COVID-19 Contact Networks in Hispanic and Latino Communities

Analysis of contact tracing data from a large California healthcare provider network

Introduction

Across the United States, COVID-19 is disproportionately affecting Hispanic and Latino communities.[1] These communities are experiencing higher diagnosis rates and increased likelihood for hospitalization and death.[2,3] As the largest ethnic group in California, "Latino people are overrepresented [as compared to White people] in cumulative cases (3,784 versus 1,112 per 100,000 people) and are underrepresented in cumulative testing (35,635 versus 48,930 per 100,000 people)."[4] Table 1 shows that close to half (48.5%) of the COVID-19 related deaths in California were among Latinos.

Table 1. California population and COVID-19 indicators by race/ethnicity, March 22-October 3, 2020

	Total N°	Latino	Black	White	Asian	Other/ Unknown
Population	38,329,281	39.1%	5.3%	37.5%	14.4%	-
Cases	817,947	45.3%	3.0%	12.4%	4.1%	35.3%
Deaths	17,815	48.5%	7.3%	29.9%	11.5%	2.8%
People in crowded households*	6,305,218	71.2%	3.4%	10.1%	13.1%	-
People in households with essential workers	24,116,506	44.8%	4.5%	31.7%	15.4%	-
People in crowded households with essential workers	4,817,502	73.5%	2.7%	8.7%	13.2%	-

* People in households with the number of rooms being smaller than the number of occupants in the home.

Source: Reference N° 4

Latino and Hispanic people in California have higher risk of exposure to and transmission of COVID-19, which stems from numerous inequities in social determinants of health that also impact COVID-19 outcomes. Past research points to "systemic drivers that influence how Hispanic persons live and work [that] increase their exposure risks."[5] Job characteristics, household size, and health care disparities are just a few of the factors contributing to the higher risk of COVID-19 exposure and transmission for Hispanic and Latino people.

➤ Hispanic and Latino people are more likely to be essential workers, or be unable to work remotely due to occupation, and are more likely to have jobs that place them at greater risk of exposure to and transmission of COVID-19.[1,6,7]

➤ Hispanic and Latino people also live in larger households on average, making social distancing a challenge and creating more opportunities for exposure and transmission. Research shows that "Latino people in California are 8.1 times more likely to live in crowded households with an essential worker compared with White people (23.6 percent versus 2.9 percent)."[4]

➤ Disparities related to health and healthcare, such as a lack of health insurance, access to care, and underlying health conditions, contribute to poorer COVID-19 outcomes for Hispanic and Latino people than for other ethnic groups.[3,4,7]

The Tracing Health network analysis project sought to explore underlying factors contributing to higher COVID-19 transmission rates seen in Hispanic and Latino communities. This paper uses Tracing Health contact tracing data from a large California healthcare provider network to examine household size, occupation, and contact network size of Hispanic and Latino people as compared to non-Hispanic and Latino people (see Appendix for design and methods). Since analysis includes data about cases from a single healthcare provider network, results cannot be generalized to all people in California. Findings show that on average, Hispanic and Latino people in this sample are more likely to live in larger households, work in essential jobs, and have larger contact networks than people who do not identify as Hispanic or Latino. This means that Hispanic and Latino people experience higher levels of known COVID-19 transmission risk factors that are often beyond their control.

For references, please refer to the appendix at the end of this document or visit:
https://www.tracinghealth.org/wp-content/uploads/2021/10/TH-Network-Analysis-Brief-Appendices.pdf

Hispanic and Latino people live in larger households; report larger contact networks on average

Hypotheses Tested:

1. Hispanic and Latino individuals will live in larger households on average than individuals who do not identify as Hispanic or Latino.

2. As an individual's household size increases, the size of their contact network will also increase.

Table 2. Average Hispanic and non-Hispanic household size in the United States and California.

|	United States	California
Hispanic	3.25	4.1
Non-Hispanic	2.43	2.5

Source: Reference N°s 8 & 9

When people live in larger households, they come into contact with more people on average and might have a harder time following COVID-19 prevention strategies, such as social distancing and self-quarantine, than people who live in smaller households.[10]

Risk of COVID-19 infection increases with household size: One study modeled that "with our baseline parameters, [risk of infection] ranged from <0.2% for individuals living alone to 5.4% for households of 7 or more." [11]

Figure 1. Household Size by Network Size
Relationship between household size and size of contact network
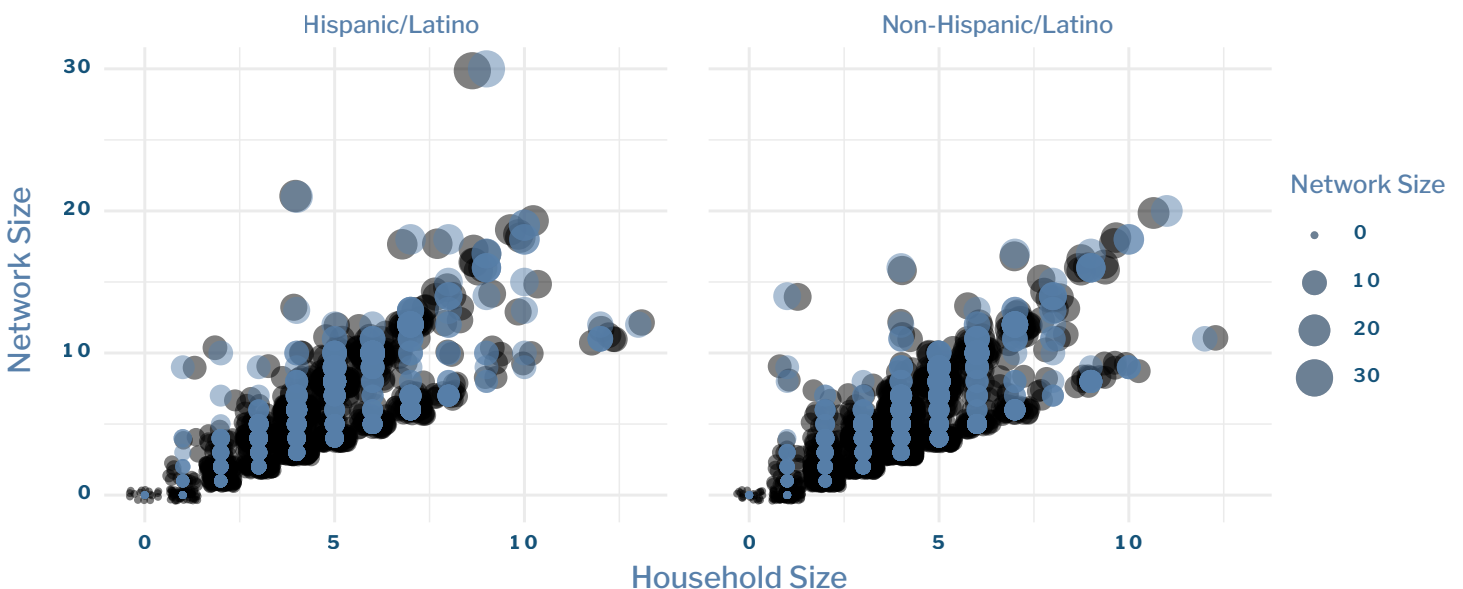
Source: Tracing Health Program

Tracing Health data show that a person's contact network is positively related to household size, which explains 65.9% of the variation seen in the size of a person's contact network (p<0.00). Figure 1 shows that on average, the size of a person's contact network increases by 0.48 for each additional person in their household (p<0.00). Table 2 shows that in both California and the United States, Hispanic and Latino people live in larger households on average, which increases opportunity for exposure to COVID-19.[8,9] One study of hospitalized COVID-19 patients found that 38.3% of Hispanic patients reported larger household size (living in a household of at least 4 other people) compared to non-Hispanic patients (13.4%) and more exposure to infected household contacts (23.7% versus 15.2%).[12] A higher likelihood of living in a larger household translates to higher exposure to and infection with COVID-19.

Tracing Health data show differences in the average household size of Hispanic and Latino people and non-Hispanic and Latino people (p<0.00). On average, Hispanic and Latino people live in larger households (average of 4 people) than people who do not identify as Hispanic or Latino (average of 3 people). Since Hispanic and Latino people live in larger households on average, they are more likely to have challenges with social distancing and increased exposure to COVID-19.

This paper uses Tracing Health contact tracing data from a large California healthcare provider network (see Appendix for design and methods). Since analysis includes data about cases from a single healthcare provider network, results cannot be generalized to all people in California.

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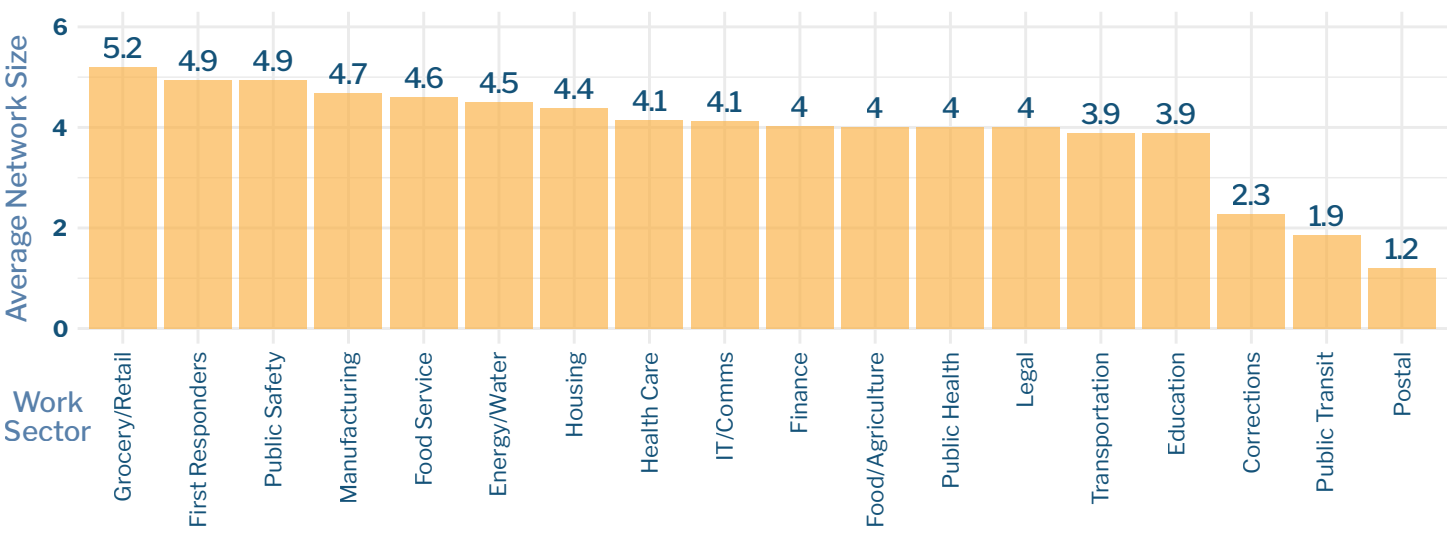
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Hispanic and Latino people come into contact with more people at work, leading to larger contact networks and increased COVID-19 exposure

Hypotheses Tested:

(1) Hispanic and Latino individuals will be proportionally more likely to work in essential jobs than individuals who do not identify as Hispanic or Latino.

(2) Individuals who work in essential jobs will have larger contact networks on average than individuals who do not work in essential jobs.

Hispanic and Latino workers are more likely to hold essential jobs than non-Hispanics and Latinos, leading to increased occupational exposure to COVID-19.[2,13] Hispanic and Latino adults are also more likely to live in households with at least one essential worker (64.5%) compared with non-Hispanic Black (56.5%) and White (46.6%) adults.[14] Selden and Berdhal (2020) found that Black and Hispanic workers disproportionately hold essential jobs, or those that present risk of exposure to infectious disease, as compared to White workers, as well as being less likely to have the option of working from home.[14,15]

Figure 2. Contact Network Size by Work Sector

Source: Tracing Health Program

Tracing Health results show this is especially true for Hispanic and Latino people, who are proportionally more likely to work in essential jobs than individuals who do not identify as Hispanic or Latino (45% and 38% respectively, p<0.00). Essential workers who are Hispanic or Latino have significantly (p<0.00) larger contact networks on average (4.9 contacts) than non-Hispanic/Latino essential workers (3.8 contacts). **This means Hispanic and Latino people are more likely to come into contact with more people at work on average than non-Hispanic/Latino people, which leads to more contacts on average and increased COVID-19 exposure.**

▶ *When people leave home to work, they come into contact with more people on average than people who work from home and they may not be able to stay home if they get sick.*

Nande et al. (2020) found that risk of acquiring COVID-19 increased with essential worker status, modelling a relative risk of 1.6 for essential workers as compared to 0.8 for households with no essential workers.[11] Many essential workers are unable to take time off work due to ineligibility for wage replacement and dependence on income or health insurance.[6]

Tracing Health data shows there is no significant difference in network size between essential workers (4.27) and non-essential workers (4.13). This finding is surprising, since Nande et al. (2020) demonstrates that essential workers encounter more people on average than non-essential workers. [11] However, analysis shows there are notable differences in network size by work sector, with results approaching statistical significance (p=0.08). Figure 2 shows that people who reported working as grocery/retail workers, first responders, public safety workers, and those working in manufacturing and food service have more contacts on average than workers in other sectors. Further research is needed to understand why Tracing Health data shows no significant difference in network size by essential work status and why workers in some sectors have significantly larger contact networks than others.

This paper uses Tracing Health contact tracing data from a large California healthcare provider network (see Appendix for design and methods). Since analysis includes data about cases from a single healthcare provider network, results cannot be generalized to all people in California.

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# Hispanic and Latino people have larger contact networks, which leads to increased COVID-19 exposure

Hypothesis Tested : ① The contact and transmission networks of Hispanic and Latino individuals will be larger and have higher density than the contact and transmission networks of individuals who do not identify as Hispanic/Latino.

▶ *Ethnicity is intertwined with many factors, household size and essential work being just two. These factors create the structures that increase a person's chances of becoming sick.*

A CDC Mobility and Mortality Weekly Report (MMWR) found that of COVID-19 patients in Denver, Hispanic patients reported living in households of five or more and having more known COVID-19 exposures in addition to higher rates of working in an essential industry as compared to non-Hispanic people. The same study also found that Hispanic individuals reported more frequent exposure to a known COVID-19 case within the household and outside the household.[5] **The combination of larger households and working outside of the home creates more points of contact and potential opportunities for exposure to and transmission of COVID-19.**

Tracing health data show that contact and transmission networks are larger for Hispanic and Latino people than for people who do not identify as Hispanic or Latino. Figure 3 shows that on average, Hispanic and Latino people had larger networks (average of 4.6 connections) than people who did not identify as Hispanic or Latino (average of 3.8 people, p<0.00). **This means Hispanic and Latino people encountered more people on average than non-Hispanic and Latino people, which can lead to increased COVID-19 exposure.**

Figure 3. Average Contact Network Size by Ethnicity
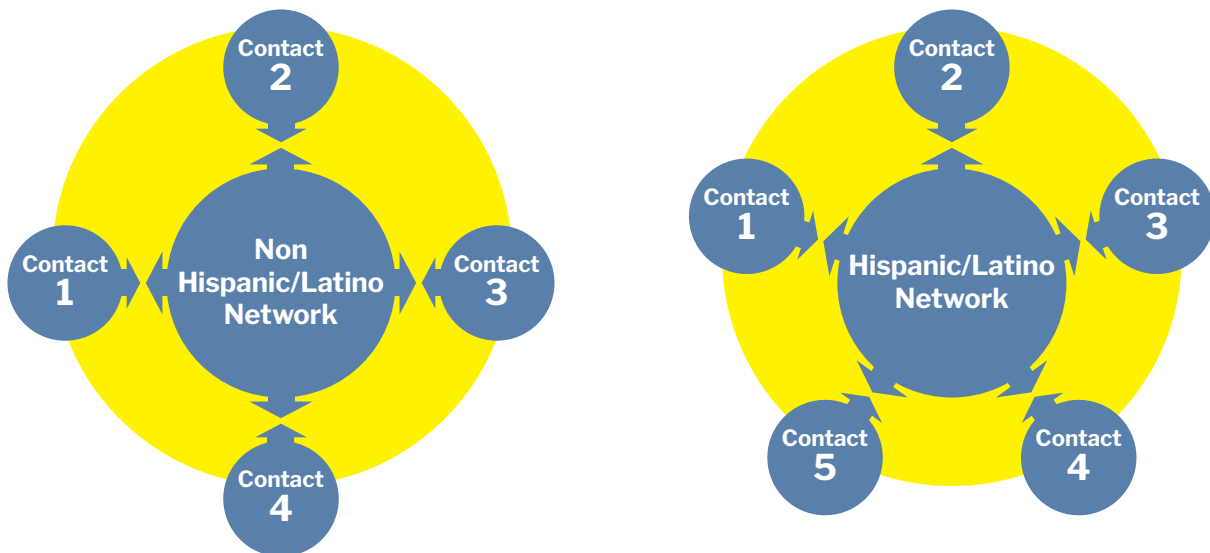
Source: Tracing Health Program

Tracing Health has prioritized hiring a workforce that is culturally centered and able to provide primary language services. A majority of Tracing Health community care specialists are bilingual/multilingual and nearly half are Hispanic / Latino. The ability to offer contact tracing services in peoples preferred language creates trust, avoids miscommunication and therefore leads to better health outcomes.

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Conclusions of our Analysis

Our analysis through August 2021 underlines the following critical points:

① *Hispanic and Latino people live in larger households; report larger contact networks on average.*

② *Hispanic and Latino people come into contact with more people at work, leading to larger contact networks and increased COVID-19 exposure.*

③ *Hispanic and Latino people have larger contact networks, which leads to increased COVID-19 exposure.*

Opportunities for Action

Better understanding the COVID-19 health disparities experienced by Hispanic and Latino communities can help inform health and community interventions tailored to their cultural and situational context.

Opportunities for action include:

▶ **Developing culturally appropriate COVID-19 testing, vaccination, and advocacy programs.** In Washington, the NATIVE Project partnered with community-based organizations and advocates from communities of color to host vaccination clinics tailored to each community. "With the inherent racism that nonwhite communities experience regularly, seeing community members, hearing information in their first language and feeling comfortable at the clinics was vital to their success." [16]

▶ **Implementing sector specific outreach strategies.** Tracing Health data showed that people doing essential work in certain sectors have more contacts on average than essential workers in other sectors. However, additional analysis is needed to validate these findings and prioritize which sectors should be targeted for outreach, education, and more comprehensive interventions.

Further Areas of Investigation

Findings from this project highlight that Hispanic and Latino people in this sample are more likely to live in larger households, work in essential jobs, and have larger contact networks – thus, experiencing higher risk factors for COVID-19 exposure and transmission.

Further investigation may help us better understand additional factors around the increased risk as well as inform potential strategies and interventions including:

▶ Qualitative follow-up with Hispanic and Latino individuals who have been affected by COVID-19 to better understand how the underlying causes identified through this analysis play out in a day-to-day setting and how these causes may be mitigated or otherwise controlled.

▶ Geospatial mapping of networks to examine geographic trends and identify "hot spots" or areas for targeted intervention.

▶ Further analysis of Tracing Health data looking at ethnic groups other than Hispanic and Latino.

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Appendix A: Methods

Design

This study used contact tracing data and multiple quantitative techniques to investigate network characteristics of Kaiser Permanente California members who tested positive for COVID-19 from November 30, 2020, through May 11, 2021.

Data

Contact tracing data were collected by the Public Health Institute's Tracing Health program, de-identified, and shared with the Population Health Innovation Lab (PHIL) for analysis. The datasets include information about Kaiser Permanente members who became infected with COVID-19 (i.e., index cases) and their contacts.

Data about people include information for 8,863 Kaiser Permanente members who tested positive for COVID-19 and their 5,268 reported contacts (total n=14,131). This dataset includes information about the age, ethnicity, primary language spoken, household size, and occupation of people who tested positive for COVID-19 and completed a case interview with a Tracing Health contact tracer.

A subset of data was used for hypothesis testing. A case was included in the data used for hypothesis testing if 1) the case interview was completed, and 2) household member count was reported. In total, 3,224 cases were used for hypothesis testing.

Variable Operationalization

Seven key variables were used to test research hypotheses.
A description of variables and their operationalization is provided in Table 1 below.

Table 1. Description of Variables and Operationalization

Variable	Operationalization
Network Size (DV)	Network size is calculated based on a person's degree and reported household member count. Degree equals the number of connections reported for a person and is calculated using network analysis. Household member count is reported by index cases during case interviews. Network size equals the sum of a person's degree and household size, minus 1.
Network Density (DV)	The entire network's graph density. A network with a graph density of 1 has all possible connections reported; a graph density of 0 means no connections were reported. This variable was calculated using network analysis.
Ethnicity (IV)	A person's self-reported ethnicity (Hispanic/Latino or non-Hispanic/Latino). This field was captured as a dichotomous variable (0, 1) during contact tracing interviews.
Household Size (IV)	The reported number of people living in a person's household (including the index case). This field was captured as an integer during contact tracing interviews.
Occupation (IV)	A person's self-reported occupation. This field was captured as text during contact tracing interviews.
Essential Worker (IV)	A person's status as an essential worker. This variable was coded as a dichotomous variable (0, 1) using occupation data. Coding followed the Centers for Disease Control and Prevention's (CDC's) definition of essential workers.
Sector (IV)	A person's work sector. This variable was coded as a categorical variable using occupation data. Coding followed the CDC's Advisory Committee on Immunization Practice's workforce categories.

Note: DV = dependent variable, IV = independent variable

Source: Tracing Health Program

Analysis

PHIL researchers used de-identified, secondary data provided by Tracing Health to map and analyze the COVID-19 transmission networks of Kaiser Permanente members in California, with specific analytic attention paid to Hispanic and Latino individuals.

Multiple quantitative techniques were used to investigate network characteristics and test five research hypotheses. Descriptive statistics were calculated in support of each research hypothesis. Network analysis was used to calculate network size and network density. Bivariate regression analysis was used to predict the relationship between household size and network size. Analysis of variance (ANOVA) tests were used to assess differences among groups, including occupation sectors and household sizes. T-tests were used to assess differences by ethnicity and essential work.

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Appendix B: Contacts per Index Case

Tracing Health data show that index cases reported coming into contact with 4.2 people on average. Most index cases reported 2 contacts (10%, n=567 index cases) or 4 contacts (10%, n=546 index cases). It was also common for index cases to report coming into contact with 3 people (7%, n=412 index cases), 6 people (6%, n=358 index cases), or 1 person (6%, n=344 index cases). It was uncommon for index cases to report 11 or more contacts (2%, n=120 index cases). Analysis included data for index cases who completed interviews and reported household size (n=3,224 cases).

Figure 4. Contacts per Kaiser Permanente Index Case
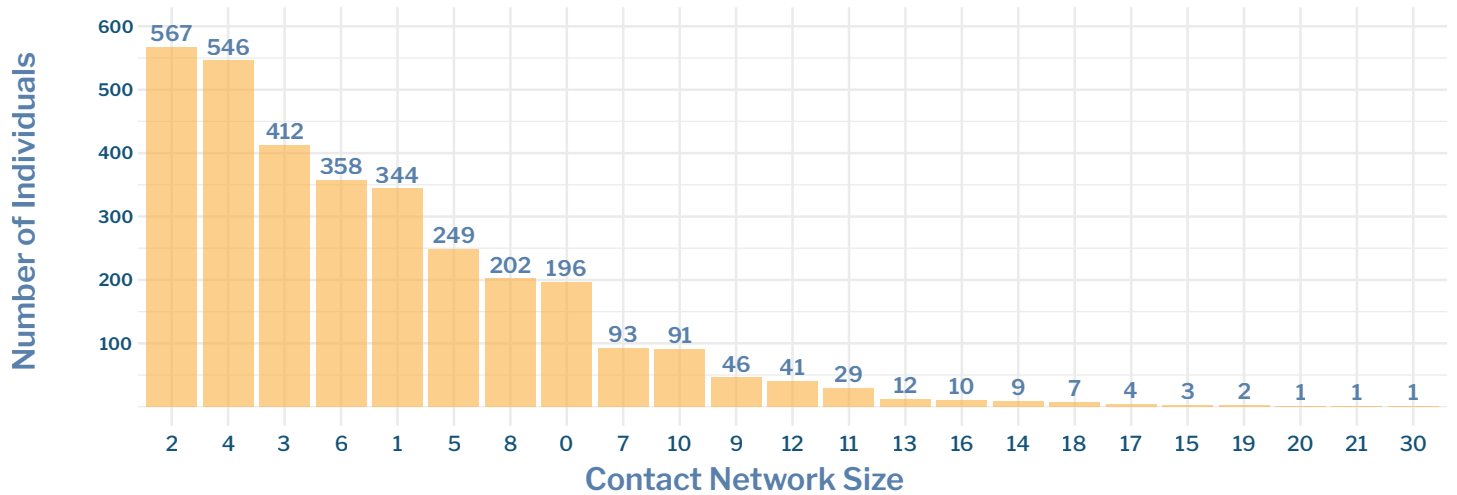
Source: Tracing Health Program

References

1   Hooper, M. W., Nápoles, A. M., & Pérez-Stable, E. J. (2020). COVID-19 and Racial/Ethnic Disparities. JAMA, 323(24), 2466–2467. https://doi.org/10.1001/jama.2020.8598

2   Rodriguez-Diaz, C. E., Guilamo-Ramos, V., Mena, L., Hall, E., Honermann, B., Crowley, J. S., Baral, S., Prado, G. J., Marzan-Rodriguez, M., Beyrer, C., Sullivan, P. S., & Millett, G. A. (2020). Risk for COVID-19 infection and death among Latinos in the United States: examining heterogeneity in transmission dynamics. Annals of epidemiology, 52, 46–53.e2. https://doi.org/10.1016/j.annepidem.2020.07.007

3   American Psychiatric Association. (2020). Coronavirus , Mental Health and Hispanics in the United States. 1–4. https://www.psychiatry.org/File Library/Psychiatrists/APA-COVID-19-Mental-Health-Facts-Hispanics.pdf

4   Reitsma, M. B., Claypool, A. L., Vargo, J., Shete, P. B., McCorvie, R., Wheeler, W. H., Rocha, D. A., Myers, J. F., Murray, E. L., Bregman, B., Dominguez, D. M., Nguyen, A. D., Porse, C., Fritz, C. L., Jain, S., Watt, J. P., Salomon, J. A., & Goldhaber-Fiebert, J. D. (2021). Racial/ethnic disparities in covid-19 exposure risk, testing, and cases at the subcounty level in California. Health Affairs, 40(6), 870–878. https://doi.org/10.1377/hlthaff.2021.00098

5   Podewils, L. J., Burket, T. L., Mettenbrink, C., Steiner, A., Seidel, A., Scott, K., Cervantes, L., & Hasnain-Wynia, R. (2020). Disproportionate Incidence of COVID-19 Infection, Hospitalizations, and Deaths Among Persons Identifying as Hispanic or Latino — Denver, Colorado March–October 2020. Morbidity and Mortality Weekly Report (MMWR), 69(48), 1812–1816. https://www.cdc.gov/mmwr/volumes/69/wr/mm6948a3.htm

6   Dubay, L., Aarons, J., Brown, K. S., & Kenney, G. M. (2020). How Risk of Exposure to the Coronavirus at Work Varies by Race and Ethnicity and How to Protect the Health and Well-Being of Workers and Their Families. The Urban Institute. December.

7   Artiga, S., Garfield, R., & Orgera, K. (2020). Communities of Color at Higher Risk for Health and Economic Challenges due to COVID-19. https://www.kff.org/coronavirus-covid-19/issue-brief/communities-of-color-at-higher-risk-for-health-and-economic-challenges-due-to-covid-19/

8   www.census.gov

9   California Senate Office of Research. (2017). A Statistical Picture of Latinos in California 2017 Update California Senate Office of Research. July. https://latinocaucus.legislature.ca.gov/sites/latinocaucus.legislature.ca.gov/files/forms/Statistical Picture of Latinos in California - 2017 Update.pdf

10 Centers for Disease Control and Prevention. (2020, December 20). Risk of exposure to covid-19. https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/racial-ethnic-disparities/increased-risk-exposure.html.

11 Nande, A., Adlam, B., Sheen, J., Levy, M. Z., & Hill, A. L. (2021). Dynamics of COVID-19 under social distancing measures are driven by transmission network structure. PLoS Computational Biology, 17(2). https://doi.org/10.1371/JOURNAL.PCBI.1008684

12 Beusekom, M. van. (2020, December 4). Disparities detailed in black, Hispanic COVID patients in NYC, Denver. Center for Infectious Disease Research and Policy (CIDRAP) News. https://www.cidrap.umn.edu/news-perspective/2020/12/disparities-detailed-black-hispanic-covid-patients-nyc-denver

13 Cases were considered essential workers if a) their work was needed to ensure the continuity of necessary public functions, and b) the job could not be performed from home. Learn more about categories of essential workers at https://www.cdc.gov/vaccines/covid-19/categories-essential-workers.html.

14 Selden, T. M., & Berdahl, T. A. (2020). COVID-19 and racial/ethnic disparities in health risk, employment, and household composition. Health Affairs, 39(9), 1624–1632. https://doi.org/10.1377/hlthaff.2020.00897

15 Gould, E., & Shierholz, H. (2020). Not everybody can work from home: Black and Hispanic workers are much less likely to be able to telework. Working Economics Blog. https://www.epi.org/blog/black-and-hispanic-workers-are-much-less-likely-to-be-able-to-work-from-home/

16 Dreher, A. (2021, July 10). Answering the 'spiritual call to action': How the NATIVE Project brought vaccines to Spokane's communities of color. The Spokesman-Review. https://www-spokesman-com.cdn.ampproject.org/c/s/www.spokesman.com/stories/2021/jul/11/how-the-native-project-brought-vaccines-to/?amp-content=amp.

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