Life Satisfaction and Eudamonia is Lower in Urban Adolescents

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This is the first study to focus on the urban-rural happiness gradient in adolescents. Using the 2018 Programme for International Student Assessment (PISA) dataset of about half a million adolescents, we find a moderately large negative effect of large city (>1m) on happiness: about -0.5 on a 0-10 scale, and for some countries a larger effect, close to -1. We explore not just cognitive life satisfaction, but also the more rarely studied Eudaimonia, which reveals a similar urban-rural gradient. By studying adolescents, we mitigate self-sorting issues since adolescents, in general, do not move by choice. We address another potential source of sorting (due to parental choices) by comparing the urban-rural gradient for adolescents with that typically found for adults.

Programme for International Student Assessment (PISA), happiness, life satisfaction, subjective wellbeing, urban-rural, cities

Highlights

- first study to focus on urban-rural happiness gradient in adolescents
- negative effect of large city (>1m) on happiness: about -0.5 on 0-10 scale
- negative effect of large city (>1m) on eudaimonia: -0.1 to -0.15 on on a standardized scale

When asking a parent what they want most for their children, many would arguably respond, "I want them to be happy." Parents typically wish that their children will find fulfillment and happiness in life, and most worry about their children's mental health and well-being. A recent survey from the Pew Research Center found that 40% of parents were extremely, or very worried, about their children struggling with anxiety or depression (Minkin and Horowitz 2023). Mental health issues among adolescents are on the rise, with rates of depression and anxiety among teenagers increasing at a faster rate than in adults (Leeb et al. 2020). The COVID pandemic played a role in this trend, but there are many other factors that can

affect a teen's mental health such as interaction with friends, isolation, school environment and parent's relationship (Twenge et al. 2012, Twenge 2014, Twenge et al. 2015, Twenge 2017).

We explore how the place in which adolescents live can be related to their well-being and sense of happiness. Although happiness may not be the sole goal for adults,[1] happiness is what most parents want for their children, and what many young people desire (Humphrey et al. 2023). Furthermore, wellbeing in childhood is positively related to the child's future adult wellbeing, even after controlling for family and other influences (De Neve and Oswald 2012).

To achieve greater happiness, should adolescents experience more urbanity or more rurality? Findings should be of interest to policymakers, administrators, schools, and parents. Adults tend to be less happy in cities across the world, except in the poorest regions such as Sub-Saharan Africa and parts of Latin America (Okulicz-Kozaryn and Valente 2021, Valente and Berry 2016), but we know little about how living in an urban versus rural area can affect the wellbeing of adolescents (Marquez et al. 2024), with evidence especially missing about eudaimonia (self-assessed meaning in life).

To address these issues, we conduct quantitative analyses that explore how urbanicity can affect adolescents' wellbeing (both life satisfaction and eudaimonia). The paper is structured as follows: we start by exploring the literature on child and adolescent wellbeing. Next, we examine the theory and mechanisms driving urban vs. rural happiness. Our data and empirical analysis follows and we conclude with a discussion of results and implications for policy and practice.

Child and Adolescent Wellbeing Literature

According to Bronfenbrenner's bioecological systems model (Bronfenbrenner and Morris 2007), children's and adolescents' wellbeing is affected by their surroundings at different scales. Most immediately, their wellbeing is affected by their parents' wellbeing, which may reflect the parents' mental states and/or

[1]Some adults may have as their primary goal duty, service, work, doing the right thing, and so forth, and in doing so they may actually forego happiness for something else.

their overall life satisfaction. At a broader scale, the child's wellbeing may be affected by their living environment including the immediate neighborhood and where they live on an urban-rural spectrum. For instance, in developing countries, overcrowding and environmental pollution are massive urban problems made worse by undernutrition and infections, particularly respiratory and diarrhoeal diseases. In developed societies there are many other urban problems, e.g., injuries, poisonings, violence, drug abuse, exposure to industrial and atmospheric pollutants, including pesticides, sexually transmissible diseases, and "lifestyle" diseases including obesity and cardiovascular disease risk (Gracey 2002). At each scale, effects may be gender-specific, especially for adolescents. For instance, Nolen-Hoeksema and Hilt (2016) find that depression is more common amongst female adolescents than amongst males of the same age.

The relationship of parents' wellbeing with child and adolescent wellbeing has been examined across diverse settings with somewhat conflicting results. Powdthavee and Vignoles (2008), using British longitudinal data (BHPS), find that the father's mental distress predicts subsequent life satisfaction both of adolescent boys and girls, while mother's mental distress predicts subsequent life satisfaction of adolescent girls but not of boys. Analyses using the same BHPS data source indicate a positive relationship between parent and child life satisfaction (Clair 2012) and there is also a long-term (20 year) impact of the mother's mental health on the subsequent subjective wellbeing of their children (Layard et al. 2014, Clark and Lepinteur 2019). Results using US data (from the Fragile Families Longitudinal Survey which primarily has an urban sample) reveal that higher parental wellbeing spills over to positive subjective wellbeing for adolescents (Coles and Cage 2022, Park et al. 2024). However, Bedin and Sarriera (2014) find that such spillover effects are small in their study of parent-adolescent dyads in Brazil. Similarly, Casas et al. (2008, 2012) find only a very weak relationship between parents' and their adolescents' wellbeing, especially for their male offspring. Bryant et al. (2018) find in Australia that children of refugee parents with PTSD have greater emotional problems than children of refugees who do not suffer from PTSD.

Borga et al. (2022) find a strong correlation between parent and child wellbeing when using longitudinal

data from Ethiopia, India, Peru and Vietnam. Their analysis, however, attributes this correlation to the impact of the shared environment, rather than being due to specific parental attributes. When splitting the analysis between rural and urban samples, the study finds that mother's health is correlated with child subjective wellbeing in rural areas but not in urban areas. Other than the Borga et al. (2022) study, only a few studies have examined child wellbeing in urban relative to rural or remote areas. Some studies find that child (and especially adolescent) wellbeing is lower in rural or remote areas than in urban areas; however, these studies tend to cover only limited areas. For example in the case of Scotland, Levin (2014) finds some evidence that, relative to urban areas, adolescent mental health is lower in remote rural areas than in urban areas while life satisfaction is lower in accessible rural areas; other wellbeing measures show no difference across the urban/rural divide. Similarly, Parkes et al. (2016) find that remote location predicted poorer wellbeing outcomes for 7 year old children in Scotland, even after controlling for other factors. For Turkey, Yeresyan and Lohaus (2014) find lower wellbeing of adolescents in rural than in urban areas but find no such relationship for adolescents in Germany. The effects on wellbeing of living in a rural versus urban area may differ by gender. Powdthavee and Vignoles (2008) discuss the possibility that adolescents' need for friends and other close relationships may be greater for females than for males. They do not test whether this explanation may lead to gendered outcomes in urban versus rural locations; however, if their hypothesis is correct then it may be the case that the gender wellbeing divide differs across rural versus urban areas; subsequently, we test for such an effect.

The nature of the surrounding environment may also impact child (and adult) wellbeing. Within the US, Fava et al. (2022) find that a better neighborhood perception by the mother when the child is 3 years old is associated with higher child wellbeing when the child is 9 years old. Using data from urban Catalonia, Oriol and Miranda (2023) find that the degree of optimism of an adolescent (and a child) is positively related to their subsequent cognitive and affective wellbeing. If optimism is determined in part by the surrounding community, and not just by personal and parental characteristics, then the nature of the community that one lives in may also be influential for adolescent and child wellbeing through this

channel. Using a related dataset to ours, Marquez et al. (2024) find that adolescent life satisfaction is positively related to family wealth and is decreasing in the size of settlement. Marquez et al. (2024) does not focus on urban-rural differences, however, but instead focuses on global trends in adolescent wellbeing. Marquez et al. (2024) uses 2022 OECD PISA (Programme for International Student Assessment) data which is available for 74 countries (although regression results are presented for respondents only from 43 countries).[2] While the study controls for country GNI per capita, it does not include country fixed effects to control for other factors (e.g., national cultural differences). Furthermore, the use of 2022 data leaves open the possibility that the results are affected by the differential impact of COVID and related policy responses across settlement types. Our study, which uses 2018 PISA data pre-dates these COVID effects.

In addition, we examine the relationship not just of settlement size to life satisfaction but also to eudaimonia which has not been examined for adolescents across urbanicity. Furthermore, we test if effects differ between males and females.

For adults, Berry and Okulicz-Kozaryn (2011) confirmed that at least in the US, there's a gradient in SWB that rises from its lowest levels in the large cities to its highest levels in the rural periphery, the so called "urban-rural happiness gradient," when controlling for many of the characteristics that affect individual' happiness. In our own testing, while we cannot control for parents' wellbeing, we do control for material wellbeing of the family, which is a major determinant of adult subjective wellbeing (Clark 2018). Controlling for this factor (and others) we test whether adolescents face an urban/rural divide in wellbeing, and whether an urban-rural gradient is present for adolescents, measured by both life satisfaction and eudaimonia. In addition, we test whether these results are consistent across adolescent boys and girls.

[2] A second model, estimated for respondents in 13 countries, includes a range of controls for satisfaction with local services and environment.

Theory and Mechanisms of Urban Unhappiness

Genes determine about half of subjective wellbeing (SWB) (Schnittker 2008, Lykken and Tellegen 1996, Brooks 2013). Humans have not evolved for city life—living in an artificial setting among thousands of people densely packed together. Some animals such as ants or bees may thrive in a high density environment, but not humans: for over 95% of our evolutionary history there were no cities—hunters and gatherers lived in bands of 50-80 people (Maryanski and Turner 1992). Humans evolved to prefer nature and those who learned how to live in harmony with nature are more likely to survive and thrive (Pretty 2012, Yamamoto 2016). Concurrently, a defining feature of cities is heterogeneity or diversity (Wirth 1938), which accordingly produces: mistrust, uneasiness, conflict, and misanthropy (Milgram 1970, Thrift 2005, Amin 2006, Okulicz-Kozaryn and Valente 2022).[3] Ingroup preference or homophily (love of the same) theory explains this process: humans have preference for other humans who they perceive to be "like them" (McPherson et al. 2001, Tajfel 1982, Tajfel et al. 1971, Smelser and Alexander 1999, Putnam 2007, Fowler and Christakis 2008), and dislike outgroups or dissimilar persons. Therefore, living in a densely populated heterogeneous place can contribute to unhappiness.

Livability theory (Veenhoven and Ehrhardt 1995, Veenhoven 2014, 2000) states that humans, just like other animals, have needs (such as those on the Maslow's Hierarchy of Needs (Maslow [1954] 1987)), and if those needs are satisfied, then conditions are livable, and happiness follows. However, it is unclear what the livability theory predicts in regards to urbanism. Some aspects of city life may improve livability, and hence, happiness. Cities have multiple benefits (Meyer 2013, Florida 2008, Glaeser 2011, O'Sullivan 2009), notably jobs and amenities that improve livability and happiness. Morrison (2024) finds that these amenities chiefly benefit more educated residents who do not suffer the same urban-rural gradient in wellbeing as do less educated city dwellers. But cities also have multiple problems such as congestion, high rates of crime, rapid spread of infectious diseases, air, noise, and light pollution (Bettencourt and

[3]On the other hand, at least in theory, in a city there can be community: for example, a neighborhood village, that at least in some ways can simulate a more natural habitat for humans (Fischer 1995, 1975, Jacobs [1961] 1993).

West 2010, Bettencourt et al. 2007, Meyer 2013, Okulicz-Kozaryn 2015, Okulicz-Kozaryn and Valente 2021). And these problems can be exacerbated among children and adolescents, who are more vulnerable than adults. For example, urban crime (and bullying) is arguably more of an issue for adolescents (perhaps especially females) than for adults who may be better able to insulate themselves from it[4] and cope with it. Indeed, adults have better coping mechanisms than adolescents since coping increases with age (Leipold et al. 2019).

A century ago, Simmel (1903) theorized that urbanism has a negative effect on human brains and neural processing. Most recently, this finding was confirmed by neuroscience—even growing up in a city has lasting negative effects later in life (Lederbogen et al. 2011).

Furthermore, the Multiple Discrepancies Theory (MDT) (Michalos 1985, 2014) states that happiness is relative and a result of multiple comparisons. Visual and social comparisons are more likely in urban areas as there are more people and more stimuli. There is some evidence that humans tend to make upwards comparisons (Frey and Stutzer 2002) thus ending up feeling relatively deprived (e.g., Luttmer 2005, Frank 2012). Adolescents, like adults, are likely to want to keep up with the "Joneses," e.g., through clothing, jewelry, parties, cars—see examples in Frank (2012).

Similarly, as in adults, there are other mechanisms that can impact adolescents' happiness in cities. The denser the city, the less nature there is (Okulicz-Kozaryn 2015) and nature is key for human flourishing (Pretty 2012). Cities tend to be the most polluted places on Earth (Meyer 2013), and not just in terms of air pollution, but also light and noise pollution, each of which can reduce happiness (Signoretta et al. 2019, Poon 2018, Lee 2016, Metcalfe 2016, Weinhold 2013, Rehdanz and Maddison 2008, Welsch 2005, York et al. 2003). Materialism and consumerism (and unethical behavior) are also concentrated in cities (e.g., Okulicz-Kozaryn and Valente 2017, Okulicz-Kozaryn 2022, Morris et al. 2021, Wirth 1938) and are likely to result in unhappiness particularly when focused on purchasing material goods and not experiences,

[4]Adults usually spend most of their time at work, at home, or in a car, which are relatively crime free zones, whereas an adolescent is arguably less able to insulate herself from their neighborhood and peers. It is important to highlight that crime is a feature of cities, with crime increasing consistently with city size (Bliss 2014, Bettencourt 2013, Bettencourt et al. 2010, Bettencourt and West 2010, Bettencourt et al. 2007).

at the cost of human needs such as social connection (e.g., Frank 2012, Leonard 2010, Van Boven 2005, Burroughs and Rindfleisch 2002, Dumludag et al. 2021).

Morrison (2024) proposes that the urban unhappiness paradox can be resolved by considering the skill levels of workers living in cities. He highlights two specific mechanisms: 1) education boosts social engagement and 2) cities promote social interaction. It is a compelling argument as low education can certainly be one component or mechanism driving urban unhappiness. However, it is important to consider that there are a number of other mechanisms as previously discussed that can contribute to urban unhappiness besides education level and skills. Furthermore, there are many highly educated people who are not socially engaged, and that cities promote some forms of social interactions, but not all, as previously discussed.

Studying urban vs. rural happiness among adolescents has an advantage over adults. Some have argued that there may be self sorting of unhappy adults into cities, i.e., it is not that cities make people unhappy, but that unhappy people move to cities. For instance, "Veenhoven (1994) argues that cities attract those already dissatisfied with their life in rural areas, and hence there could be an excess of unhappy/unsatisfied people in cities. For him, cities do not make unhappy people but attract them"(cited in Mikhaeil et al. 2024). The issue of reverse causality is mitigated when focusing on children and adolescents because, unlike adults, they do not self-sort or move into areas by choice. While their parents may self-sort by location, the literature on intergenerational transmission of life satisfaction surveyed above (e.g., Bedin and Sarriera 2014, Casas et al. 2008, 2012) mostly find that these effects are weak. Furthermore, we are not aware of any study that finds intergenerational transmission of Eudaimonia.

Previous research has partially explored the issue of how childhood location affects subsequent adult wellbeing by using the US GSS survey item, "Which of the categories on this card comes closest to the type of place you were living in when you were 16 years old?" (Okulicz-Kozaryn and Valente 2020). Growing up in urban areas had a lasting negative effect on (un)happiness among adults in the U.S. later in life (Okulicz-Kozaryn and Valente 2020). We build on this body of research by asking actual

adolescents (15 years old) about their happiness and place of residence (instead of asking adults to recall their adolescence), and we expand the research scope by examining adolescents over a wide range of countries, not just the United States.

Data

We use the 2018 PISA data from `oecd.org/pisa/data/2018database`. Respondents are adolescents (the vast majority are 15 year olds, and a few 16 year olds). The 2018 PISA is a large dataset with $> 0.5m$ observations across 80 countries (including some sub-country regions), and has a wellbeing module with several subjective wellbeing (SWB) items.

Urbanicity is recorded in school questionnaires administered to school principals (i.e., an objective urbanicity measure)[5]: "Which of the following definitions best describes the community in which your school is located?"

- A village, hamlet or rural area (fewer than 3,000 people)
- A small town (3,000 to about 15 000 people)
- A town (15,000 to about 100,000 people)
- A city (100,000 to about 1,000,000 people)
- A large city (with over 1,000,000 people).

The top bin (large city $> 1m$) provides an important advantage over the widely used World Values Survey, where the top urbanicity cutoff is only 0.5m (Deb and Okulicz-Kozaryn 2023, Mikhaeil et al. 2024): cities of 0.5m v 1m can be quite different. Urbanicity is missing for only 5.5 percent of observations.

PISA uses the 0-10 life satisfaction measure: "Overall, how satisfied are you with your life as a whole these days?" This measure is similar to the Cantril ladder which has been shown to be a valid tool for

[5]Urbanicity of school and residence are likely to be highly correlated, but are not necessarily identical. Some children who live in smaller areas may be counted as being in a larger settlement as they may attend school in a larger place.

measuring the subjective wellbeing of 15 year-olds (Levin and Currie 2014). The life satisfaction measure is missing for several countries, thus the sample size is reduced from 80 to 72 countries—tables in the results section list the countries used in our analyses.

The PISA 2018 dataset also contains a relatively rarely measured eudaimonic wellbeing variable (see Proctor and Tweed 2016). PISA defines meaning in life as the extent to which 15-year-olds comprehend, make sense of, or find significance in their lives (Schleicher 2019). PISA 2018 asked students whether they agreed or disagreed ("strongly disagree," "disagree," "agree," "strongly agree") with the following statements: "My life has clear meaning or purpose;" "I have discovered a satisfactory meaning in life;" and "I have a clear sense of what gives meaning to my life." These statements were combined to create a standardized index (mean=0, standard deviation=1) of meaning in life (eudaimonic wellbeing).

Basic controls in our models are gender and family wealth (age, education, and marital status are mostly constant and so are omitted). In addition, we control for mother's education. Most work on children and adolescents finds that mother's education is more important for children' health outcomes than father's education (Nepal 2018) and information for mothers is less likely to be missing from surveys than is fathers' information (fathers are more often missing than mothers from the household). Furthermore, given the findings of Morrison (2024), controlling for mother's education helps to control for the influence of parental wellbeing that may be correlated with parental selection into cities versus smaller settlements.

We also control for internet use on weekdays and weekends, and we utilize specific measures of how the internet is used outside of school (for social media use and "for fun"). This control is particularly important as social media can drastically impact happiness among the youth (Twenge 2017, 2014), and could potentially be correlated with urbanicity. Another control variable that we include is a proxy for the child's academic skills, using a measure that asks the respondent about how difficult they found PISA's tests (for mathematics, science and language). This variable is included to test whether the rural-urban gradient is related to the child's (academic) skills in a comparable way to that which may occur for adults. All of the variables and controls used in our analyses are listed in Table 1. Variables' distributions are

included in the appendix.

There are data limitations. There are no measures of siblings and grandparents, and we did not find a comprehensive health variable—existing ones are missing for the vast majority of respondents. Health is of course a key happiness predictor, but arguably less important for adolescents as they are healthier than adults, and since age is constant, we expect there is much less variability in health for this age-group than for adults. These limitations aside, we note that PISA is a particularly rich data source for urban/happiness researchers.

Table 1: Variable definitions.

name	description [range indicated in square parentheses]
life satisfaction	"Overall, how satisfied are you with your life as a whole these days?" [0,10]
eudamonia	"Eudaemonia: meaning in life (WLE)" "PISA 2018 asked students (ST185) to report the extent to which they agree ("strongly agree", "agree", "disagree", "strongly disagree") with the following statements: "My life has clear meaning or purpose"; "I have discovered a satisfactory meaning in life"; and "I have a clear sense of what gives meaning to my life". These statements were combined to form the standardized index of meaning in life (EUDMO). Positive values in the index indicate greater meaning in life than the average student across OECD countries." https://www.oecd-ilibrary.org/sites/0a428b07-en/index.html?itemId=/content/component/0a428b07-en [-2.1,1.7]
rural-urban	"Which of the following definitions best describes the community in which your school is located?" [1 (A village, hamlet or rural area (fewer than 3 000 people)), 5 (A large city (with over 1 000 000 people))]
female	female
family wealth	"The standardized index of family wealth (WEALTH) is based on the students' responses on whether they had the following at home: a room of their own, a link to the Internet, a dishwasher (treated as a country-specific item), a DVD player, and three other country-specific items (some items in ST20); and their responses on the number of cellular phones, televisions, computers, cars and the rooms with a bath or shower (ST21). "NCES 2011-025U.S. DEPARTMENT OF EDUCATION Technical Report and User's Guide for the Program for International Student Assessment (PISA) 2009 https://nces.ed.gov/surveys/pisa/pdf/2011025.pdf [-7.5,4.7]
mother's education	Mother's Education (ISCED) [0-6]
weekday Internet use	"During a typical weekday, for how long do you use the Internet outside of school" [1 (0),7 (>6 hrs a day)]
weekend Internet use	"During a typical weekend day, for how long do you use the Internet outside of school" [1 (0),7 (>6 hrs a day)]
social networks use	"How often do you use digital devices for the following activities outside of school?" "Participating in social networks (e.g.<Facebook>, <MySpace>)." [1 (never/hardly ever),5 (every day)]
use internet for fun	"How often do you use digital devices for the following activities outside of school?" "Browsing the Internet for fun (such as watching videos, e.g.<YouTube>)" [1 (never/hardly ever),5 (every day)]
difficult test	Perception of difficulty of the PISA test (WLE)

Results

The OLS regressions[6] of life satisfaction on urbanicity are shown in Table 2. When interpreting these results, it is important to underscore that ecological variables have relatively small effects on SWB as expected—most SWB is explained by genes (Schnittker 2008) and person level predictors (Veenhoven 2014). Nevertheless, the effect of urbanicity is about 0.5 on the 0-10 SWB scale, which is similar to the effect on SWB for adults when becoming unemployed (Clark et al. 2008); this is a relatively large effect.

In columns a1-a3 there is a big difference in happiness between adolescents in the largest cities (gt1m) and smaller areas, consistent with previous research on adults (Okulicz-Kozaryn 2016). But interestingly, unlike adults, there is also a large gap between those who reside in places with less than 3k (reference category) and places with 3-15k people. This is especially evident in models a1-a3. Model a3 includes a control for mother's education both to control for its direct effect on adolescent wellbeing and to help to control for the possibility that a happier, more educated parent chooses to locate in a particular settlement type. We note that the estimated effects of urbanicity on adolescent wellbeing is hardly changed by the addition of this variable.

Similar to research on adults (Okulicz-Kozaryn and Valente 2021), the addition of income/wealth makes the results more pronounced—income/wealth confounds with urbanicity. In the full model a4, which includes country fixed effects, we find that the urbanicity effect sizes remain large.

Model a4a adds "difficult test," a student's perception of test difficulty to proxy education. We test Morrison's (2024) hypothesis that education can help explain urban-rural happiness gradient, but we find that if anything the urban-rural happiness gradient is stronger—effect sizes on urbanicity dummies are larger. Interactions of education with urbanicity are insignificant (see appendix).

In models a4f and a4m, we split the analyses by gender and find that, urban unhappiness is higher for females, a similar result to Knight and Gunatilaka (2010): in rural China, men report lower happiness

[6]We use a standard OLS regression with robust standard errors, and treat the 11-step happiness variable as continuous. Ordinal logit and OLS regressions for ordinal happiness data consistently yield similar results (Ferrer-i-Carbonell and Frijters 2004).

than women.

Model a5 adds the four internet usage variables (noting that this addition cuts the sample size by about 200k due to non-response), and the results remain comparable.[7]

We investigate whether it may be that children in smaller places do not need as much material wealth to be happy because they have other non-costly options for entertainment. We test this by interacting the family wealth variable with the urban/rural categories to see if the effect of material wealth on life satisfaction differs according to place (hypothesizing a smaller effect of family wealth in smaller places). There is no significant effect in a6.

Table 2: OLS Regressions of Life Satisfaction. Base category for settlement size is <3k.

	a1	a2	a3	a4	a4a	a4f	a4m	a5	a6
3-15k	-0.34***	-0.38***	-0.38***	-0.19***	-0.21***	-0.22***	-0.15***	-0.19***	-0.20***
15-100k	-0.37***	-0.41***	-0.41***	-0.25***	-0.28***	-0.30***	-0.19***	-0.22***	-0.25***
100k-1m	-0.44***	-0.47***	-0.49***	-0.39***	-0.43***	-0.45***	-0.33***	-0.36***	-0.38***
gt1m	-0.61***	-0.65***	-0.67***	-0.45***	-0.50***	-0.53***	-0.36***	-0.41***	-0.45***
family wealth		0.07***	0.05***	0.22***	0.21***	0.21***	0.22***	0.26***	0.22***
female			-0.40***	-0.39***	-0.40***			-0.50***	-0.39***
mother's education			0.03***	-0.00	-0.00	0.01*	-0.01*	0.00	-0.00
difficult test					-0.12***				
3-15k × family wealth									-0.02
15-100k × family wealth									0.00
100k-1m × family wealth									0.03*
gt1m × family wealth									-0.01
constant	7.63***	7.70***	7.78***	9.32***	9.38***	9.09***	9.14***	10.05***	9.32***
4 internet use vars	no	no	no	no	no	no	no	yes	no
country dummies	no	no	no	yes	yes	yes	yes	yes	yes
N	471551	470216	463294	463294	439300	234350	228944	256075	463294

*p<0.05 **p<0.01 ***p<0.001

Next, we run the full model, a4, for each country separately, with results presented in Table 3 (note that results with sampling weights in the appendix are similar). The table shows that in most countries adolescents are less happy in cities ($> 1m$) than in rural areas ($< 3k$), except in Indonesia (IDN) and

[7] In our 2018 dataset, internet use has very low correlation with urbanicity—see appendix for details.

Lebanon (LBN), where urbanites are happier than ruralites. It is not uncommon in developing countries to observe greater urban happiness since rural areas are often less livable with insufficient availability of basic necessities such as food, water, and shelter.

The largest negative effect sizes, about -1, are in: the United Arab Emirates (ARE), Costa Rica (CRI), Russia (RUS), and Ukraine (UKR). Future research could concentrate on the extremes and investigate what is it about these specific countries that yield these large results.

	3-15k	15-100k	100k-1m	gt1m	N
ALB	-0.0	-0.2*	-0.3*	-0.2	5916
ARE	-0.4*	-0.7*	-0.8*	-1.2*	16145
ARG	-0.1	-0.2	-0.3*	-0.2	9409
AUT	-0.1	0.0	-0.0	-0.4*	6090
BGR	-0.4	-0.4	-0.7*	-0.7*	4215
BIH	-0.0	-0.1	-0.3+		5901
BLR	-0.2*	-0.0	-0.4*	-0.7*	5404
BRA	-0.0	-0.2	-0.5*	-0.4+	7851
BRN	-0.1	-0.1	-0.2+		6360
CHE	-0.1	-0.1	-0.1		5114
CHL	0.8*	0.3	0.2	0.2	6009
COL	0.2	-0.1	-0.3*	-0.5*	6460
CRI	-0.2+	-0.2*	-0.5*	-0.9*	6049
CZE	0.0	0.1	-0.0	-0.5*	6198
DEU	-0.0	0.0	-0.0	0.2	3322
DOM	0.1	0.1	-0.2	-0.2	3528
ESP	-0.3*	-0.3*	-0.5*	-0.3*	31904
EST	-0.2+	0.0	-0.1		4942
FIN	-0.1	-0.0	0.1		5203
FRA	-0.0	0.1	-0.0	0.4	5007
GBR	-0.1	-0.1	-0.2	0.1	9546
GEO	0.1	-0.1	-0.3*	-0.4*	4784
GRC	-0.1	-0.4*	-0.3*	-0.4*	5948
HKG	0.4	0.4	0.1	0.2	4078
HRV	0.6	0.7+	0.5	0.3	6289
HUN	-0.3	-0.5	-0.5	-0.6*	4801
IDN	-0.1	-0.2+	-0.3*	0.2+	9950
IRL	-0.3*	-0.3*	-0.1	-0.4*	5182
ISL	-0.0	0.0	-0.1		2915
ITA	-0.1	-0.3*	-0.3*	-0.5*	10478
JOR	-0.3*	-0.5*	-0.6*	-0.4*	8090
JPN	0.0	0.2	0.1	0.1	5669
KAZ	-0.2*	-0.4*	-0.9*	-0.7*	17919
KOR	-0.9*	-0.4	-0.6*	-0.6*	6450
KSV	-0.4*	-0.4*	-0.7*		4468
LBN	0.5*	0.4*	0.5*	1.0*	3999
LTU	-0.3*	-0.1	-0.4*		6084
LUX	0.0	-0.2+	-0.2*		4465
LVA	0.1	0.1	-0.0		4675
MAC			0.1		3707
MAR	-0.2	-0.5*	-0.4*	-0.6*	4846
MDA	-0.1	-0.1	-0.4*	-0.6*	4892
MEX	-0.1	-0.2+	-0.2+	-0.3*	5811
MKD	-0.5*	-0.7*	-0.7*	-0.8*	4391
MLT	0.1	-0.1			3030
MNE	-1.3*	-1.3*	-1.4*		6138
MYS	-0.0	-0.1	-0.5*	-0.5*	5853
NLD	-0.2	-0.1	-0.2		3514
PAN	0.3+	0.1	-0.2	-0.5*	3505
PER	-0.2+	-0.1	-0.3*	-0.5*	4855
PHL	0.3*	0.1	-0.1	-0.0	6142
POL	-0.2+	-0.2*	-0.2+	0.0	5274
PRT	-0.6*	-0.6*	-0.6*	-0.6*	5265
QAT	0.0	-0.1	-0.1	-0.3+	11765
QAZ	0.5	0.6	0.2	0.6	3664
QCI	-0.2	-0.1	-0.2+	-0.1	11923
QMR	-0.7*	-0.6*	-0.7*	0.1	1885
QRT	-0.4*	-1.0*	-1.0*	-1.0*	5293
ROU	0.3	0.2	0.1	0.1	4817
RUS	-0.5*	-0.7*	-0.7*	-1.0*	6587
SAU	-0.5*	-0.4*	-0.7*	-0.8*	5452
SRB	0.3	0.6	0.4	0.2	5832
SVK	0.0	-0.1	-0.4*		5162
SVN	-0.3	-0.2	-0.2		5473
TAP	-0.1	-0.1	-0.1	-0.2	6887
THA	-0.1+	-0.3*	-0.4*	-0.6*	8279
TUR	1.2*	0.7*	0.5	0.4	6598
UKR	-0.3*	-0.5*	-0.6*	-0.9*	5632
URY	-0.1	-0.2	-0.2	-0.5*	4330
USA	-0.0	-0.2	-0.5*	-0.2	4121
VNM	-0.0	-0.2+	-0.3*	-0.6*	5191

* p<0.05, + p<0.1; robust std err

Table 3: OLS Regressions of Life Satisfaction on place size for each country separately including covariates from a4 from table 2. Base category for settlement size is <3k. Results with sampling weights in appendix are similar.

Eudaimonia

We turn to eudaimonia, a more rarely studied type of SWB. This particular measurement of happiness taps into a person's overall sense of satisfaction based on finding meaning in life.

The results in Table 4 indicate an urban penalty of about 0.1-0.15 of a standard deviation in the largest cities ($> 1m$).

In Table 4, the patterns observed are similar to those for life satisfaction: there is a large drop from less than 3k (lt3k) to 3-15k in models b1-b3, slightly less so in model b4 when controlling for country dummies. In b4a (like in a4a) the urban-rural happiness gradient is slightly stronger controlling for student's perception of test difficulty. There is a clear gradient in models b4f and b4m. Females lose about twice the index points for eudaimonia than do males as urbanicity levels increase. Controlling for internet use does not substantially change the urbanicity coefficients in model b5. We do not have strong priors regarding the effect of family wealth on eudaimonia, but include the interaction results in column b6 for consistency with those for life satisfaction. It appears that adolescents from richer families have an additional enhancement of eudaimonia in more rural areas, a result worthy of further investigation.

Table 4: OLS regressions of Eudaimonia. Base category for settlement size is <3k.

	b1	b2	b3	b4	b4a	b4f	b4m	b5	b6
3-15k	-0.09***	-0.08***	-0.08***	-0.04***	-0.05***	-0.06***	-0.02**	-0.04***	-0.06***
15-100k	-0.13***	-0.12***	-0.11***	-0.06***	-0.07***	-0.09***	-0.03***	-0.05***	-0.07***
100k-1m	-0.14***	-0.13***	-0.13***	-0.10***	-0.11***	-0.13***	-0.06***	-0.10***	-0.12***
gt1m	-0.15***	-0.13***	-0.13***	-0.12***	-0.14***	-0.16***	-0.08***	-0.11***	-0.14***
family wealth		-0.02***	-0.02***	0.06***	0.06***	0.05***	0.07***	0.07***	0.08***
female			-0.07***	-0.07***	-0.07***			-0.12***	-0.07***
mother's education			-0.01***	-0.01***	-0.01***	-0.01***	-0.01***	-0.01***	-0.01***
difficult test					-0.02***				
3-15k × family wealth									-0.01**
15-100k × family wealth									-0.01***
100k-1m × family wealth									-0.02***
gt1m × family wealth									-0.03***
constant	0.27***	0.24***	0.34***	0.79***	0.80***	0.77***	0.72***	1.03***	0.80***
4 internet use vars	no	no	no	no	no	no	no	yes	no
country dummies	no	no	no	yes	yes	yes	yes	yes	yes
N	483,844	482,944	476,054	476,054	454,893	241,640	234,414	270,710	476,054
*p<0.05 **p<0.01 ***p<0.001									

In Table 5, the urban eudaimonia penalty for large cities is a little less consistent than for the urban life satisfaction penalty. Nevertheless, the number of countries with a significant large city (>1m) penalty for eudaimonia outweighs those with a significant large city premium by over 4:1. The weight of evidence is even clearer for second tier cities (100k-1m) where the number of countries with a significant penalty outweighs those with a significant premium by over 10:1.

	3-15k	15-100k	100k-1m	gt1m	N
ALB	-0.0	-0.1	-0.1*	-0.1*	5940
ARE	-0.1*	-0.3*	-0.3*	-0.5*	16256
ARG	0.0	0.0	0.0	0.0	9071
AUS	-0.1	-0.0	-0.1	-0.0	10845
AUT	0.1+	0.1+	-0.0	-0.0	5946
BEL	0.0	0.0	-0.1	0.2*	4134
BGR	-0.0	0.1	-0.0	-0.1	4065
BIH	-0.0	0.0	-0.0		5836
BLR	-0.0	-0.0	-0.1*	-0.2*	5347
BRA	0.2*	0.1+	0.1	0.1+	7662
BRN	-0.1*	-0.1*	-0.1*		6195
CHE	0.0	-0.1+	-0.1		4867
CHL	0.1	-0.0	-0.1	-0.2+	5741
COL	0.0	0.0	0.0	-0.1+	6469
CRI	-0.0	-0.1+	-0.1*	-0.3*	6039
CZE	-0.1	-0.1+	-0.2*	-0.2*	6066
DEU	-0.1	-0.1	-0.1	-0.0	3127
DNK	0.1*	0.2*	0.2*	0.2*	5026
DOM	-0.1	0.0	-0.0	-0.1	3016
ESP	-0.0	-0.0	-0.1*	-0.0	30916
EST	0.0	0.1*	0.0		4923
FIN	0.0	0.0	0.1		5103
FRA	-0.1	-0.2*	-0.2*	-0.3*	4871
GBR	-0.0	-0.0	-0.1	0.2*	9358
GEO	-0.0	0.1+	-0.1	-0.1*	4524
GRC	0.0	-0.1	-0.1*	-0.1+	5911
HKG	-0.2	-0.2	-0.2*	-0.2*	4087
HRV	0.0	0.1	-0.1	-0.1	6179
HUN	0.0	-0.1	-0.1	-0.2*	4761
IDN	0.0	0.0	-0.0	0.1*	10289
IRL	-0.1*	-0.1*	-0.0	-0.1*	5090
ISL	-0.1+	0.0	-0.1		2854
ITA	-0.2*	-0.2*	-0.2*	-0.2*	10203
JOR	-0.1	-0.1	-0.1+	-0.1*	8095
JPN	0.0	-0.1	-0.1	-0.1	5636
KAZ	-0.1*	-0.2*	-0.2*	-0.2*	17553
KOR	-0.5*	-0.4*	-0.4*	-0.3*	6444
KSV	-0.0	-0.0	-0.1+		4349
LBN	0.1+	0.1+	0.1	0.1+	4069
LTU	-0.1*	-0.1*	-0.2*		5986
LUX	0.0	0.0	-0.1+		4348
LVA	-0.1+	-0.1*	-0.1*		4590
MAC			0.3		3718
MAR	-0.0	0.0	0.0	-0.0	4489
MDA	-0.1+	-0.2*	-0.2*	-0.3*	4886
MEX	0.1*	0.1	0.1*	0.1	5525
MKD	0.1	0.1	0.1	0.2	4399
MLT	0.1	0.0			2978
MNE	0.7	0.7	0.6		6025
MYS	-0.0	0.1+	-0.1*	-0.2*	5952
NLD	0.1	0.1	0.2		3480
PAN	0.2*	0.2*	0.1	-0.0	3052
PER	-0.1	-0.0	-0.1	-0.1	4484
PHL	-0.1	-0.0	-0.0	-0.0	6788
POL	-0.1	-0.1*	-0.1*	-0.0	5282
PRT	-0.0	-0.0	-0.1	-0.2	5200
QAT	0.0	-0.1*	-0.1*	-0.2*	11656
QAZ	-0.4+	-0.3	-0.5*	-0.3+	3516
QCI	-0.1+	-0.1+	-0.1*	-0.1*	11938
QMR	-0.1	-0.1	-0.1	0.4*	1827
QRT	-0.2*	-0.2*	-0.3*	-0.3*	5206
ROU	-0.1	-0.1*	-0.2*	-0.1+	4771
RUS	-0.2*	-0.3*	-0.2*	-0.3*	6410
SAU	-0.1	0.0	0.0	0.0	5268
SRB	-0.2*	-0.1*	-0.1*	-0.2*	5632
SVK	-0.1+	-0.1*	-0.3*		5066
SVN	-0.0	-0.0	-0.0		5432
TAP	0.0	0.0	-0.1	-0.1	6959
THA	-0.0	-0.1*	-0.1*	-0.1*	8389
TUR	0.2	0.1	0.1	0.1	6706
UKR	-0.1*	-0.2*	-0.2*	-0.3*	5546
URY	0.0	0.0	0.2+	-0.0	3899
USA	0.1	-0.0	-0.1	0.0	4086
VNM	0.0	-0.1	-0.1*	-0.1*	5216

* p<0.05,
+ p<0.1;
robust
std err

Table 5: OLS regressions of Eudaimonia on place size for each country separately including covariates from b4 (not shown). Base category for settlement size is <3k. Most countries have eudaimonic urban penalty, but a handful of countries have a premium. See the appendix for results with sampling weights.

Conclusion and Discussion

The happiness literature is mainly focused on studying adults, with fewer studies focusing on children or adolescents. Huebner (2004) offers some general observations on life satisfaction in adolescents, and others show that high life satisfaction in adolescents is related to multiple beneficial outcomes (Proctor et al. 2010, Suldo and Huebner 2006). A growing number of happiness studies use the PISA dataset (Tang 2019, Rudolf 2020, Chung et al. 2021, Pan and Cutumisu 2023, Marquez et al. 2024), yet there is no study focusing on urbanicity and how it affects the happiness in adolescents.

Our results provide evidence that urban life is related to lower subjective wellbeing of adolescents (measured both as life satisfaction and eudaimonia). Although causality cannot be determined since this is an observational study, these findings provide support for previous research involving adults especially given the lack of choice that teens have in deciding where to live. Our results suggest that there is something about city life, particularly in the largest cities, that negatively impacts SWB. Urban unhappiness for adolescents is not due to any choice that they can make about moving to cities, rather it seems that cities' themselves, and their natural characteristics and problems (e.g., high density, high crime rate, high cost of living, too much stimuli and pollution) affect adolescents' happiness.

Rurality, or smaller places, arguably provide more fertile ground for spontaneity and freedom for young people—in rural areas children can just go outside and play, hang out and have fun without onerous rules and restrictions. Our finding that female adolescents experience a greater urban penalty than males may reflect greater concern with crime and/or greater negative effects of inter-personal comparisons for females in an urban relative to a more rural setting. The city is designed for adults to work and to indulge in consumerism. Children are neither productive for jobs nor fit for many city amenities like airports, universities, etc.[8]

One explanation as to why rural children may be happier is that their parents are happier and this

[8]Of course, there are other amenities like some types of entertainment (theater, museums) that are fitting for children, but cities weren't built with children/teens in mind. Schools in urban areas, for example, rarely have as much space for recreation as do rural schools.

flows through to their offspring (which is a type of selection effect). However, we control for determinants of parental wellbeing (and its possible interaction with urbanicity) through the inclusion of mother's education and family wealth. We note also that research cited earlier indicates that the link between parent and child wellbeing may be quite weak. Furthermore, our results show a large gap in adolescent wellbeing between places with fewer than 3k people and places with 3-15k people. In contrast, the literature does not indicate any such gap for adults. Hence, selection on adult wellbeing does not appear to explain the adolescent wellbeing gradient for urbanicity. In addition, the urban-rural gradient is accentuated once we control for the child's academic skills and we find no interaction effect of those skills with city size.

One limitation is that although we would like to take into account possible grandparent and sibling effects, we do not have such measures in the 2018 PISA. In cities, many live with their nuclear family, far away from relatives and both parents usually work leaving their children in the care of others, so urban parents may spend less time with their children than those in rural areas. In smaller places, care-giving may be more commonly conducted by parents, grandparents or other extended relatives, contributing to happiness. Indeed, proximity to family may be one mechanism through which urbanicity affects the wellbeing gradient. Future research should ideally also control for the number of siblings especially given that people in smaller places and rural areas still have more children than people living in mega-cities (Lerch 2019).

Implications for Practice

These findings should be of interest to policymakers, administrators, schools, and particularly to parents. Most parents want their children to be happy and these results suggest that where they choose to settle to start a family matters—to achieve greater happiness for their children they should enjoy more rurality and nature.

Cities are for adults—to work, produce, and consume. Much of the production-related built envi-

ronment such as factories and offices is irrelevant for children and adolescents. So too is much of the consumption-related built environment such as nightclubs, higher education, most healthcare and many stores.

Research on urbanicity and subjective well-being is crucial as it sparks conversations about how to lead a happier life. It also empowers individuals to make life-altering decisions, such as choosing where to live and raise a family. At the same time, for income-generation reasons, advocating for living in smaller areas is problematic. Thus, we are not suggesting that young families should flock to rural areas. We are simply highlighting what is lost and suggesting that urban parents and caregivers should try to expose their children to more rurality, for instance by organizing trips, vacations and other activities outside of cities. Through such avenues, urban children can enjoy at least a taste of rural life.

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ONLINE APPENDIX

[note: this section will NOT be a part of the final version of the manuscript, but will be available online instead]

1 Variables' Distributions

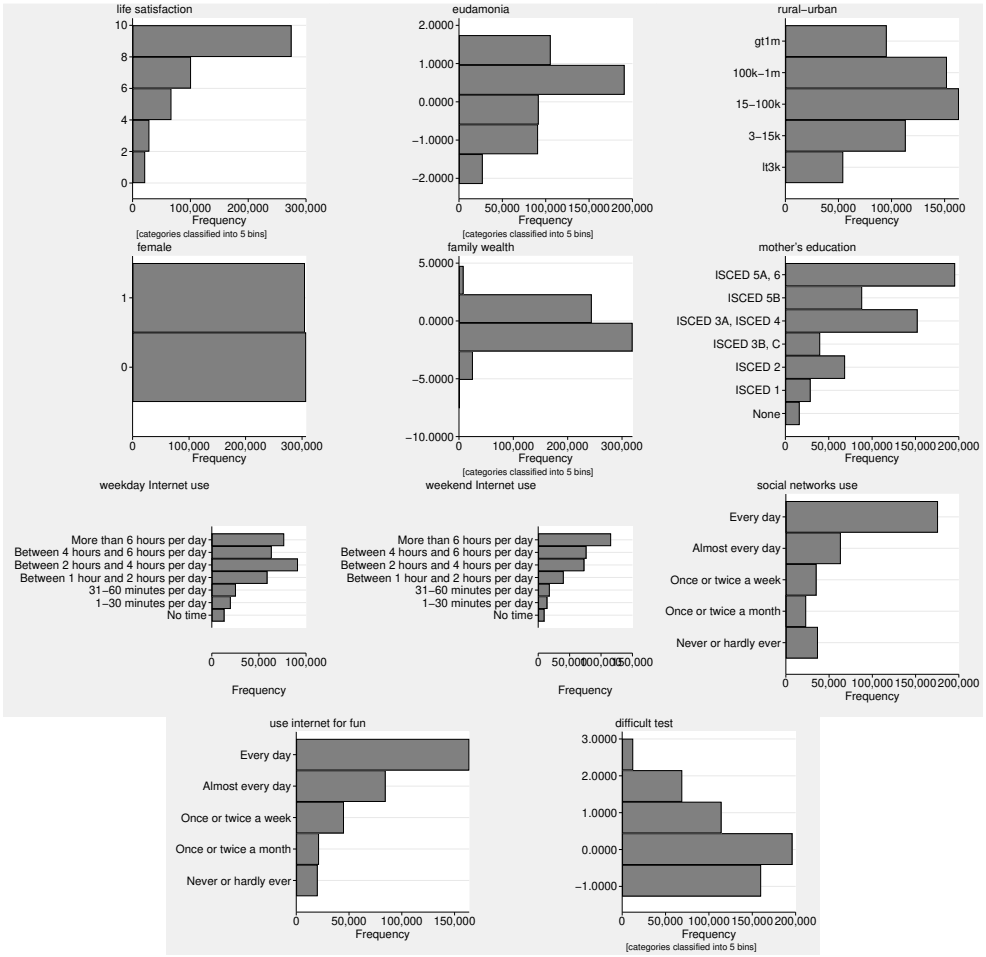

Figure 1: Variables' distribution.

2 Additional Results

	lt3k	3-15k	15-100k	100k-1m	gt1m	N
ALB	0.0	-0.0	-0.2*	-0.2*	-0.1	6,002
ARE	0.0	-0.4*	-0.7*	-0.8*	-1.1*	16,355
ARG	0.0	0.0	-0.1	-0.2	-0.1	10,442
AUT	0.0	-0.1	0.0	-0.0	-0.5*	6,466
BGR	0.0	-0.1	0.0	-0.2	-0.3	4,403
BIH	0.0	-0.0	-0.1	-0.2		5,982
BLR	0.0	-0.1	0.1	-0.3*	-0.6*	5,712
BRA	0.0	-0.1	-0.2	-0.5*	-0.4*	8,385
BRN	0.0	-0.1	-0.0	-0.2		6,528
CHE	0.0	-0.2+	-0.2	-0.3+		5,441
CHL	0.0	0.5*	0.3	0.2	0.3	6,442
COL	0.0	0.2	-0.1	-0.3*	-0.6*	6,633
CRI	0.0	-0.2*	-0.1+	-0.4*	-0.9*	6,420
CZE	0.0	-0.0	-0.1	-0.1	-0.4*	6,487
DEU	0.0	0.0	0.0	-0.0	0.1	3,839
DOM	0.0	0.1	0.1	-0.1	-0.2	3,694
ESP	0.0	-0.3*	-0.3*	-0.4*	-0.4*	33,374
EST	0.0	-0.2+	-0.0	-0.0		5,129
FIN	0.0	-0.1	0.0	0.1		5,384
FRA	0.0	0.1	0.2	0.1	0.4+	5,312
GBR	0.0	-0.1	-0.2	-0.2*	-0.2	11,090
GEO	0.0	0.2+	0.1	-0.1	-0.2	4,929
GRC	0.0	-0.0	-0.3*	-0.3*	-0.3*	5,995
HKG	0.0	0.3	0.3	0.1	0.1	4,205
HRV	0.0	0.7	0.8+	0.5	0.4	6,376
HUN	0.0	-0.2	-0.4	-0.4	-0.4	4,926
IDN	0.0	-0.1	-0.1	-0.2*	0.3*	10,131
IRL	0.0	-0.3*	-0.3*	-0.1	-0.5*	5,422
ISL	0.0	0.0	0.1	-0.0		3,011
ITA	0.0	-0.1	-0.3*	-0.4*	-0.6*	10,745
JOR	0.0	-0.1	-0.2	-0.2	0.0	8,395
JPN		0.0	0.3+	0.2	0.2	6,030
KAZ	0.0	-0.2*	-0.5*	-0.9*	-1.1*	18,736
KOR	0.0	-0.9*	-0.3	-0.6*	-0.5+	6,511
KSV	0.0	-0.3*	-0.3*	-0.6*		4,522
LBN	0.0	0.6*	0.6*	0.6*	1.5*	4,390
LTU	0.0	-0.2*	-0.1	-0.4*		6,568
LUX		0.0	-0.1	-0.0		5,010
LVA	0.0	0.1	0.2	0.1		4,928
MAC	0.0			0.3		3,746
MAR	0.0	-0.2	-0.4*	-0.3*	-0.4*	5,116
MDA	0.0	0.1	0.1	-0.0	0.1	5,232
MEX	0.0	-0.0	-0.1	0.1	-0.0	5,961
MKD	0.0	-0.5*	-0.6*	-0.6*	-0.8*	4,652
MLT	0.0	0.0	-0.2			3,142
MNE	0.0	-1.3*	-1.3*	-1.4*		6,253
MYS	0.0	-0.0	-0.0	-0.4*	-0.4*	5,880
NLD	0.0	-0.1	-0.1	-0.2		3,617
PAN	0.0	0.3+	0.1	-0.1	-0.5*	3,775
PER	0.0	-0.2*	-0.2*	-0.3*	-0.6*	4,926
PHL	0.0	0.5*	0.2+	0.1	0.2	6,299
POL	0.0	-0.2+	-0.2*	-0.2	-0.0	5,463
PRT	0.0	-0.6*	-0.6*	-0.6*	-0.6*	5,477
QAT	0.0	0.0	-0.0	-0.1	-0.1	12,127
QAZ	0.0	0.6	0.8	0.4	0.9	3,719
QCI	0.0	-0.2	-0.1	-0.2	-0.0	11,943
QMR	0.0	-0.8*	-0.6*	-0.7*	0.0	1,942
QRT	0.0	-0.3*	-0.9*	-0.9*	-0.9*	5,525
ROU	0.0	0.4*	0.4*	0.4*	0.4+	4,948
RUS	0.0	-0.5*	-0.6*	-0.6*	-0.8*	6,866
SAU	0.0	-0.5*	-0.4*	-0.7*	-0.8*	5,794
SRB	0.0	0.4	0.7	0.6	0.4	5,918
SVK	0.0	0.1	-0.1	-0.3*		5,275
SVN	0.0	-0.3	-0.2	-0.2		5,550
TAP	0.0	-0.1	-0.1	-0.1	-0.3	6,962
THA	0.0	-0.1+	-0.3*	-0.4*	-0.6*	8,357
TUR	0.0	1.1*	0.7*	0.5+	0.6+	6,643
UKR	0.0	-0.2+	-0.3*	-0.4*	-0.6*	5,898
URY	0.0	0.0	-0.1	-0.0	-0.2	4,652
USA	0.0	0.0	-0.1	-0.4*	-0.2	4,252
VNM	0.0	0.0	-0.2	-0.2*	-0.6*	5,291

* p<0.05,
+ p<0.1;
robust
std err

Table 6: OLS regressions of SWB on place size only (bivariate; a1) for each country separately. Base category for settlement size is <3k.

3 internet use

Urbanicity has very low positive correlation with internet use

```
. d city int*
Variable      Storage   Display    Value
    name         type    format    label      Variable label
------------------------------------------------------------------------------
city            byte    %9.0g      city       RECODE of SC001Q01TA (Which of
                                                the following definitions best
                                                describes the comm
intWday         byte    %2.0f      labels341
                                              During a typical weekday, for how
                                                long do you use the Internet
                                                outside of school
intWend         byte    %2.0f      labels342
                                              On a typical weekend day, for how
                                                long do you use the Internet
                                                outside of school
intSN           byte    %2.0f      labels374
                                              Use digital devices outside of
                                                school: Participating in Social
                                                Networks (e.g. <F
intFun          byte    %2.0f      labels376
                                              Use digital devices outside of
                                                school: Browsing the Internet
                                                for fun (such as wa

. pwcorr city int*
             |     city  intWday  intWend    intSN   intFun
-------------+---------------------------------------------
        city |   1.0000
     intWday |   0.0488   1.0000
     intWend |   0.0720   0.7251   1.0000
       intSN |   0.0569   0.2594   0.2792   1.0000
      intFun |   0.0866   0.3066   0.3479   0.5249   1.0000
```

.9

Using some internet is good for an adolescent, but using a lot on the weekend is bad

```
reg ls i.city wealth fem faEd i.intWday i.intWend, robust
Linear regression                               Number of obs     =    266,770
                                                F(19, 266750)     =     340.73
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0238
                                                Root MSE          =     2.5032
------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |  -.4296694   .0196451   -21.87   0.000    -.4681732   -.3911656
    15-100k  |  -.4853962   .0185923   -26.11   0.000    -.5218366   -.4489557
    100k-1m  |  -.5295389   .0186871   -28.34   0.000    -.5661651   -.4929126
       gt1m  |  -.7087667   .0212434   -33.36   0.000    -.7504032   -.6671301
             |
      wealth |    .058285   .0053595    10.87   0.000     .0477805    .0687896
         fem |  -.4855582   .0097124   -49.99   0.000    -.5045942   -.4665223
        faEd |  -.0238479   .0051004    -4.68   0.000    -.0338445   -.0138513
             |
     intWday |
1-30 minu..  |   .1687749   .0381252     4.43   0.000     .0940505    .2434993
31-60 min..  |   .1174412   .0369693     3.18   0.001     .0449823    .1899001
Between 1..  |   .0837295   .0347786     2.41   0.016     .0155643    .1518946
Between 2..  |  -.0017767   .0345739    -0.05   0.959    -.0695406    .0659872
Between 4..  |  -.0369376   .0357303    -1.03   0.301    -.1069681    .0330928
More than..  |   .0083298   .0365747     0.23   0.820    -.0633557    .0800153
             |
     intWend |
1-30 minu..  |    .241415    .046509     5.19   0.000     .1502586    .3325714
31-60 min..  |    .296678   .0448001     6.62   0.000     .2088711     .384485
Between 1..  |   .2990314    .042022     7.12   0.000     .2166694    .3813934
Between 2..  |      .1492   .0414603     3.60   0.000     .0679389     .230461
Between 4..  |  -.0009641   .0418857    -0.02   0.982     -.083059    .0811307
More than..  |  -.2383889   .0423359    -5.63   0.000    -.3213662   -.1554117
             |
       _cons |   7.966607   .0429739   185.38   0.000     7.882379    8.050834
------------------------------------------------------------------------------
```

.9

And below another robustness check, using clustered std err on school and school level covariates–results similar

```
. d STRATIO SCHLTYPE CLSIZE EDUSHORT STAFFSHORT STUBEHA TEACHBEHA
Variable      Storage   Display    Value
    name         type    format    label      Variable label
------------------------------------------------------------------------------
STRATIO         double  %10.0g                Student-Teacher ratio
SCHLTYPE        byte    %10.0g                School Ownership
CLSIZE          byte    %10.0g                Class Size
EDUSHORT        double  %10.0g                Shortage of educational material
                                                (WLE)
STAFFSHORT      double  %10.0g                Shortage of educational staff
                                                (WLE)
STUBEHA         double  %10.0g                Student behaviour hindering
                                                learning (WLE)
TEACHBEHA       double  %10.0g                Teacher behaviour hindering
                                                learning (WLE)

. reg ls i.city wealth i.gender faEd i.Region STRATIO SCHLTYPE CLSIZE EDUSHORT
>  STAFFSHORT STUBEHA TEACHBEHA , robust cluster(CNTSCHID)
Linear regression                               Number of obs     =    389,098
                                                F(131, 15010)     =     129.21
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0686
                                                Root MSE          =      2.488

                          (Std. err. adjusted for 15,011 clusters in CNTSCHID)
------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.19       0.02    -8.07    0.00        -0.24       -0.14
    15-100k  |      -0.26       0.02   -11.18    0.00        -0.31       -0.22
    100k-1m  |      -0.41       0.02   -16.91    0.00        -0.45       -0.36
       gt1m  |      -0.44       0.03   -16.02    0.00        -0.49       -0.38
             |
      wealth |       0.21       0.01    38.32    0.00         0.20        0.22
             |
      gender |
        Male |       0.40       0.01    42.56    0.00         0.38        0.42
         faEd |      -0.02       0.00    -5.15    0.00        -0.03       -0.01
             |
      Region | -----COUNTRY DUMMIES OMITTED HERE---------
             |
     STRATIO |       0.00       0.00     0.71    0.48        -0.00        0.00
    SCHLTYPE |       0.06       0.01     5.75    0.00         0.04        0.09
      CLSIZE |       0.00       0.00     2.39    0.02         0.00        0.00
    EDUSHORT |       0.01       0.01     2.07    0.04         0.00        0.03
  STAFFSHORT |      -0.01       0.01    -1.07    0.29        -0.02        0.01
     STUBEHA |       0.01       0.01     1.15    0.25        -0.01        0.02
   TEACHBEHA |      -0.02       0.01    -2.34    0.02        -0.03       -0.00
       _cons |       8.66       0.07   117.75    0.00         8.52        8.81
------------------------------------------------------------------------------
```

.9

Finally sampling weights–results similar for life satisfaction, but weaker for eudaimonia. Also see https://www.statalist.org/forums/forum/general-stata-discussion/general/1435058-should-i-apply-we and https://largescaleassessmentsineducation.springeropen.com/articles/10.1186/s40536-021-00099-0

```
. reg ls i.city, robust  //it is huuuge yay!
Linear regression                               Number of obs     =    471,551
                                                F(4, 471546)      =     398.44
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0034
                                                Root MSE          =     2.5877
```

```
------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.34       0.01   -23.16    0.00        -0.37       -0.32
    15-100k  |      -0.37       0.01   -26.19    0.00        -0.40       -0.34
    100k-1m  |      -0.44       0.01   -30.78    0.00        -0.47       -0.41
       gt1m  |      -0.61       0.02   -38.86    0.00        -0.64       -0.58
             |
       _cons |       7.63       0.01   624.06    0.00         7.61        7.66
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg ls i.city [pw=W_FSTUWT], robust
(sum of wgt is 24,137,093.50498)

Linear regression                               Number of obs     =    471,551
                                                F(4, 471546)      =     107.54
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0060
                                                Root MSE          =      2.611

------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.31       0.04    -7.59    0.00        -0.39       -0.23
    15-100k  |      -0.48       0.04   -13.33    0.00        -0.56       -0.41
    100k-1m  |      -0.61       0.04   -16.85    0.00        -0.68       -0.54
       gt1m  |      -0.68       0.04   -18.14    0.00        -0.76       -0.61
             |
       _cons |       7.57       0.03   235.80    0.00         7.51        7.64
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg ls i.city wealth fem faEd i.Region, robust beta

Linear regression                               Number of obs     =    452,931
                                                F(128, 452802)    =     299.51
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0697
                                                Root MSE          =     2.4886

------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.19       0.02   -12.48    0.00                   -0.03
    15-100k  |      -0.25       0.01   -17.35    0.00                   -0.04
    100k-1m  |      -0.40       0.01   -27.55    0.00                   -0.07
       gt1m  |      -0.46       0.02   -26.97    0.00                   -0.06
             |
      wealth |       0.21       0.00    48.55    0.00                    0.10
         fem |      -0.39       0.01   -52.08    0.00                   -0.07
        faEd |      -0.02       0.00    -5.06    0.00                   -0.01
             |
      Region | -----COUNTRY DUMMIES OMITTED HERE-----
       _cons |       9.34       0.03   305.46    0.00                       .
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg ls i.city wealth fem faEd i.Region [pw=W_FSTUWT], robust
(sum of wgt is 23,248,792.65115)

Linear regression                               Number of obs     =    452,931
                                                F(128, 452802)    =     252.32
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0587
                                                Root MSE          =     2.5304

------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.22       0.04    -5.04    0.00        -0.30       -0.13
    15-100k  |      -0.30       0.04    -7.60    0.00        -0.37       -0.22
    100k-1m  |      -0.46       0.04   -11.93    0.00        -0.54       -0.38
       gt1m  |      -0.45       0.04   -10.95    0.00        -0.53       -0.37
             |
      wealth |       0.18       0.01    17.53    0.00         0.16        0.20
```

```
         fem |      -0.32       0.02   -17.08    0.00        -0.36       -0.28
       faEd |      -0.00       0.01    -0.13    0.90        -0.02        0.02
            |
      Region |-----COUNTRY DUMMIES OMITTED HERE-----
       _cons |       9.27       0.05   198.36    0.00         9.18        9.37
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg EUDMO i.city, robust

Linear regression                               Number of obs     =    483,844
                                                F(4, 483839)      =     242.03
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0019
                                                Root MSE          =     .97663
------------------------------------------------------------------------------
             |               Robust
       EUDMO | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.09       0.01   -16.55    0.00        -0.10       -0.08
    15-100k  |      -0.13       0.01   -25.09    0.00        -0.14       -0.12
    100k-1m  |      -0.14       0.01   -27.48    0.00        -0.15       -0.13
       gt1m  |      -0.15       0.01   -26.23    0.00        -0.16       -0.14
             |
       _cons |       0.27       0.00    61.12    0.00         0.26        0.28
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg EUDMO i.city [pw=W_FSTUWT], robust
(sum of wgt is 24,302,689.2416)

Linear regression                               Number of obs     =    483,844
                                                F(4, 483839)      =     121.94
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0062
                                                Root MSE          =       .955
------------------------------------------------------------------------------
             |               Robust
       EUDMO | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.07       0.01    -5.04    0.00        -0.09       -0.04
    15-100k  |      -0.17       0.01   -14.08    0.00        -0.20       -0.15
    100k-1m  |      -0.22       0.01   -17.58    0.00        -0.24       -0.19
       gt1m  |      -0.21       0.01   -16.79    0.00        -0.24       -0.19
             |
       _cons |       0.35       0.01    33.16    0.00         0.33        0.37
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg EUDMO i.city wealth fem faEd i.Region, robust beta

Linear regression                               Number of obs     =    465,568
                                                F(131, 465436)    =     226.40
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0575
                                                Root MSE          =     .94722
------------------------------------------------------------------------------
             |               Robust
       EUDMO | Coefficient  std. err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.05       0.01    -8.25    0.00                   -0.02
    15-100k  |      -0.06       0.01   -11.49    0.00                   -0.03
    100k-1m  |      -0.10       0.01   -19.37    0.00                   -0.05
       gt1m  |      -0.13       0.01   -20.65    0.00                   -0.05
             |
      wealth |       0.06       0.00    36.44    0.00                    0.07
         fem |      -0.07       0.00   -24.54    0.00                   -0.03
       faEd |       0.01       0.00     4.07    0.00                    0.01
             |
      Region |-----COUNTRY DUMMIES OMITTED HERE-----
       _cons |       0.74       0.01    58.53    0.00                       .
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg EUDMO i.city wealth fem faEd i.Region [pw=W_FSTUWT], robust
(sum of wgt is 23,464,999.88423)
```

```
Linear regression                               Number of obs     =    465,568
                                                F(131, 465436)    =     179.18
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0696
                                                Root MSE          =     .92214
------------------------------------------------------------------------------
             |               Robust
       EUDMO | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.02       0.01    -1.29    0.20        -0.05        0.01
    15-100k  |      -0.03       0.01    -2.41    0.02        -0.06       -0.01
    100k-1m  |      -0.07       0.01    -5.14    0.00        -0.09       -0.04
       gt1m  |      -0.06       0.01    -4.04    0.00        -0.09       -0.03
             |
      wealth |       0.04       0.00    10.86    0.00         0.03        0.05
         fem |      -0.04       0.01    -5.29    0.00        -0.05       -0.02
        faEd |       0.01       0.00     1.66    0.10        -0.00        0.01
             |
      Region |-----COUNTRY DUMMIES OMITTED HERE-----
       _cons |       0.69       0.02    39.15    0.00         0.65        0.72
------------------------------------------------------------------------------

.
end of do-file

. do "/tmp/SD17808.000000"

. reg EUDMO i.city wealth fem faEd i.Region, robust beta

Linear regression                               Number of obs     =    465,568
                                                F(131, 465436)    =     226.40
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0575
                                                Root MSE          =     .94722
------------------------------------------------------------------------------
             |               Robust
       EUDMO | Coefficient  std. err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.05       0.01    -8.25    0.00                   -0.02
    15-100k  |      -0.06       0.01   -11.49    0.00                   -0.03
    100k-1m  |      -0.10       0.01   -19.37    0.00                   -0.05
       gt1m  |      -0.13       0.01   -20.65    0.00                   -0.05
             |
      wealth |       0.06       0.00    36.44    0.00                    0.07
         fem |      -0.07       0.00   -24.54    0.00                   -0.03
        faEd |       0.01       0.00     4.07    0.00                    0.01
             |
      Region |-----COUNTRY DUMMIES OMITTED HERE-----
       _cons |       0.74       0.01    58.53    0.00                       .
------------------------------------------------------------------------------

.
end of do-file

.
```

.9

4 Interactions of education with urbanicity

```
reg ls c.city##c.PISADIFF wealth fem maEd i.Region , robust

Linear regression                               Number of obs     =    439,300
                                                F(124, 439175)    =     309.83
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0722
                                                Root MSE          =     2.4727

------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |      -0.12       0.00   -32.84    0.00        -0.13       -0.11
   PISADIFF |      -0.11       0.01    -9.22    0.00        -0.13       -0.08
             |
      c.city#|
  c.PISADIFF |      -0.00       0.00    -0.86    0.39        -0.01        0.00
             |
      wealth |       0.21       0.00    46.32    0.00         0.20        0.22
```

```
        fem |      -0.40       0.01   -53.78    0.00        -0.42       -0.39
       maEd |      -0.00       0.00    -1.80    0.07        -0.01        0.00
```

```
reg ls i.city##c.PISADIFF wealth fem maEd i.Region , robust
```

```
Linear regression                               Number of obs     =    439,300
                                                F(130, 439169)    =     296.71
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0723
                                                Root MSE          =     2.4725

------------------------------------------------------------------------------
             |               Robust
          ls | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        city |
      3-15k  |      -0.21       0.02   -13.19    0.00        -0.24       -0.18
    15-100k  |      -0.27       0.02   -17.71    0.00        -0.30       -0.24
    100k-1m  |      -0.43       0.02   -27.89    0.00        -0.46       -0.40
       gt1m  |      -0.49       0.02   -27.84    0.00        -0.53       -0.46
             |
    PISADIFF |      -0.11       0.01    -8.14    0.00        -0.13       -0.08
             |
        city#|
  c.PISADIFF |
      3-15k  |      -0.00       0.02    -0.22    0.82        -0.03        0.03
    15-100k  |      -0.01       0.02    -0.80    0.43        -0.04        0.02
    100k-1m  |      -0.01       0.02    -0.89    0.37        -0.04        0.02
       gt1m  |      -0.00       0.02    -0.20    0.84        -0.04        0.03
             |
      wealth |       0.21       0.00    46.42    0.00         0.20        0.22
         fem |      -0.40       0.01   -53.75    0.00        -0.42       -0.39
       maEd |      -0.00       0.00    -1.85    0.06        -0.01        0.00
```

.9