



Respondent-driven sampling and an unusual epidemic

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Abstract

Respondent-driven sampling (RDS) is frequently used when sampling hard-to-reach and/or stigmatized communities. RDS utilizes a peer-driven recruitment mechanism where sampled individuals pass on participation coupons to at most c of their acquaintances in the community ($c = 3$ being a common choice), who then in turn pass on to their acquaintances if they choose to participate, and so on. This process of distributing coupons is shown to behave like a new Reed-Frost type network epidemic model, in which becoming infected corresponds to receiving a coupon. The difference from existing network epidemic models is that an infected individual can not infect (i.e. sample) all of its contacts, but only at most c of them. We calculate R_0 , the probability of a major “outbreak”, and the relative size of a major outbreak in the limit of infinite population size and evaluate their adequacy in finite populations. We study the effect of varying c and compare RDS to the corresponding usual epidemic models, i.e. the case of $c = \infty$. Our results suggest that the number of coupons has a large effect on RDS recruitment. Additionally, we use our findings to explain previous empirical observations.

Key words: Respondent-driven sampling; Epidemic model; Configuration model; Reed-Frost.

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