Finite-size scaling of human-population distributions over fixed-size cells and relation to fractal spatial structure

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Using demographic data of high spatial resolution for a region in the south of Europe, we study the population over fixed-size spatial cells. We find that, counterintuitively, the distribution of the number of inhabitants per cell increases its variability when the size of the cells is increased. Nevertheless, the shape of the distributions is kept constant, which allows us to introduce a scaling law, analogous to finite-size scaling. The scaling of the moments of the distribution is found to be related with the multifractal properties of the spatial pattern formed by the population. The agreement between theory and empirical data is satisfactory, yielding that only two exponents are necessary to describe the human-population pattern: $d_f = 1.29$ and $\tau_2 = 1.69$. These results have been published in Ref. [1].

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