



Short communication

Contrasting the experiences for high- and low-income Asian Americans during COVID-19

Stella S. Yi^{a,*}, Shahmir H. Ali^b, Matthew Chin^a, Rienna G. Russo^a, Lan N. Doan^a, Pasquale Rummo^c

^a Department of Population Health, Section for Health Equity, New York University Grossman School of Medicine, New York, NY, United States

^b Department of Social and Behavioral Sciences, School of Global Public Health, New York University, New York, NY, United States

^c Department of Population Health, Section on Health Choice, Policy and Evaluation, New York University Grossman School of Medicine, New York, NY, United States

ARTICLE INFO

Keywords:

Asian Americans
COVID-19
Social determinants of health
Income inequality
Income
Socioeconomic status

ABSTRACT

There is a lack of quantitative research examining how the pandemic has affected individuals at different income levels. The Asian American population has the highest level of income inequality and serves as an excellent case study for examining differences in experience between income groups. A non-probability sample of 3084 Asian American adults living in the US was surveyed in June 2020, examining health-related behaviors and outcomes. Descriptive analyses and chi-squared statistics were conducted to identify differences in income groups (low, medium, high) among Asian Americans across regional subgroups (East, South, Southeast, Multiethnic) and disaggregated ethnicities (Chinese, Asian Indian, Japanese, and Filipino). In bivariable analyses, a significantly ($p < 0.05$) greater percentage of high-income individuals during the pandemic reported having enough money to buy the food they needed, a way to get to the store for food, and reported stores where they get food had everything they needed. High-income Chinese, Japanese, and Filipino individual also noted that, since the COVID-19 crisis, they are now working partially or fully from home. In the total sample, multivariable adjusted logistic regressions revealed medium- and low-income individuals to have low odds of working partially or fully from home (AOR:0.55, 95%CI:0.42–0.72), higher odds of not having enough money to buy the food they needed (AOR:3.54, 95%CI:1.43–11.81), and higher odds of eating less (AOR:1.58, 95%CI:1.14–2.22). These results highlight the importance of considering income distribution when characterizing disparities in health behaviors within racial/ethnic minority groups and underscore the need to bolster the infrastructure supporting low-income Asian Americans.

1. Introduction

The COVID-19 pandemic is disproportionately affecting those who are most vulnerable in the United States (U.S.), including elevated mortality rates in racial/ethnic minority communities (Flagg et al., 2020; Rubin-Miller et al., 2020), reflecting deep structural inequities in our country's infrastructure. However, there is one thread missing from the current rhetoric but critical to our understanding of the long-term impacts of the COVID-19 pandemic: the distinction of the lived experiences of individuals at differing income levels using quantitative data.

There are stark differences in news coverage, and in some cases, the published literature of pandemic experiences by income level. Many lower-income individuals commute to work on crowded mass

transportation and face food insecurity, including challenges in stockpiling foods and skipping meals for both adults and children. In parallel, higher-income individuals cook more, utilize online grocery shopping and food delivery, and focus on other challenges associated with working from home – the latter three also allow for more effective social distancing. Interestingly, recent coverage indicated that Americans may be turning to processed foods as a source of comfort (Julie Creswell et al., 2020). But one cannot help but note that this is a somewhat shortsighted perspective given that many individuals – particularly lower-income groups – tend to already survive on processed foods (Baraldi et al., 2018). Similar recognition of the role income plays in changing behavior during the COVID-19 pandemic – and potentially, on longer term health outcomes – has not been explicitly named in news

* Corresponding author at: Department of Population Health, New York University School of Medicine, 180 Madison Avenue, 8th Floor, Room 8-13, New York, NY 10016, United States.

E-mail address: Stella.Yi@nyulangone.org (S.S. Yi).

<https://doi.org/10.1016/j.pmedr.2021.101519>

Received 12 March 2021; Received in revised form 29 July 2021; Accepted 8 August 2021

Available online 12 August 2021

2211-3355/© 2021 The Authors.

Published by Elsevier Inc.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

coverage nor the published literature.

The Asian American population is a prime case study in which to examine this dichotomy of experiences during the COVID-19 crisis. The Asian American racial group has the highest income inequality compared to other racial/ethnic groups in the U.S. (Kochhar and Cilluffo, 2018). Income inequality, a measure of the economic gap between the highest and lowest income groups, has increased the most for the Asian American population over the last 50 years (Kochhar and Cilluffo, 2018). Moreover, owing to the pervasive model minority stereotype and implicit bias within the general population and researchers alike, the experiences of lower-income Asian Americans are often overlooked and ignored (Yi et al., 2016). Social determinants of health, such as low-income status, have been associated with lower prevalence of healthy lifestyle behaviors (Bhattacharya Becerra et al., 2015) as well as poorer self-rated physical and mental health (Kim et al., 2012) among Asian Americans. However, understanding the role of income in Asian American health disparities also requires acknowledging different trends across disaggregated Asian ethnic subgroups; a recent nationwide analysis found that socio-economic status (including household income) played a mediating role in reduced self-rated health among Cambodian, Chinese, Hmong, and Vietnamese Americans, but not for Korean and Filipino Americans (Ahmmad et al., 2021). To address these gaps and stimulate further research, data which help inform discussions on the importance of addressing income within research studies related to the COVID-19 crisis is needed. We present analyses illustrating the disparate experiences that higher- and lower-income Asian Americans have had during the COVID-19 pandemic.

2. Methods

In June 2020, a non-probability sample of Asian American adults living across the U.S. was surveyed on a number of health-related behaviors and outcomes, including changes experienced following the onset of the COVID-19 pandemic. Survey items were derived from the University of Tennessee COVID-19 Food Survey (The University of Tennessee, 2021). Details on the study methodology have been described elsewhere (Rummo et al., 2021). Briefly, participants were recruited through online panels and communities, social networks, and websites through the Dynata online surveying company using a 3-stage randomization process which matched participants with surveys they are likely to be eligible for (Dynata, 2021). Measures to improve data quality included preventing participants from taking surveys multiple times, and survey invitations did not include details of survey items in an effort to mitigate topic-related selection bias. In this report, we focused on variables related to changes in employment (work environment), food quality and behaviors, and food access resulting from the COVID-19 crisis. We assessed differences in responses to these COVID-19 pandemic related constructs by three categories of household income: less than \$20,000 per year (low-income), \$20,000 to less than \$175,000 per year (middle-income), and more than \$175,000 per year (high-income). Although past analyses of social or health outcomes during the COVID-19 pandemic in the United States by income status have used household income thresholds of \$25,000 (Raifman and Raifman, 2020) or \$50,000 (Palacio and Tamariz, 2021) to approximate lower and higher income brackets, the income categories chosen for this study were informed by the actual income distribution of Asian Americans in the U.S., where a plurality is observed for household incomes less than \$20,000 and more than \$175,000 (Kochhar and Cilluffo). Disparities in responses to the pandemic-related variables were examined across these income groups among Asian Americans by region and disaggregated by ethnicity to the smallest extent sample size allowed. We examined four regional Asian American subgroups: East Asians (Chinese, Japanese, Korean, Taiwanese, Hmong, Okinawan, Mong, Iwo Jiman, Laohmong, Nipponese), South Asians (Asian Indian, Bangladeshi, Pakistani, East Indian, Burmese, Bharat, Nepalese, Sri Lankan, Dravidian, Bengalese, Bhutanese), Southeast Asians (Filipino, Vietnamese, Thai, Cambodian,

Laotian, Indonesian, Malaysian, Singaporean, Siamese, Indochinese), and Multiethnic Asians (identifying as ethnicities from at least two Asian subgroups from the preceding three subgroups). We further examined income disparities among four disaggregated Asian American ethnicities with a sample size of at least 300 participants, which in our sample were Chinese, Asian Indian, Japanese, and Filipino participants.

2.1. Statistical analysis

Descriptive analyses were conducted to identify differences in income groups among Asian Americans across the regional subgroups and disaggregated ethnicities. We conducted Pearson's chi-square tests to assess for statistically significance differences across the regional subgroups and disaggregated ethnicities. Further, we conducted chi-squared tests to identify differences in the COVID-19 pandemic related indicators by Asian regional subgroups and disaggregated Asian American ethnicities, and reported Cramer's V coefficients for each analysis to indicate effect size. Finally, a series of logistic regression analyses were conducted to assess whether the odds of select COVID-19 pandemic related indicators differed between high-income and middle- to low-income Asian Americans when adjusted for age, gender, household size, and educational attainment. Adjusted analyses of low vs. middle- to high-income Asian Americans were unable to be conducted due to the small sample size of low-income Asian Americans.

3. Results

There were a total of 3,084 responses completed, of which 3,018 were included in the final sample after removing duplicate responses and invalid data. The average age of participants was 43.0 years (SD: 16.5), a majority of whom were women (53.3%) and had a Bachelor's degree or higher (71.1%); and with an average household size of 3 people (SD: 1.5). A majority of participants identified as East Asian (57.6%) followed by Southeast Asian (19.4%), South Asian (18.9%), and Multiethnic (4.1%) (Table 1). Chinese participants comprised the greatest percentage of the study sample (29.3%) followed by Asian Indian (15.5%), Japanese (13.9%), and Filipino participants (10.7%). Overall, 4.2% of participants were low-income, 62.1% were middle-income, and 12.7% were high-income. When grouped by Asian regional subgroups, East Asian (14.4%) participants had the highest proportion of high income participants while Multiethnic (8.1%) participants had the highest proportion of low income participants, and income groups were statistically different for most Asian subgroups. When disaggregated by Asian American ethnicity, Chinese (13.3%) participants had the highest proportion of high income participants and Filipino (5.9%) participants had the highest proportion of low income participants.

Socioeconomic and behavioral indicators related to the COVID-19 pandemic varied in the statistical significance across income groups (Table 2). We report the pandemic-related indicators by income group (i.e., high- vs. low-income), and then by Asian American regional subgroups and income group. We did not include the Multiethnic subgroup due to small sample sizes that precluded meaningful conclusions. Although the percentages differed by Asian American subgroup, a higher percentage of high vs. low income individuals noted that since the COVID-19 crisis they are now working partially or fully from home (Total: 53.9% vs. 19.5% ($p < 0.001$); East Asian: 54.0% vs. 12.3% ($p < 0.001$); South Asian: 55.7% vs. 33.3% ($p = 0.030$); Southeast Asian: 51.0% vs. 20.7% ($p < 0.001$)) while conversely, a higher percentage of low vs. high income individuals either lost their job/work closed or had less hours (Total: 23.4% vs. 8.1% ($p < 0.001$); East Asian: 23.1% vs. 8.0% ($p < 0.001$); South Asian; 12.5% vs. 10.0% ($p = 0.030$); Southeast Asian: 24.1% vs. 8.2% ($p < 0.001$)). In adjusted analyses, medium- and low-income Asian Americans were less likely to work partially or fully from home (AOR:0.55, 95%CI:0.42–0.72).

Similarly, a significantly greater percentage of high vs. low income

Table 1
Income distribution among Asian American subgroups (n = 3018).

	Total		Less than \$20,000		\$20,000 to less than \$175,000		\$175,000 or more	
	N	%	N	%	N	%	N	%
	3018	100	128	4.2	1874	62.1	382	12.7
Regional subgroups								
East Asian ¹	1737	57.6	65	3.7	1119	64.4	250	14.4
South Asian ²	570	18.9	24	4.2	344	60.4	70	12.3
Southeast Asian ³	587	19.4	29	4.9	358	61.0	49	8.3
Multiethnic ⁴	124	4.1	10	8.1	53	42.7	13	10.5
Disaggregated ethnicities								
Chinese	883	29.3	31	3.5	549	62.2	142	16.1
Asian Indian	452	15.0	20	4.4	273	60.4	60	13.3
Japanese	419	13.9	17	4.1	276	65.9	50	11.9
Filipino	322	10.7	19	5.9	192	59.6	27	8.4

¹Chinese, Japanese, Cantonese, Korean, Taiwanesese, Hmong, Okinawan, Mong, Iwo Jiman, Laohmong, Nipponese; ²Asian Indian, Bangladeshi, Pakistani, East Indian, Burmese, Bharat, Nepalese, Sri Lankan, Dravidian, Bengalese, Bhutanese; ³Filipino, Vietnamese, Thai, Cmbodian, Laotian, Indonesian, Malaysian, Singaporean, Siamese, Indochinese; ⁴identifying ethnicities from at least two subgroups from the preceding three subgroups.

individuals reported having enough money to buy the food they needed during the COVID-19 pandemic (Total: 93.2% vs. 46.1% ($p < 0.001$); East Asian: 93.6% vs. 61.5% ($p < 0.001$); South Asian: 92.9% vs. 33.3% ($p < 0.001$); Southeast Asian: 93.9% vs. 31.0% ($p < 0.001$)), had a way to get to the store for food (Total: 92.4% vs. 73.4% ($p < 0.001$); East Asian: 93.2% vs. 84.6% ($p = 0.076$); South Asian 88.6% vs. 54.2% ($p = 0.031$); Southeast Asian: 93.9% vs. 65.5% ($p = 0.006$)), and noted the stores where they get food had everything they needed (Total: 57.9% vs. 38.3% ($p < 0.001$); East Asian: 56.0% vs. 41.5% ($p = 0.029$); South Asian: 61.4% vs. 37.5% ($p = 0.102$); Southeast Asian: 57.1% vs. 34.5% ($p = 0.018$)). In adjusted analyses, medium- and low-income Asian Americans were more likely to not have enough money to buy the food they need (AOR:3.54, 95%CI:1.43–11.81), or only have enough for some of the food they need (AOR:2.87, 95%CI:1.85–4.68).

A greater percentage of low vs. high income individuals reported eating less during the pandemic (Total: 29.7% vs. 13.9% ($p < 0.001$); East Asian: 30.8% vs. 13.2%; South Asian: 37.5% vs. 20.0% ($p = 0.080$); Southeast Asian: 17.2% vs. 8.2% ($p = 0.039$)); and that they are no longer receiving food resources (e.g., school meals, federal food assistance) that they received pre-pandemic (Total: 19.5% vs. 6.8% ($p < 0.001$); East Asian: 12.3% vs. 5.2% ($p = 0.023$); South Asian: 29.2% vs. 5.7% ($p = 0.030$); Southeast Asian: 24.1% vs. 14.3% ($p < 0.001$)). In adjusted analyses, medium- and low-income Asian Americans were more likely to eat less during the pandemic (AOR:1.58, 95% CI:1.14–2.22) or report only sometimes having a way to get to store during the pandemic (AOR:2.38, 95%CI:1.44–4.17). Little to no differences were observed for overall healthfulness of diet since the start of the COVID-19 pandemic or having gone to the store for food in the last week.

Among disaggregated ethnicities, there was a significantly higher percentage of high vs. low income individuals noting that since the COVID-19 crisis they are now working partially or fully from home was observed among only Chinese (52.8% vs. 16.1%, $p < 0.001$), Japanese (50.0% vs. 23.5%, $p = 0.005$), and Filipino (40.7% vs. 26.3%, $p = 0.001$) individuals. Likewise, although differences across all disaggregated ethnicities were observed among high and low income individuals in the proportion who had enough money to buy the food they needed was observed, the magnitude of these differences differed; Chinese (95.8% vs. 58.1%, $p < 0.001$), Asian Indian (91.7% vs. 20.0%, $p < 0.001$), Japanese (94.0% vs. 58.8%, $p < 0.001$), and Filipino (92.6% vs. 26.3%, $p < 0.001$). Finally, there was a significantly higher percentage of low vs. high income individuals reporting eating less during the pandemic among only Chinese (35.5% vs. 11.3%, $p = 0.005$) and Asian Indian (40.0% vs. 16.7%, $p = 0.041$) individuals.

4. Discussion

In our analysis of Asian Americans during the COVID-19 pandemic, stark differences were observed for high vs. low income individuals with regards to loss of work and working from home, having enough money to buy food, eating enough, and having access to other food resources. Income inequality has been one of the most significant drivers of COVID-19 related health disparities in the US (Elgar et al., 2020; Deaton, 2021), and has been linked with concerns of poor physical and mental health outcomes during the pandemic (Burgess, 2020; Whitehead et al., 2021), access to COVID-19 related resources (Ali et al., 2021), and other indicators of health-related resilience (Prime et al., 2020; Riehm et al., 2021). Importantly, income status has also been observed to be significant in understanding why other racial/ethnic minority groups in the U. S. (such as Black and Latino Americans) have faced a disproportionate pandemic-induced social and economic burden (More than One in Four Latino and Black Households with Children Are Experiencing Three or More Hardships during COVID-19, 2021), with lower-income communities also reporting a more significant income decline during the pandemic (Adamczyk, 2020). However, unlike other racial/ethnic minorities, the significant pre-pandemic income inequalities displayed by Asian Americans (Kochhar and Cilluffo) highlights the importance of considering income distribution when characterizing disparities in health behaviors and other pandemic-related outcomes among this diverse population of Americans. Though, explicit description of general income groupings in future study analyses would clarify the generalizability of results for all racial/ethnic groups (Yi, 2020).

Asian Americans were heavily affected economically during the COVID-19 crisis; years of historical invisibility from a government and social services perspective paired with rising xenophobia and hate crimes have stymied a larger outcry from the general public. Asian American small business owners – especially in the food industry – are hard hit across the country (Dang et al., 2020; Ong and Mar, 2020). Chinese ethnic neighborhoods are experiencing disproportionate business closures (Ali et al., 2021; Yi et al., 2020), and the unemployment rate for Asian Americans jumped from 2.8% in August 2019 to 15.0% in May 2020 and stabilizing at 6.6% as of January 2021 (Horsley; Bureau of Labor Statistics, 2021). Most recently the Biden administration's memorandum condemning racism and xenophobia (Biden, 2021) against Asian Americans is a promising sign of progress and the federal government's recognition of how the pandemic has impacted Asian Americans.

Although data from this study provides some of the first disaggregate evidence on COVID-19 related income disparities among Asian Americans, there are a number of limitations that must be acknowledged. First, given data represents a relatively high-income, educated non-probability sample of English-speaking Asian Americans recruited

Table 2
COVID-19 pandemic-related socio-economic and behavioral disparities among Asian American study sample (n = 3018).

	Total		Less than \$20,000		\$20,000 to less than \$175,000		\$175,000 or more		p value ¹	Effect Size ²	AOR ³ (less than \$175,000)
	N	%	N	%	N	%	N	%			
Changes during the COVID-19 pandemic	3018	100	128	4.2%	1874	62.1%	382	12.7%			
How has your work environment changed since COVID-19?									<0.001	0.120	
I did not work outside of the home, so no change	800	26.5	41	32.0	499	26.6	78	20.4			
I worked outside of the home and still work outside of the home, so no change	401	13.3	18	14.1	264	14.1	50	13.1			
I now do some of my work inside of the home	332	11.0	6	4.7	221	11.8	53	13.9			
I now do all of my work inside of the home	826	27.4	19	14.8	529	28.2	153	40.1			
My hours outside of the home have been decreased	199	6.6	10	7.8	117	6.2	15	3.9			
My work has been closed or I have lost my job	270	8.9	20	15.6	156	8.3	16	4.2			
Other/Refused/Missing	190	6.3	14	10.9	88	4.7	17	4.5			
How has your work environment changed since COVID-19?									<0.001	0.115	
No change	1201	39.8	59	46.1	763	40.7	128	33.5			Ref
Work from home (partially/fully)	1158	38.4	25	19.5	750	40.0	206	53.9			0.55 (0.42–0.72)
Lost job, work closed, less hours	469	15.5	30	23.4	273	14.6	31	8.1			1.18 (0.77–1.85)
Other/Refused/Missing	190	6.3	14	10.9	88	4.7	17	4.5			
Enough money to buy the food you need?									<0.001	0.187	
I have enough money to buy the food I need	2330	77.2	59	46.1	1494	79.7	356	93.2			Ref
I have enough to buy some of the food I need	520	17.2	45	35.2	312	16.6	22	5.8			2.87 (1.85–4.68)
I do not have enough money to buy the food I need	134	4.4	20	15.6	63	3.4	4	1.0			3.54 (1.43–11.81)
Refused/Missing	34	1.1	4	3.1	5	0.3	0	0.0			
Eating less, more, or the same?									<0.001	0.086	
Eating less	635	21.0	38	29.7	389	20.8	53	13.9			1.58 (1.14–2.22)
The same	1739	57.6	66	51.6	1071	57.2	261	68.3			Ref
Eating more	625	20.7	21	16.4	407	21.7	66	17.3			1.33 (0.98–1.82)
Refused/Missing	19	0.6	3	2.3	7	0.4	2	0.5			
Compared to before COVID-19, how healthy is your overall diet?									0.034	0.054	
Less healthy	727	24.1	32	25.0	461	24.6	70	18.3			1.29 (0.95–1.76)
The same	1606	53.2	63	49.2	981	52.3	223	58.4			Ref
More healthy	671	22.2	31	24.2	427	22.8	87	22.8			1.09 (0.82–1.45)
Refused/Missing	14	0.5	4	3.1	5	0.3	2	0.5			
Way to get to the store for food since COVID-19									<0.001	0.082	
Yes	2544	84.3	94	73.4	1600	85.4	353	92.4			Ref
Sometimes	296	9.8	24	18.8	174	9.3	17	4.5			2.38 (1.44–4.17)
No	109	3.6	6	4.7	63	3.4	9	2.4			1.65 (0.83–3.65)
Not applicable / Refused	69	2.3	4	3.1	37	2.0	3	0.8			
Gone to the store for food in the last week									0.0267	0.033	
Yes	2593	85.9	104	81.3	1618	86.3	336	88.0			Ref
No	403	13.4	24	18.8	246	13.1	45	11.8			1.10 (0.78–1.58)
Refused	22	0.7	0	0.0	10	0.5	1	0.3			
Able to get the food you were looking for at the store									<0.001	0.074	
Store had everything I needed	1517	50.3	49	38.3	958	51.1	221	57.9			
Store had most of what I needed	261	8.6	46	35.9	602	32.1	110	28.8			
Store had little/nothing of what I needed	95	3.1	9	7.0	52	2.8	3	0.8			
Refused/Missing	445	14.7	24	18.8	262	14.0	48	12.6			
Food resources you are now not getting									<0.001	0.078	
There are no other food resources I was receiving	2074	68.7	70	54.7	1331	71.0	291	76.2			
There are resources I am no longer receiving	327	10.8	25	19.5	197	10.5	26	6.8			
I am still receiving all of the resources I was getting before	489	16.2	27	21.1	288	15.4	60	15.7			
Refused/Missing	128	4.2	6	4.7	58	3.1	5	1.3			

¹Pearson’s chi-square tests ² Cramer’s V coefficient of chi-square tests ³ Odds ratios adjusted for age, gender, educational attainment, and household size.

from an online platform, findings may not be generalizable to Asian Americans across the U.S. (notably those of limited English proficiency or those with limited internet utilization). Second, the small sample size of certain participant sub-groups (notably regional subgroups and ethnicities) limited the ability to adequately conducted analyses of differences in COVID-19 related outcomes adjusted for other socio-demographic variables. However, preliminary findings pave the way for scaled up, representative surveillance of COVID-19 outcomes, or more targeted research on income-related COVID-19 disparities among specific disaggregated Asian American subgroups. Finally, although reliance on self-reported data may present a barrier to reliability, further research may contextualize these findings by examining other observational indicators of the impact of COVID-19 on Asian American

communities, such as changes to the food retail environment among Asian American ethnic enclaves (Ali et al., 2021; Yi et al., 2020).

This analysis underscores the need to bolster the infrastructure supporting low-income Asian Americans. When possible, and as noted above, researchers should disaggregate Asian American data by income level so severe disparities can be identified. Additionally, policymakers must ensure that Asian American families and small businesses have adequate access to capital to endure this crisis through targeted efforts. Low-income Asian Americans may not have benefited from prior economic relief efforts, including the economic impact payments and paycheck protection program, due to lack of eligibility, awareness, or English literacy. Lastly, public and private funders should prioritize providing resources to Asian American community-based organizations

that are best suited to and most effective at providing tailored social services to low-income Asian Americans.

5. Conclusion

There are some experiences that are shared across all, regardless of socioeconomic position, like the fragility of the economy, the safety of our children and families, discriminatory sentiment towards age subgroups, or the new norms around social distancing. However, we argue that a failure to account for the inequitable impacts that COVID-19 will continue to exert on disparities in the ability to improve lifestyle behaviors across the socioeconomic spectrum will only muddy our ability to make sound scientific conclusions. Indeed, such inequities will hamper the success of future policies designed to mitigate disparities and promote health equity.

Funding

This work is supported by the National Institutes of Health (NIH) National Institute on Minority Health and Health Disparities (NIMHD) Award Number U54MD000538 and R01HL141427 from the National Heart, Lung, and Blood Institute and the preparation of this manuscript supported in part by U.S. Department of Health & Human Services, Centers for Disease Control and Prevention (CDC) Award Numbers NU38OT2020001477, CFDA number 93.421 and 1NH23IP922639-01-00, CFDA number 93.185. LD is supported by the NIH Resource Centers for Minority Aging Research (RCMAR) Award Number 5P30AG059302. The contents of this publication are solely the responsibility of the authors and do not necessarily represent the official views of the funders.

CRediT authorship contribution statement

Stella S. Yi: Conceptualization, Methodology, Writing – original draft, Funding acquisition, Supervision. **Shahmir H. Ali:** Methodology, Formal analysis, Writing – original draft. **Matthew Chin:** Writing – original draft. **Rienna G. Russo:** Writing - review & editing. **Lan N. Doan:** Writing - review & editing. **Pasquale Rummo:** Writing - review & editing, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Flagg, A., Sharma, D., Fenn, L., Stobbe, M., Aug 21, 2020. COVID-19's Toll on People of Color Is Worse Than We Knew.
- Rubin-Miller, L., Alban, C., Artiga, S., Sullivan, S., Sep 16, 2020. COVID-19 Racial Disparities in Testing, Infection, Hospitalization, and Death: Analysis of Epic Patient Data.
- Julie Creswell. Apr 7, 2020. 'I Just Need the Comfort': Processed Foods Make a Pandemic Comeback. *The New York Times*.
- Baraldi, L.G., Martinez Steele, E., Canella, D.S., Monteiro, C.A., 2018. Consumption of ultra-processed foods and associated sociodemographic factors in the USA between 2007 and 2012: evidence from a nationally representative cross-sectional study. *BMJ Open* 8 (3), e020574. <https://doi.org/10.1136/bmjopen-2017-020574>.
- Rakesh Kochhar, Anthony Cilluffo. JULY 12, 2018. Incomes of whites, blacks, Hispanics and Asians in the U.S., 1970 and 2016. Pew Research Center.
- Yi, S.S., Kwon, S.C., Sacks, R., Trinh-Shevrin, C., 2016. Commentary: Persistence and health-related consequences of the model minority stereotype for Asian Americans. *Ethn Dis.* 26 (1), 133–138. <https://doi.org/10.18865/ed.26.1.133>.

- Bhattacharya Becerra, M., Herring, P., Marshak, H.H., Banta, J.E., 2015. Social determinants of physical activity among adult Asian-Americans: results from a population-based survey in California. *J. Immigrant Minority Health* 17 (4), 1061–1069. <https://doi.org/10.1007/s10903-014-0074-z>.
- Kim, I., Chen, J., Spencer, M.S., 2012. Social determinants of health and mental health among Asian Americans in the United States. *J. Soc. Social Work Res.* 3 (4), 346–361. <https://doi.org/10.5243/jsswr.2012.21>.
- Ahmmad, Z., Wen, M., Li, K., 2021. Self-rated health disparities among Asian Americans: mediating roles of education level and household income. *J. Immigrant Minority Health* 23 (3), 583–590. <https://doi.org/10.1007/s10903-020-01051-0>.
- The University of Tennessee. COVID-19 Food Survey. Info for Researchers. Published 2021. Accessed June 18, 2021. <https://covid19foodsurvey.wpcomstaging.com/info-for-researchers/>.
- Rummo, P.E., Naik, R., Thorpe, L.E., Yi, S.S., 2021. Changes in diet and food shopping behaviors among Asian-American adults due to COVID-19. *Obesity Sci. Practice* 7 (3), 307–320. <https://doi.org/10.1002/osp4.v7.310.1002/osp4.485>.
- Dynata. Dynata. Accessed May 10, 2021. <https://www.dynata.com>.
- Raifman, M.A., Raifman, J.R., 2020. Disparities in the population at risk of severe illness from COVID-19 by race/ethnicity and income. *Am. J. Prev. Med.* 59 (1), 137–139. <https://doi.org/10.1016/j.amepre.2020.04.003>.
- Palacio, A., Tamariz, L., 2021. Social Determinants of Health Mediate COVID-19 Disparities in South Florida. *J Gen Intern Med.* 36 (2), 472–477. <https://doi.org/10.1007/s11606-020-06341-9>.
- Kochhar, R., Cilluffo, A., Income inequality in the U.S. is rising most rapidly among Asians.
- Elgar, F.J., Stefaniak, A., Wohl, M.J.A., 2020. The trouble with trust: Time-series analysis of social capital, income inequality, and COVID-19 deaths in 84 countries. *Soc. Sci. Med.* 263, 113365. <https://doi.org/10.1016/j.socscimed.2020.113365>.
- Deaton, A., 2021. Covid-19 and Global Income Inequality. *National Bureau of Economic Research*.
- Burgess, R., COVID-19 mental-health responses neglect social realities. *Nature*. Published online May 4, 2020. doi: 10.1038/d41586-020-01313-9.
- Whitehead, M., Taylor-Robinson, D., Barr, B., Poverty, Health, and Covid-19. *British Medical Journal Publishing Group*; 2021.
- Ali, S.H., Tozan, Y., Jones, A.M., Foreman, J., Capasso, A., DiClemente, R.J., 2021. Regional and socioeconomic predictors of perceived ability to access coronavirus testing in the United States: results from a nationwide online COVID-19 survey. *Ann. Epidemiol.* 58, 7–14.
- Prime, H., Wade, M., Browne, D.T., Risk and resilience in family well-being during the COVID-19 pandemic. *American Psychologist*. Published online 2020.
- Riehm, K.E., Brenneke, S.G., Adams, L.B., Gilan, D., Lieb, K., Kunzler, A.M., Smail, E.J., Holiugue, C., Stuart, E.A., Kalb, L.G., Thurl, J., 2021. Association between psychological resilience and changes in mental distress during the COVID-19 pandemic. *J. Affect. Disord.* 282, 381–385.
- More than One in Four Latino and Black Households with Children Are Experiencing Three or More Hardships during COVID-19. *Child Trends*. Accessed May 10, 2021. <https://www.childtrends.org/publications/more-than-one-in-four-latino-and-black-households-with-children-are-experiencing-three-or-more-hardships-during-covid-19>.
- Adamczyk A. Inequality has been building for decades in the U.S., but experts say the pandemic “ripped it open.” *CNBC*. Published October 23, 2020. Accessed May 10, 2021. <https://www.cnbc.com/2020/10/23/coronavirus-is-exacerbating-economic-inequality-in-the-us.html>.
- Yi, Stella S., 2020. Taking action to improve asian american health. *J. Public Health* 110, 435–437. <https://doi.org/10.2105/AJPH.2020.305596>.
- Dang, E., Huang, S., Kwok, A., Lung, H., Park, M., Yueh, E., August 6, 2020. COVID-19 and advancing Asian American recovery. <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/covid-19-and-advancing-asian-american-recovery>.
- Ong, P., Mar, D., 2020. COVID-19's Employment Disruptions to Asian Americans. *UCLA: Center for Neighborhood Knowledge*. Retrieved from <https://escholarship.org/uc/it/em/9nt3h1db>.
- Ali, S.H., Imbruce, V.M., Russo, R.G., Kaplan, S., Stevenson, K., Mezzacca, T.A., Foster, V., Radee, A., Chong, S., Tsui, F., Kranick, J., Yi, S.S., 2021. Evaluating closures of fresh fruit and vegetable vendors during the COVID-19 pandemic: methodology and preliminary results using omnidirectional street view imagery. *JMIR Formative Res.* 5 (2), e23870. <https://doi.org/10.2196/23870>.
- Yi, S., Ali, S., Russo, R., et al. Changes to the Food Retail Environment Due to COVID-19 in New York City, May to July 2020. In: *Vol 28. WILEY 111 RIVER ST, HOBOKEN 07030-5774, NJ USA*; 2020:65–66.
- Horsley, S., October 1, 2020. “Overlooked”: Asian American Jobless Rate Surges But Few Take Notice. <https://www.npr.org/2020/10/01/918834644/overlooked-asian-american-jobless-rate-surges-but-few-take-notice>.
- Bureau of Labor Statistics. The Employment Situation - January 2021.
- Joseph R. Biden, January 26, 2021. Memorandum Condemning and Combating Racism, Xenophobia, and Intolerance Against Asian Americans and Pacific Islanders in the United States. <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/26/memorandum-condemning-and-combating-racism-xenophobia-and-intolerance-against-asian-americans-and-pacific-islanders-in-the-united-states/>.