

Author's response

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Title: The Impact of Covid19 on the Urban-Rural Happiness

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1 Response to Editor

Dear Professor Burger,

Thank you for the opportunity to submit a revised draft. We have revised the manuscript in light of the reviewers' suggestions. We list below in inline format our brief responses to reviewers' comments and attach at the end tracked changes that show precisely the additions and deletions. In light of the positive peer reviewer's recommendations we are hopeful that you will be able to make a positive decision. We appreciate your consideration. Thank you!

Best,
Authors

2 Response to Reviewer #1

I believe the revision has enhanced the paper. However, there is still room for improvement.

thanks

My specific comments and suggestions follow:

1. Sample selection and country information:

The paper aims to explore how Covid-19 changed subjective well-being (SWB) in cities compared to smaller places. For this inquiry the authors select a sample of countries that can be characterized as severely affected. To what extent the countries are affected is measured by the number of infected and deaths due to Covid-19. In my opinion, the paper would benefit from clearly stating this earlier in the text, explaining the country selection process in detail, and justifying the decisions made.

the country selection process fits better in data section; but early on, at the end of introduction section we now added:

In section “3 Data” we focus on the sample selection from World Values Surveys down to: United Kingdom, the Netherlands, and Uruguay—the countries that are severely affected by the pandemic (infections and deaths) and with substantial samples available pre/during the pandemic for cities/smaller areas.

I believe that the manuscript would be enhanced by additional information on the country cases. As there are only three cases, this should be feasible to do. What kind of policies/restrictions were implemented during the covid-19 pandemic? Do the three cases differ in policy responses? Special attention should be given to policies that may have had different consequences in cities and rural areas. In general, a more detailed description of the country cases would improve the paper, assist in interpreting the results (incl. gauging external validity), and strengthen the discussion. For instance, when interpreting the reduction in SWB for rural areas in GBR (bottom of page 4).

Note: there was already a section in appendix “Covid Trends in GBR, NLD, URY”

Now added in appendix under “Variable Definitions and Distributions” crosstabs by country and urbanicity and wave

And to your point, in terms of policy responses, we have found 3 datasources and added from them in the appendix in a new sec “Policy Responses in GBR, NLD, URY”—the information is substantial, but not perfect or complete and while much information is comparable, there is also a qualitative component not directly comparable.

The sample consists of both developed countries (GBR and NLD) and a developing country (URY). Does it make sense to pool data from countries at different stages of development? Are developing and developed countries expected to be affected by Covid-19 in a similar fashion? Including more justification regarding this decision would improve the manuscript.

We name in the abstract the three countries studied.

Now, also to better orient the reader re sample selection early on, we added at the end of introduction:

In section “3 Data” we focus on the sample selection from World Values Surveys down to: United Kingdom, the Netherlands, and Uruguay—the countries that are severely affected by the pandemic (infections and deaths) and with substantial samples available pre/during the pandemic for cities/smaller areas.

Yes! agreed, the countries are diverse! And this is the very reason we first proceed country-by-country, and only then introduce a pooled model—we now add this point in a footnote in the ms. And note, in the pooled model, as countries are quite diverse, we had country dummies—this point is also now made in the manuscript.

The authors begin the abstract by referring to "the developed world." This seems somewhat unsatisfactory given that the paper also uses data from a developing country. In my opinion, it would also be beneficial to add text and references on urban-rural happiness in developing countries, or perhaps focus more on sources of happiness in different places (see under bullet point 4 for elaboration).

We meant the general background info on the urban-rural happiness gradient more pronounced in the developed countries. But, yes, a fair point, it might have been confusing—now dropped "the developed world" from abstract.

2. Tables:
I am not convinced by the argument made for not having Table 6 in the main text of the paper. The text related to tables 1-3 is focused on comparing what happens in places of different population sizes. The reader will be interested in seeing if these differences are statistically significant.

With 2 figures and 4 tables, it's already plenty of displays, a total of 6; our philosophy was to focus on main findings in the paper and postpone auxiliary analyses to appendix like done in top outlets such as Nature, Science, or PNAS.

Another reason is that it's not just adding table 6—there is a closely related crosstab table following it and another table with alternative specification; hence it would be adding 3 tables, not one. Still, you have a point "The reader will be interested in seeing if these differences are statistically significant" Therefore there is the following text following table 3 in the body of the ms:

In the online appendix we do not split by urban/rural but instead we add a urban/rural dummy and interaction with the pandemic dummy—the interaction is statistically insignificant, i.e., the pandemic differential urban v rural effect is not statistically significant if split by country. However, if the urbanicity variable is not collapsed into the binary urban-rural, but left as several categories, the differences for the Great Britain and Uruguay are statistically significant.

3. Significance levels:
It would be helpful to have some more information on the uncertainty of the estimates. Can you add the estimated standard errors to the OLS tables, or at least provide a description of the significance levels indicated by the stars in a table footer?

yes, apologies, formatting issue in word, now submitted as LaTeX with significance levels in footer

4. Interpretation of "the effect":
The statement "There is a direction, it's just not causal" is very confusing. With the research design used, it would be hard to defend these as causal estimates. For instance, one potential threat to identification is that slower diffusion of infectious disease to rural areas compared to urban areas may have affected the results (in line with the reference in the manuscript by Cuadros et al. 2021). Another threat, which the authors also mention, is omitted variables. Perhaps it is better to call these estimates associations or relationships?

we added a paragraph in limitations section highlighting your points
we do not say in ms "There is a direction, it's just not causal"

we say in abs:

As in any non-experimental research, causality may not be present.

“Perhaps it is better to call these estimates associations or relationships?”—again we do highlight already in abs that data are non-experimental and hence causality may not be present; still, the results are more than associations—we control for predictors of DV; we conduct robustness checks with different specifications, and have before-after (pre and during pandemic) 2 group (urban rural) specification, so called difference-in-difference (DID).—we highlight these points in the added paragraph as well.

I am also curious about how the authors interpret the impact of Covid-19. Is it narrowly focused on disease and mortality (and the scare inflicted by such happenings to people in the vicinity), or could economic consequences of restrictions, such as unemployment, also be part of the relationship? There are potentially many sources to life satisfaction in both rural and urban areas. One of the standard arguments for urban advantage is the availability of commodities, services, and work/career opportunities. The opportunity to take advantage of such amenities were perhaps also reduced by the restrictions? I think the paper could benefit from elaborating on such a “bundle view/domain satisfaction view” of life satisfaction. Such a perspective is indirectly mentioned with exposure to nature being defined as a rural amenity (first paragraph of Section 2), and the faster spread of infectious disease being an urban disamenity.

yes totally! it is arguably also reduction in urban amenities availability! we have hinted at it earlier but now elaborate in discussion section—thank you!

Other comments:

Table 2 and 3 have the same heading.

fixed (in fact all tables 1-3 had the same heading)

As mentioned by reviewer 2, you do not investigate what happens post Covid-19. The first part of the introduction would benefit from reflecting this.

we have fixed that already earlier: it is pre v during; not post
also reviewer 2 says she has been satisfied with the revision

The conclusion and discussion section references the US case quite frequently. It would benefit from focusing more on the countries studied. I do not see the relevance of the last paragraph in this section.

Much data and research on the topic is from the US. Both of us live in the US and have an understanding of urbanization, happiness, and covid in the US.

Still, we cut on the US where it was less relevant.

We have rephrased the last paragraph so it is better connected to the article.

I can imagine that surveys were hard to collect in the countries where Covid-19 hit hardest. Perhaps include some reflections on this and how it might have affected the results? Did it change the response rates?

TODO yes these crosstabs for example that i now added

Limitations and future research: You talk about generalization and countries with different covid-19 infection rates. This is something you have started to look at in the appendix - by including some simple analysis of Morocco and Venezuela. These examples can perhaps be used more actively in the discussion section? In the appendix, perhaps add similar regressions of these countries as the others?

TODO yes

3 Response to Reviewer #2

You have done a good job revising your manuscript. You have satisfactorily responded to all my remarks and suggestions.

great! thanks!

My comments are now minor and concern various errors/omissions in the reference list:

- You do not cite the two publications by Carlsen and Leknes correctly/fully in the reference list. With regards to the first, you write "unpublished" and year 2019, and with regards to the second, you write Regional Studies without informing about the volume number and the page numbers. The correct citations are:

Carlsen, F., and Leknes, S. (2022a). The paradox of the unhappy, growing city: Reconciling evidence. Cities, 126, 103648.

Carlsen, F., and Leknes, S. (2022b). For whom are cities good places to live? Regional Studies, 56(12), 2177-2190.

And consequently, on page 2, line 15/16, instead of "Carlsen and Leknes (2019, 2022)", please write "Carlsen and Leknes (2022a, 2022b)".

- On page 2, line 14, you write "Sorensen (2020)", but the surname is spelled wrong, and the publication year is wrong. So instead of "Sorensen (2020)", please write "Sørensen (2021)". In the citation in the reference list, the surname and the publication year are also wrong. In addition, the citation lacks both the volume number and the article number. The correct citation to write in the reference list is the following:

Sørensen, J. F. L. (2021). The rural happiness paradox in developed countries. Social Science Research, 98, 102581.

TODO

4 Tracked Text Changes

(see next page)

The Impact of Covid19 on the Urban-Rural Happiness Gradient

Friday 26th April, 2024 07:08

abstract:

People in the developed world tend to be less happy in cities than in rural areas, i.e., the so called “urban-rural happiness gradient.” The recent covid19 pandemic offers an opportunity to explore one of the disadvantages of large cities and dense settlements: the greater spread of infectious diseases. Thus, in this paper, we examine how covid19 affected happiness in the largest cities compared to smaller areas using the World Values Survey. A remarkable finding is We find a large differential, or effect size pre-post, pre v during pandemic for cities versus smaller areas. Cities areas cities became two times less happy post-pandemic during the pandemic versus pre-pandemic compared to smaller areas. In absolute terms, while .2 to .5 difference on a 1-10 SWB scale is small, one must take into account not large, given the massive scale of urbanization: .2 to .5 on a 1-10 SWB scale for millions of people is a massive slump in human wellbeing. Findings are correlational, not causal, the practical effect in the population is large. As in any non-experimental research, causality may not be present. The results from Great Britain, the Netherlands, and Uruguay studied here may not generalize to other countries, especially ones with much different covid19 rates, policy responses, and urbanization patterns.

URBAN, RURAL, URBAN-RURAL HAPPINESS GRADIENT, HAPPINESS, LIFE SATISFACTION, SUBJECTIVE WELLBEING, COVID19, WORLD VALUES SURVEY (WVS)

¹Here is the great city: here have you nothing to seek and everything to lose. —Nietzsche(Nietzsche)

1 Introduction

Covid19 has changed our way of life (?). Pre-pandemic there was city renewal, rebirth, and urban triumphalism. Just a few years back, Ed Glaeser wrote a bestselling book titled, “Triumph of the cityCity” (?). Now, post-pandemic, there is The pandemic however brought urban scepticism, scare, and, in some cases, urban collapse and scare. Many cities were hollowed out in important ways by the covid19 pandemic. covid19—commercially (e.g., offices, restaurants, stores) and residentially (many urbanites fled urban centers to less dense areas particularly in the suburbs) (?). Pundits now wonder if the “golden era for large cities’ might be turning into an ‘urban doom loop’ (??).

The covid19 pandemic has exposed the differences between urban and rural areas exposed urban-rural differences. A person’s chance of getting the virus and surviving it was closely associated to their zipcode (?). Urban areas were the epicenters of the virus outbreak: the dense population and inevitable close proximity to others, a defining feature of cities, resulted in rapid transmission and a fertile ground for infection. One of the disadvantages of city life is the increased spread of infectious disease¹ (??). The transmission of infectious disease is a social contact process. Urbanization can increase increases the conditions and statistical likelihood that microbes are being spread, which has resulted in a tripling of the total number of disease outbreaks per decade since the 1980s (???). Although the scale of covid19 was unparalleled, major infectious disease outbreaks in the past, e.g., SARS and Ebola, occurred in

¹See for example, “SIR Models for Spread of Disease” (??).

urbanising hinterlands and quickly spread to metropolitan areas (?). Rural areas, in contrast, given their ~~lower~~-low population density and geographic isolation, provide a natural social distancing environment that slows the spread of infectious viruses. As such, covid19 affected cities more than smaller areas (?).

In the present study, we take a development perspective using a measure of human development, progress, or flourishing: subjective wellbeing (SWB). Our hypothesis is that since cities suffer disproportionately from infectious diseases, city happiness decreased disproportionately during the covid19 pandemic.

We start with a brief ~~overview of discussion of the urban-rural happiness gradient, point to gaps in the literature, and reflect on~~ how covid19 impacted different aspects of life in urban versus rural areas. ~~Next we present the underlying theory, the urban-rural happiness gradient theory suggesting that happiness should be observed in the least dense and heterogeneous places, such as rural areas. We end the literature review by pointing to gaps in the literature and pro-urban proclivity pre-pandemic.~~ Our empirical analysis follows and we conclude with a discussion of the results and limitations/directions for future research.

2 Urban-Rural HappinessGradient

~~? investigated global differences in satisfaction with urban life. In developed countries, rural residence increased happiness at double the rate that big-city residence boosted malaise, a pattern most pronounced in societies with an Anglo-Saxon heritage. ? found that~~ The urban-rural happiness gradient states, generally, that happiness raises from its lowest in largest cities to its highest levels in more advanced developed countries, rural areas approach or exceed urban areas in life satisfaction, while in developing countries the low levels of economic development result in gaps favoring urban areas over rural areas when it comes to income, education and life satisfaction. Over the last decade, many studies have explored the urban-rural happiness gradient around the world. This body of research has indicated that generally, rural residents tend to report higher levels of happiness compared to their urban counterparts for recent review see ?. There are notable exceptions, however, Millennials in the US for example (?). smallest places, little towns, villages, and open country. Often the gradient is simplified as a gap that exists between the extremes, i.e., large cities versus rural areas. Urban unhappiness is common (??????). Recent studies added nuance: ??????. As a corollary, exposure to nature, the opposite of urbanicity, is related to happiness (?????).

~~In a recent paper,~~

? points out that only a few studies examine the effect of covid19 on SWB. ? ~~does an overall~~ do an overall analysis for Europe, but ~~misses~~-miss the urban-rural differential. Thus, this is the first study on this topic.

Health is one of the strongest predictors of SWB, if not the ~~very strongest~~-decent strongest—decent health is clearly necessary for SWB (e.g., ?) ~~—health is and therefore,~~ expected to be strongly linked with SWB. ~~And cities suffer disproportionately during pandemics~~ During pandemics, city inhabitants suffer disproportionately in terms of health. ~~—Again, because~~ cities are hotbeds of infectious ~~disease—infections~~ disease—infections and contamination are promoted by proximity and close contact between ~~humans—by definition~~ humans—by definition, cities offer the most fertile ground for infectious ~~disease~~ diseases to spread.

There are detailed data for the geography of the covid19 pandemic in the US, and other countries likely followed a similar pattern—large central metropolitan areas were the most affected compared to fringe metros and medium cities (?). The covid19 urban disadvantage at the beginning of the pandemic translated to almost 2x more incidences of the disease and almost 3x more mortality in urban areas compared to rural areas. Then, the rates converged and towards the end of the pandemic, cities recovered while rural areas had higher rates (?). Still, the urban (not rural) scare ~~remains—cities remains~~² as cities are hit first by pandemics, and proximity to others ~~and~~ astronomically increase the chance of infection ~~is astronomically greater in the cities—and death.~~

It is important to underscore that the infection rates are reported per capita, for example, per 100,000 population. If it was reported

²This is a speculation, of course, and future research is needed. However, pundits and scholars are starting to discuss how the era of “urban supremacy” might be over and the covid19 pandemic was a catalysis for this phenomenon, see for example (?).

per area, say ~~sq-km~~ square kilometers (sq km), i.e., how much disease incidence is recorded in a particular area, the urban disadvantage would have been ~~astronomical-enormous~~ during covid19. For instance in New York City, the population density is about 11k/sq km, whereas in Montana it is about 3/sq km, ~~this is~~ about a 3600x difference. Urban density not only increases the risk of infection and the spread of infectious diseases (?), but it also increases the need for social distancing—which in itself (regardless of a pandemic) has a negative effect on SWB by causing psychological distress (?).

3 Data

We use the World Values Survey (WVS) 7-wave (1981-2022) cumulative file freely available at ~~their website~~: worldvaluessurvey.org. ~~We proceed as follows with the sample selection: the~~ The WVS is representative of countries, typically with country-wave samples of over 1k. The key variables are urbanicity and happiness—variable descriptions and distributions, including control variables, are in the online appendix for peer review appended at the end.

~~The~~ rate of covid19 infection increased substantially later in 2020, peaked in 2021 ~~, and still had a considerable effect in 2022. Hence, we restrict and again in 2022 (see online appendix for covid19 data from~~ coronavirus.jhu.edu/region). ~~Hence,~~ the covid19 period sample ~~to is~~ 2021 and ~~2022 (2023 is not available yet).~~ Data 2022.

The WVS data in 2021 are only available for ~~small developing countries with small cities (not much urbanism):~~ Armenia, Kenya, Maldives, Morocco, and Venezuela.³ ~~Hence, for~~ We drop Armenia, Kenya, and Maldives. Armenia's pre-pandemic sample for large city is only 4 respondents. Kenya was only observed in one time period in WVS, 2021. The Maldives is a small island without an urban-rural gradient.

Morocco, a country of 37 million people, seem to have been largely spared from the pandemic: only 1.2m cases (3%) and 16k deaths. While Venezuela, which is under a dictatorship largely cut off from the world, might have been protected from covid19 (or perhaps the statistics are tampered with) due to its isolation—despite having about 30 million people in its population, there were only .5m cases (2%) and 5k deaths, compared to neighboring Colombia with a population of 50m with more than 10x the number of cases, 6.3m, and 142k deaths. All cases and deaths data are from coronavirus.jhu.edu/region. We examine these two cases, Morocco and Venezuela, further in the online appendix.³

In 2022 we retained WVS sampled: Czechia, Libya, Netherlands, Northern Ireland, Slovakia, United Kingdom, and Uruguay. ~~Next, we checked sample sizes by year and urbanicity (X049) for each country. We excluded: Czechia—it had no~~ We dropped: Czechia—no city with a population larger than > 500k before 2022 ; Libya—there were only sampled: Libya—only 7 respondents in cities larger than > 500k before 2022; Northern Ireland—the total sample size is 447 and there's data only Ireland—data for one wave only; and Slovakia—only 61 respondents in cities with a population larger than > 500k pre-2022. Which leaves us with: the United Kingdom (GBR) with 25m cases out 67m population (37%) and 221k deaths, the Netherlands(NLD) with 8.7m cases out of 18m population (48%) and 24k deaths, and Uruguay (URY) with 1m cases out of 3.4m population (30%) and 7k deaths.

4 Results

The results are displayed in ~~figure~~ Figure 1. Each panel shows results for a separate country: United Kingdom (GBR), the Netherlands (NLD), and Uruguay (URY). The Y axis is life satisfaction, and the ~~X-axis is the urban-rural gradient—degrees~~ X axis is the rural-urban gradient, degrees of urbanicity. ~~Blue~~ The blue bars show pre-pandemic averages (year varies by country; the latest available), and ~~the~~ green bars show pandemic ~~/post-pandemic~~ averages (2022).

³Kenya does have large cities but it has been largely spared from covid19—at 50m population it only had 342k cases (less than 1%) and 6k deaths. Likewise, there are large cities in Venezuela, but it is a dictatorship largely cut off from the world, which might have protected it from covid19—despite being about 30m there were only .5m cases and 5k deaths, while in neighboring Colombia of 50m there were 6.3m cases and 142k deaths—

³We thank an anonymous reviewer for making this suggestion

The focus here is on the differential from the bar graphs for cities (>.5m) before and during the pandemic (the last two bars in each country panel). The baseline for urbanicity is smaller areas (all other bars, <.5m).

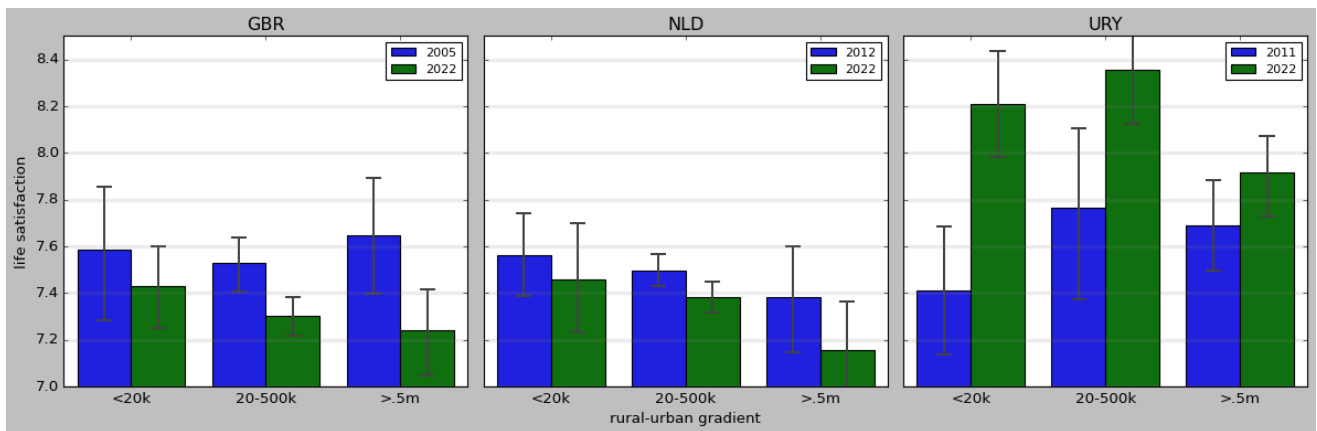


Figure 1: Life satisfaction (1 = *unhappy* to 10 = *happy*) means with 95% CI against rural urban gradient categories. GBR = United Kingdom, NLD = Netherlands, URY = Uruguay.

In both the United Kingdom (GBR) and the Netherlands (NLD), the biggest difference pre-post pre-during pandemic (blue v green bar) is for the largest places (>.5m). Uruguay (URY), on the other hand, experienced an increase in SWB pre-during pandemic across different urbanicity levels, but the largest places (>.5m) increased the least. Thus, across the three countries, we find support for our hypothesis that large cities' happiness suffered disproportionately post-during the pandemic. Next, we repeat the analysis shown in figure 1 bar graphs, but with more detailed urban-rural classification to explore nuances in figure Figure 2.

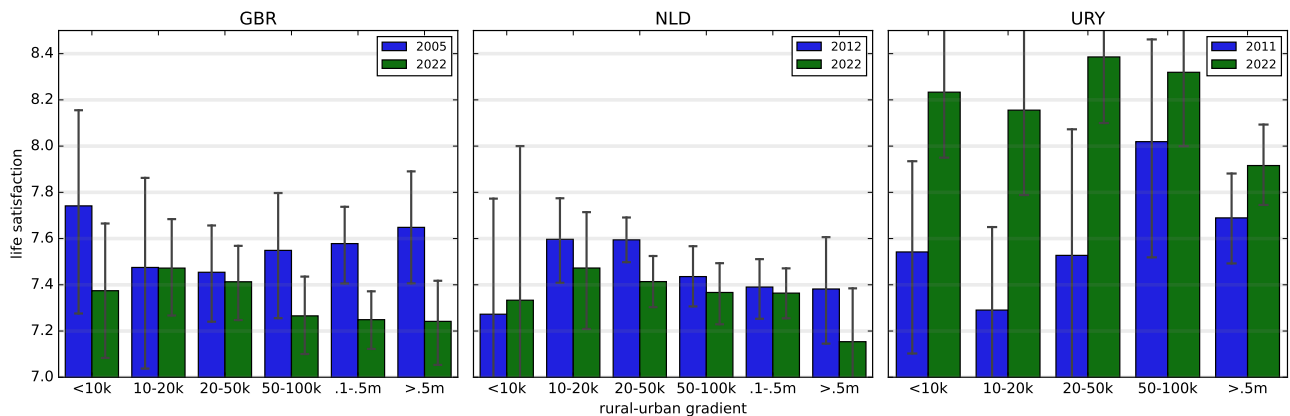


Figure 2: Life satisfaction (1 = *unhappy* to 10 = *happy*) means with 95% CI against rural urban gradient categories. GBR = United Kingdom, NLD = Netherlands, URY = Uruguay. Note: URY is missing .1-.5m cat-category due to small cell sizes.

The results show that in the United Kingdom, pre-pandemic, the happiest places were the smallest (< 10k), while during the pandemic, both the smallest and largest places were most affected and saw significant reduction in SWB. It is unexpected to see this reduction in the smallest places, and the result could be due to some country specific factors.

In the Netherlands, there's not much change in subjective well-being SWB in the smaller places pre and post-during the pandemic, except for the largest cities where there's a significant larger drop in SWB as expected. There was also a smaller drop in places with 10-20k, and especially in the 20-50k categories.

Uruguay, a developing country, shows a different story: SWB increased across urbanicity, including the largest areas (>500k.5m), but that's also where the smallest increase occurred, as expected. Many of the CI are wide, and it is not clear which differences are so

even large mean differences may not be statistically significant.

Next, we test the differences with ~~regression.~~ OLS regression.⁴ First, since the focus is on cities versus smaller areas (rural and towns), for simplicity, we collapsed ~~categories up to all categories~~ $< .5m$ into one, as rural and towns, and contrast ~~this category it~~ with cities (~~larger than~~ $> .5m$).

There are also two technical reasons for ~~this approach such a binary gap approach versus using the original gradient in the bar charts~~. It is a simpler exposition to have an urban dichotomy as opposed to a ~~full~~ gradient, given that we also have two other breakdowns: ~~pre-post-COVID~~ ~~pre-during COVID~~, and by country. And, critically, the cell sizes run small with too many breakdowns for this relatively small dataset. When more data becomes available, future research should test the full urban-rural gradient.

Our hypothesis is that while the pandemic decreased SWB in general, we expect to see an even greater SWB decrease in cities. We are focused on the ~~pre-post~~ ~~pre-during~~ pandemic differences in SWB levels in ~~big-city~~ ~~city~~ ($> .5m$) versus smaller areas ($< .5m$).

The bivariate regression results are ~~set in table in~~ Table 1. We first separate our analyses by country and then within each country by rural and towns (~~$< .5m$~~ ~~v~~ ~~$< .5m$~~) versus cities ($> .5m$). We regress life satisfaction on a year dummy for 2022 with the base case being the latest pre-pandemic wave as shown in ~~figures~~ Figures 1 and 2.

	GBR		NLD		URY	
	$< .5m$	$> .5m$	$< .5m$	$> .5m$	$< .5m$	$> .5m$
2022	-0.21**	-0.41**	-0.12**	-0.23	0.75***	0.23+
constant	7.54***	7.65***	7.50***	7.38***	7.54***	7.69***
N	3111	521	3572	373	1154	836
adj R2	0.003	0.008	0.002	0.002	0.036	0.002

+ 0.10 * 0.05 ** 0.01 *** 0.001; robust std err

Table 1: OLS regressions of life satisfaction. WVS country samples split by rural and towns ($< .5m$) v cities ($> .5m$)

The effect sizes on the year 2022 dummy are the bar length differences from ~~fig 1~~ Fig 1 or 2 for cities ($> .5m$) and the average bar lengths for smaller areas now collapsed as ($< .5m$). For GBR the difference ~~pre-post~~ ~~pre-during~~ pandemic is about .2 for rural areas and towns ($< .5m$), and the difference for cities ($> .5m$) is about .4, and so forth for the NLD and URY. A remarkable finding in our analysis is the roughly 2 times difference for GBR ~~and NLD~~ (.2 v .4) and NLD (.1 v .2), and 3 times difference for URY ~~this~~ URY (.7 v .2)—this is a strong differential. When comparing cities ($> .5m$) versus smaller areas ($< .5m$), cities became 2 to 3 times less happy ~~post-pandemic~~ ~~during the pandemic~~ compared to pre-pandemic levels.

Still, one of the coefficients for the NLD is not significant, and only weakly significant for URY, and there is left out variable bias. Differences in SWB levels should be even bigger when controlling for SWB predictors as the urban rural happiness gradient often emerges only after controlling for SWB predictors (?). Hence, we elaborate our models with SWB predictors in ~~table~~ Table 2.

	GBR		NLD		URY	
	$< .5m$	$> .5m$	$< .5m$	$> .5m$	$< .5m$	$> .5m$
2022	-0.18*	-0.39+	-0.20***	-0.45**	0.42***	0.21
income	0.09***	0.01	0.06***	0.14***	0.07*	0.13***
age	-0.03*	-0.08**	-0.02+	-0.06+	0.00	-0.06**
age2	0.00**	0.00**	0.00**	0.00*	-0.00	0.00**
male	-0.18**	-0.13	-0.11*	-0.27+	0.06	0.19
married or living together as married	0.53***	0.74***	0.44***	0.23	0.46**	0.06
divorced/separated/widowed	0.07	0.15	-0.11	-0.14	-0.37+	-0.19
autonomy	-0.11*	-0.07	-0.11**	-0.01	-0.06	0.06
freedom	0.44***	0.42***	0.35***	0.43***	0.43***	0.36***
trust	0.12+	0.42**	0.43***	0.28+	-0.05	0.10
postmaterialist	-0.05	-0.18	-0.11*	0.14	-0.02	0.15
god important	0.01	0.05*	0.02*	-0.01	0.05**	0.06**
constant	4.08***	5.95***	4.59***	4.80***	3.47***	4.58***
N	1985	309	2283	237	736	579
adj R2	0.321	0.313	0.279	0.398	0.276	0.201

+ 0.10 * 0.05 ** 0.01 *** 0.001; robust std err

Table 2: OLS regressions of life satisfaction. WVS country samples split by rural and towns ($< .5m$) v cities ($> .5m$)

The elaborated models in ~~table 2~~ Table 2 mostly confirm our earlier results. We find that there's again roughly a 2 times difference for GBR and the NLD, while for URY the differential is reduced from about 3 times to roughly 2 times as well.

⁴ The usual argument in favor of OLS over categorical models is repeated in the online appendix. And a set of control variables is also motivated.

As a robustness check we add “health” as a control variable in [table Table 3](#). It is important to underscore that there’s a confounding effect between [pre-post-pre-during](#) covid19 and health by definition. And there will also be confounding effects between urbanicity and health since covid19 is more prevalent [in-\(at least in initial phase\) in](#) cities as previously discussed. Hence, these regressions are less useful in determining [pre-post covid19 urban-rural differentials](#). ~~Taking into account health, the results on the over-time SWB difference-pre-during difference, and the coefficients~~ are smaller and less significant, as expected. Remarkably though, we find that the urbanicity differentials, even though less statistically significant, are still about 2 times larger for GBR and URY and even stronger for the NLD. ~~Arguably, the high infections rate of covid19 in cities is in addition to other urban problems such as misanthropy and overall malaise (?????). Future research is needed.~~

	GBR		NLD		URY	
	< .5m	> .5m	< .5m	> .5m	< .5m	> .5m
2022	-0.12	-0.26	-0.06	-0.24+	0.44***	0.23
health	0.48***	0.67***	0.62***	0.77***	0.56***	0.32**
income	0.05**	-0.01	0.04***	0.08**	0.05	0.12***
age	-0.02*	-0.07*	-0.01	-0.03	0.01	-0.05*
age2	0.00**	0.00**	0.00**	0.00+	-0.00	0.00*
male	-0.16*	-0.15	-0.09+	-0.23+	-0.01	0.14
married or living together as married	0.49***	0.60**	0.38***	0.21	0.41**	0.04
divorced/separated/widowed	0.05	0.20	-0.15	-0.27	-0.36+	-0.16
autonomy	-0.12**	-0.09	-0.10**	0.07	-0.09	0.04
freedom	0.38***	0.29***	0.29***	0.31***	0.40***	0.35***
trust	0.07	0.28*	0.34***	0.21	-0.07	0.01
postmaterialist	-0.05	-0.26+	-0.09*	0.06	0.01	0.12
god important	0.01	0.02	0.02+	0.00	0.05**	0.06**
constant	2.72***	4.29***	2.46***	2.01*	1.31+	3.31***
N	1985	309	2279	236	736	578
adj R2	0.379	0.416	0.371	0.527	0.320	0.216
+ 0.10 * 0.05 ** 0.01 *** 0.001; robust std err						

Table 3: OLS regressions of life satisfaction. [WVS country samples split by rural and towns \(< .5m\) v cities \(> .5m\)](#).

[In the online appendix we do not split by urban/rural but instead we add a urban/rural dummy and interaction with the pandemic dummy—the interaction is statistically insignificant, i.e., the pandemic differential urban v rural effect is not statistically significant if split by country. However, if the urbanicity variable is not collapsed into the binary urban-rural, but left as several categories, the differences for the Great Britain and Uruguay are statistically significant.](#) Finally, we pool data for the three countries ~~together—together in Table 4.~~ ~~it is useful to formally test the differences with interactions in table 4.~~

	a1	a2	a3	a4	a5
pandemic	-0.20**	-0.13+	-0.10	-0.02	-0.18*
city lg500k	0.05	0.19*	0.20*	0.11	0.07
pandemic × city lg500k	-0.26*	-0.26*	-0.26*	-0.21+	-0.15
United Kingdom	-0.04	0.03	0.08	-0.01	-0.04
Uruguay	0.82***	0.92***	0.95***	0.68***	0.43***
2011	-0.82***	-0.72***	-0.54***	-0.47***	-0.44***
2012	-0.10	0.15+	0.11	0.02	0.05
income		0.14***	0.13***	0.08***	0.08***
age		-0.05***	-0.04***	-0.03***	-0.03***
age2		0.00***	0.00***	0.00***	0.00***
male		-0.16***	-0.17***	-0.16***	-0.11**
married or living together as married		0.46***	0.46***	0.39***	0.44***
divorced/separated/widowed		0.01	0.01	-0.03	-0.07
god important			0.03***	0.03***	0.02***
trust			0.38***	0.25***	0.26***
postmaterialist			-0.04	-0.05+	-0.04
autonomy			-0.10***	-0.10***	-0.09***
health				0.71***	
freedom					0.40***
constant	7.58***	7.42***	7.14***	4.40***	4.47***
N	9196	7746	6038	6032	5970
adj R2	0.020	0.094	0.113	0.230	0.291
+ 0.10 * 0.05 ** 0.01 *** 0.001; robust std err					

Table 4: OLS regressions of life satisfaction. [Country-wave pooled models](#).

We start with a basic model where we regress life satisfaction on a dummy for the largest cities, and [post-pandemic-during-pandemic](#) wave dummy where “[post-pandemic](#)” = 1 if *year* = 2022. We also include country dummies, as we now pull all the data together. We also include year dummies in addition to [pre-post-pandemic](#) dummy since data were collected in different countries in different years.

In column a1, as expected ~~we see that post-~~, [during the](#) pandemic SWB went down by -.2, and especially so for cities by an additional

-26. When adding basic controls in model a2, ~~we find that the main variable of interest testing our hypothesis, post-~~ "pandemic*city lg 500k," stays about the same at -.26. We include an extended list of controls in model a3, and again the coefficient stays at -.26. It is only after adding "health" in model a4 that the coefficient slightly drops to -.21. ~~Finally, the~~

~~The~~ addition of freedom in model a5 cuts the effect most substantially to -.15 and loses statistical significance. ~~Future research should further explore why controlling for "freedom"~~ The freedom variable comes from the following survey item: "Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them. Please use this scale where 1 means 'none at all' and 10 means 'a great deal' to indicate how much freedom of choice and control you feel you have over the way your life turns out." A rationale to look at freedom is that it confounds with city; i.e., cities have more freedom than rural areas at least in some senses. The idea goes back at least to Ferdinand Toennies' "Gemeinschaft und Gesellschaft" (?)—city air is free—e.g., nonstandard/nonconformist people, such as LGBTQ, are more free in an urban area.

The WVS freedom variable also measures control over one's life. Clearly, during the covid19 pandemic, city residents, all things equal, would have felt a greater loss of control over their lives since they were more exposed to being infected. This explains why it 'freedom' removes the effect ~~of the interaction variable "pandemic x city lg500k."~~⁵

5 Conclusion and Discussion

The ~~present study argues that the~~ covid19 pandemic has ~~adversely impacted SWB around the world, but especially lowered SWB in large cities and metropolitan areas. Before the~~. In the US, before the pandemic, city happiness was on the rise relative to rural areas (?). As rural areas have been left behind (?), the rural happiness advantage has decreased. A rural Californian explains (? , p. 2):

"In the rural parts of the state we drive more miles, we drive older cars, our economy is an agriculture- and resource-based economy that relies on tractors. You can't move an 80,000-pound load in an electric truck. They've devastated ag [agricultural] jobs, timber jobs, mining jobs with their environmental regulations, so, yes, we have a harder time sustaining the economy, and therefore there's more people that are in a poorer situation."

~~The situation may be similar in many other countries—urbanization had been favored over rurality in world development in general (?).~~

Ironically, the covid19 pandemic made the economic advantage and prosperity of cities quickly wither away. The pandemic created significant economic turmoil particularly in large urban centers: as businesses and industries shut down, millions lost their jobs, and thousands fled to the suburbs or smaller places, hoping to avoid human interaction and protect themselves against the virus. Places like New York City, that were vibrant and full of life, became dull and empty. Still, as of 2023, much of ~~the~~ commercial real estate in urban cores is empty.

Urban and rural areas experienced and coped with the pandemic very differently. Urban areas became the center of coronavirus outbreaks around the world, and many cities saw their healthcare systems become quickly overwhelmed given the magnitude of the ~~virus—makeshift virus—makeshift~~ hospitals and makeshift morgues were set up in ~~cities—urban places~~ like New York City.

There's always a strong correlation between subjective well being and health. Health is the key predictor of ~~happiness—almost happiness—almost~~ no one considers health unimportant (e.g., ?). The virus not only made people severely ill, but it prevented people who had any other health emergencies or issues from being properly taken care of (e.g., cancer, heart disease, diabetes). ~~This was~~

⁵The original WVS code We thank an anonymous reviewer for the freedom variable is A173: "Some people feel they have completely free choice and control over their lives providing this explanation. Likewise, while other people feel that what they do has no real effect on what happens the anonymous reviewer also points to them. Please use this scale where 1 means 'none at all' and 10 means 'a great deal' to indicate how much freedom of choice and control institutional trust (the more you feel trust the institution the more you have over are confident that the way your life turns out." A rationale to look at freedom COVID-19 situation is that it confounds with city; handled well by the authorities). e., city has more freedom than Maybe rural at least in some senses residents have higher institutional trust and if so, maybe this could explain their lower loss of happiness. The idea goes back at least to Ferdinand Toennies' "Gemeinschaft und Gesellschaft" (?)—city air is free—eFor discussion see ? . g.Future research could further explore freedom, nonstandard/nonconformist types such as LGBTQ are more free in a city control, and institutional trust.

~~particularly an issue in large metropolitan areas. The~~ Thus, the number of people who's health was directly or indirectly affected by covid19 is significantly larger than the reported statistics of covid19 infection. This was particularly an issue in large metropolitan areas. Covid19's impact on wellbeing is arguably larger than simply measuring it by incidence, hospitalization, and death counts—e.g., social distancing in itself (regardless of infection) increases psychological distress (?). Thus, it is no surprise that our findings show such a significant and relatively large drop in happiness levels in cities as compared to smaller places.

Understanding the urban-rural discrepancies is important because policymakers can implement policies targeted to create a more healthy and livable environment for urban and rural residents based on the different challenges they experience to foster happiness. The spread of infectious disease in cities is unavoidable and will likely happen again in the near future. Learning from the challenges brought by covid19 might result in lifesaving, health and happiness promoting measures.

It is important to highlight that only the initial phase of an infection per capita is greater in cities, then urban versus rural rates converge~~and in last stage~~, and in the last stage, infections are higher in rural ~~as cities got~~ areas as cities get hit first and ~~recovered first~~ recover first (?)—at least in the US—and we assume that elsewhere the mechanism will be similar.

But there is arguably a strong psychological effect, urban scare, that will also last well ~~after the pandemic for the foreseeable future~~ beyond the pandemic in the foreseeable future—future research can test it. Likewise, urban quality of life versus rural quality of life even given ~~the same~~ similar⁶ per capita infection is very different—one can easily go about daily life and even enjoy most rural activities in rural areas, while the opposite is true in ~~cities—city—cities—the urban~~ way of life is unbearable during a pandemic ~~is unbearable.~~

The massive difference in population density of urban versus rural needs to be underscored. The disproportionate population density signifies that even if the infection rate were similar across urban-rural areas, the difference in infection rate per sq km would be massive. And this is one key factor behind the urban scare from covid19—the sheer number of infections in one's proximity was astronomical.

~~Many people think that covid19 is largely gone and cities are safe to return to. One of the authors of this study was reckless enough to go to a large city, New York City, and surely enough just got infected with covid19 this summer (2023) when we were revising this paper. We advise the readers to keep away from large cities—you will be safer from infectious disease and happier.~~

In many ways, cities cannot be ~~fixed—there is~~ fixed—there is an inherent conflict, dysfunction and even misanthropy in metropolis ~~???????~~. Others would argue that a city can be fixed and made happier (for a review see ?). ? offers many ideas by 10 philosophers. For instance, to re-imagine cities as places that offer convivial and sensual shared space for shared pleasure, “a mesh of small, safe, intimate places, rather than a series of grand urban projects.”

6 Limitations and Future Research

~~As more~~ These are the first analyses examining the urban-rural SWB differential during the covid19 pandemic. As such, there are limitations that need to be considered. First, even though population size and density correlate, they are not the same—future research could use density to explore whether these findings are robust. Unfortunately, the WVS only measures urbanicity by population size, and we know that the spread of infectious diseases like covid19 and the subjective “urban scare” are not only due to population size, but also refer to density.

In addition, there may be time effects—covid19 developed differently in different places over time—see covid19 trajectories in the online appendix. We only used 2 periods for each country—before and during the pandemic. Another dataset that has more time points would be useful to test the robustness of these findings.

As more data becomes available, it will be instructive to closely examine countries that were most affected by covid19. The results from Great Britain, the Netherlands, and Uruguay studied here may not generalize to other countries, especially ones with much

⁶Assuming similar per capita rates is not illogical: cities experience increased infection rate only initially, but then infection rates in smaller areas rise as cities recover and disease spreads to smaller areas.

[different covid19 rates, policy responses and urbanization patters](#). Italy and the U.S., for example, will probably show much greater negative effects on SWB than what we found in [GBR, the NLD and URY](#) [the UK \(GBR\)](#), [the Netherlands \(NLD\)](#) and [Urguguay \(URY\)](#). Although covid19 infection rates are significantly lower now [\(in 2023\)](#), and another massive pandemic could be decades ahead, we'll likely experience covid19 lingering effects for many years to come. This could arguably include urban scare, prevalence of misanthropolis (a metropolis full of distrust and dislike of humankind) (?), and possibly an urban crisis. It would be useful to study the long term effect on urban-rural [gradient-happiness gradient/gap](#) and whether covid19 has [widen-widened](#) more permanently the urban-rural happiness gap that had been closing prior to the pandemic (?).

This is only the first study on the topic and more research is needed to examine the impact of covid19 on the urban-rural gradient/[gap](#). We are interested in the general and overall patterns we observed [here](#) and believe it provides a good starting point for a much needed debate on this topic. Future research can focus on a more direct link between infections, hospitalizations, and deaths and SWB by linking public health data with SWB data for specific locations. Likewise there is a huge difference in infection rates across countries (e.g., Italy, the US, China), and across places within countries. Such differences could be perhaps explored in a natural experiment framework where massively infected area can be matched with a similar area but with low infection rate.

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7 [Online Appendix](#)

7.1 [Variable Definitions and Distributions](#)

Table 5: Variable definitions.

name	description
happiness	"All things considered, how satisfied are you with your life as a whole these days?" 1="dissatisfied" to 10="satisfied"; WVS
place size	"OBSERVATIONS BY THE INTERVIEWER; Code size of town where interview was conducted"
income	"Scale of incomes"
age	age
male	male
married or living together as married	"Are you currently(READ OUT AND CODE ONE ONLY) 1 'Married' 2 'Living together as married' 3 'Divorced' 4 'Separated' 5 'Widowed' 6 'Single/Never married' 7 'Divorced, Separated or Widow' 8 'Living apart but steady relation (married,cohabitation)'"
divorced/separated/widowed	"Are you currently(READ OUT AND CODE ONE ONLY) 1 'Married' 2 'Living together as married' 3 'Divorced' 4 'Separated' 5 'Widowed' 6 'Single/Never married' 7 'Divorced, Separated or Widow' 8 'Living apart but steady relation (married,cohabitation)'"
autonomy	"Autonomy index"
freedom	"Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them. Please use this scale where 1 means 'none at all' and 10 means 'a great deal' to indicate how much freedom of choice and control you feel you have over the way your life turns out."
health	"State of health (subjective)"
trust	"Most people can be trusted"
postmaterialist	"Post materialist index "
god important	"How important is God in your life? Please use this scale to indicate- 10 means very important and 1 means not at all important."

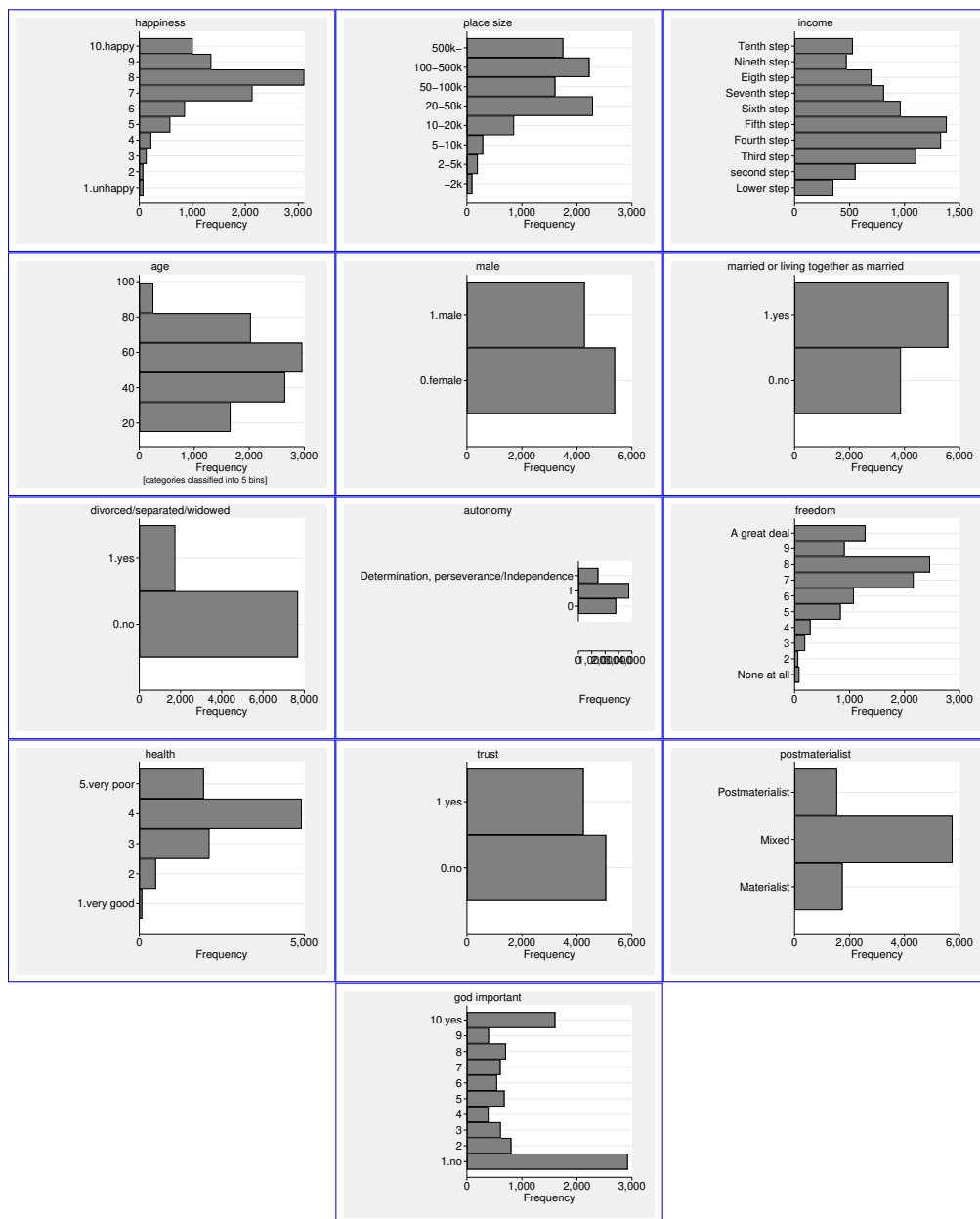


Figure 3: Variables' distribution.

7.2 Model and Controls

We use a standard OLS regression with robust standard errors. We treat the 10-step happiness variable as continuous. Ordinal happiness can be treated as a continuous variable (?). OLS has become the default method in happiness research (?). Theoretically, while there is still debate about the cardinality of SWB, there are strong arguments to treat it as a cardinal variable (??).

In the choice of controls, we generally follow ?. There are specific controls worth discussing. One great advantage of city living that is often forgotten is freedom, "City air makes men free (Stadt Luft macht frei)" ?, p. 12⁷, hence we control for freedom. Health is a key predictor of SWB, and also note that the subjective health measure used here is a reasonable measure of actual health (?).

More discussion regarding the control choice of freedom is in the paper at the end of the results section.

⁷It originated in the Middle Ages, and it meant freedom from feudalism, non-feudal islands in a sea of feudalism (?).

7.3 Morocco (MAR) and Venezuela (VEN)

Morocco (MAR), like Uruguay (URY) in the body of the paper, increased SWB everywhere, but least in the largest cities (>500k), and also in 100-500k category. The 20-50k category should not be interpreted as there are only 22 observations in 2001, (and 0 obs in the 50-10k category).

In the case of Venezuela (VEN), most places had a drop in SWB, and while larger places had a little more drop than smaller ones, there are no clear patterns unlike in other countries. And this is not surprising. Venezuela, like Morocco, only had a little proportion of its population affected by covid, about 2-3 percent. But unlike Morocco, it is a non-free autocracy with an unstable/turbulent economy—we did not expect to see much of an effect of covid in Venezuela.

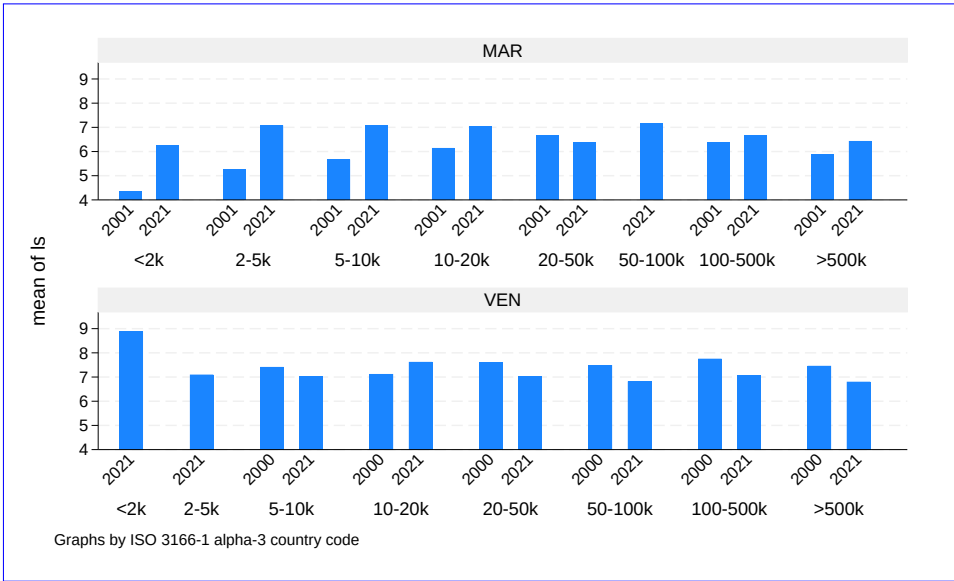


Figure 4: Urban-rural happiness gradeint in Morocco and Venezuela pre and during the pandemic.

7.4 Covid Trends in GBR, NLD, URY

Ideally, we would like to see trends by settlement size, but these are best and most cross-country consistent data we have found—data from <https://coronavirus.jhu.edu/region>.

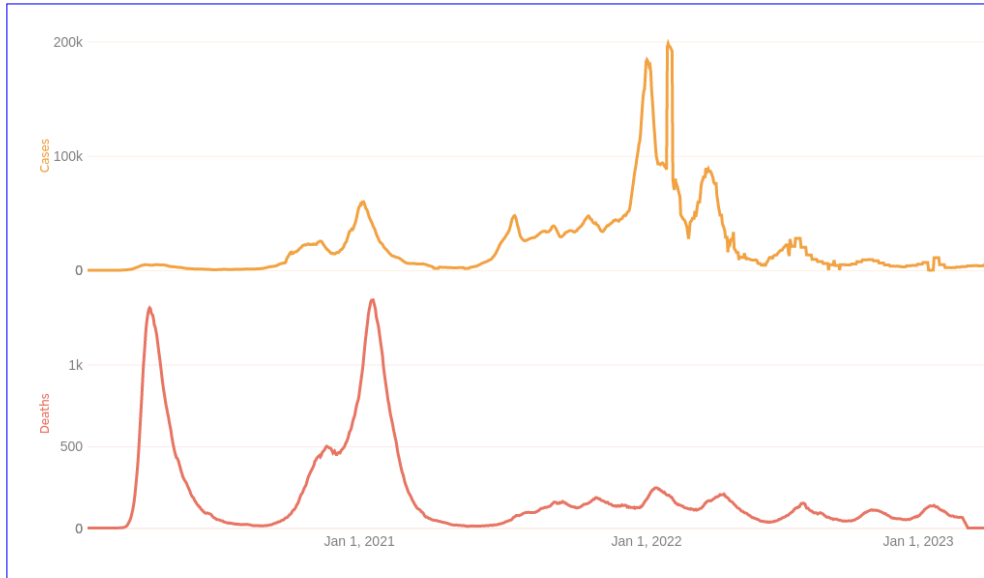


Figure 5: [GBR](#)

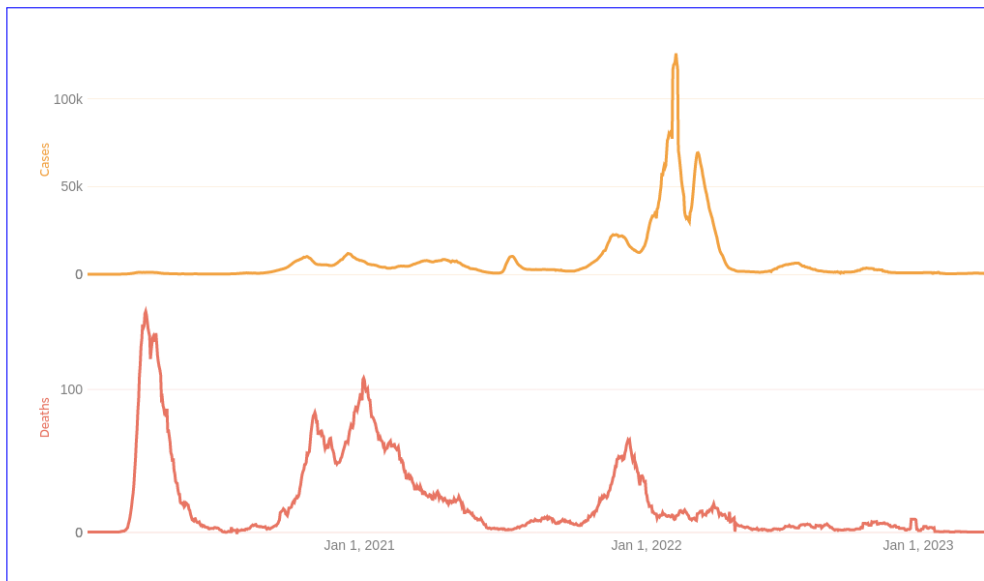


Figure 6: [NLD](#)

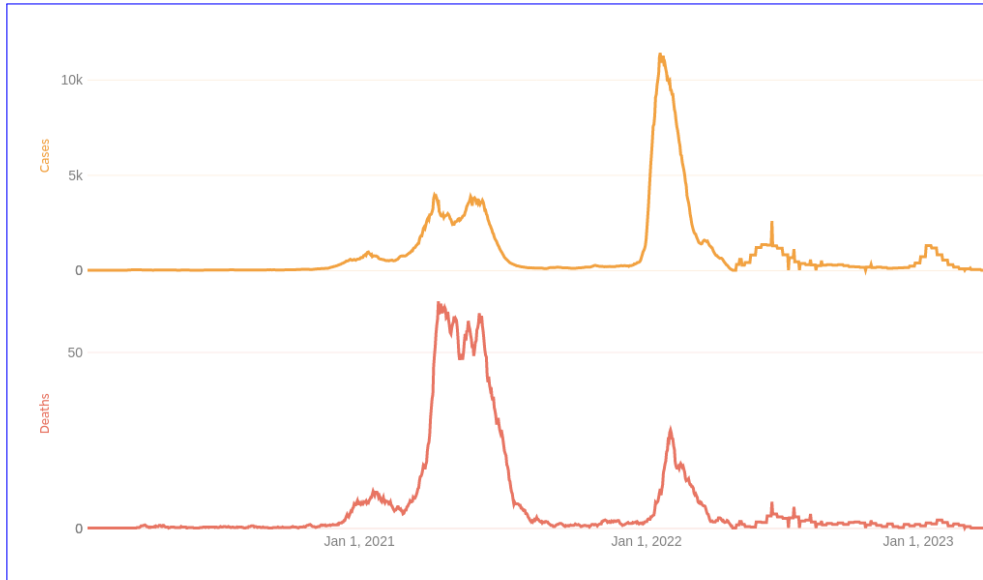


Figure 7: URY

7.5 Interaction or Pandemic Dummy with Urban/Rural Dummy Separately for Each Country

In Table 1, we repeat the previous 3 sets of models, but instead of splitting by urban/rural, we add an interaction to test if the pandemic urban rural difference is statistically significant, and it is not. The sign and effect sizes are as expected.

	GBR1	NLD1	URY1	GBR2	NLD2	URY2	GBR3	NLD3	URY3
pandemic	-0.21**	-0.12*	0.75***	-0.18*	-0.22***	0.29+	-0.13+	-0.07	0.29*
city lg500k	0.11	-0.12	0.16	0.25	0.16	-0.07	0.16	0.11	-0.12
pandemic × city lg500k	-0.20	-0.11	-0.53**	-0.24	-0.12	-0.11	-0.17	-0.12	-0.08
income				0.08***	0.07***	0.10***	0.04**	0.04***	0.08**
age				-0.04***	-0.02*	-0.03	-0.03**	-0.01	-0.02
age2				0.00***	0.00***	0.00	0.00***	0.00***	0.00
male				-0.18**	-0.12*	0.08	-0.16**	-0.10*	0.03
married or living together as married				0.56***	0.43***	0.28*	0.51***	0.37***	0.25*
divorced/separated/widowed				0.07	-0.10	-0.21	0.06	-0.15+	-0.19
autonomy				-0.10*	-0.10**	-0.04	-0.11**	-0.08**	-0.06
freedom				0.44***	0.36***	0.39***	0.37***	0.29***	0.37***
trust				0.16**	0.43***	0.11	0.11+	0.32***	0.01
postmaterialist				-0.06	-0.09*	0.06	-0.07	-0.08*	0.04
god important				0.02*	0.01	0.05**	0.01	0.01	0.05**
health							0.51***	0.64***	0.46***
constant	7.54***	7.50***	7.53***	4.30***	4.58***	4.20***	2.89***	2.37***	2.45***
N	3628	3872	1696	2290	2520	1160	2290	2515	1159
adj R2	0.003	0.003	0.020	0.319	0.287	0.215	0.383	0.386	0.248

± 0.10 * 0.05 ** 0.01 *** 0.001; robust std err

Table 6: OLS regressions of life satisfaction.

However, having more gradation in urbanicity, produces more statistical significance in table 7. The rationale is to use more/fuller information on urbanicity. And with regressions, the rationale is also to have a large stable base case, here < 50k, and compare it against the 3 larger places 50 – 100, 100 – 500, gt500

Settlement size	town3				Total
	1	2	3	4	
under 2000	95	0	0	0	95
2-5000	197	0	0	0	197
5-10000	293	0	0	0	293
10-20000	856	0	0	0	856
20-50000	2,291	0	0	0	2,291
50-100000	0	1,605	0	0	1,605
100-500000	0	0	2,195	0	2,195
500000 and more	0	0	0	1,749	1,749

Total | 3,732 1,605 2,195 1,749 | 9,281

	x1GBR	x2NLD	x3URY	x4GBR	x5NLD	x6URY
2005	0.00			0.00		
2022	-0.08	-0.17*	0.83***	-0.02	-0.31***	0.76***
town3=1	0.00	0.00	0.00	0.00	0.00	0.00
town3=2	0.05	-0.15+	0.59*	0.13	-0.08	0.70**
town3=3	0.08	-0.20*		0.17	-0.08	
town3=4	0.15	-0.21	0.26	0.48**	0.23*	0.15
2005 × town3=1	0.00			0.00		
2005 × town3=2	0.00			0.00		
2005 × town3=3	0.00			0.00		
2005 × town3=4	0.00			0.00		
2022 × town3=1	0.00	0.00	0.00	0.00	0.00	0.00
2022 × town3=2	-0.21	0.10	-0.53	-0.32	0.04	-0.54+
2022 × town3=3	-0.25+	0.14		-0.25	0.08	
2022 × town3=4	-0.33+	-0.06	-0.61**	-0.38+	-0.14	-0.54**
2012		0.00			0.00	
2012 × town3=1		0.00			0.00	
2012 × town3=2		0.00			0.00	
2012 × town3=3		0.00			0.00	
2012 × town3=4		0.00			0.00	
2011			0.00			0.00
2011 × town3=1			0.00			0.00
2011 × town3=2			0.00			0.00
2011 × town3=4			0.00			0.00
income				0.14***	0.13***	0.16***
age				-0.05***	-0.05***	-0.05**
age2				0.00***	0.00***	0.00**
male				-0.28***	-0.09*	-0.08
married or living together as married				0.54***	0.46***	0.41***
divorced/separated/widowed				0.04	0.07	-0.08
constant	7.50***	7.59***	7.43***	7.28***	7.57***	7.51***
N	3628	3872	1696	2846	3250	1650
adj R2	0.003	0.004	0.021	0.085	0.108	0.067

+ 0.10 * 0.05 ** 0.01 *** 0.001;
robust std err

Table 7: OLS regressions of life satisfaction.