Presentation title:

Crime and the dynamic denominator challenge

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The need to identify an appropriate crime denominator is not new, indeed Boggs highlighted the relevance of this 50+ years ago. Crime risk is typically expressed as a rate - burglary per 1000 houses, or violence per 10,000 persons. However, these use 'static' census-based denominators and not necessarily in-situ populations. The ambient population has been used to address this. However, we argue the daytime/night-time ambient population data frequently used is too coarse and does not reflect the dynamic nature of urban mobility and population flow in urban centres. For example, there are distinct spatial and temporal patterns that can be observed temporally – for example using the 168-hour crime week (1*24 hours over a seven day week) To explore this further we examine the influence of dynamic population denominators on crime over the 168-hour week using two data sources. Firstly, street-based mobility patterns are examined over a 3-year period in three cities in the UK, using Smart Street Sensor Footfall data. These sensors are predominantly located in retail venues. We examine footfall data across the 168-hour week for a range of crime types (violence with/without injury, burglary, theft, criminal damage, vehicle crime, and shoplifting). A series of SARIMA models examine the relationship between footfall and each crime type and the most significant temporal patterns were associated with shoplifting. Secondly, public transport passenger data is examined as a possible dynamic denominator. Time zones are aggregated into 6 passenger travel classifications (early morning, morning peak, daytime, evening peak, late evening, and night-time) and then compared with a range of crime types on public transport. The differences here are marked by the influence of quieter/busier periods (passenger density) and crime. This second study captures the impact of Covid – which strongly impacted on reduced passenger numbers and how this influences the dynamic denominators for crime.