



Published in final edited form as:

Wellbeing Space Soc. 2024 ; 6: . doi:10.1016/j.wss.2024.100185.

Pandemic effects on social capital in residents and non-residents of Chinese immigrant enclaves in Philadelphia

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Abstract

The COVID-19 pandemic's effect on established Chinese ethnic enclaves, which faced socio-economic disruptions as well as anti-Asian sentiment, is unknown. We compared the pandemic's effect on social capital among residents and non-residents of Chinese ethnic enclaves in Philadelphia. Despite declines in group participation and citizenship activity (joining with others or speaking with local officials to address a neighborhood problem), the pandemic increased support received from other individuals and cognitive social capital (e.g., neighborhood trust and sense of belonging), with more pronounced changes in enclaves. Our findings provide evidence of both greater vulnerability and resilience in terms of social capital among Chinese immigrants during the pandemic. Understanding the pandemic's effects on social capital in different neighborhood contexts can underscore communities' strengths, and ways to improve resilience to future challenges.

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Ethics statement

We wish to confirm that the work described in this manuscript has been carried out in accordance with the Helsinki Declaration of Helsinki for research involving humans. Additionally, written informed consent was obtained from all participants, and the privacy rights of participants were closely observed.

CRedit authorship contribution statement

Marilyn Tseng: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Emily Walton:** Conceptualization, Data curation, Funding acquisition, Methodology, Writing – review & editing. **Brian L. Egleston:** Formal analysis, Methodology, Writing – review & editing. **Carolyn Y. Fang:** Conceptualization, Data curation, Funding acquisition, Methodology, Project administration, Resources, Writing – review & editing.

Declaration of competing interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

Keywords

COVID-19 pandemic; Enclave; Immigrant; Neighborhood; Social capital

Introduction

The COVID-19 pandemic has had substantial impacts on Chinese communities throughout the US, where social and economic disruptions were compounded by anti-Asian sentiment based on the racialization of COVID-19 as a ‘Chinese Virus’. (Rogers et al., 2020) In particular, the imposition of public health guidelines for social distancing changed the norms that govern social interactions, which in turn may have influenced access to social capital. Social capital is broadly defined as the resources—such as information, social support, and instrumental assistance—available from reciprocal network connections, which can be used to pursue individual or collective goals (Wang and Ganapati, 2018; Yu et al., 2021). Social capital is often conceptualized as having structural and cognitive components. The structural component refers to observable social interactions, such as the formal groups in which one participates or individual relationships that provide different forms of support. The cognitive component refers to perceptions of trust, reciprocity, norms, and values within the community (Wang and Ganapati, 2018; Ehsan et al., 2019). Social capital is available at different levels of interaction. Ties with those who share one’s social identity give rise to bonding social capital; ties with people of a different social identity outside of one’s close social networks give rise to bridging social capital; and ties to government or other structures of power or authority provide a basis for linking social capital (Ehsan et al., 2019; De Silva et al., 2006).

Communities with greater social capital have mounted a more effective response to the COVID-19 pandemic (Liu et al., 2022; Mathbor, 2007; Aldrich, 2012), with some evidence of better adherence to social distancing (Borgonovi and Andrieu, 2020; Durante et al., 2020), and lower infection (Bartscher et al., 2020; Wu, 2021) and death rates (Fraser et al., 2020). Whether and how social capital itself has been affected by the pandemic, however, is unclear. Guidelines about social distancing may have disrupted communities’ ability to facilitate and organize social capital. On the other hand, the experience of the pandemic may have strengthened social bonds by building a sense of solidarity through shared hardship, as has been observed in studies of communities after natural disasters (Dussaillant and Guzmán Astete, 2015).

This stronger sense of solidarity might be more pronounced for individuals of Chinese ethnicity in the US in the wake of anti-Asian violence, and more particularly among residents of ethnic enclaves, where fear of COVID-19 drastically reduced patronage of Chinatown businesses early in the pandemic (Fiorillo, 2020; Carman and Heil, February 14, 2020; Aratani, 2020). Residents of ethnic enclaves are generally also thought to have more social capital, through opportunities to connect with others who share similar social and cultural backgrounds. (Becares and Nazroo, 2013) Worth noting, however, is that different types of enclaves may also have different capacities for resilience. In addition to high co-ethnic density, for example, established enclaves, often located in central urban areas,

generally also include neighborhood institutions such as culture- and language-specific community organizations, businesses, and churches that contribute to a sense of connection and belonging. (Walton, 2016; Wagner et al., 2021) Newly emerging enclaves, the result of movement to neighborhoods outside of urban centers, often have recent increases in co-ethnic density but not the social and economic structures available in established enclaves (Wagner et al., 2021). This lack of social and cultural institutions in emerging enclaves may mean they are less supportive of some forms of structural social capital, such as group membership and bridging and linking capital.

How the pandemic has affected social capital in Chinese ethnic enclaves, and whether this relationship is different in established vs. emerging enclaves, are unknown. Understanding how the COVID-19 pandemic relates to social capital in different ethnic neighborhood contexts can underscore communities' strengths, as well as methods to improve resilience in future challenges. The current study investigates the impact of the pandemic on social capital among residents and non-residents of established and emerging Chinese ethnic enclaves in Philadelphia. We hypothesized the following (Fig. 1):

1. Enclave residents would have higher social capital at baseline, with the highest in established enclaves.
2. The pandemic would have different effects on different components of social capital – specifically,
 - a. because of public health guidelines about social distancing, a decrease in group participation, and
 - b. because of shared hardship and a sense of solidarity, increases in support from individual relationships and in cognitive social capital.
3. Because cultural institutions and closer social ties may improve resilience in enclave neighborhoods, the increases in individual support and cognitive social capital would be more pronounced among residents of enclaves, especially among residents of established enclaves.

Methods

Study sample

From September 2018 to December 2019, we recruited a convenience sample of $n = 520$ Chinese immigrant adult men and women into a longitudinal study on neighborhoods and cardiometabolic risk through community organizations, events, businesses, chain referrals, and contacts within the Chinese community in the Philadelphia region. Research staff screened interested participants for eligibility, obtained written consent to participate, oriented participants to study procedures, and scheduled appointments for interviews and data collection visits. Because the study was designed primarily to examine post-migration determinants of cardiometabolic risk trajectories, the sample was limited to healthy individuals who had immigrated as adults. Eligibility criteria included: (1) Chinese heritage; (2) migration from Asia at age ≥ 18 y; (3) age 35–65 y; and (4) residence in the Philadelphia region. Exclusion criteria included: (1) known, physician-diagnosed and/or treated clinical

disease (diabetes, myocardial infarction, stroke, heart failure, cardiovascular procedures, cancer (except non-melanoma skin cancer)); (2) pregnancy or lactation; (3) current or planned (within 2 years) nursing home residence; and (4) impaired cognitive ability or inability to provide informed consent. The study was approved by the Fox Chase Cancer Center Institutional Review Board, and all contact and informed consent documents were provided in English and Chinese.

We used a non-probability quota sampling approach to draw approximately equal proportions of the sample from each of 3 neighborhood types: established, emerging, and non-enclave. Established and emerging enclaves were identified through a systematic process using data from the American Community Survey 5-Year Estimates (2014–2018). First, we calculated Location Quotients (LQ), as the ratio of the proportion of Chinese residents in a given census tract to the proportion of Chinese residents in the total population of the Philadelphia metropolitan area. (Smaje, 1995) A z-score cutpoint of >2.58 SD (significant at 0.01 level) (Poulsen et al., 2010) above the mean for the Philadelphia metropolitan area identified four areas (Chipman et al., 2016). We then used local knowledge as well as academic (Sze, 2010; Li et al., 2013) and lay (Patusky and Ceffalio, 2004; Bahadur, 2005; Pew Charitable Trusts 2011) sources to confirm selection of three of the areas recognized locally as Chinese enclaves, but excluded one university neighborhood where there were many transient Asian students. We distinguished ‘established’ and ‘emerging’ enclaves by examining change in LQ between 2000 and 2010. The established enclaves, represented by three census tracts in Center City (Chinatown) and 9 census tracts in South Philadelphia, were areas in which at least one census tract maintained a LQ z-score > 2.58 ($p < 0.01$) in both 2000 and 2010. The 9 census tracts in the emerging enclave located in the Near Northeast section of Philadelphia all had LQ z-scores < 1.96 in 2000 but >2.58 in 2010 (Fig. 2).

Study procedures

From September 2018 to January 2020, interviewers fluent in Chinese conducted detailed baseline interviews, either in person or over the telephone, in the appropriate dialect (Mandarin or Cantonese). Interviews elicited information on sociodemographic characteristics and other relevant variables.

From May to July 2020, participants were re-contacted by telephone to complete a follow-up interview. Study staff obtained completed interviews from $n = 419$ participants (80.6 % retention).

Measures

Sociodemographic characteristics including age, gender, marital status, length of US residence, highest level of education, and current occupation were assessed at baseline. For current occupation, participants selected a category from among the following: not employed; farmer/farm worker; machine/vehicle operator; crafts worker; service worker; clerical worker; sales worker; manager/administrator; or professional/technical. For these analyses, the occupation categories were collapsed into four groups: (i) crafts worker, machine or vehicle operator, or farmer/farm worker (‘blue collar’); (ii) service worker; (iii)

clerical worker, sales worker, manager/administrator, professional/technical ('white collar'), or self-employed; or (iv) not employed.

Level of acculturation was assessed at baseline using an abridged, 11-item version of the General Ethnicity Questionnaire – American version (GEQA) (Tsai et al., 2000), which assesses the respondent's degree of engagement with and acculturation into American culture, and activities (e.g., 'I celebrate American holidays', 'At home, I eat American food'), with a minimum of 1.0 (least acculturated) and a possible maximum score of 5.0 (most acculturated). The scale demonstrated high internal reliability in the present sample (Cronbach's $\alpha=0.86$) and in prior studies (Tseng and Fang, 2014).

Social capital was assessed at baseline and during the pandemic follow-up interview using the short version of the Adapted Social Capital Assessment Tool (SASCAT). (De Silva et al., 2006) SASCAT captures three components of *structural social capital*: (1) membership in neighborhood groups; (2) receiving support from specific individuals; and (3) citizenship activities (Table 1). (De Silva et al., 2006) To capture group membership, participants were asked if they had been an active member in any of eight types of groups (Table 1). Scores could range from 0 to 8, reflecting the number of group types the respondent belonged to. Support from individuals was assessed by asking whether in the last 12 months participants had received help or support from others (Table 1), for a possible response range of 0–9 reflecting the number of types of individuals they received support from. Additional analyses examined these different types of individuals separately in terms of bonding (family, neighbors, friends), bridging (community leaders, religious leaders, politicians), and linking (government officials, social workers) social capital, as categorized by De Silva et al. (De Silva et al., 2006) Citizenship activities were assessed based on responses to two questions regarding whether in the last 12 months participants had joined with other members in their neighborhood to address a problem or common issue, or talked with a local authority or governmental organization about neighborhood problems, with affirmative responses summed for a possible maximum score of 2. Cognitive social capital was assessed through four questions on perceptions of neighborhood trust, social harmony, sense of belonging, and fairness (Table 1). (De Silva et al., 2006) As above, affirmative responses were summed for a possible range of 0–4.

Similar to prior studies, (De Silva and Harpham, 2007; Dinesen et al., 2013; Flores et al., 2014) social capital variables were dichotomized depending on their distributions: group membership and citizenship activities were dichotomized as any vs. none; individual support was dichotomized as support from ≥ 3 vs. <3 individuals; and cognitive capital was dichotomized as a score of 4 vs. <4 . Construct validity of SASCAT has been demonstrated among low-income samples internationally, (De Silva et al., 2006; Dewitt et al., 2005) and other studies have shown associations of various aspects of social capital measured using SASCAT with life satisfaction, (Takahashi et al., 2011) post-traumatic stress disorder following the 2007 earthquake in Peru, (Flores et al., 2014) and child nutritional status. (De Silva and Harpham, 2007) Internal reliability was not assessed for the group membership, individual support, and citizenship components of SASCAT since they are indexes whose individual items are not necessarily correlated. (Streiner, 2003) However, coefficient alpha

for the 4-item cognitive social capital scale was 0.76, demonstrating good internal reliability for this construct in our sample.

We examined other Census tract-level variables commonly used as indicators of socioeconomic disadvantage (Krieger et al., 1997) as potential confounders. These included proportion of adults age 25 and older with a college degree; percent of occupied housing units that were owner-occupied; percent of adults age 18–64 years living in poverty; and median household income. Additionally, ethnic density was operationalized as the proportion of Census tract residents who were Chinese. To reflect characteristics of the sample during the period of data collection, we used 2016–2020 data from American Community Survey 5-Year Estimates.

Statistical analysis

Of the 520 participants recruited into the study, two were excluded for missing covariate data, leaving a sample of 518 for this analysis, 417 of whom also completed follow-up interviews. We used analysis-of-variance and Cochran-Mantel-Haenszel test statistics to evaluate unadjusted, bivariate associations of neighborhood type (established, emerging, and non-enclave) with social capital and other covariates. Measures of social capital were: group membership, support from individuals, citizenship, and cognitive social capital; additional analyses considered support from individuals from separate sources in terms of bonding, bridging, and linking capital.

To test Hypothesis 1, we used logistic regression analyses to model baseline associations between neighborhood type and higher vs. lower social capital, with social capital variables dichotomized as described above. Variables expected a priori to be associated with neighborhood type and/or social capital were included as potential confounders in fully adjusted models. These were age at baseline (years), gender, marital status (married or not), education level (<8 years, 8–11 years, high school graduate, Bachelors degree or higher), occupational category (blue collar, service, or white collar occupation), length of residence in the US (years), acculturation level (continuous GEQA score), percent of adults in the Census tract with a college degree, median household income of the Census tract, percent of adults in poverty in the Census tract, and percent of homes in the Census tract that were owner-occupied.

To test Hypothesis 2, we ran logistic regression models to quantify the likelihood of having higher social capital during the pandemic as compared to baseline using Generalized Estimating Equations (GEE) with an exchangeable correlation matrix, to account for repeated measures. These models included 935 observations (518 baseline + 417 follow-up observations) and adjusted for the covariates listed above.

Finally, to test Hypothesis 3, we examined effect modification of the association between time (pandemic vs. baseline) and social capital by neighborhood type in the same GEE logistic regression models but including a time (baseline or pandemic) x neighborhood type interaction term. Interaction p -values < 0.10 were investigated further by modeling change in social capital separately for each neighborhood type.

Results were similar when we extended enclave boundaries to include a ¼-mile buffer, which resulted in an additional 33 participants in established enclaves and an additional 29 in the emerging enclave. The findings presented here represent the original boundaries without the ¼-mile buffer.

All analyses were conducted using SAS (version 9.4, 2013, SAS Institute, Inc., Cary, NC).

Results

Of 518 participants, 128 lived in an established enclave, 171 in the emerging enclave, and 219 in a neighborhood categorized as non-enclave. Mean (SD) age was 52.7 (7.7) years, 34.2 % were male, and 84.4 % were married (Table 2). Most participants had not completed college and were in blue collar or service occupations. Residents across neighborhood types were not significantly different with respect to age, gender, marital status, and level education. However, non-enclave residents had the highest mean length of US residence and acculturation scores, and emerging enclave residents were the least likely to be white-collar or self-employed. Established enclave residents lived in census tracts that were more ethnically dense, had higher proportions of college-educated adults, and had higher median household income. Emerging enclave residents lived in census tracts with lower proportions of college-educated adults, higher proportions of owner-occupied housing units, and lower median household income.

With respect to social capital at baseline, while 14 % of the sample participated in one group, most people (82 %) did not participate in any. The most commonly reported groups overall were religious groups (8.5 %), community associations or co-ops (7.1 %), and work-related groups or trade unions (5.0 %) (data not shown). Although overall group participation did not differ across neighborhoods, non-enclave residents were more likely to participate in work-related organizations (7.8 %) than either established (3.1 %) or emerging (2.9 %) enclave residents ($p = 0.05$) (data not shown). On the other hand, most participants (75 %) reported receiving some form of support from individuals – mostly family (72.6 %), friends (48.1 %), and neighbors (39.6 %). Accordingly, participants reported more bonding social capital but markedly less bridging or linking capital; while 75 % reported at least one form of bonding social capital, fewer than 10 % reported at least one form of either bridging or linking capital. Social capital in the form of citizenship was generally low, with 85 % reporting neither form of citizenship activity. In contrast, almost 80 % of the sample reported the maximum score of 4 for cognitive social capital, and no participants reported the minimum score of 0.

In multivariate analyses of pre-pandemic social capital, emerging enclave residents were significantly more likely to report support from other individuals (OR 1.79, 95 % CI 1.09, 2.96) – namely in the form of bridging (OR 3.44, 95 % CI 1.39, 8.49) and linking (OR 3.06, 95 % CI 1.00, 9.37) capital – than residents of non-enclaves (Table 3). They were also significantly more likely to report citizenship activities than were non-enclave residents (OR 2.09, 95 % CI 1.02, 4.29). Contrary to expectation, established enclave residents did not report higher levels of any of the forms of social capital compared to emerging enclave residents, although they were marginally significantly more likely to report linking capital

compared to residents of non-enclaves (OR 3.02, 95 % CI 0.95, 9.52). Other forms of social capital – group membership, bonding social capital, and cognitive social capital – did not differ significantly across neighborhood types at baseline.

Multivariate analyses including repeated measures indicated a significant decline in group membership; overall, study participants were about half as likely to participate in a group during the pandemic as compared to baseline (OR 0.55 (95 % CI 0.37, 0.81) (Table 4). While the decrease occurred across all neighborhoods, it was most pronounced and only statistically significant in established enclaves (Chinatown and South Philadelphia), where group membership declined from 22.3 % to 6.8 % (pandemic vs. baseline OR 0.23, 95 % CI 0.09, 0.58). The most marked declines were for participation in community associations and religious organizations, while membership in work-related groups remained stable (data not shown).

Citizenship activities also declined significantly, with participants only a third as likely to report any citizenship activities during the pandemic compared to baseline (OR 0.34, 95 % CI 0.21, 0.55). The overall decrease was driven by statistically significant decreases among established and non-enclave residents, while it was not significant for residents of emerging enclaves (interaction $p = 0.016$). Established enclave residents again reported the most pronounced decline, from 14.8 % at baseline to 1.0 % during the pandemic (pandemic vs. baseline OR 0.03, 95 % CI 0.003, 0.25).

In contrast, individual support increased overall (OR 4.33, 95 % CI 3.27, 5.74) and across all neighborhoods. The proportion who reported receiving assistance from 3+ sources increased from 35.5 % at baseline to 69.3 % during the pandemic, with the greatest increases concentrated among the three sources of bonding capital: family, friends, and neighbors (data not shown). The increases in both overall individual support and bonding capital in particular were largest among residents of established enclaves and least pronounced among emerging enclave residents, who had higher levels at baseline (interaction $p = 0.006$ for overall individual support, interaction $p = 0.046$ for bonding social capital). Linking social capital as a source of individual support, however, decreased across all neighborhoods (OR 0.10, 9 % CI 0.03, 0.34). This decrease was significant among established and emerging enclave residents but not in non-enclave residents, whose linking social capital at baseline was already very low.

Finally, cognitive social capital increased significantly overall (OR 17.97, 95 % CI 8.24, 39.17). During the pandemic, 98.3 % of participants reported the maximum score of four, compared with 77.6 % at baseline (data not shown). The increase was more pronounced among established and emerging enclave residents (interaction $p = 0.011$); during the pandemic, all participants residing in established enclaves reported the maximum possible score for this component of social capital.

Discussion

Primary findings of this study are that: (1) emerging enclave residents reported higher pre-pandemic levels of individual support, particularly in the form of bridging and linking

capital, and citizenship activities; (2) despite declines in group participation and citizenship activities, the pandemic increased support received from individuals, especially in the form of bonding social capital, and cognitive social capital among Chinese immigrants in all neighborhood types; and (3) despite a more pronounced decrease in group membership, established enclave residents also had more pronounced increases in individual support (mainly in the form of bonding social capital) and cognitive social capital.

We expected a greater level of social capital at baseline and greater resilience in social capital with the pandemic in established enclaves, which provide both the social structures to connect with people who share cultural heritage, values, and norms, as well as physical structures such as churches and community centers to facilitate such interactions. Consistent with this expectation was the observation that non-enclave residents were the least likely to report bridging or linking social capital and citizenship activities at baseline. However, contrary to expectation, although established enclave residents had the most pronounced increase in individual support during the pandemic, they did not report significantly higher levels of social capital at baseline. Moreover, a reliance on neighborhood-based meeting spaces for community and religious groups might have made them more vulnerable to restrictions on social distancing, as they showed the greatest declines in group membership. Instead, emerging enclave residents reported higher levels of individual support – mainly because they were more likely to report support from sources of bridging and linking capital – compared to residents of both established enclaves and non-enclave neighborhoods. They also seemed to show greater resilience during the pandemic overall – demonstrating significant increases in individual support and cognitive social capital.

As expected from the pandemic's social disruptions and severely restricted opportunities for group activities, the pandemic related simultaneously to a decrease in group participation-based social capital and to increases in individual support and cognitive social capital. In studies of the effect of the pandemic among youths in China, social capital remained stable for most participants, but changes that occurred were generally consistent with the current findings: a decrease in participation in community organizations, and an increase in living with, having a good relationship with, and receiving support from family (Yu et al., 2021). Similarly, during the pandemic, older adults in Japan participated less in groups while their social cohesion increased (Sato et al., 2022). In our study, although the increase in individual support was somewhat more pronounced in established enclaves, that it increased across all neighborhood types suggests that enclaves did not uniquely facilitate this form of social capital.

The lack of difference in cognitive social capital at baseline – which was high overall – was surprising since we expected better social cohesion and trust in enclaves where shared identity should play a role. A mixed-methods study conducted among ethnic minority communities in England (Becares and Nazroo, 2013) also suggests that the association of enclave neighborhoods with social capital is complex. In that study, the association differed by ethnic group and was also only associated when aggregated as an area-level measure. Whereas Indian participants referred to amenities such as temples, community centers, and social networks, Caribbean participants, who were also more likely than Indian participants to live in the most deprived areas, did not remark on these positive attributes, suggesting that

neighborhood impacts on social capital depend on the context and position of the immigrant community in wider society.

On the other hand, our finding regarding the increase in cognitive social capital with the pandemic is consistent with studies conducted after earthquakes in Japan, Pakistan, and Chile, which have generally shown an increase in cognitive social capital following these disasters, particularly in places where pre-disaster levels of social capital were higher (Dussailant and Guzmán Astete, 2015). Disasters may strengthen social bonds by building a sense of solidarity and common identity through shared hardship, creating opportunities for collective activity, and increasing trust of strangers (Dussailant and Guzmán Astete, 2015; Lee and Fraser, 2019; Ntontis et al., 2018; Partelow, 2021; Toya and Skidmore, 2014; Yamamura, 2016). The COVID-19 pandemic similarly seems to have had positive impacts on social capital, (Cappelen et al., 2020) especially in enclaves, where we observed more pronounced increases. The racialization of COVID-19 led to widespread avoidance of Chinese neighborhoods, with severe economic impacts, (Fiorillo, 2020; Carman and Heil, February 14, 2020; Aratani, 2020) and may have contributed to the increase in anti-Asian violence, including in Philadelphia. (Orso, 2021; Falk and Conant, 2021) Such severe economic and social disruptions likely increased the need for and reliance on some of the structures for social capital – in particular, existing close ties (bonding social capital) – and community solidarity that is the basis for cognitive social capital. Also worth noting is that the significant decline in group membership during the pandemic, while an indicator of reduced structural social capital, may also indicate high cognitive social capital if individuals did not participate in groups to protect the health of community members.

While cognitive social capital in the established enclaves was high – during the pandemic, 100 % of participants in these neighborhoods reported the maximum score of four on this scale – these neighborhoods still remain vulnerable to changes that might disrupt sense of community. As early as 2013, sociodemographic shifts associated with gentrification have been noted in Philadelphia’s Chinatown, raising concerns over the enclave’s survival. (Li et al., 2013) These changes may be accelerating with several new apartment buildings and public parks in the northern section of Chinatown. (Schmidt, 2022; Russ, 2019)

Other work emphasizes that collective hardship does not always lead to an increase in social capital in other forms. Social trust appears to have decreased following the Spanish Flu pandemic 1918–1920, possibly because of the failure of governments and public health institutions to contain the crisis (Aassve et al., 2021). Dussailant and Guzman (Dussailant and Guzmán Astete, 2015) suggest that disasters might erode social trust in conditions of scarce recovery resources, unequal access to information and opportunities during recovery, or displacement.

In our study sample, we also observed that citizenship activities and linking capital decreased, suggesting severed connections with larger societal structures as individuals moved towards closer bonds. During the pandemic, involvement in citizenship activities decreased to less than half of pre-pandemic levels, and fewer than 1 % of participants reported any form of linking capital. Thus, while a consequence of the pandemic might have been to draw people more closely together, another consequence might have been to further

distance them from governmental and decision-making processes and the people involved in those processes. Taken together, these findings highlight the importance of considering impacts on multiple forms of social capital, given their different roles in community recovery.

A limitation of the study is that people who did not participate in a follow-up interview during the pandemic tended to have lower cognitive social capital at baseline, possibly overstating the increase in cognitive social capital during the pandemic. However, the proportion of participants who responded during the pandemic was high overall (~80 %) and similar across neighborhoods. Second, while SASCAT's assessment of individual support has been evaluated for validity, measures of bonding, bridging, and linking social capital that together make up the measure of individual support have not been validated. The issue is of particular relevance if, as our results suggest, a community stressor such as a pandemic serves to increase some forms of social capital (such as bonding) while curtailing others (such as linking). Future work should more directly address the associations of these different forms of social capital with neighborhood and community stress.

Generalizability of the findings is unclear; our convenience sample included healthy individuals who had immigrated to the US as adults, and, further, these findings warrant replication in other neighborhoods. An additional limitation is that we used census tract boundaries to delineate borders for the established and emerging enclave areas rather than residents' own perceptions of where the borders fall. However, to identify neighborhood types we used a robust method that was both based on objective criteria and supported by academic and lay understanding of Philadelphia neighborhoods. Further, our findings were unchanged in sensitivity analyses extending enclave boundaries to include a ¼-mile buffer.

Major strengths of the study include its longitudinal design, with repeated measures of both structural and cognitive components of social capital, to capture change in these factors from before to during the pandemic. In addition, our operationalization of neighborhood types allowed us to distinguish between established and emerging enclaves, and our recruitment strategy resulted in a unique sample of Chinese immigrants residing in a wide range of neighborhood types in the Philadelphia region.

Besides replication in other geographic areas and ethnic groups, our findings suggest three directions for future work. First, both the contributors to and consequences of the significant increases in individual support and cognitive social capital with the pandemic warrant further investigation. Clarifying the extent to which neighborhood, as opposed to individual characteristics, enabled enclave residents in particular to access individual sources of support or to feel a greater sense of harmony with their community can inform strategies to improve resilience to community hardship. Whether increases in these forms of social capital protected against experiences of discrimination and social isolation will be informative of the potential benefits of strategies to build social capital.

Second, in the current study, residents of non-enclaves generally reported levels of social capital at baseline that were comparable to their enclave-residing counterparts. The roots of cognitive capital in non-enclave neighborhoods warrants further exploration – in particular,

whether features of the neighborhoods have facilitated development of neighborhood trust, and the extent to which it is due to individual psychosocial characteristics. Clarifying the factors that contribute to social capital for Chinese immigrants living in areas of low co-ethnic density would also be informative for efforts to support the development of social resources in other minoritized groups.

Finally, given that residents of the emerging enclave in the current study proved to be remarkably resilient in the face of the pandemic, understanding the processes by which neighborhoods undergoing sociodemographic changes develop the physical and social structures that nurture social capital can point to ways to equip communities to improve their resilience. Overall, future work to discover community-level factors that contribute to the growth of different forms of social capital merits deeper exploration. Qualitative or mixed-method approaches may help illuminate the processes by which specific neighborhood characteristics facilitate or impede the development of social capital.

Our findings provide evidence that while the pandemic related to declines in group membership in this sample of Chinese immigrants, it was associated with increases in other forms of social capital. These changes were more pronounced for residents of established enclaves, suggesting both greater vulnerability and greater resilience in these communities that merit further exploration. An overall decrease in forms of social capital linking individuals to wider society, including its power structures, was also apparent. These findings suggest the importance of clarifying how social capital derived from interacting within an immigrant enclave might be leveraged to counter the effects of a community stressor such as the COVID-19 pandemic.

Acknowledgements

The authors are grateful to Ms. Wanzi Yang, Ms. Julia Zhong, Ms. Minzi Li, and Ms. Yuku Chen for their crucial work in collecting and managing data for this study.

Funding

This work was supported by the National Institutes of Health grants R01 MD012621, U54 CA221705 and P30 CA06927.

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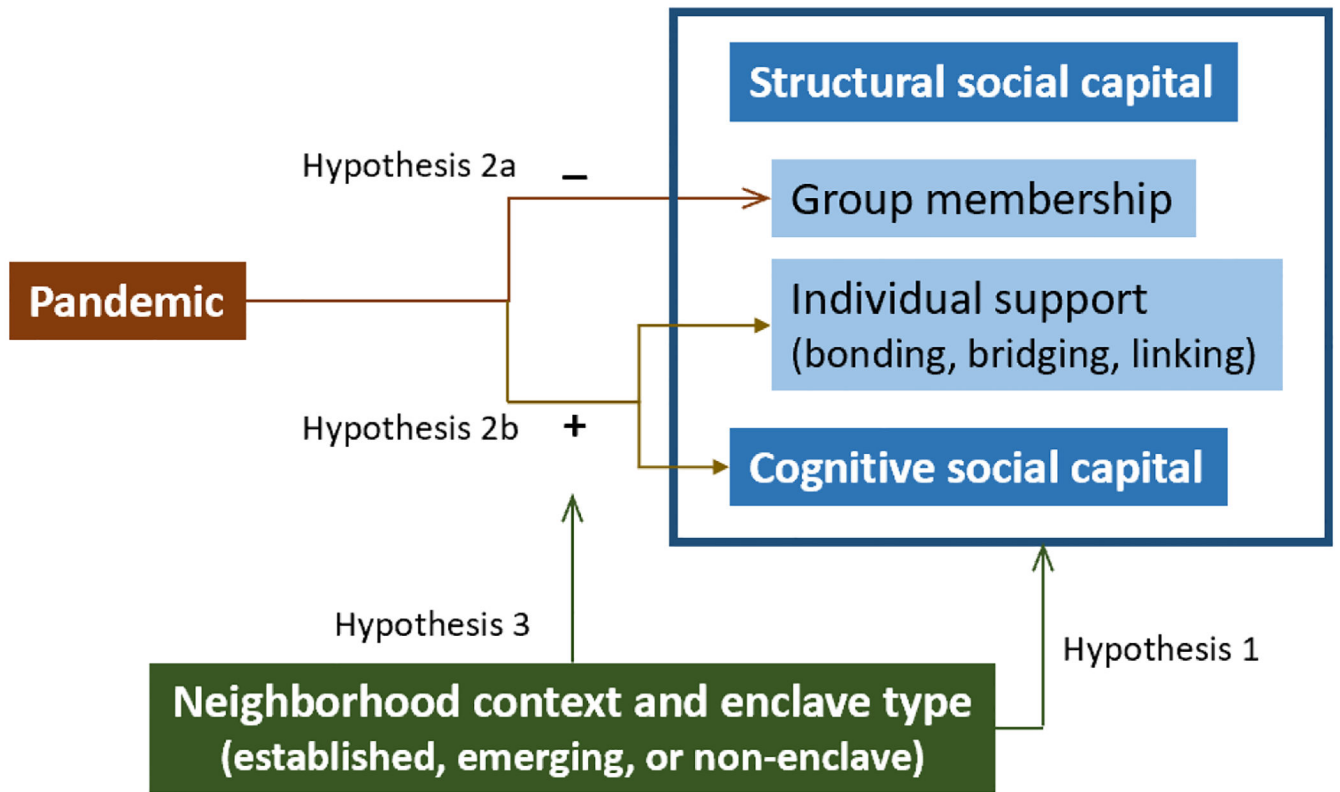


Fig. 1. Conceptual model linking COVID-19 pandemic to social capital.

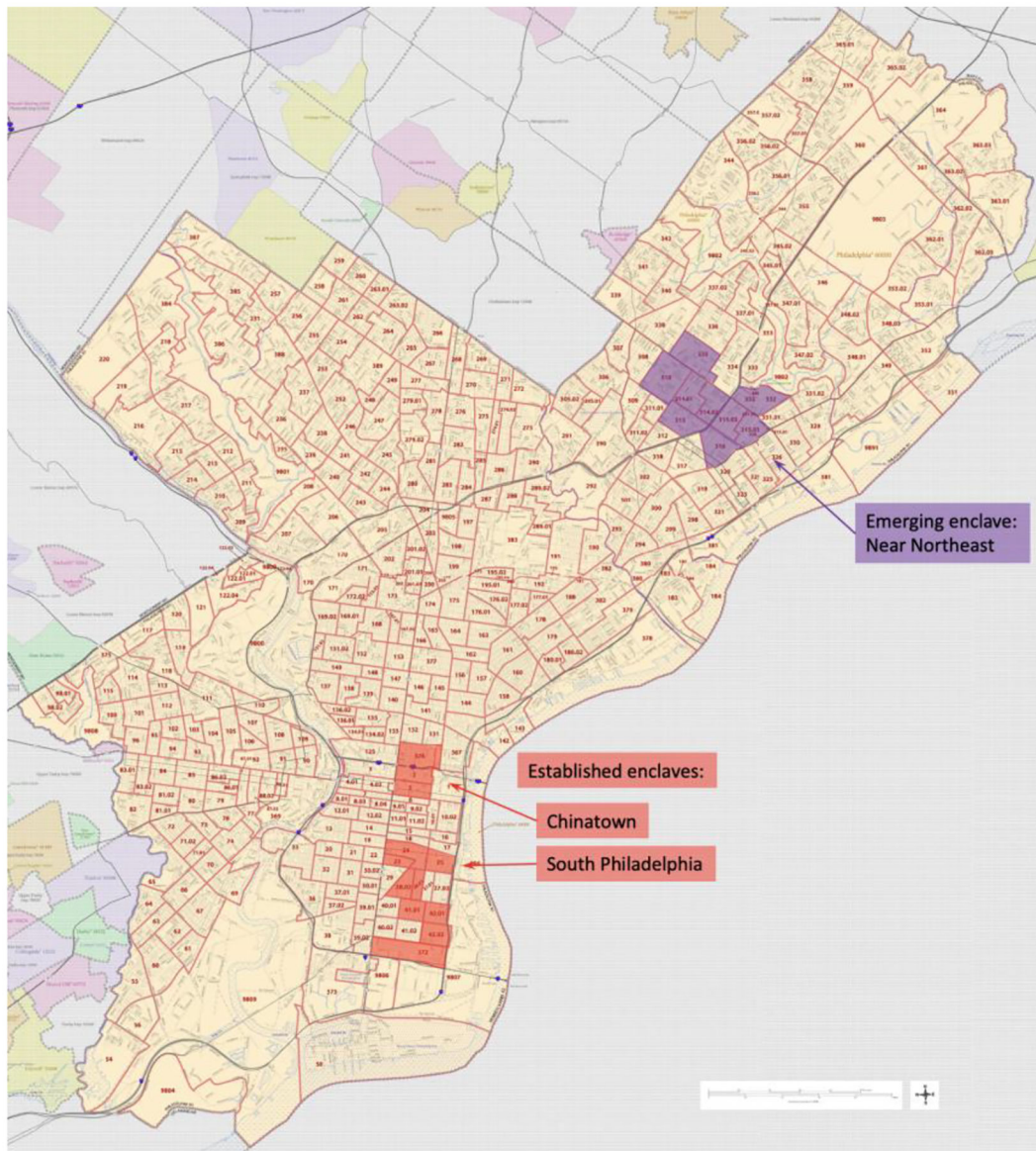


Fig. 2. Census tracts included in established and emerging enclaves in Philadelphia. Map adapted from 2010 census tract reference maps for Philadelphia County, PA. (US Census Bureau 2010).

Measure of social capital using the short version of the Adapted Social Capital Assessment Tool (SASCAT).⁵.

Table 1

Questions		Possible range
Structural social capital		
Group membership	<p>In the last 12 months have you been an active member of any of the following types of groups in your neighborhood?</p> <ul style="list-style-type: none"> • Work-related / trade union • Religious group • Community association / co-op • Credit group • Women's group • Sports group • Political group • Other 	0-8
Individual support	<p>In the last 12 months, have you received any help or support from any of the following? This can be emotional help, economic help or assistance in helping you know or do things.</p> <ul style="list-style-type: none"> • Family • Politicians • Neighbors • Government officials / civil service • Friends who are not neighbors • Social worker • Neighborhood or community leaders • Religious leaders • Other • Citizenship activities <p>In the last 12 months, have you joined together with other members in your neighborhood to address a problem or common issue?</p>	0-9
Cognitive social capital	<p>In the last 12 months, have you talked with a local authority or governmental organization about problems in your neighborhood?</p> <ul style="list-style-type: none"> • In general, can the majority of people in your neighborhood be trusted? • Do the majority of people in your neighborhood generally get along with each other? • Do you feel as though you are really a part of this neighborhood? • Do you think that the majority of people in this neighborhood would try to take advantage of you if they got the chance? 	0-2 0-4

Table 2
Descriptive characteristics of study sample at baseline ($n = 518$), overall and by neighborhood type.

	All	Non-enclave	Emerging enclave	Established enclave	<i>p</i> -value ^d
<i>n</i>	518	219	171	128	
Mean (SD) age (y)	52.7 (7.7)	52.8 (8.0)	53.2 (6.7)	51.8 (8.3)	0.29
Male (%)	34.2	38.4	33.3	28.1	0.15
Married (%)	84.4	85.4	86.6	79.7	0.23
Highest level of education (%)					0.24
<8 years	46.3	44.3	45.0	51.6	
8–11 y or vocational/technical school	17.4	16.9	21.1	13.3	
High school completion or some college	31.1	32.0	31.6	28.9	
College or graduate degree	5.2	6.9	2.3	6.3	
Occupational category (%)					0.0003 ^{b,c}
Not employed	25.7	19.2	31.6	28.9	
Blue collar	25.3	23.7	27.5	25.0	
Service	38.6	41.6	38.6	33.6	
White collar / self-employed	10.4	15.5	2.3	12.5	
Mean (SD) length of US residence (y)	17.6 (9.8)	19.2 (10.3)	16.3 (8.9)	16.6 (10.0)	0.006 ^{b,d}
Mean (SD) General Ethnicity Questionnaire (acculturation) score	2.51 (0.74)	2.60 (0.74)	2.43 (0.72)	2.44 (0.75)	0.04 ^{b,d}
(SD))					
% Chinese residents	13.1 (11.5)	4.5 (4.1)	18.1 (5.8)	21.0 (15.3)	<0.0001 ^{b,c,d}
% adults age 25+ with a college degree	28.7 (17.4)	29.1 (16.2)	15.4 (6.2)	45.6 (14.4)	<0.0001 ^{b,c,d}
% of housing units owner-occupied	56.5 (19.6)	55.0 (23.2)	60.2 (14.3)	54.0 (18.1)	0.008 ^{b,c}
% adults age 18–64 in poverty	17.4 (8.9)	17.7 (11.8)	17.7 (5.9)	16.5 (5.9)	0.39
Median household income	56,632 (21,143)	54,036 (27,139)	50,071 (8116)	69,838 (14,902)	<0.0001 ^{b,c,d}
Structural social capital Group membership					0.93
0	81.7	81.7	83.6	78.9	
1	14.1	13.2	13.5	16.4	
2	4.2	4.1	2.9	4.7	
Support from individuals					0.13
0	24.5	22.4	22.2	31.3	

	All	Non-enclave	Emerging enclave	Established enclave	p-value ^a
1	19.5	21.5	15.8	21.1	
2	20.5	23.7	19.3	16.4	
3	28.6	27.4	33.3	24.2	
4	7.0	5.0	9.4	7.0	
Bonding capital					
0	25.5	23.3	22.8	32.8	0.20
1	19.7	21.0	16.4	21.9	
2	23.9	25.1	26.3	18.8	
3	30.9	30.6	34.5	26.6	
Bridging capital					
0	91.1	94.5	87.7	89.8	0.11
1	6.6	3.7	8.2	9.4	
2	2.1	1.8	3.5	0.8	
3	0.2	0.0	0.6	0.0	
Linking capital					
0	93.8	96.8	90.6	93.0	0.09
1	5.6	2.7	8.2	7.0	
2	0.6	0.5	1.2	0.0	
Citizenship					
0	85.1	85.8	84.2	85.3	0.91
1	11.8	11.9	12.3	10.9	
2	3.1	2.3	3.5	3.9	
Cognitive social capital					
1	9.1	7.8	9.9	10.2	0.43
2	5.4	3.2	6.4	7.8	
3	7.9	7.3	9.4	7.0	
4	77.6	81.7	74.3	75.0	

^aP-value for difference in distribution of across neighborhoods using Cochran-Mantel-Haenszel chi-square test or analysis-of-variance for continuous variables.

^bNon-enclave significantly different from emerging enclave residents.

^cEmerging enclave residents significantly different from established enclave residents.

Non-enclave significantly different from established enclave residents.
p

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Table 3

Fully adjusted^a odds ratios (OR) and corresponding 95 % confidence intervals (CI) for greater social capital at baseline by neighborhood type. Boldface indicates statistically significant associations ($n = 518$).

	Non-enclave	Emerging enclave	Established enclave	<i>p</i> -value ^b
Group membership (1 vs. 0)	1.00 (ref)	1.31 (0.69, 2.50)	1.13 (0.59, 2.15)	0.707
Support from individuals (>3 vs. <3)	1.00 (ref)	1.79 (1.09, 2.96)	0.92 (0.53, 1.57)	0.045
Bonding capital (3 vs <3)	1.00 (ref)	1.28 (0.88, 2.13)	0.80 (0.46, 1.40)	0.373
Bridging capital (1 vs 0)	1.00 (ref)	3.44 (1.39, 8.49)	1.86 (0.74, 4.71)	0.032
Linking capital (1 vs 0)	1.00 (ref)	3.06 (0.998, 9.37)	3.02 (0.95, 9.52)	0.055
Citizenship (1 vs. 0)	1.00 (ref)	2.09 (1.02, 4.29)	0.84 (0.41, 1.72)	0.064
Cognitive social capital (4 vs. < 4)	1.00 (ref)	0.60 (0.34, 1.08)	0.66 (0.36, 1.23)	0.151

^aAdjusted for age at baseline (years), gender, marital status (married or not), education level (<8 years, 8–11 years, high school graduate, Bachelors degree or higher), occupational category (blue collar, service, or white collar / self-employed), length of residence in the US (years), acculturation level (continuous GEQA score), percent of adults in the Census tract with a college degree, median household income of the Census tract, percent of adults in poverty in the Census tract. and percent of homes in the Census tract that were owner-occupied.

^b*P*-value from Wald test statistic.

Table 4

Fully adjusted^a odds ratios (OR) and corresponding 95 % confidence intervals (CI) for greater social capital during pandemic vs. baseline, overall and by neighborhood type. Boldface indicates statistically significant associations.

	All	Non-enclave ^b	Emerging enclave ^b	Established enclave ^b
Group membership (1 vs. 0)				
Baseline	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Pandemic	0.55 (0.37, 0.81)	0.65 (0.36, 1.17)	0.68 (0.34, 1.38)	0.23 (0.09, 0.58)
Interaction p-value ^c		0.103		
Support from individuals (3 vs. <3)				
Baseline	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Pandemic	4.33 (3.27, 5.74)	5.15 (3.31, 8.00)	2.49 (1.53, 4.05)	8.01 (4.30, 13.91)
Interaction p-value		0.006		
Bonding capital (3 vs <3)				
Baseline	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Pandemic	5.05 (3.80, 6.72)	5.01 (3.22, 7.80)	3.51 (2.12, 5.72)	10.07 (5.29, 18.16)
Interaction p-value		0.046		
Bridging capital (1 vs 0)				
Baseline	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Pandemic	0.73 (0.44, 1.20)	1.36 (0.58, 3.21)	0.55 (0.24, 1.29)	0.44 (0.14, 1.40)
Interaction p-value		0.265		
Linking capital (1 vs 0)				
Baseline	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Pandemic	0.10 (0.03, 0.34)	0.28 (0.05, 1.49)	0.06 (0.008, 0.50)	NE ^f
Interaction p-value		0.092		
Citizenship (1 vs. 0)				
Baseline	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Pandemic	0.34 (0.21, 0.55)	0.25 (0.11, 0.59)	0.67 (0.33, 1.34)	0.03 (0.003, 0.25)
Interaction p-value		0.016		
Cognitive social capital (4 vs. <4)				
Baseline	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Pandemic	17.97 (8.24, 39.17)	8.40 (3.18, 22.21)	32.28 (7.23, 144.10)	NE ^d
Interaction p-value		0.011		

^aAdjusted for age at baseline (years), gender, marital status (married or not), education level (<8 years, 8–11 years, high school graduate, Bachelors degree or higher), occupational category (blue collar, service, or white collar / self-employed), length of residence in the US (years), acculturation level (continuous GEQA score), percent of adults in the Census tract with a college degree, median household income of the Census tract, percent of adults in poverty in the Census tract. and percent of homes in the Census tract that were owner-occupied.

^bNeighborhood-specific estimates were derived from models stratified on neighborhood type.

^cP-value from Wald test statistic for interaction term in model including the covariates listed above.

^dNot estimated due to zero cell values.