9^{th} International Conference on Computational Social Science IC^2S^2
July 17-20, 2023, Copenhagen, Denmark

Exploring UK urban psychology through Urban Gradients

Keywords: Cities, psychology, inequality, financial satisfaction, social satisfaction

Extended Abstract

Cities have played a central role in shaping the last century's technological and economic acceleration [1]. The share of individuals living in urban areas has itself accelerated, from 10% in the 1910s to a projected level of 68% by 2050 [2]. This development means cities will increasingly shape psychological well-being.

Urbanization is largely driven by economies of agglomeration, whereby individuals, businesses, and governments benefit from proximity [3]. As a consequence, social and economic opportunities - central determinants of well-being - are now concentrated in urban areas [4]. This abundance of opportunities suggest that city life is socially and economically prosperous. This optimistic outlook is not mirrored in the the socio-psychological literature. It has documented a host of urban stressors [5]. Most prominently, inequality has been shown to be a pervasive problem across wealth, opportunities, health, and social relations [6,7]. Additional urban stressors include high living costs, noise, pollution, crowdedness, discrimination, crime, long commutes, social isolation, and lack of green spaces. Thus, urban areas are abundant on both opportunities and challenges.

In this study, we asses the resulting association between urbanicity and well-being, social satisfaction, and economic satisfaction. We do so by utilising the rich geographic and psychological information from the UK Biobank available for 156,000 people in the UK.

A central challenge of urban research is defining cities, suburbs, and rural areas. This is important since city-based statistics are sensitive to different definitions [8]. We overcome this challenge by employing a novel, objective, and continuous measure of urbanicity, defined as "city size adjusted distance to city center" (see Figure 1 for an explanation). This measure avoids delineating boundaries and allows us to disentangle inner-city and sub/peri-urban. Through non-linear regression, in the form of generalised additive location-and-scale models, we asses how mean-levels and the variability around the mean (inequality) change as a function of urbanicity. Lastly, we conduct a series of robustness tests.

We summarise our findings in two terms, an *urban desirability paradox* and *peri-urban bliss* effect. The urban desirability paradox refers to the contrast between the popularity of cities as reflected in increasing urbanisation levels and the general psychological dissatisfaction we discover. The top plots of Figure 2 shows adverse trends for all psychological variables as we move from $d = 0$ to $d = 0.02$. Happiness, meaningful lives, family satisfaction, friendship satisfaction, job satisfaction, and financial satisfaction decreases while addiction, professional help for mental distress, and loneliness increase. Our objective variable, income, also increases with urbanicity. The bottom plots of Figure 2 show the associated change in standard deviation around the mean. We see that the SDs (or inequality) increase in urban areas for all factors.

Interestingly, several healthy optima are observed in peri-urban areas located in the range from $d = 0.15$ to $d = 0.25$. Especially social satisfaction, family satisfaction, and loneliness show clear peaks and lowest variance in this region. In this area we see similar but less pronounced maxima for both means and SDs for financial satisfaction and the well-being related

variables. We can illustrate this blissful radius for cities of different sizes. For a city with a population of 100 K, this area is $\approx$ 6 km from the city center. For a city with a population of 1 M, it is $\approx$ 20 km from the center.

Lastly, our robustness analyses show that these results are mostly invariant under different analysis choices, such as excluding the London population, including cities with populations as low as 100K, adding noise to city centers, and controlling for age and income.

References

[1] Steffen, W., Persson, A., Deutsch, L., Zalasiewicz, J., Williams, M., Richardson, K., Crumley, C., Crutzen, P., Folke, C., Gordon, L., Molina, M., Ramanathan, V., Rockström, J., Scheffer, M., Schellnhuber, H. J., Svedin, U. (2011). *The Anthropocene: From Global Change to Planetary Stewardship*. *Ambio*, 40(7), 739–761. https://doi.org/10.1007/s13280-011-0185-x

[2] United Nations. (2017). New urban agenda: H III: Habitat III: Quito 17-20 October 2016. *United Nations Conference on Housing and Sustainable Urban Developmen*t, Nairobi. United Nations.

[3] Balland, P.-A., Jara-Figueroa, C., Petralia, S. G., Steijn, M. P. A., Rigby, D. L., Hidalgo, C. A. (2020). Complex economic activities concentrate in large cities. *Nature Human Behaviour*, 4(3), 248–254. https://doi.org/10.1038/s41562-019-0803-

[4] Diener, E., Oishi, S., Tay, L. (2018). Advances in subjective well-being research. *Nature Human Behaviour*, 2(4), 253.

[5] Adli, M., Berger, M., Brakemeier, E.-L., Engel, L., Fingerhut, J., Gomez-Carrillo, A., Hehl, R., Heinz, A., H, J. M., Mehran, N., Tolaas, S., Walter, H., Weiland, U., Stollmann, J. (2017). Neurourbanism: Towards a new discipline. *The Lancet Psychiatry*, 4(3), 183–185. https://doi.org/10.1016/S2215-0366(16)30371-6

[6] Helliwell, J. F., Huang, H., Wang, S., Norton, M. (2020). Social environments for world happiness. *World Happiness Report 2020*, 1, 13–45.

[7] Heinrich Mora, E., Heine, C., Jackson, J. J., West, G. B., Yang, V. C., Kempes, C. P. (2021). Scaling of urban income inequality in the USA. *Journal of the Royal Society Interface*, 18(181), 20210223.

[8] Arcaute, E., Hatna, E., Ferguson, P., Youn, H., Johansson, A., Batty, M. (2015). Constructing cities, deconstructing scaling laws. *Journal of The Royal Society Interface*, 12(102), 20140745. https://doi.org/10.1098/rsif.2014.0745

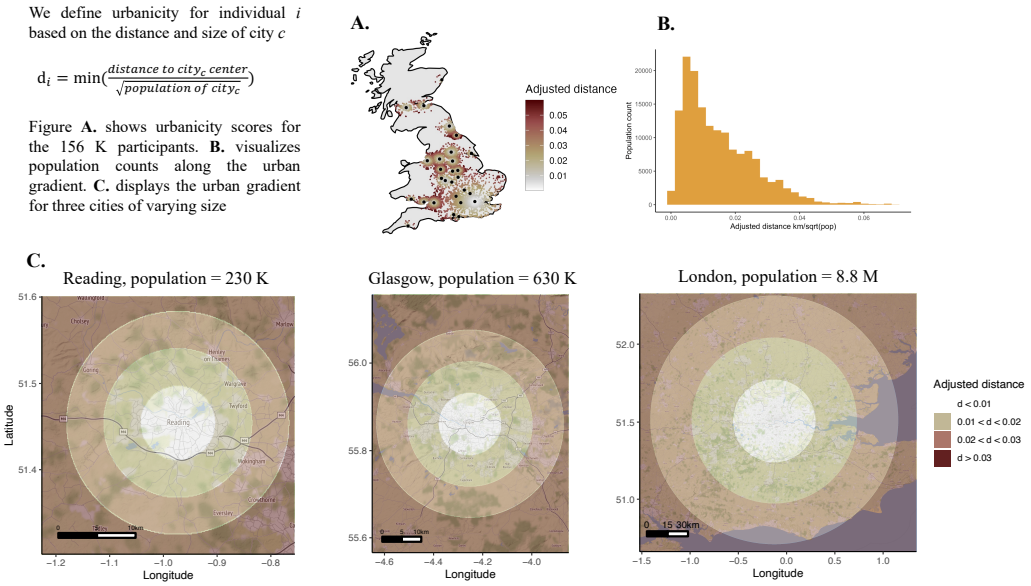

Figure 1: Methods: we use a continuous measure of urbanicity defined in terms of distance and size of cities. **A.** shows urbanicity scores for the 156 K participants. **B.** visualizes population counts along the urban gradient. **C.** displays how the urban gradient varies for three cities of different size.

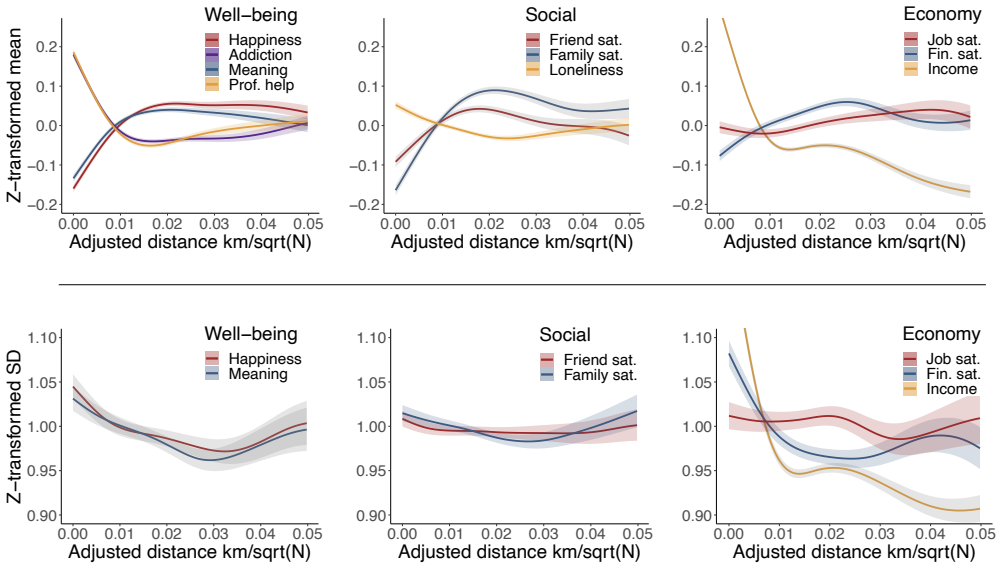

Figure 2: Urban gradients with confidence bands. Top row reveal *mean* levels as a function of urbanicity while the bottom rows shows associated change in *standard deviation* around the mean. Because some variables are binary responses they are excluded from the SD results