10 Supplementary materials

10.1 Variable age representation

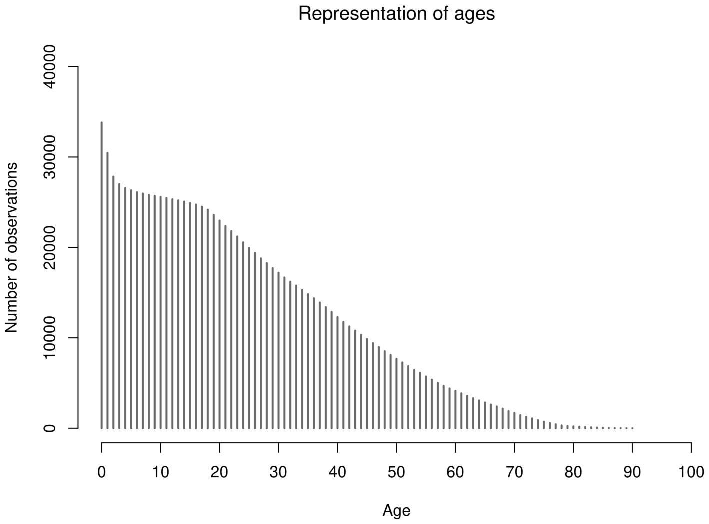

Fig. 6: Histogram showing total RPs observed of each age category

10.2 Birth year representation in the HSN

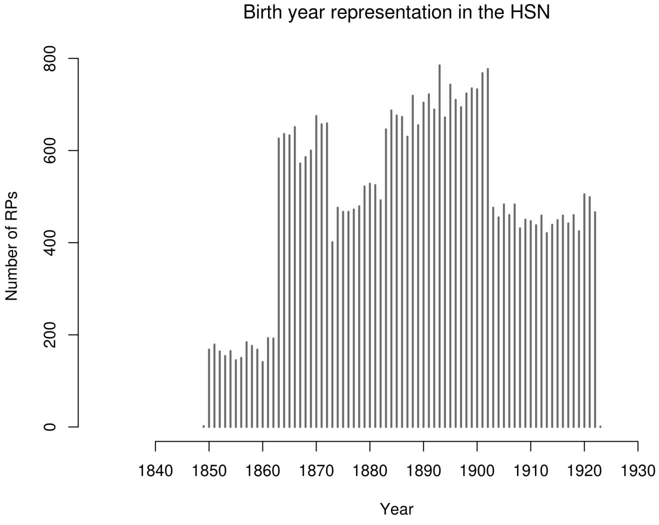

Fig. 7: Histogram showing totals of RPs born in each year

10.3 Model results

In the manuscript we focus on simulated counterfactuals, as direct estimates from the statistical model are hard to interpret, and are meaningless in isolation. However, here we provide some detail on the results of the Gaussian process for each gender. Model estimates derive an η^2, a maximum covariance between ages, of 6.26 for females and 5.89 for males (95% HPDI females = [3.46, 10.15], males = [3.23, 9.47]). The rate of decline in covariance, ρ^2, is 17.61 for females and 16.42 for males (95% HPDI females = [14.64, 20.73], males = [13.50, 19.20]). There is thus very little difference between women and men in terms of the covariance between ages and how fast this covariance falls of with distance between ages.

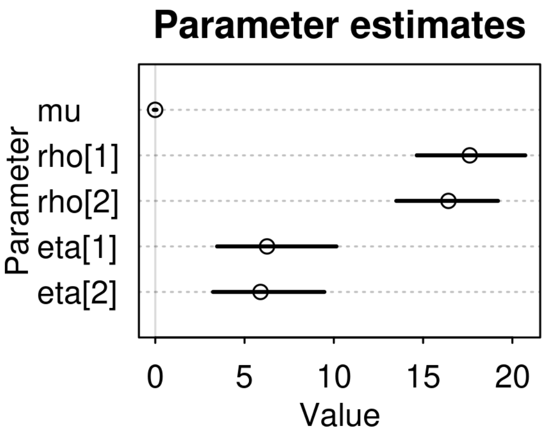

Fig. 8: Parameter estimates from Poisson model

10.4 Rhat and number of effective samples

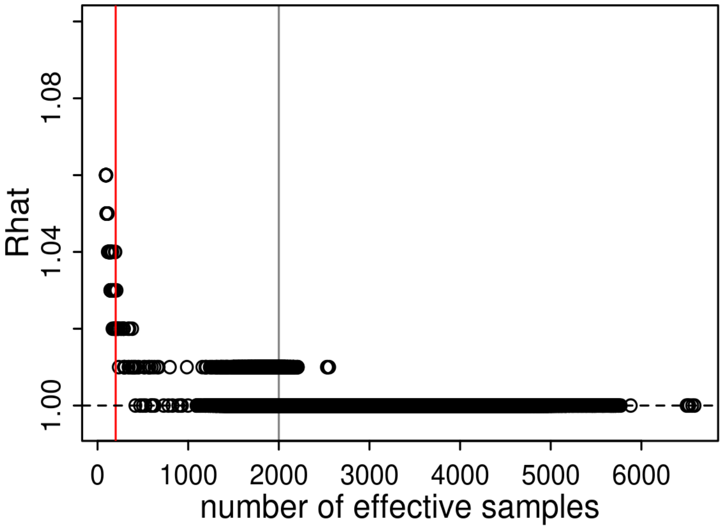

Fig. 9: Plot of Rhat values against number of effective samples, red line indicates 10% of samples while grey line indicates total samples drawn

10.5 Individual differences in moves per year

By interrogating alpha estimates, the individual offsets, we obtain a different perspective on the long tail of mobility. Figure 10 shows that relatively few individuals account for high mobility behavior.

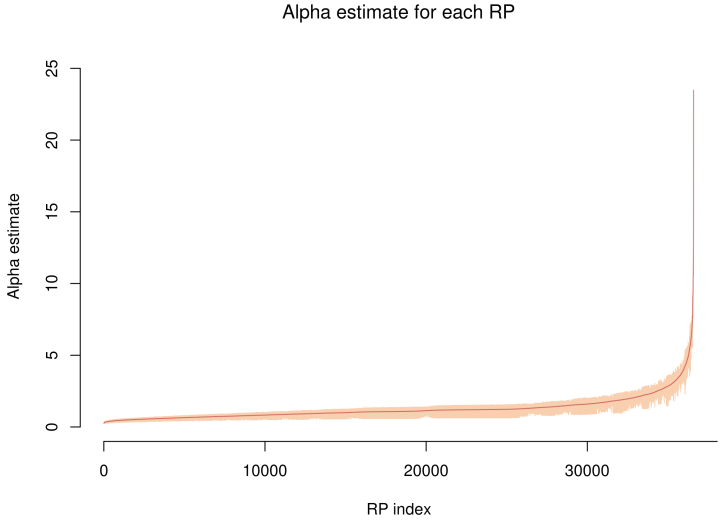

Fig. 10: Individual differences in mobility propensity as demonstrated by exponentiated alpha estimates. Red line is the mean while orange interval is the 50% percentile interval of model estimates.

10.6 Individual trajectories

To address individual trajectories of how moves are accumulated over the life course, we plot accumulation pathways showing the total number of moves an individual has at a particular age (Figure 11). The individual trajectories demonstrate that although a majority of RPs have low mobility, there is wide variation in how RPs accumulate moves, for both genders. Some individuals experience high numbers of early life residential moves (as children of high mobility parents). Likewise, a subset of RPs seems to experience steep inclines for some parts of life, suggesting a role for high mobility sequences. However, most trajectories feature shallow slopes and thus relatively steady accumulation of moves. The highest density of trajectories end with total numbers of residential moves below 20 for both genders (light red for women and light purple for men), reflecting the results of Figure 2.

Trajectories of females and males mirror each other, as residential mobility tends to be a household activity after marriage. We see some difference here between the genders in childhood, with male children having steeper acquirement sequences early on in life.

The individual trajectories hint at a possible negative relationship between longevity and mobility for both genders, as high mobility individuals (darker shades) seem to disappear (emigrate or die) earlier in life than low mobility individuals (light shades) (Figure **??**). Such a relationship could suggest a high cost to hyper-mobility. However, further work is required to clarify this point, as it is also possible that it is merely easier to track individuals that stay in one place.

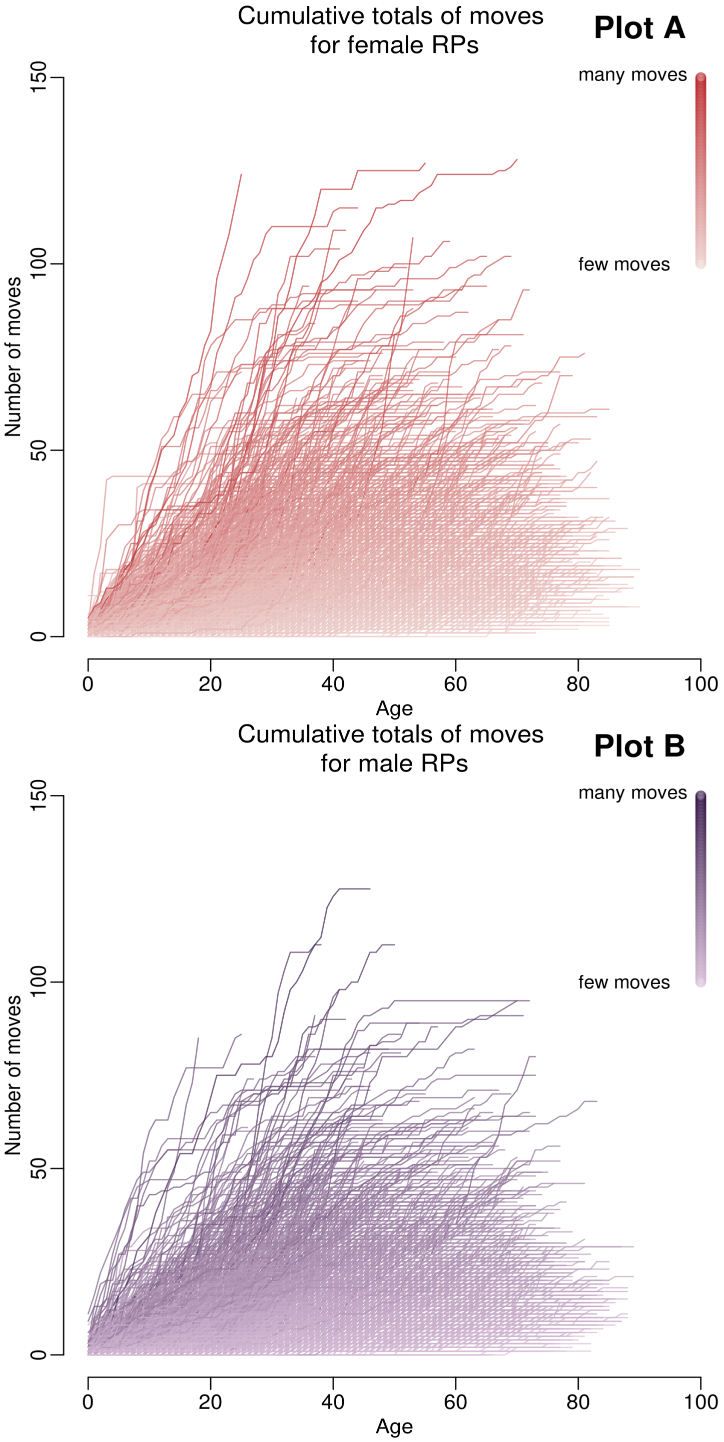

Fig. 11: Individual trajectories of RPs as moves are accumulated over the life course for females in plot A, and for males in plot B. Each line represents an individual accumulating moves through time. Lines are colored by final total moves, with darker shades reflecting higher total mobility.

10.7 Gamma-Poisson model

Given the over-dispersion of our age counts, we also fit a Gamma-Poisson regression model to estimate the number of moves a RP has each year (y) for the years they are observed.

$$y_i \sim \text{NegBinomial}(\lambda_i, \phi) \tag{4}$$

$$(\lambda_i) = e^{(\mu + \alpha_{\text{person\_id}_i} + \beta_{\text{age}_i\,\text{gender}_i})} \tag{5}$$

λ_i represents an expectation for each case i in the data (an individual, at a specific age, with a given number of moves). We calculate λ_i for each gender. ϕ allows us to adjust the variance independently of the mean, and thus to account for the over-dispersion.

Considering Figures 12 and 13, we see high consistency in the estimates of the Gamma-Poisson models with the Poisson regression, suggesting a limited role for over-dispersion in generating our results. Likewise, within the Gamma-Poisson model, while the gaussian process parameters should not be interpreted in isolation, they have very similar estimates.

We generate age-based variation on the outcome scale of moves per year from the Gamma-Poisson model. Age-based variation can be seen in figure 13, suggesting the same pattern as the Poisson model both qualitatively (peak between 20 and 30) and quantitatively (0.4 moves per year at peak).

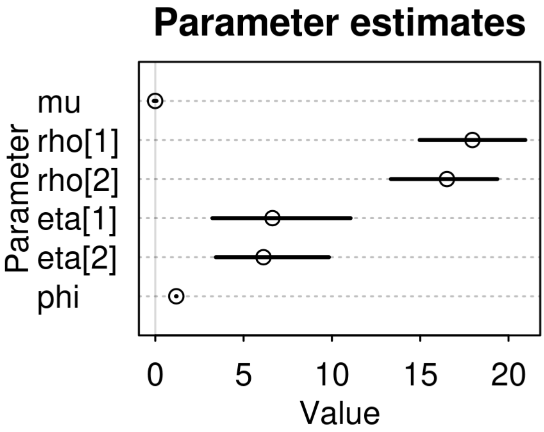

Fig. 12: Parameter estimates from Gamma-Poisson model

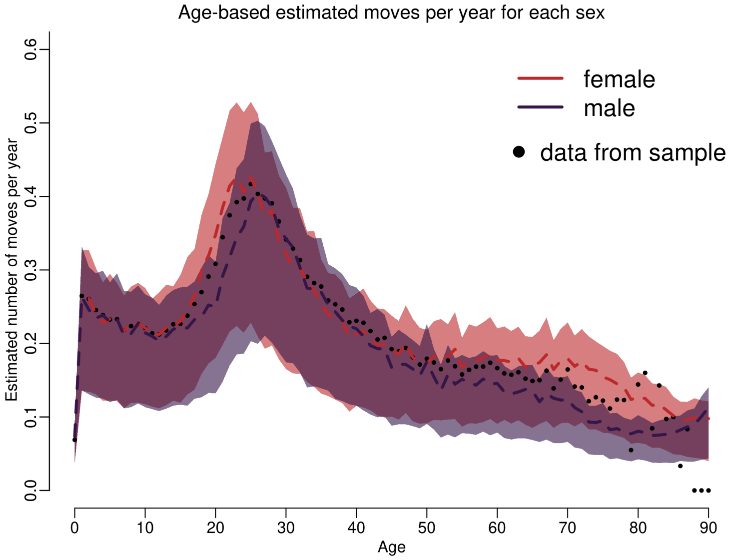

Fig. 13: 50% percentile interval (color band) of moves per year per age as estimated with β, μ and the distribution of individual effects for both genders(red for females, purple for males). Dashed line denotes mean numbers of moves per age from model, for respective gender. Black circles are mean numbers of moves per age from sample.

11 Figure list and captions

- Fig. 1: Province map of the Netherlands in circa 1920, greyscale for province boundary distinction, reproduced from Ekamper et al., 2011
- Fig. 2: Histogram of total numbers of moves over a lifetime for females (red) and males (purple), surviving until at least age 20 in the lifecourse dataframe (see table 1). Dashed lines denote gender-specific medians. Yellow line indicates frequency for both genders divided by 2, and so the equal point between genders; when red bars are higher than the yellow line, it means more women in this category, and vice versa for when purple bars are lower than the yellow line.
- Fig. 3: Plot A shows the 50% percentile interval (color band) of moves per year per age as estimated with β, μ and the distribution of individual effects for both genders(red for females, purple for males). Dashed line denotes mean numbers of moves per age from model, for respective gender. Black circles are mean numbers of moves per age from sample. Plot B shows the contrast between genders in moves per age, with dashed line denoting 0 = no difference. Positive deviations from 0 indicate more female mobility, negative deviations denote more male mobility.
- Fig. 4: Plot A shows total mobility events by age for each gender (red for females, purple for males) with the 50% percentile interval of age-based sums of simulated numbers of moves for each observation of the sample. Dark lines denote mean for each gender from the sample. Plot B shows contrast between genders in total mobility events by age, with dashed line denoting 0 = no difference. Positive deviations from 0 indicate more female mobility, negative deviations denote more male mobility
- Fig. 5: Heatmap of moves per year for 73 model runs fit to birth year subsets of data. Females in Plot A and males in Plot B. Each diagonal represents a birth year based model fit, showing how a RP born that year would move through time, until 1945, which is when observation records end. Rows allow for observation of the age-based pattern for all model fits while columns allow for an interrogation of cohort effects. Squares are colored by simulated average number of moves per year of age as in Figure 3, darker colors represent higher mobility
- Fig. 6: Histogram showing total RPs observed of each age category
- Fig. 7: Histogram showing totals of RPs born in each year
- Fig. 8: Parameter estimates from Poisson model
- Fig. 9: Plot of Rhat values against number of effective samples, red line indicates 10% of samples while grey line indicates total samples drawn
- Fig. 10: Individual differences in mobility propensity as demonstrated by exponentiated alpha estimates. Red line is the mean while orange interval is the 50% percentile interval of model estimates.
- Fig. 11: Individual trajectories of RPs as moves are accumulated over the life course for females in plot A, and for males in plot B. Each line represents an individual accumulating moves through time. Lines are colored by final total moves, with darker shades reflecting higher total mobility.
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for females, purple for males). Dashed line denotes mean numbers of moves per age from model, for respective gender. Black circles are mean numbers of moves per age from sample.