

## Neighbourhood deprivation and Eye diseases

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Geographical variation in health is one of the key domains of epidemiological investigations. The role of neighbourhood or community level factors in health and disease is a growing area of study, as the physical and social environment in which a person lives and works can affect their health, even after accounting for individual risk factors.<sup>1</sup> The World Health Organisation's (WHO) endorsement of the Rio Declaration has recently refocused political will to improve public health and reduce health inequalities through action on social determinants of health.<sup>2</sup> Action requires understanding the status of health inequalities, causal risk factors and their impact, and evidence based interventions. Epidemiological studies on neighbourhood risk factors are important to public health and policy because they help us to understand and address health inequalities, and lead to development of potential interventions.

Differences in the distribution of eye diseases are well documented between and within countries,<sup>3</sup> though there are currently few ophthalmic studies that investigate neighbourhood factors. That is why the study from Hamano and co-authors in this current edition is of interest.<sup>4</sup> The authors examined national healthcare data from Sweden, which they report to have high levels of validity and completeness. There were over 4 million registrants aged over 40 with records over a 10-year period.

The authors have derived their own measure of neighbourhood socioeconomic characteristics using census-derived aggregates, a common technique to create proxies of neighbourhood level factors. They report that people living in the most deprived areas were more likely to have a recorded diagnosis of macular degeneration (MD), cataract, diabetic retinopathy or glaucoma related conditions. The findings are consistent with previous studies that show people living in more deprived areas have a higher frequency of acute angle closure hospitalization,<sup>5</sup> and similar to work demonstrating an association with visual impairment,<sup>6,7</sup> age related MD<sup>8</sup> and greater severity of glaucoma at diagnosis.<sup>9</sup>

It is difficult to separate the effects of individual socioeconomic position (SEP) from neighbourhood effects. People with lower levels of educational attainment and income are more likely to live in more deprived areas. Therefore, separating independent effects of area measures from individual factors can be difficult. Sophisticated statistical techniques have allowed further development in this area. Multilevel models have allowed researchers to estimate associations between neighbourhood deprivation and outcomes adjusting for individual SEP and accounting for the clustering of individuals within neighbourhoods. They have also allowed researchers to estimate the extent to which outcomes vary between neighbourhoods and the contribution of neighbourhood level and individual level factors to these geographic inequalities

The authors have used multilevel modelling, and they recognize this as a strength of their study. They have adjusted for individual level SEP factors and have shown that neighbourhood deprivation was independently associated with

higher risk of being diagnosed with an age related eye disease. However, the individual level variables were also used to derive the area level indicator, which makes it difficult to distinguish potential mediating factors. Nonetheless, the study serves as a starting point to highlight an important topic of investigation. More direct measures of neighbourhood factors would provide more accurate estimates of causal mechanisms to inform future interventions.

Differences in any health outcome that can be attributed to relative social circumstances are unfair.<sup>10</sup> It is striking that even in Sweden, one of the most equal societies in the world, there is evidence of health inequalities due to where people live. The authors suggest a range of potential mechanisms that could mediate this effect, all of which can be viewed within the context of a socio-ecological model of disease that is at the heart of public health. It is clear from neighbourhood studies on a range of other health outcomes that there are interlinked pathways connecting area deprivation with individual poor health.<sup>11</sup> Key mediators of area deprivation include material circumstances, behavioral and psychosocial risk factors and differential access to health care and other health-promoting amenities. Pathways to poor eye health are less defined and eliciting these mechanisms is the next step. This will require developing conceptual models to underpin testable research questions on potential causal processes that mediate the relationship between area deprivation and eye diseases. Pathways may operate at multiple geographies; across neighbourhoods and healthcare sector boundaries and using observed community-based boundaries rather than arbitrary census derived boundaries should be considered. Where one lives during childhood and where one lives in adulthood can differ and may exert different effects on the development of eye diseases. It is a complex problem, but better understanding will lead to potential interventions that will improve the eye health of the populations we serve.

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