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Pattern recognition of social contact events from wearable proximity sensor data using principal component analysis

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Abstract

Data from wearable proximity sensors can be used to measure and describe social contact patterns between individuals in a household. Previous work describing contact patterns, has been qualitative and relies on visual, subjective observations. Data of this kind has been collected for a short period of measurement ranging from 2-3 days. An automated, quantitative analysis of contact patterns could enable an accurate and new representation of social contact patterns.

Data was collected from ten households, for 21 days in a pilot study implemented in South Africa. 20 datasets were analysed, representing contact events of 20 individuals. Principal Component Analysis was implemented to determine the similarity of contact events across the days of the experiment and to estimate the minimum number of days required to be sampled, to validly represent an individual's contact activity.

The results show that there is a great variation in contact activity across the days of the experiment, as represented by the number of clusters of similar days. The minimum number of days required was determined by the number of days that had a significant contribution to the first three principal components and this varied across individuals from 5 – 11 days. Further analysis on a larger cohort has a potential to provide better social contact parameters for complex social behavioural models and may assist in understanding transmission dynamics of respiratory pathogens, needed in public health research.