4.1 Advantages

High frequency, geographical granularity, and high population coverage

Timely and geographically granular information on affected populations is crucial for formulating effective responses to disasters (UN Global Pulse, 2014). The ubiquitous use of cell phones provides opportunities to gain valuable insights into large-scale population movements (González, Hidalgo, & Barabási, 2008) (Song, Qu, Blumm, & Barabási, 2010) (Wesolowski, Eagle, Tatem, et al., 2012) (Simini, González, Maritan, & Barabási, 2012) (Wilson et al., 2016). A call detail record (CDR) is information on a mobile network event, such as a call, short message service (SMS), and data communication—it is generated at every network event and includes its time and location information. Thus, with data being generated for all subscribers in real time, longitudinal data can be provided for a large number of populations. Past research highlights the usefulness of CDR data for tracking population movements following a disaster and epidemic in a timely and frequent manner. For example, in Haiti, CDR data were used to measure population mobility and displacement patterns in the aftermath of the 2010 earthquake. The data covered approximately 63% of the total subscribers and 90% of the inhabited areas, and the result showed the high correspondence of geospatial distribution of population movements between CDR data and large-scale retrospective survey data (Bengtsson et al., 2011).

In Kenya CDR data were used for quantifying broad travel patterns and distinguishing regional differences in travel behaviors. Due to the existence of strong seasonality in volumes and direction of population flows, Wesolowski et al. (2012) used a subset of CDR data from two districts in western Kenya. The study compared the CDR data from 34,861 subscribers (4.6% of the total population in these districts) with travel survey data, which include detailed information on travels from the same time and place, collected during cross-sectional surveys of 2,650 individuals. The result highlighted the differences and strengths in each dataset; both datasets were able to identify the main districts where people travel while there are differences in estimates on the number of travellers between them. Overall, observed number of trips per person is greater for CDR data as small trips are likely to be unreported or misreported in the travel survey. The study also examined how CDR data can be used for assessing the possible spread of diseases in a region; the result indicates that travel patterns estimated from CDR data can be useful for targeted surveillance in the regions given that the volume and range of travels tend to be underestimated by the travel survey. The traditional travel survey is still important as it enhances the utility of CDR data as it can provide important information about motivations for travel and types of people who frequently travel (Wesolowski et al., 2014).