

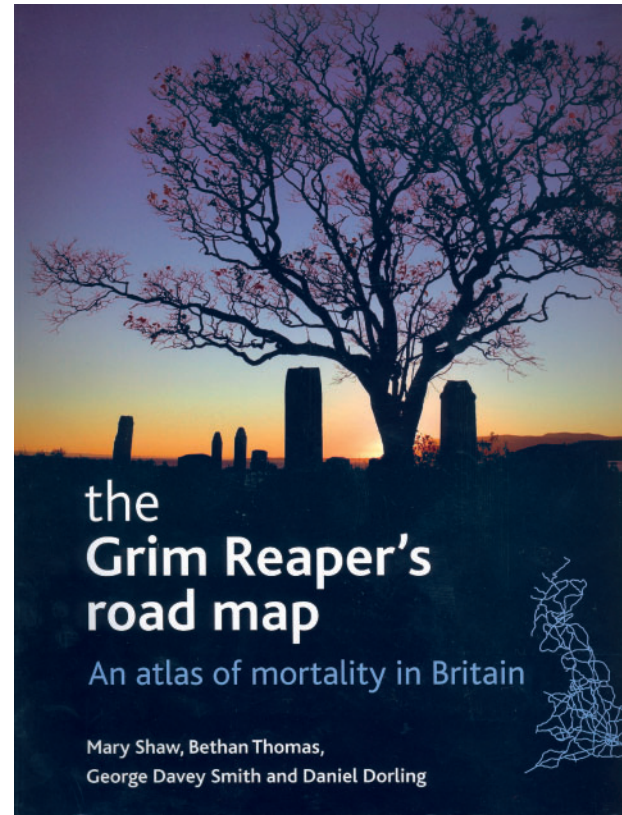
Essay Review

Cartographic Insights into the Burden of Mortality in the United Kingdom: A Review of 'The Grim Reaper's Road Map'. Mary Shaw, Bethan Thomas, George Davey Smith, Daniel Dorling. Bristol, UK: Policy Press, 2008, pp. 272, £39.99. ISBN: 9781861348234.

Shaw and colleagues¹, drawing upon their collective expertise in the field of geography, epidemiology and medicine, provide a comprehensive picture of how the specter of death looms across the political landscape of the UK. Upon seeing the title, the image that conjured up was one of a skeletal figure carrying a large scythe, clothed in a black cloak and hood, flying across the UK spreading death along its way. Indeed, the Grim Reaper seems to be discriminatory in his actions, with some places experiencing a less severe wrath than others, something the atlas effectively illustrates. Shaw and colleagues pack the atlas with more than 100 cartograms displaying standardized mortality rates (SMRs) for groups of diseases and major causes of death. The units of representation are parliamentary constituencies in the UK. Cartograms are accompanied by a brief interpretation, age-sex bar charts of disease distributions and insightful historical factoids. These together serve to contextualize the information, enriching the overall reading experience.

For the uninitiated, a word about cartograms may be worthwhile. Often, spatial distributions of any phenomenon are represented on maps by administrative or other boundaries. The areas within these boundaries are then shaded to match the value of the phenomenon, and colours and shades are used to make comparisons across different spaces delineated by these boundaries. As the familiar shapes of administrative boundaries are preserved, these representations are highly intuitive. But these maps display information in units of area, not population. Our visual perception tends to weight the shades from the largest areas more heavily since they occupy more of our visual space. If population density is even across the entire visual space this is not a problem. However, if large areas have very few people living in them, this can be misleading, biasing our inferences towards the values in large areas with lower population densities.

Cartograms overcome this problem by standardizing the visual information presented to population size, i.e., each square centimetre of cartogram represents the same population size as any other square centimetre. There is, therefore, a trade-off between informational accuracy and intuitive representation that has to be made while visualizing geographies of a



particular phenomenon. Shaw and colleagues choose cartograms for this atlas, where the units displayed are same-sized hexagons representing each parliamentary constituency in the UK. While presenting technically correct information is undoubtedly desirable, it would also have been helpful for the authors to provide some comment on the situations in which the use of cartograms might lead to different interpretations than if they had chosen to map mortality rates using the actual parliamentary boundaries.

A key strength of the atlas is the sheer amount of information and detail presented, allowing us to discriminate between diseases in finding clues for spatial risk processes. For example, browsing through the pages we find that pancreatic (p. 147)¹ and lymphatic (p. 131)¹ cancer mortality rates share roughly the same mean and variance. However, pancreatic cancer appears to be spatially random, whereas lymphatic cancer appears to have some spatial patterning. For lymphatic cancer, mortality rates appear lowest in

the countryside around Liverpool, Bolton and Leeds. Rates then tend to rise towards the north or south. From an epidemiologic research perspective, therefore, one might be more motivated in formulating and studying the spatial hypothesis related to lymphatic cancer mortality, but not pancreatic cancer mortality.

Additionally, age–sex bar charts accompany the cartograms, and these are exceptionally helpful in tying the experience of gender and age in the UK to specific mortality causes. Where spatial distributions of mortality are substantially distinct between males and females, gender-specific cartograms are presented as well. Also, all of the 109 core cartograms are accompanied by ICD-9 and ICD-10 breakdowns of condition descriptions, making what is being represented more transparent to the reader.

There are some aspects of the atlas that could have facilitated greater clarity and a wider readership. The colour coding of the mortality rate is not always particularly intuitive. The colour schemes in the legends are held constant across cartograms, thus facilitating comparisons across mortality distributions. However, the colour scheme from low to high mortality rates goes from grey to lavender through aqua to sky blue then kelly green, through mustard, daffodil, rose, magenta and violet! In some cartograms, the lavender and violet hexagons are difficult to distinguish even though these colours indicate rates at opposite ends of the rate spectrum. Additionally, since grey is the only non-coloured code used, it could easily be interpreted as missing data. Using a total of two colours, one colour at each end of the range, would have been easier to interpret and produce more intuitive images.² Coding darker colours as higher values or using colour schemes consistent with ‘cultural or historical expectations’ (e.g. red for severe, blue for less severe) could have enhanced the ease of pattern perception within the representations.² The colour scheme in this atlas is a bit of challenge even for those with perfect colour vision, and as such might be practically inaccessible for those with colour vision impairment (so men who are more likely to be colour blind, may not be able to appreciate this atlas as much as women!).

Since one purpose of a map is for readers to make quantitative comparisons of a variable across places, a word of caution may be warranted regarding the use of indirect SMRs in the atlas. Outside Europe, many atlases use the direct method of age adjustment.² In the direct method, the expected deaths for the directly standardized rate are calculated by multiplying each place’s set of age-specific mortality rates against one standard age distribution (e.g., local mortality \times national age). In the indirect method, used by Shaw and colleagues, expected deaths are calculated by multiplying each place’s age distribution against one standard set of age-specific mortality rates (e.g.,

local age \times national mortality).² For the direct calculation, mortality rates vary across places, whereas for the indirect method, age distribution varies across places. Both methods tell you where excess deaths happen, but for the indirect method, the standard by which these rates are calculated changes as a result of the local age distribution and not the local mortality rates. Therefore, because in the indirect method different standard populations are used in each place, we cannot make quantitative comparisons between two places, (p. 73)³ unless age and area effects on mortality are independent of each other.⁴ As Pickle notes on interpreting indirectly calculated SMRs, ‘If county A has an SMR of 2 and county B has an SMR of 4, it is correct to say that they both have an excess of cases but county B is not necessarily twice as bad as county A’ (p. 9).² These cartograms are certainly useful for locating areas of excess mortality needing intervention, but they may be misleading to those comparing rates between places, e.g., for prioritizing resource allocation based on disease severity, unless the age–area independence assumption holds.²

Since researchers and policymakers often use maps to make place-to-place comparisons, both the U.S. National Center for Health Statistics and the World Health Organization recommend using the direct method for age standardization.^{5,6} While Shaw and colleagues state that they used the indirect method to avoid problems with the direct method for places, where there were no deaths for a specific cause at a particular time, (p. 236)¹ it would have been helpful if the authors had dedicated some discussion to whether they expect their choice of the indirect method vs the direct method to lead to any substantially different interpretations of the patterns represented in the atlas. This is a case where an expert judgement made for technical reasons may dramatically change inferences made by laypersons. Thus, this choice deserves more attention than a paragraph or two in the last pages of the atlas, unless through empirical analysis there are found to be no substantive differences in inference.

Lastly, it is also worth emphasizing that, like all geographic representations, simply because there are geographical differences does not automatically mean that geography by itself makes the difference.⁷ Often there are several national-level processes that drive phenomena which apply to ‘all’ constituencies, and in atlases this remains masked. For instance, much of the geographical patterning may reflect historically produced spatial distributions of social class or poverty related to local places, but driven by larger-scale processes as opposed to reflecting differences uniquely attributable to local variations in places’ inherent environmental qualities.⁷ In fact, the authors discuss this at length in the introduction. A few cartograms

displaying related socio-economic variables would have been illuminating. There is perhaps a missed opportunity in this atlas to address this gap and thereby bridge the distance between cartography and quantitative health geography to better understand the 'explanatory role' of geography in shaping mortality patterns.

The atlas becomes increasingly interesting the more time you spend with it. However, it will likely be of most immediate value to those who already have substantial experience interpreting cartograms. For researchers, it offers a wealth of information with a great deal more precision than we usually find in visual-spatial representations. Persons with some facility in reading and interpreting cartograms will also find this atlas eminently provocative. For example, the width of the spectrum of diseases over which high mortality rates persist in Glasgow is itself mortifying. For practitioners and policymakers, an accurate interpretation of the imagery may be somewhat cumbersome, though the choice of parliamentary constituencies as the unit of presentation has obvious practical appeal. In summary, the atlas is an excellent tool for those comfortable in analysing information, a rich source for generating social and geographic hypotheses and an opportunity to juxtapose distributions of diseases against each other, opening the possibility of classifying diseases as sharing or not sharing common socio-spatial causes.

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