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Short Communication

SARS-CoV-2 contact tracing among disadvantaged populations during epidemic intervals should be a priority strategy: results from a pilot experiment in Barcelona

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ABSTRACT

Objectives: The aim of this study was to trace contacts of coronavirus disease 2019 (COVID-19) hospitalised patients and determine the risk factors of infection in urban areas.

Study design: Longitudinal analysis of contacts identified from index cases.

Methods: A contact tracing study was carried out in the Northern Metropolitan area of Barcelona, Spain, during the inter-epidemic lapse of May to July 2020, a period of low SARS-CoV-2 incidence. Index cases were notified from the referral hospital. Contacts were traced and followed up for 14 days. Reverse transcription polymerase chain reaction was performed on day 0 and day 14 for contacts.

Results: In total, 368 contacts were identified from 81 index cases (median of seven contacts per index case), from which 308 were traced successfully. The median age of contacts was 28 years, 62% (223 of 368) were men. During the follow-up period, 100 contacts tested positive for COVID-19 (32.5% [95% confidence interval {CI} = 27.3–38.0]), with a secondary infection rate of 48.3% (95% CI = 40.8–55.9) among housemates. Clusters of index and respective contacts tended to aggregate within disadvantaged neighbourhoods ($P < 0.001$), and non-national index cases ($N = 28$, 34.1%) resulted in higher secondary infection rates compared with nationals (51.0% [95% CI = 41.0–60.9] vs 22.3% [95% CI = 16.8–28.8]; $P < 0.001$).

Conclusions: Disadvantaged communities experience a disproportionate burden of COVID-19 and may act as infection reservoirs. Contact tracing with a cross-cutting approach among these communities is required, especially during inter-epidemic periods.

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Background

New diagnostics enabling contact tracing of coronavirus disease 2019 (COVID-19) cases are a milestone for the control and

prevention of SARS-CoV-2 infection,¹ as demonstrated by the outstanding results in China, Taiwan and South Korea. The overall impact of contact tracing is highest during the early stages of an epidemic outbreak and during low incidence periods, when most of the cases can be identified early and contacts effectively traced. Furthermore, it has been argued that during low-incidence periods, SARS-CoV-2 is concentrated within large families living in crowded

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urban areas, which might, in turn, be the source of further outbreaks or even new epidemic waves.²

With these assumptions, a pilot contact tracing programme was set up in the Northern Metropolitan Health Area of Barcelona. The programme took place between May and July 2020, which was after the first wave of COVID-19 and during a period of low new in-hospital cases. The study area included the Northern Metropolitan urban crown of Barcelona, which is an overpopulated region of 406,000 inhabitants with pockets of disadvantaged communities and an immigrant population of 17%. Index cases, defined as patients presenting with COVID-19 of mid or severe severity and diagnosed using standard methods (reverse transcription polymerase chain reaction [RT-PCR] or antigen detection), were systematically notified from the referral hospital of the area. Contacts were identified during an in-person interview with the index case or a close relative and contacted within 24 h thereafter. A socio-demographic questionnaire was completed and contacts were followed up during 14 days. RT-PCR was performed on day 0 and day 14 for contacts.

Results

A total of 81 hospitalised cases were notified during the study period, which represents 86% of all cases reported from the study area during the same period. The median age of cases was of 53.5 years (range 1–98 years; interquartile range [IQR] 17–52), 62% (50 of 81) were men and 34% (28 of 81) were of non-national origin from Southern Asia ($n = 10$), Central and Southern America ($n = 5$), Northern Africa ($n = 5$), Sub-Saharan Africa ($n = 3$) and 'other' ($n = 5$). From these 81 cases, up to 368 contacts were identified, of whom 84% (308 of 368) were effectively traced. The median age of contacts was of 28 years (range 1–95 years; IQR 17–46), and 62% (223 of 368) were men. The median number of contacts referred per index case was 7 (range 0–28), 62% of contacts were household members (223 of 368) and 73% were relatives of the index case (268 of 368). Index cases tended to be older than the contacts ($P < 0.001$), whereas the gender distribution was similar ($P = 0.2$). In total, 18% of contacts (55 of 308) developed symptoms compatible with COVID-19 during the follow-up period. From the systematic screening of contacts, 100 new cases were identified (secondary infection rate of 32.5% [95% confidence interval {CI} = 27.3–38.0]); 88% (88 of 100) during the first screening (day 0) and 12% (12 of 100) during the second screening (day 14). Overall, 30% of SARS-CoV-2 infected contacts showed symptoms of disease (30 of 100). The main risk factors for infection among contacts were being a household contact ($P < 0.001$), which had an infection rate of 48.3% (95% CI = 40.8–55.9), having a higher cluster size ($P = 0.003$) and being of non-national origin ($P < 0.001$). In terms of nationality, non-national index cases resulted in a much higher secondary infection rate than nationals (51.0% [95% CI = 41.0–60.9] vs 22.3% [95% CI = 16.8–28.8]; $P < 0.001$). Furthermore, we performed a geo-location of index cases with cross-reference to estimated household annual incomes obtained from the National Institute of Statistics in Spain³ (see Fig. 1). We observed a clear clustering of index cases in low-income areas (multi-distance spatial cluster analysis P -value of < 0.001).

Discussion

From the results of this study, important remarks about COVID-19 infection could be highlighted. Firstly, our specific household secondary infection rate lies in the upper bounds of previously published studies.^{4,5} Secondly, the majority of index cases and their contacts came from the most disadvantaged (lower income) population stratum. And thirdly, there is an overrepresentation of index

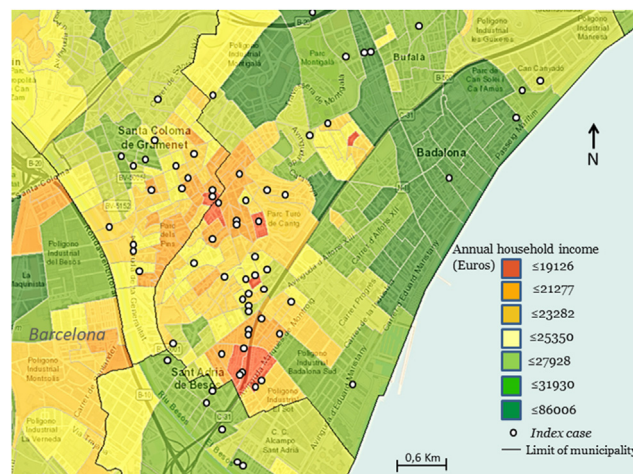


Fig. 1. Mapping of index cases and estimated annual household income per year by neighbourhood (2017).

cases from migrant communities, which resulted in a high rate of secondary infections in these populations.

Overall, these data suggest that socio-economic determinants have a major influence on the risk of SARS-CoV-2 transmission during low-incidence periods, as suggested by other authors⁶ and previously described in Barcelona.⁷ This may be due to economic factors (e.g. small flats, multiple roommates, employment requiring close personal interaction, difficulties in adhering to poorly adapted social distancing measures), cultural determinants (e.g. language and cultural barriers to access health services) or lack of insurance (e.g. undocumented immigrants). From a public health perspective, these communities could become hot spots during epidemic intervals and may play a substantial role in the resurgence of COVID-19, as seen in August 2020 in Spain.

The key role of disadvantaged communities in the spread of SARS-CoV-2 has already been described in the US among undocumented and uninsured immigrant populations,⁸ and homeless populations in Europe.⁹ Furthermore, these pockets of the population may play an important role in amplifying new SARS-CoV-2 variants when introduced within these communities. This point deserves special attention because non-national communities are currently the most frequent international travellers (in the absence of international tourism) and may import new variants, despite pre- and post-travel screening measures.

These observations support the notion that early implementation of intensive contact tracing at the right moment and targeting low-income populations should be a priority. This intervention should encompass a sociocultural package of measures and tailored interventions, such as socio-economic support during confinements and the use of culturally friendly approaches (i.e. through the intervention of sociocultural mediators), which has not received sufficient attention to date.¹⁰ This could help to overcome the social determinants of COVID-19 infection, mitigate poverty-related factors and, subsequently, improve health indicators of these populations.

From a wider perspective, the data in this study strongly suggest that targeted and timely contact tracing would be highly cost-effective (high numbers of new cases identified) and would help to create a more resilient society towards the spread of COVID-19. Indeed, it may be reasonable to consider sociocultural criteria when prioritising the distribution of COVID-19 vaccines. In the absence of vaccination, disadvantaged communities would still experience a disproportionate burden of disease and become viral reservoirs

during low-transmission intervals, which could ultimately lead to uncontrollable infection resurgences.

Author statements

Ethical approval

This study was approved by the Ethical Board of the Hospital Universitari Germans Trias i Pujol, with the reference number PI-20-349.

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Competing interests

None to declare.

Author contributions

All authors contributed to the design of the study, contributed to interpretation of the data, commented on the manuscript and approved the final draft. Xavier Vallès was responsible for the data management and statistical analysis. SV, LV, ILM, OPQ, LS, LMC, MDP, IB, JO and AE carried out the fieldwork.

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