

# **Using integrated visualisation techniques to show relationships between CVD events and patient migration patterns in Auckland, New Zealand**

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## **Abstract**

There is evidence that residential mobility is associated with mortality rates. The negative health effects of living in a deprived neighbourhood may influence the incidence of cardiovascular disease (CVD), even after controlling for socio-demographic characteristics. However, few studies have investigated the application of integrated visualization to communicate the effects of residential migration and other risk factors on CVD events.

We focus on integrated visualization of the relationship between CVD events and patient movements in Auckland, New Zealand (NZ) based on area-level deprivation, rurality, age, gender and ethnicity at both the individual level and aggregated geographic scale. Aggregate analyses were conducted using “Upper Zones”, a dedicated data zone based on multiple criteria such as homogeneity, population equity, compactness and environmental context with populations ranging between 12,000 and 18,000. Upper Zones were developed using census Meshblocks (MBs), NZ’s smallest available administrative unit.

Individual-level data related to patients aged 30+ years resident in the Auckland Region between 2006-2011 were obtained by linking several routine national health databases, using an encrypted national health identifier (eNHI). Our data included information regarding the MB of the patients’ residence, clinics visited, CVD events and demographic information for every calendar quarter between 1/1/2006 and 31/12/2011. A measure of rurality was linked from a separate data set based on the meshblock ID.

We considered two types of patient movement in this paper; patient movement between primary care practices and patient residential migration. These were further stratified using the socio-demographic factors mentioned above to visualise patterns of CVD using individual time-geographic trajectories, aggregated flows; Kriskograms; Ringmaps and 3-D rods.

We reveal distinct patterns for purposefully selected subgroups and highlight disparities by geographic areas, deprivation, age, gender and ethnicity before discussing the implications of our findings in relation to the treatment and management of CVD.

## **Keywords:**

CVD, visualization, mobility, health inequalities, ringmaps