.20**	**4.58**
Niger (2000-2016)	49.32	61.08	**1.32**	**3.49**
Nigeria (2003-2021)	48.44	52.68	**9.28**	**9.38**
Rwanda (2000-2018)	47.13	66.25	2.47	2.25
Sao Tome & Principe (2000-2021)	61.66	67.59	**0.81**	**1.76**
Senegal (2000-2021)	56.94	67.09	6.70	3.48
Sierra Leone (2005-2021)	48.24	60.06	5.13	5.04
South Africa (2000-2019)	58.47	66.18	4.74	2.86

Sudan (2000-2017)	58.32	65.45	5.42	3.81
Tanzania (2000-2018)	52.36	66.54	6.51	3.73
Togo (2000-2020)	54.74	61.04	4.05	2.06
Uganda (2003-2019)	50.37	62.99	4.25	1.95
Zambia (2000-2021)	45.23	61.22	**4.25**	**4.47**
Zimbabwe (2000-2021)	44.69	59.25	4.86	3.73
North Africa and the Middle East (10)				
Algeria (2000-2021)	70.48	76.38	**1.58**	**1.75**
Egypt (2000-2017)	68.01	71.30	4.48	2.35
Iran (2003-2014)	69.82	74.78	4.31	1.05
Iraq (2003-2021)	65.64	70.38	2.75	1.46
Jordan (2000-2020)	71.92	75.18	1.61	0.64
Morocco (2000-2017)	66.79	73.66	1.74	1.43
Syria (2003-2009)	72.41	73.85	1.34	1.17
Tunisia (2009-2021)	75.27	73.77	2.06	2.01
Turkey (2000-2016)	71.86	76.66	3.16	0.65
Yemen (2000-2016)	62.59	66.06	4.79	2.35

Note: In bold countries where subnational disparities on life expectancy have been reduced, in italics countries where it remains constant. Country classification in five regions based on geographical regions from V-Dem Institute (2023) variable e_regionpol_6C.

Table A.3 – Descriptive statistics.

Variable		Mean	Std. dev.	Min	Max	Observations
Life Expectancy	overall	64.141	7.942	42.130	80.120	*N = 1626*
	between		7.422	47.784	78.460	*n = 101*
	within		2.605	49.333	74.258	*T-bar = 16.099*
Life Expectancy Women	overall	66.724	8.546	43.360	83.700	*N = 1502*
	between		7.899	49.871	80.848	*n = 98*
	within		2.727	48.860	78.393	*T-bar = 15.3265*
Life Expectancy Men	overall	62.225	7.438	40.690	79.320	*N = 1502*
	between		6.877	45.632	77.583	*n = 98*
	within		2.387	48.796	70.989	*T-bar = 15.3265*
Subnational Disparities in Life Expectancy	overall	3.156	1.756	0.196	9.401	*N = 1626*
	between		1.586	0.441	8.377	*n = 101*
	within		0.764	0.057	6.474	*T-bar = 16.099*
Subnational Disparities in Life Expectancy Women	overall	3.885	2.357	0.257	12.264	*N = 1502*
	between		2.183	0.503	11.306	*n = 98*
	within		0.986	0.003	8.859	*T-bar = 15.3265*
Subnational Disparities in Life Expectancy Men	overall	3.427	2.141	0.272	14.255	*N = 1502*
	between		1.947	0.436	10.017	*n = 98*
	within		0.986	0.139	11.795	*T-bar = 15.3265*
Subnational Disparities in Income per capita PPP	overall	32.785	16.585	1.309	83.179	*N = 1626*
	between		16.319	4.608	82.751	*n = 101*
	within		5.163	7.465	52.547	*T-bar = 16.099*
Subnational Disparities in Income per capita PPP. Women	overall	31.236	16.039	1.289	81.540	*N = 1502*
	between		15.916	3.948	80.710	*n = 98*
	within		4.815	7.696	50.756	*T-bar = 15.3265*
Subnational Disparities in Income per capita PPP. Men	overall	33.690	17.033	1.332	85.106	*N = 1502*
	between		16.729	4.876	84.461	*n = 98*
	within		5.317	7.290	53.731	*T-bar = 15.3265*
Subnational Disparities in Education	overall	15.793	11.771	2.243	77.637	*N = 1626*
	between		10.947	2.523	56.992	*n = 101*
	within		2.924	1.987	36.936	*T-bar = 16.099*
Subnational Disparities in Education Women	overall	17.641	13.407	2.195	82.654	*N = 1502*
	between		12.553	2.859	62.171	*n = 98*
	within		3.328	5.209	44.763	*T-bar = 15.3265*
Subnational Disparities in Education Men	overall	14.391	10.543	2.024	69.592	*N = 1502*
	between		9.798	2.437	53.483	*n = 98*
	within		2.652	3.610	32.617	*T-bar = 15.3265*
Income per capita PPP (in logs)	overall	8.414	0.849	6.415	10.170	*N = 1626*
	between		0.824	6.698	9.882	*n = 101*
	within		0.172	7.522	9.213	*T-bar = 16.099*
	overall	-0.599	0.508	-1.899	1.218	*N = 1626*

Governance Quality	between		0.516	-1.628	1.154	*n = 101*
	within		0.144	-1.529	0.010	*T-bar = 16.099*
Public Health Expenditure (GDP ratio)	overall	2.015	1.412	0.141	11.820	*N = 1626*
	between		1.447	0.217	10.061	*n = 101*
	within		0.509	-1.206	5.641	*T-bar = 16.099*
Private Health Expenditure (GDP ratio)	overall	2.525	1.331	0.195	10.852	*N = 1626*
	between		1.289	0.220	7.678	*n = 101*
	within		0.559	0.270	5.699	*T-bar = 16.099*
Ethnic Fractionalization	overall	0.565	0.231	0.039	0.930	*N = 1525*
	between		0.231	0.039	0.930	*n = 95*
	within					*T-bar = 16.0526*
Population (in logs)	overall	16.254	1.669	11.667	21.065	*N = 1626*
	between		1.801	11.715	21.039	*n = 101*
	within		0.118	15.877	16.665	*T-bar = 16.099*
Surface (in logs)	overall	12.328	1.865	5.704	16.073	*N = 1626*
	between		1.865	5.704	16.073	*n = 101*
	within					*T-bar = 16.099*
Federalism	overall	1.611	1.203	1.000	5.000	*N = 1402*
	between		1.203	1.000	5.000	*n = 86*
	within					*T-bar = 16.3023*
Tax Decentralization	overall	0.180	0.196	0.000	0.997	*N = 459*
	between		0.196	0.004	0.989	*n = 41*
	within		0.028	0.051	0.399	*T-bar = 11.1951*
Geographic diversity	overall	0.109	1.471	-1.968	4.527	*N = 1532*
	between		1.471	-1.968	4.527	*n = 95*
	within					*T-bar = 16.1263*

Online Appendix

Table OA.1 – Female life expectancy and subnational disparities (PW_CV_LEXP) by country.

List of countries ordered by region (first-last available year)	Life expectancy (country average)		Subnational disparities in life expectancy (population weighted)	
	First period	Last period	First period	Last period
Asia and Pacific (19)				
Afghanistan (2007-2018)	60.91	66.46	5.55	2.71
Bangladesh (2000-2021)	66.11	74.27	4.59	1.96
Bhutan (2007-2013)	68.68	71.45	6.65	6.65
Cambodia (2000-2017)	60.53	72.69	7.11	4.19
China (2010-2018)	78.33	80.64	2.96	2.75
Fiji (2004-2010)	68.48	69.27	1.79	1.35
India (2013-2021)	*70.08*	*68.89*	*5.09*	*4.98*
Indonesia (2000-2020)	67.98	70.98	3.57	2.29
Lao (2009-2020)	65.44	70.59	10.18	5.81
Maldives (2006-2020)	76.65	81.27	1.62	0.75
Myanmar (2017-2019)	*69.00*	*69.80*	*4.21*	*4.22*
Nepal (2016-2021)	70.52	70.36	2.12	2.20
Pakistan (2016-2021)	68.17	68.62	3.29	2.70
Papua New Guinea (2014-2020)	67.06	68.80	4.87	4.87
Philippines (2000-2020)	71.24	74.00	2.76	3.02
Samoa (2020-2021)	*75.46*	*75.50*	*0.95*	*0.94*
Thailand (2003-2021)	77.11	83.04	0.66	0.52
Timor Leste (2006-2019)	64.73	69.95	4.97	3.02
Vietnam (2000-2017)	77.11	78.72	3.14	1.83
Latin America and the Caribbean (18)				
Belize (2003-2014)	71.61	76.34	1.33	2.79
Bolivia (2005-2011)	*66.68*	*69.09*	*4.99*	*5.68*
Brazil (2000-2013)	73.43	77.12	4.64	1.77
Chile (2000-2005)	79.98	81.08	0.94	0.94
Colombia (2002-2018)	75.98	79.66	0.90	2.05
Dominican Rep. (2010-2021)	*75.66*	*76.29*	*1.72*	*2.33*
El Salvador (2004-2017)	74.97	77.49	0.94	0.84
Guatemala (2000-2018)	71.11	75.57	2.39	1.84
Guyana (2003-2021)	68.00	69.10	3.80	2.42
Haiti (2000-2020)	60.12	67.12	3.83	4.20
Honduras (2002-2021)	71.44	72.53	2.21	1.26
Jamaica (2002-2014)	73.17	74.21	2.28	2.37
Mexico (2000-2018)	76.51	77.29	3.11	1.30
Nicaragua (2000-2015)	70.19	75.93	2.24	2.24
Paraguay (2000-2015)	72.69	76.00	1.43	1.43
Peru (2000-2015)	72.93	77.74	5.26	1.81
Suriname (2005-2021)	*70.43*	*73.55*	*3.17*	*1.79*
Venezuela (2000-2004)	76.15	76.32	1.24	1.24
Eastern Europe and Central Asia (10)				
Azerbaijan (2003-2009)	70.34	72.78	4.59	4.60
Georgia (2002-2021)	74.34	76.68	3.65	2.23
Kazakhstan (2000-2018)	69.97	75.01	4.74	2.71
Kyrgyzstan (2003-2021)	70.34	74.35	6.58	1.39
Moldova (2002-2015)	70.51	73.84	1.81	0.84
Mongolia (2002-2021)	77.02	75.70	2.38	2.36

North Macedonia (2005-2021)	*76.16*	*76.11*	*1.18*	*1.46*
Tajikistan (2000-2020)	65.96	70.17	3.16	2.16
Turkmenistan (2020-2021)	*71.98*	*72.66*	*2.64*	*2.66*
Uzbekistan (2000-2009)	68.76	71.57	3.21	3.75
Sub-Saharan Africa (41)				
Angola (2014-2019)	*62.47*	*64.92*	*7.45*	*8.04*
Benin (2000-2021)	58.43	61.45	4.41	2.78
Botswana (2000-2016)	52.84	68.06	4.45	1.24
Burkina Faso (2005-2013)	*54.62*	*59.26*	*6.73*	*8.55*
Burundi (2002-2020)	51.85	63.68	3.84	5.05
Cameroon (2000-2021)	54.56	62.02	9.21	7.08
Central African Rep. (2000-2021)	46.59	56.30	6.99	5.04
Chad (2005-2021)	*49.30*	*54.28*	*7.03*	*9.25*
Comoros (2000-2015)	60.37	65.16	2.17	1.87
Congo Brazzaville (2002-2018)	55.73	65.27	6.52	6.16
Congo Democrat. Rep. (2005-2021)	*55.45*	*61.52*	*6.19*	*5.95*
Cote d'Ivoire (2000-2019)	52.35	60.59	5.83	2.69
Eswatini (2000-2017)	49.32	61.54	1.60	5.47
Ethiopia (2000-2019)	51.20	68.80	3.35	3.15
Gabon (2000-2015)	62.24	67.83	5.81	3.24
Gambia (2000-2021)	59.02	63.53	10.21	1.55
Ghana (2000-2020)	59.29	66.39	6.12	3.59
Guinea (2002-2021)	53.64	60.10	8.67	7.28
Guinea Bissau (2020-2021)	*62.27*	*61.80*	*8.33*	*8.50*
Kenya (2000-2017)	55.60	64.96	11.44	3.62
Lesotho (2001-2021)	49.02	55.93	5.30	4.77
Liberia (2010-2016)	60.64	61.55	4.59	4.59
Madagascar (2006-2021)	62.72	66.87	7.29	5.42
Malawi (2000-2019)	46.31	67.97	2.94	2.33
Mali (2000-2021)	50.69	60.33	7.28	7.25
Mauritania (2000-2019)	62.61	67.08	6.47	1.97
Mozambique (2000-2014)	51.11	59.44	8.76	6.68
Namibia (2000-2015)	53.98	65.20	4.64	5.17
Niger (2000-2016)	49.69	62.10	4.36	4.95
Nigeria (2005-2021)	*50.26*	*53.07*	*11.99*	*12.26*
Rwanda (2000-2018)	48.28	68.27	3.92	2.67
Sao Tome & Principe (2000-2021)	63.43	70.42	0.93	2.01
Senegal (2000-2021)	58.10	69.28	8.83	4.10
Sierra Leone (2005-2021)	48.85	61.35	7.59	6.62
South Africa (2000-2019)	61.05	69.11	5.22	3.20
Sudan (2005-2017)	*61.02*	*68.02*	*6.55*	*4.37*
Tanzania (2000-2018)	53.52	68.65	8.54	4.29
Togo (2000-2020)	55.81	61.58	5.25	2.51
Uganda (2003-2019)	51.91	64.99	5.74	2.36
Zambia (2010-2021)	*58.53*	*63.93*	*4.21*	*5.11*
Zimbabwe (2010-2021)	*52.24*	*62.05*	*4.80*	*4.26*
North Africa and the Middle East (10)				
Algeria (2000-2021)	71.95	77.96	1.84	2.03
Egypt (2000-2017)	70.10	73.97	5.41	2.75
Iran (2003-2014)	72.23	77.36	5.18	1.22
Iraq (2003-2021)	69.93	72.42	3.24	1.70
Jordan (2000-2020)	73.70	77.77	1.87	0.74

Morocco (2000-2017)	68.53	75.66	2.09	1.70
Syria (2003-2009)	74.98	76.67	1.39	1.37
Tunisia (2009-2021)	78.33	77.15	2.38	2.33
Turkey (2000-2016)	75.27	79.89	3.78	0.75
Yemen (2000-2015)	64.55	68.90	6.13	2.82

Note: In italics countries whit fewer year to year observations. Country classification in five regions based on geographical regions from V-Dem Institute (2023) variable e_regionpol_6C.

Table OA.2 – Male life expectancy and subnational disparities (PW_CV_LEXP) by country.

List of countries ordered by region (first-last available year)	Life expectancy (country average)		Subnational disparities in life expectancy (population weighted)	
	First period	Last period	First period	Last period
Asia and Pacific (19)				
Afghanistan (2007-2018)	57.34	59.92	4.68	2.25
Bangladesh (2000-2021)	65.47	70.60	4.00	1.62
Bhutan (2007-2013)	65.52	68.23	5.55	5.55
Cambodia (2000-2017)	56.56	68.21	6.39	3.62
China (2010-2018)	73.08	75.05	3.26	2.93
Fiji (2004-2010)	64.55	65.54	1.55	1.09
India (2013-2021)	*66.96*	*65.76*	*4.25*	*4.12*
Indonesia (2000-2020)	64.90	66.75	3.17	1.97
Lao (2009-2020)	61.23	66.52	8.96	4.98
Maldives (2006-2020)	73.99	78.85	1.35	0.62
Myanmar (2017-2019)	*62.84*	*63.57*	*3.64*	*3.64*
Nepal (2016-2021)	67.03	66.57	1.82	1.81
Pakistan (2016-2021)	63.50	63.79	2.54	2.30
Papua New Guinea (2014-2020)	62.09	63.40	4.21	4.20
Philippines (2000-2020)	67.64	70.24	2.41	2.59
Samoa (2020-2021)	*70.34*	*70.31*	*0.80*	*0.80*
Thailand (2003-2021)	69.37	74.52	0.57	0.39
Timor Leste (2006-2019)	61.59	66.72	4.32	2.60
Vietnam (2000-2017)	67.77	69.26	2.76	1.57
Latin America and the Caribbean (18)				
Belize (2003-2014)	66.52	70.67	0.85	2.39
Bolivia (2005-2011)	*62.25*	*64.16*	*4.36*	*4.93*
Brazil (2000-2013)	66.26	70.75	4.04	1.51
Chile (2000-2005)	73.71	74.91	0.82	0.82
Colombia (2002-2018)	68.08	73.84	0.76	1.76
Dominican Rep. (2010-2021)	*68.93*	*69.30*	*1.47*	*1.97*
El Salvador (2004-2017)	65.57	66.91	0.80	0.72
Guatemala (2000-2018)	63.98	69.90	2.10	1.56
Guyana (2003-2021)	61.54	62.48	3.25	2.03
Haiti (2000-2020)	56.61	61.13	3.53	3.60
Honduras (2002-2021)	67.41	67.90	1.91	1.07
Jamaica (2002-2014)	68.66	71.73	1.96	2.03
Mexico (2000-2018)	70.69	70.83	2.70	1.11
Nicaragua (2000-2015)	64.28	70.01	1.96	1.96
Paraguay (2000-2015)	67.06	70.55	1.24	1.23
Peru (2000-2015)	68.03	73.58	4.59	1.55
Suriname (2005-2021)	*63.98*	*67.21*	*2.73*	*1.52*
Venezuela (2000-2004)	69.07	68.95	1.07	1.07

Eastern Europe and Central Asia (10)				
Azerbaijan (2003-2009)	63.16	65.98	4.01	4.01
Georgia (2002-2021)	65.54	66.80	3.18	2.40
Kazakhstan (2000-2018)	58.66	67.60	4.26	2.36
Kyrgyzstan (2003-2021)	62.14	65.80	5.85	1.21
Moldova (2002-2015)	63.29	64.83	1.57	0.72
Mongolia (2002-2021)	67.50	66.54	2.06	2.05
North Macedonia (2005-2021)	*71.48*	*71.66*	*1.03*	*2.00*
Tajikistan (2000-2020)	60.70	66.00	2.83	1.87
Turkmenistan (2020-2021)	*65.39*	*65.87*	*2.30*	*2.31*
Uzbekistan (2000-2009)	62.73	66.18	2.87	3.32
Sub-Saharan Africa (41)				
Angola (2014-2019)	*57.61*	*59.98*	*6.55*	*7.05*
Benin (2000-2021)	54.68	58.22	3.99	2.36
Botswana (2000-2016)	49.14	62.77	3.96	1.09
Burkina Faso (2005-2013)	*51.48*	*56.28*	*6.29*	*7.60*
Burundi (2002-2020)	47.90	59.47	3.53	4.29
Cameroon (2000-2021)	51.32	58.69	8.34	6.00
Central African Rep. (2000-2021)	44.32	51.65	6.28	4.24
Chad (2005-2021)	*47.33*	*50.85*	*6.74*	*7.93*
Comoros (2000-2015)	57.31	60.81	2.03	1.62
Congo Brazzaville (2002-2018)	54.39	62.84	5.78	5.22
Congo Democrat. Rep. (2005-2021)	*52.39*	*56.95*	*5.49*	*5.04*
Cote d'Ivoire (2000-2019)	49.46	58.16	5.61	2.80
Eswatini (2000-2017)	45.10	54.47	1.42	4.76
Ethiopia (2000-2019)	49.89	63.05	3.12	2.69
Gabon (2000-2015)	59.90	63.36	5.07	2.76
Gambia (2000-2021)	54.95	60.66	9.34	1.30
Ghana (2000-2020)	57.10	61.90	5.39	3.01
Guinea (2002-2021)	52.88	57.60	7.74	6.10
Guinea Bissau (2020-2021)	*57.61*	*57.39*	*7.00*	*7.15*
Kenya (2000-2017)	53.16	60.09	10.37	3.11
Lesotho (2001-2021)	44.77	50.37	4.74	4.12
Liberia (2010-2016)	58.19	59.26	3.91	3.92
Madagascar (2006-2021)	59.96	62.23	6.45	4.64
Malawi (2000-2019)	42.78	60.40	2.91	1.98
Mali (2000-2021)	50.37	57.62	7.21	6.08
Mauritania (2000-2019)	59.44	63.59	5.66	3.89
Mozambique (2000-2014)	47.79	54.99	8.61	5.82
Namibia (2000-2015)	49.91	58.11	4.09	4.51
Niger (2000-2016)	48.88	60.07	6.01	4.66
Nigeria (2005-2021)	*48.36*	*52.29*	*11.08*	*10.59*
Rwanda (2000-2018)	45.90	64.01	3.74	2.24
Sao Tome & Principe (2000-2021)	59.93	65.16	0.78	1.68
Senegal (2000-2021)	55.76	64.75	7.86	3.44
Sierra Leone (2005-2021)	47.59	58.76	7.00	5.68
South Africa (2000-2019)	55.40	62.83	4.61	2.76
Sudan (2005-2017)	*53.91*	*62.96*	*5.74*	*3.76*
Tanzania (2000-2018)	51.20	64.48	7.97	3.67
Togo (2000-2020)	53.67	60.49	4.63	2.11
Uganda (2003-2019)	48.76	60.89	5.08	1.99
Zambia (2010-2021)	*54.92*	*58.49*	*3.76*	*4.43*
Zimbabwe (2010-2021)	*48.95*	*56.23*	*4.19*	*3.68*

North Africa and the Middle East (10)				
Algeria (2000-2021)	*57.61*	*59.98*	1.54	1.69
Egypt (2000-2017)	54.68	58.22	4.65	2.30
Iran (2003-2014)	49.14	62.77	4.41	1.03
Iraq (2003-2021)	*51.48*	*56.28*	2.74	1.42
Jordan (2000-2020)	47.90	59.47	1.59	0.62
Morocco (2000-2017)	51.32	58.69	1.79	1.45
Syria (2003-2009)	44.32	51.65	1.21	1.13
Tunisia (2009-2021)	*47.33*	*50.85*	1.98	1.94
Turkey (2000-2016)	57.31	60.81	3.25	0.62
Yemen (2000-2015)	54.39	62.84	5.33	2.36

Note: In italics countries whit fewer year to year observations. Country classification in five regions based on geographical regions from V-Dem Institute (2023) variable e_regionpol_6C.

Table OA.3 – Determinants of Subnational Disparities in Life Expectancy (PW_LOG_LEXP).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subnational Disparities in Income per capita PPP	0.016*** [0.125] (0.004)	0.014*** [0.108] (0.004)	0.017*** [0.131] (0.004)	0.015*** [0.117] (0.004)	0.015*** [0.112] (0.004)	0.028*** [0.151] (0.005)	0.047*** [0.356] (0.006)	0.015*** [0.115] (0.004)
Subnational Disparities in Education	0.046*** [0.313] (0.006)	0.039*** [0.269] (0.006)	0.045*** [0.307] (0.006)	0.042*** [0.287] (0.006)	0.046*** [0.314] (0.006)	0.052*** [0.354] (0.007)	0.029*** [0.198] (0.011)	0.040*** [0.272] (0.006)
Income per capita PPP (in logs)	-0.148* [-0.072] (0.090)	-0.109 [-0.053] (0.096)	-0.145* [-0.070] (0.086)	-0.201** [-0.098] (0.086)	3.545*** [-0.076] (1.021)	-0.127 [-0.062] (0.104)	-0.432*** [-0.210] (0.131)	0.164* [-0.079] (0.099)
Governance Quality	-0.202** [-0.059] (0.082)	-0.209** [-0.061] (0.085)	-0.157* [-0.045] (0.082)	-0.151* [-0.044] (0.081)	-0.219*** [-0.064] (0.082)	-0.245*** [-0.071] (0.093)	0.113 [0.033] (0.139)	-0.203** [-0.059] (0.087)
Public Health Expenditure	-0.027* [-0.022] (0.017)	-0.020 [-0.016] (-0.004)	-0.016 [-0.013] (0.016)	-0.014 [-0.011] (0.016)	-0.025 [-0.020] (0.016)	-0.031 [-0.025] (0.020)	-0.065** [-0.028] (0.026)	-0.022 [-0.013] (0.022)
Private Health Expenditure	-0.013 [-0.018] (0.026)	-0.004 [-0.003] (0.027)	-0.018 [-0.014] (0.025)	-0.016 [-0.012] (0.025)	-0.016 [-0.012] (0.025)	-0.005 [0.003] (0.030)	-0.037 [-0.028] (0.042)	-0.017 [-0.013] (0.027)
Ethnic fractionalization		0.882*** [0.116] (0.289)						
Population (in logs)			0.140*** [0.148] (0.033)					
Surface (in logs)				0.196*** [0.208] (0.026)				
Income per cap PPP (squared)					-0.220*** [-0.091] (0.059)			
Federalism						0.165*** [0.113] (0.053)		
Tax decentralization							2.194*** [0.248] (0.467)	
Geographic diversity								0.197*** [0.166] (0.049)
Asia and Pacific	-0.494*** (0.173)	-0.338* (0.204)	-0.633*** (0.176)	-0.453*** (0.166)	-0.589*** (0.177)	-0.436*** (0.182)	-0.364 (0.277)	-0.726*** (0.201)
Eastern Europe and Central Asia	-0.518** (0.213)	-0.618*** (0.233)	-0.474*** (0.204)	-0.552*** (0.202)	-0.569*** (0.213)	-0.213 (0.241)	-0.214 (0.364)	-0.784*** (0.213)
Latin America and the Caribbean	-1.286*** (0.182)	-1.322*** (0.206)	-1.327*** (0.175)	-1.319*** (0.171)	-1.316*** (0.181)	-1.326*** (0.185)	-1.076*** (0.280)	-1.573*** (0.180)
North Africa and the Middle East	-0.995*** (0.236)	-1.072*** (0.282)	-1.202*** (0.230)	-1.183*** (0.225)	-1.055*** (0.237)	-0.654** (0.273)	0.053 (0.337)	-1.704*** (0.286)
Constant	3.906*** (0.748)	3.309*** (0.784)	1.437* (0.862)	2.059*** (0.740)	-11.355*** (4.324)	3.099*** (0.866)	5.638*** (1.185)	4.360*** (0.831)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.524	0.543	0.537	0.543	0.532	0.526	0.683	0.539
Wald Chi2	399.862	446.778	464.411	539.003	435.623	361.339	394.815	452.184
Countries	101	95	101	101	101	86	41	95
Observations	1626	1525	1626	1626	1626	1402	459	1532

Notes: All regressions report PCSE (in parentheses) and standardized betas [in brackets] and include period fixed effects. Annual data. Level of significance: 10% (*), 5% (**), and 1% (***).

Table OA.4 – Determinants of Subnational Disparities in Life Expectancy (PW_LOG_LEXP).
Robustness.

	Annual					5 year means		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Number of lags=>	1 lag	2 lags	3 lags	4 lags	5 lags	0 lags	1 lag	1st period
Subnational Disparities in Income per cap. PPP (lagged)	0.025*** [0.189] (0.004)	0.021*** [0.163] (0.004)	0.023*** [0.178] (0.004)	0.023*** [0.175] (0.003)	0.012*** [0.091] (0.004)	0.042*** [0.319] (0.006)	0.033*** [0.253] (0.006)	0.039*** [0.296] (0.006)
Subnational Disparities in Education (lagged)	0.028*** [0.195] (0.006)	0.032*** [0.217] (0.006)	0.032*** [0.222] (0.006)	0.039*** [0.267] (0.007)	0.053*** [0.361] (0.007)	0.037*** [0.248] (0.011)	0.048*** [0.324] (0.010)	0.036*** [0.255] (0.010)
Income per capita PPP (in logs)	-0.218** [-0.106] (0.093)	-0.225** [-0.109] (0.097)	-0.235** [-0.114] (0.107)	-0.182* [-0.088] (0.104)	-0.116 [-0.056] (0.106)	-0.257* [-0.124] (0.156)	-0.150 [-0.072] (0.153)	-0.238 [-0.155] (0.159)
Governance Quality	-0.244*** [-0.071] (0.086)	-0.250*** [-0.073] (0.091)	-0.296*** [-0.086] (0.101)	-0.310*** [-0.090] (0.102)	-0.320*** [-0.093] (0.111)	-0.216 [-0.063] (0.165)	-0.506*** [-0.148] (0.186)	-0.257 [-0.076] (0.179)
Public Health Expenditure	-0.025 [-0.020] (0.017)	-0.035* [-0.028] (0.019)	-0.035* [-0.028] (0.020)	-0.039** [-0.031] (0.019)	-0.036* [-0.029] (0.020)	-0.089** [-0.073] (0.044)	-0.055 [-0.045] (0.047)	-0.090** [-0.074] (0.044)
Private Health Expenditure	-0.015 [-0.011] (0.028)	-0.027 [-0.021] (0.029)	-0.026 [-0.020] (0.032)	-0.031 [-0.027] (0.035)	-0.050 [-0.038] (0.034)	-0.048 [-0.036] (0.044)	-0.119** [-0.090] (0.052)	-0.072 [-0.054] (0.047)
Asia and Pacific	-0.599*** (0.176)	-0.578*** (0.181)	-0.565*** (0.193)	-0.611*** (0.196)	-0.619*** (0.204)	-0.383 (0.238)	-0.504*** (0.266)	-0.487*** (0.249)
Eastern Europe and Central Asia	-0.675*** (0.211)	-0.647*** (0.213)	-0.625*** (0.226)	-0.625*** (0.231)	-0.592*** (0.238)	-0.271 (0.324)	-0.332 (0.347)	-0.342 (0.333)
Latin America and the Caribbean	-1.370*** (0.182)	-1.328*** (0.183)	-1.302*** (0.195)	-1.313*** (0.200)	-1.241*** (0.200)	-1.067*** (0.278)	-1.066*** (0.297)	-1.030*** (0.283)
North Africa and the Middle East	-1.023*** (0.228)	-1.035*** (0.237)	-0.989*** (0.250)	-1.054*** (0.254)	-1.173*** (0.262)	-0.532 (0.343)	-0.831* (0.374)	-0.624* (0.353)
Constant	4.207*** (0.816)	4.351*** (0.845)	4.326*** (0.934)	3.471*** (0.901)	3.416*** (0.938)	4.055*** (1.359)	3.204** (1.318)	4.066** (1.391)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.533	0.542	0.553	0.555	0.572	0.613	0.638	0.604
Wald Chi2	421.951	415.881	415.083	399.345	379.105	332.344	319.025	300.699
Countries	101	101	101	100	99	101	99	101
Observations	1525	1424	1323	1222	1122	392	291	354

Notes: All regressions report PCSE (in parentheses) and standardized betas [in brackets] and include period fixed effects. Level of significance: 10% (*), 5% (**), and 1% (***).

Table OA.5 – Determinants of Subnational Disparities in Life Expectancy (PW_LOG_LEXP). Gender differences.

Subnational Disparities in Life Expectancy (total and by gender)					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	Total	**Men**	**Women**	**Total**	**Total**
Subnational Disparities in Income per cap. PPP (total)	0.016*** [0.126] (0.004)			0.016*** [0.120] (0.005)	0.018*** [0.138] (0.004)
Subnational Disparities in Education (total)	0.053*** [0.360] (0.006)				
Subnational Disparities in Income per cap. PPP (men)		0 .016*** [0.099] (0.005)			
Subnational Disparities in Education (men)		0.067*** [0.347] (0.008)		0 .047*** [0.294] (0.007)	
Subnational Disparities in Income per cap. PPP (Women)			0.023*** [0.126] (0.005)		
Subnational Disparities in Education (Women)			0.079*** [0.467] (0.007)		0.051*** [0.403] (0.005)
Additional controls	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes
Continent effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.556	0.529	0.591	0.546	0.562
Wald Chi2	437.629	547.333	599.520	409.205	461.642
Countries	98	98	98	98	98
Observations	1502	1501	1502	1502	1502

Notes: All regressions report PCSE (in parentheses) and standardized betas [in brackets] and include period fixed effects. Other control variables included are income per capita PPP, governance quality, public and private health expenditure and a constant. Annual data. Level of significance: 10% (*), 5% (**), and 1% (***).