Vaccination Homophily in Social Networks During the Covid-19 Pandemic

Keywords: ego-networks, network diary, homophily, vaccination, Covid19

Homophily, a well-observed attribute of social networks refers to the tendency of social contacts to be similar to one another (*1*). This similarity applies not only for social-demographic characteristics such as gender (*2*), educational attainment or race and ethnicity (*3*, *4*), but also for values, personality traits and behavioral aspects, including health behavior (*5*, *6*). Furthermore, social network sites seem to amplify homophily and are tied to the emergence of echo chambers (*7*), a term referring to the phenomenon when information is unable to flow between groups. Vaccination status is not an exception: research on vaccine hesitancy – the primary barrier of adaptation of vaccines among high income countries (*8*) – suggests that the predictors of vaccine refusal widely correlate with factors shaping interaction patterns in society (*9*, *10*), while they also cluster geographically (*11*, *12*). As attitudes and behaviors tend to spread within social networks (*13*), vaccination decision of an individual is also strongly influenced by their social contacts (*14–16*), eventually leading to vaccination homophily and vaccination clustering. The consequences can be significant, particularly in terms of vaccine hesitancy, which contributes to outbreaks of diseases (*17*, *18*).

This paper aims to survey and understand vaccination homophily in egocentric networks during the Covid-19 pandemic. We use a merged dataset of two nationally representative surveys conducted in Hungary in November 2021 and June 2022 (N=2,000). Using a network diary approach (*19*), we measured the egocentric network by asking respondents to list all their personal interactions in the last 24 hours. The diary log contained information about the Covid-19 vaccination status of each alter. This allowed us to calculate vaccination rates in the network of each individual.

The results suggest strong clustering by vaccination status. Fig.1a shows that the mean vaccination rate in vaccinated individuals' networks is 91% compared to 49% in unvaccinated individuals' networks (MED = 100% vs. 50%). When focusing on household members, these differences are even more polarized, 92% for vaccinated individuals and 31% for not vaccinated ones (MED=100% vs. 0%). The level of homophily decreases when considering more exterior circles of the ego-network, like other family members, friends, or colleagues.

The vaccination rate of the respondents' social network is indeed the strongest predictor of vaccination status (AME=0.329, SE=0.016) (Fig.1b) and vaccination homohily is large among both vaccinated and unvaccinated individuals (Fig.1c). The model predicting vaccination homophily in the respondents' network (Fig.1d) shows that age, education and a severe contact with the Covid-19 virus are positively associated with homophily, whereas people living in smaller settlements and those with a large number of contacts have lower probability of having a homophilic network regarding vaccination status. However, including interactions to this model showed, that a large network size decreases the probability of homophily only among unvaccinated individuals (Fig.1e). A high level of education signals stronger homophily only among vaccinated individuals, and it has the exact opposite effect among unvaccinated ones (Fig.1f). We also found that a selective exposure to Covid-19 news on social media is positively associated with homophily in the unvaccinated population, but not in the vaccinated one (Fig.1g).

Our findings corroborate previous reports by showing that vaccination homophily is prevailing and close contacts in egocentric networks may have played a crucial role in vaccination decisions during the Covid-19 pandemic.

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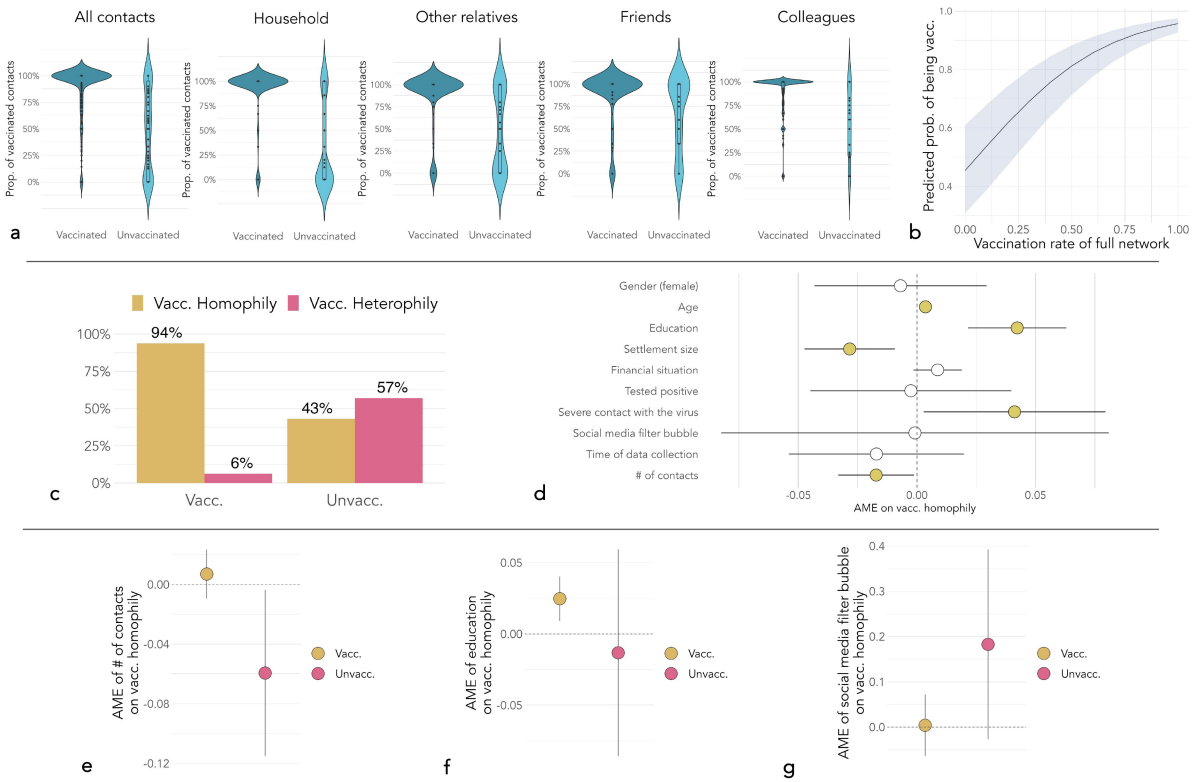

Fig 1. a Vaccination rates among different types of alters. **b** The effect of the full network's vaccination rate on vaccination status. **c** Rates of vaccination homo- and heterophily. **d** Factors that predict vaccination homophily (colored points - *p<.05*). The interaction effect of vaccination status with network size **(e**), education **(f)**, and social media filter bubble **(g)** on vaccination homophily.