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Disaggregating Health Inequalities within Rio de Janeiro, 2002-2010, by Applying an Urban Health Inequality Index

Fach/Einrichtung: Public Health

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Background. Today the world is more urban than ever. Identification and monitoring of social determinants of health and health inequalities in urban settings are essential tasks for assessing the performance of health systems and ensuring that public policies promote health in an equitable manner. Brazil faces a (moment of) great opportunity with newly introduced social policies accompanied by a general economic upheaval. Rio de Janeiro stands in the spotlight of discussion undergoing an urban renewal and for being a host for several mega-events.

Indices serve to measure dynamics in urban health inequalities. Methodological models overcoming the small numbers problem remain one of the main obstacles in order to produce valid and stable intra-urban inequality measures. Studies to uncover health inequalities at small-scale level must grapple with the competing needs to produce statistically stable results and to capture the detailed complexity and heterogeneity resulting from urban dynamics. Here, the Urban Health Index (UHI) is a flexible, composite metric that can be used to measure inequalities in urban settings.

Objective. The study had two main objectives. Firstly, to develop a feasible methodological approach in order to adapt the Urban Health Index (UHI) to the urban setting of Rio de Janeiro while tackling small numbers, which resulted in a modified UHI for small areas (UHI_{SA}). Secondly, the UHI_{SA} was used to capture and present health inequalities through graphing, mapping, spatial statistics and correlation analyses with the aim to provide an extensive picture of health inequalities in Rio de Janeiro.

Method. The UHI_{SA} was adapted for a longitudinal analysis to quantify health inequalities at ward-level within the city of Rio de Janeiro for the years 2002-2010. Eight main health indicators were generated using mortality data. Several techniques were examined in order to

address the problem of small numbers and unstable estimates (i.e. definition of minimum population size, years-weighted moving average, age-standardisation, weighting of single indicators).
The indicators were combined to form the index, a dimensionless number between 0 and 1; the wards were then rank ordered by UHI value. The distribution of the rank ordered UHI-values provides information on inequality amongst wards, using the ratio of the extremes and the gradient of the middle values. The outcomes were applied for spatial statistical methods and correlations analyses.

Results and Discussion. **A – Methodological Framework for the Adaption of the UHI:** It can be seen that small-scale analyses are conductible; pitfalls imposed by small numbers are addressable. Several simple methodological strategies were presented in order to tackle the instabilities inherent in estimates based on small numbers to improve validity of results. It was described how stable annual mortality rates could only be obtained when using geographic units that were too large for small-scale analysis. Thus, a minimum population size of 5,000 at ward-level was only defined to delimit unusual deviation. In addition, and as an alternative to Bayesian methods, a years-weighted moving average was used for the study units to restrict random fluctuation over time without creating layers of data from different neighbouring units. Age-standardisation was identified as a challenging issue, as it added instability to the estimates while not necessarily emphasising the inequality measures of the UHI_{SA}, and was therefore only applied to selected indicators that were more robust in numbers and showed a clear age-dependent epidemiology. In general, direct age-standardisation techniques are preferred for intra-urban studies but SMR provides better stability when small numbers are underlying. Finally, the UHI, as a composite index of single indicators, is able to withstand some of the instabilities that occurred in its indicators by means of arbitrary weighting schemes and selection of lower goalposts. The UHI's flexibility is not restricted by the small number problem and the tool's strength is its adaptability and flexibility even in methodological challenging urban settings.

B – Health Inequalities in Rio de Janeiro: In 2010 higher UHI_{SA} values were observed than in 2002. Over the decade, the ratio of extremes in 2010 declined relative to 2002, as did the slope of the middle values. The results suggest that the health equity situation has improved and health inequalities were reduced at all levels of analysis within the last decade. However, familiar patterns of inequality remain and a spatial division between the affluent South and the deprived North and East is still visible, including patterns of spatial segregation and clusters of low-index values in the North. The UHI_{SA} correlated on an ecological ward-level with socio-economic and urban environment indicators (i.e. square meter price of apartments, low education of mother, low income and proportion of black ethnicity) and underline that the possibility to achieve good health is unequally distributed and discriminates certain population groups. Findings lend support to the concept that space is a very important social

determinant of health. The Family Health Programme and the current urban renewal process (Rio2016) have optimistic prospects in terms of achieving better health equity, as both recognise spatial patterns of inequality.

Further Implications. The experiences and pitfalls of the small-scale study in Rio de Janeiro can be used for urban studies in other settings. The UHI/UHI_{SA} is a recommendable tool in order to conduct intra-urban studies. Methodological frameworks for its implementation are still an issue and could not yet be clearly clarified. It seems advisable to test the effect of Bayesian methods or age-standardisation before final application. There is a need for feasible strategies to capture the micro-urban level with its fine-grain resolution of inequalities.