

Investigation of temporal changes in social contact rates in Flanders, Belgium



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Introduction

There is a lack of knowledge about whether or not mixing patterns change over years within a particular population and how that would affect infectious disease spreading [1]. Our study is the first one that attempts to investigate whether or not contact rates remain stable over time by analyzing results from two contact surveys conducted in Belgium in two different years (2006 and 2010).

Data and Methods

A representative diary-based social contact survey was conducted between September 2010 and February 2011 in Flanders, Belgium, using an adapted version of the diaries used in the Belgian survey anno 2006 [2].

Methods:

- Different data mining techniques are used to explore the data and the age-specific number of social contacts is modelled using a GAMLSS model [3].
- Assortativeness of contact matrices is measured using J_s^2 index [4].
- The relative change in basic reproduction number (R_0) and the ratio of relative incidence (RRI) with 95% Bootstrap confidence interval (BCI) are used to investigate the impact on epidemic spread due to school closure, gender differences, and changes in mixing patterns over years.

Results

- A total of 32,108 contacts were recorded by 1759 participants.
- More than 10% contacts were with household members.
- Skin to skin touching is significantly affected by duration, contact with household member, location and frequency of contact.
- 81% of the contacts lasting less than 15 minutes with non-household members are non physical contacts.
- The duration of contacts is associated with contact frequency and location.

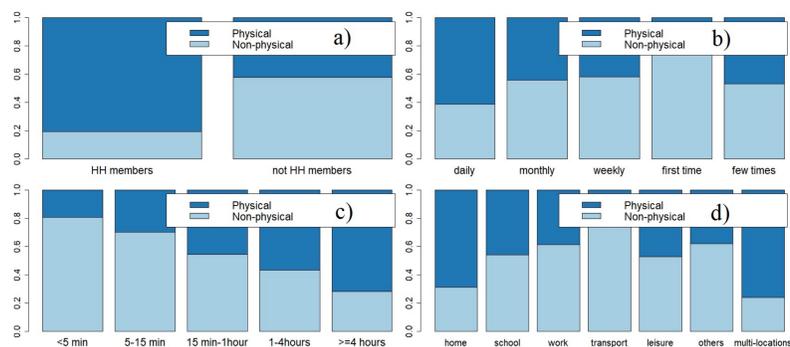


Figure 1: The proportion of physical/non-physical contacts, by household members (a), frequency (b), duration (c), and location (d)

Factors associated to the number of contacts:

- Socio-demographic factors: age, household size, using public transportation.
- Temporal factors: weekdays/weekend, regular/holiday.
- Health factors: morbidity, feeling anxiety, feeling ill and having problems in carrying out daily activities.

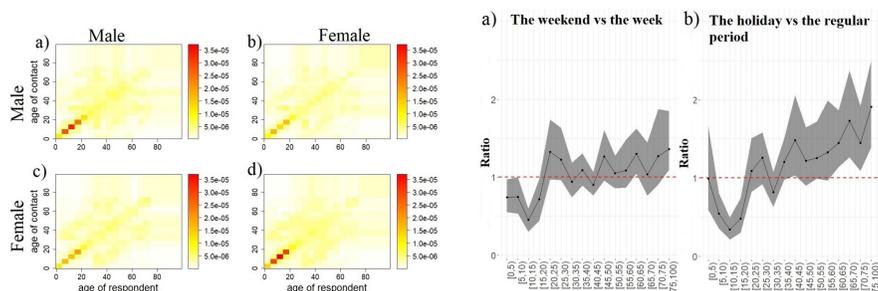


Figure 2: Estimated age- and sex-specific contact rates (on the left) and ratios of RIs (on the right).

- Males and females have a tendency of having more same-gender contacts.
- 24% reduction in R_0 is observed for weekend versus weekday and a 30% reduction in R_0 for holiday versus regular term; especially fewer contacts between children: more inter-generational mixing.

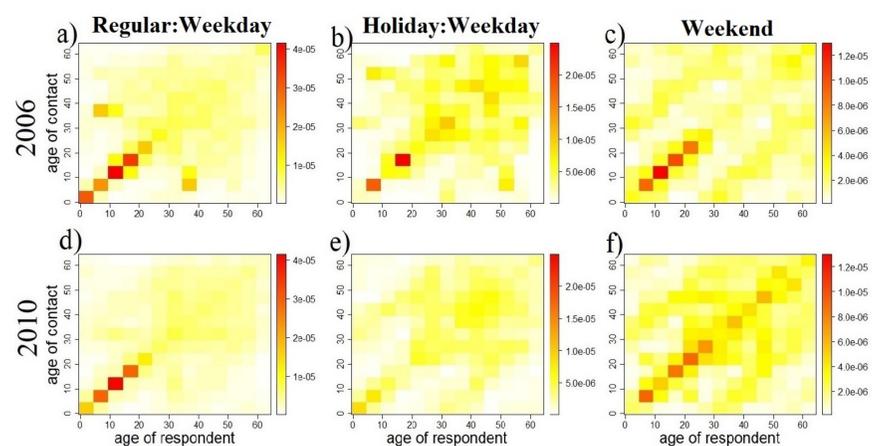


Figure 3: Estimated contact rates in different time settings. The color scale indicates the contact rates from low (white) to high (red).

- The contact patterns in 2006 and 2010 show the same degree of assortativeness for all time settings.

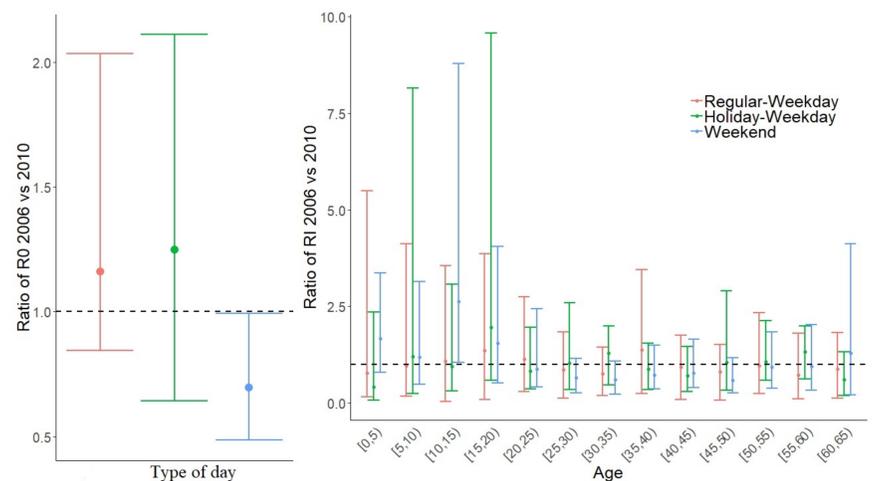


Figure 4: The ratios of R_0 (a) and the ratios of RIs by 5-year age groups (b) for the 2006 and 2010 social contact surveys in Flanders.

- Significant changes in R_0 are only observed in the weekend.
- No evidence to support changes in RIs over time in all time settings, except for the age group 10-15 years during the weekend.

Conclusions

- Contact patterns feature strong homophily both in age and gender.
- A large reduction in R_0 for weekend versus weekday and for holiday versus regular term is observed in both surveys.
- For each type of day surveyed, the contact patterns in 2006 and 2010 exhibit the same degree of assortativeness.
- The 4/5-year gap has little impact on the epidemiological differences of contact matrices between two time points.

We found social contact patterns are stable over a limited time span of 5 years.

Acknowledgments

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