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IZA DP No. 18151

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Abdihafit Shaeye
Kent State University

Ruth Uwaifo Oyelere
Agnes Scott College, GLO and IZA

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ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

COVID-19 Induced Asian Discrimination and Health: What Can We Learn from Reported Health Status?*

There is a growing literature that provides concrete evidence of the effects of the pandemic on both health and socioeconomic outcomes. While the general negative effects of the pandemic were felt across race, gender, social status, and age, there is emerging literature suggesting a disproportionate negative effect on people of Asian heritage, referred to by some as an "Asian chilling effect". There is documented evidence that the origin of the COVID-19 virus in Asia led to increased discrimination and xenophobia against individuals of Asian descent, which resulted in an unprecedented rise in anti-Asian hate during COVID. In this paper, we estimate the impact of this treatment on reported health status in the U.S. Using a difference-in-differences (DD) approach, we provide evidence that COVID-induced discrimination against Asians led to a "chilling effect" in the U.S. In particular, we find a decrease in the health status of Asians compared to comparable non-Hispanic Whites from the pandemic onward. Our results are consistent across alternative measures of health. We also conduct multiple tests to ensure the robustness of our results and provide a potential pathway for this effect.

JEL Classification: I10, I12, I14, J15, J10

Keywords: health disparities, health status, COVID-19, physical disabilities, asian discrimination

Corresponding author:
Ruth Uwaifo Oyelere
Department of Economics
Agnes Scott College
141 E. College Ave.
Decatur, GA 30030
USA
E-mail: ruwaifo@agnesscott.edu

* Comments are appreciated.

1 Introduction

The COVID-19 pandemic introduced not only a global health crisis but also a complex web of economic and social disruptions that disproportionately affected certain countries, regions, and racial and ethnic groups. In the United States, while all populations experienced hardship, Asians were uniquely impacted by a surge in racialized discrimination stemming from the virus's perceived origin in China (Gover et al., 2020; Lu et al., 2021; Nguyen et al., 2020; Tessler et al., 2020). This form of racial scapegoating, fueled by political rhetoric and media narratives, contributed to what we refer to as the "Asian chilling effect," encompassing heightened experiences of exclusion, stigma, and hostility across multiple domains of life. This discrimination parallels the backlash against certain groups after the 9/11 terrorist attacks. Past literature suggests that Arab and Muslim Americans were subjected to increased hate crimes and racial profiling due to Islamophobic rhetoric and surveillance (Disha et al., 2011; Hanes & Machin, 2014), and this has led to negative health outcomes among this group (Johnston & Lordan, 2012). The consequences of the discrimination faced by these groups serve as a motivation for our hypothesizing the potential for similar effects of discrimination on stress for Asians, which we hypothesize will ultimately affect mental and physical health.

There is a growing literature that provides evidence of the pandemic's well-documented adverse impacts on physical (e.g., morbidity and mortality) and mental health, economic stability (e.g., unemployment and business closures; housing insecurity), and social isolation.[1] Within this literature, there are papers that suggest the effects of the pandemic were compounded for Asian Americans given the widespread anti-Asian sentiment (Huang et al., 2023; Amuedo-Dorantes et al., 2024; Mundra and Uwaifo Oyelere, 2024; Ibrahim et al., 2024; Ho et al., 2023).

While several studies have explored the mental health consequences of exposure to this discrimination (Ibrahim et al., 2024; Ho et al., 2023), less is known about its effect on overall health and well-being and the potential longer-term health impacts. This study addresses that gap by exploring whether anti-Asian discrimination during the pandemic has led to a disproportionate decline in self-reported health among Asians/Pacific Islanders, relative

[1] See Wang et al., 2022; Brodeur et al., 2021; Cullen et al., 2020; Adams-Prassl et al., 2021; Chetty et al., 2024; Tisdell, 2020 for more details on impacts on health and economic indicators.

to their non-Hispanic White counterparts. In particular, we seek to estimate the impact of exposure to anti-Asian discrimination on overall health. In attempting to answer this question, we test whether the "chilling effect" on Asians during the pandemic also extends to health.

To address our question of interest, we make use of data from the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS) from 2015–2024. To identify causal effects and provide evidence of the "chilling effect" on Asians, we employ a difference-in-differences (DD) estimation strategy, controlling for typical factors that affect health. Our results suggest that exposure to anti-Asian discrimination from the pandemic onward led to a decrease in reported health status for Asian/Pacific Islanders compared to non-Hispanic Whites. In particular, we find that exposure to discrimination led to a 0.023 decline in self-reported health among Asians (Asian/Pacific Islander), relative to Whites (non-Hispanic Whites). We also find a 0.9 percentage point increase in the probability that Asians report physical health difficulties compared to Whites. In terms of the probability that Asians report having excellent or very good health, we also find a 1 percentage point decrease compared to Whites. Our results are consistent with our hypothesis of a delayed health effect. To ensure that our results capture the effect of COVID-19 anti-Asian discrimination on health, we conduct several robustness checks, which confirm the validity of our results. In addition, we rule out alternative explanations for our findings. Given these findings, we provide evidence of a "chilling effect" on Asians with respect to health, linked to the increased discrimination against this group from the pandemic onward.

Our paper contributes to the literature by identifying the causal impact of COVID-19-induced anti-Asian discrimination on reported health status in the U.S. In particular, we highlight the disproportionate changes in self-reported health status of the Asian population relative to their non-Hispanic White counterparts during and after the pandemic in a large national survey. While, as noted above, a growing body of literature has explored the role of the pandemic on certain health-related outcomes for Asians in the U.S., to the best of our knowledge, we are the first to estimate the impact of COVID-19-triggered anti-Asian hate on self-reported health status and physical health difficulties of Asian and Pacific Islanders in the U.S. In addition, while past research has documented the effect of this discrimination on

housing security and labor market outcomes such as entrepreneurship, our paper provides evidence that this "chilling effect" extends beyond economic outcomes to overall health. Our paper also corroborates previous literature that documents the effects of anti-Muslim discrimination on health (Johnston & Lordan, 2021). In addition, our paper contributes novel insights into the longer-term consequences of COVID-19-driven racial discrimination for Asians, whose status as a "model minority" also extends to health (Kim et al., 2021). Hence, our results have implications for health policy, which we explore in the concluding section of our paper.

The rest of our paper is organized as follows. Section 2 discusses the literature. Section 3 presents our data and descriptive analysis. Section 4 outlines our empirical strategy. In Section 5, we present our main results. In Section 6, we provide robustness checks to further corroborate the validity of our main findings. Section 7 concludes with a summary, implications for policy, and future research.

2 Literature Review

Our paper lies at the nexus of three streams of literature. First, there is the wide literature that has explored the impact of the pandemic on economic, health, and socioeconomic factors (Wang et al., 2022; Brodeur et al., 2021; Cullen et al., 2020; Adams-Prassl et al., 2021; Chetty et al., 2024; Tisdell, 2020). Similarly, there is also literature that has provided evidence of a significant increase in anti-Asian sentiment and discrimination during the pandemic and beyond (Cho et al., 2025; Gover et al., 2020; Knorre et al., 2024; Lu et al., 2021; Nguyen et al., 2020; Tessler et al., 2020). A smaller but growing literature has tried to explore the potential correlation or causal link between the increase in anti-Asian discrimination and different economic and health-related outcomes. For the sake of brevity, we highlight key papers that fit into these literature streams and show how our paper tries to fill a gap. However, this review is in no way exhaustive.

The COVID-19 pandemic outbreak introduced profound public health and economic disruptions across the United States, with significant consequences for individuals across all racial and ethnic groups, albeit disproportionately impacting minorities (Wang et al., 2022; CDC, 2021; Tai et al., 2022). In addition to its direct impact on mortality and health,

the economic fallout from public health mandates, such as lockdowns and business closures, negatively impacted mental health, income, employment, and housing security (see Brodeur et al., 2021; Cullen et al., 2020; Adams-Prassl et al., 2021; Chetty et al., 2024; Tisdell, 2020).

Separate from the growing health and economic literature that documents the socioeconomic and health-related impacts of COVID, a much broader literature has documented the sharp rise in prejudice against Asians [2] following the onset of the outbreak of COVID-19 (Gover et al., 2020; Lu et al., 2021; Nguyen et al., 2020; Tessler et al., 2020). These incidents ranged from verbal harassment and discrimination to extreme acts of violence, such as physical assaults, stabbings, and deadly attacks (see Gover et al., 2020; Darling-Hammond et al., 2020; Cao et al., 2023; Findling et al., 2022; Knorre et al., 2024 for more details on this anti-Asian discrimination).

In particular, Gover et al. (2020) noted that there was a significant increase in anti-Asian sentiment, scapegoating, and xenophobic violence due to the perceived geographic origin of the coronavirus in Asia (China). Similarly, Darling-Hammond et al. (2020) and Cao et al. (2023) attribute some of these negative anti-Asian reactions to government officials referring to COVID-19 as the "China virus" or "Wuhan virus," further legitimizing anti-Asian bias and fueling public hostility toward this group. Amuedo-Dorantes et al. (2024) note that this spike in discrimination sharply differed from the relatively low incidence of harassment that Asians faced before the onset of the pandemic.

Public perception surveys also reflect these shifts. For example, a survey from the Pew Research Center in mid-2020 found that nearly 40% of U.S. adults believed it had become more common to express racist views toward Asian Americans (Ruiz et al., 2020). These authors further noted that Asian Americans were more likely than any other group to report experiencing racial slurs or jokes after the onset of the COVID-19 pandemic. Federal data corroborate these findings. In particular, using FBI statistics in 2024, Cho et al. (2025) report that "anti-Asian hate crimes increased from 199 in 2019 to a peak of 783 in 2021, before declining slightly to 527 in 2022—still more than twice the pre-pandemic level." Immediately following the onset of the pandemic, the advocacy group "Stop AAPI Hate" was formed in

[2]For simplicity, we generally refer to the Asian/Pacific Islander group as "Asian" and to non-Hispanic White individuals as "White" throughout the paper.

response to rising anti-Asian discrimination.[3] This group launched a targeted initiative to track incidents of anti-Asian violence and discrimination. The survey they conducted in 2023 indicates that nearly half of AAPI respondents experienced race-based hate incidents, over a quarter of which involved physical assault (Stop AAPI Hate, 2024a). Anti-Asian rhetoric has not only led to discrimination but also an increase in racially motivated violence directed toward Asian Americans (see Darling-Hammond et al., 2020; Cao et al., 2023; Findling et al., 2022; Knorre et al., 2024). Findling et al. (2022) allude to a specific example of this targeted violence: in 2021, eight Americans, including six Asian American women, were killed when a man went on a shooting rampage at three spas in Atlanta.

The documented increase in anti-Asian sentiment and discrimination has led to a growing body of research exploring the potential effects of this exposure on socioeconomic, health, and labor market outcomes. For example, Huang et al. (2023) estimated about $7.42 billion in revenue losses from an 18.4% drop in customer traffic to Asian restaurants. They attribute this drop to racialized consumer behavior and xenophobic fears. With respect to entrepreneurship, a sector in which Asians have typically thrived, Amuedo-Dorantes et al. (2024) found that the self-employment rate among Asian immigrants declined by 17% relative to Whites during the pandemic, and they attribute this decrease, at least in part, to anti-Asian sentiment. In housing, the findings of Mundra and Uwaifo Oyelere (2024) suggest that Asians experienced a disproportionate increase in housing vulnerability during the pandemic compared to African Americans or Hispanics. They suggest this "chilling effect" on Asians could be linked with the unique challenges they faced during this time, including anti-Asian discrimination.

Within the literature that has considered the effect of rising anti-Asian discrimination, research that examines health effects is the most common. In the context of COVID-19, there is a growing literature that has explored the rise of anti-Asian racism and how it might affect mental health among Asian Americans (see Ho et al., 2023 and Ibrahim et al., 2024 for systematic reviews of this literature). For example, using data from the University of Southern California's Center for Economic and Social Research's Understanding Coronavirus in America survey, Wu et al. (2020) find that, since the onset of COVID-19,

[3]AAPI represents Asian American Pacific Islanders.

Asians have experienced higher rates of mental health disorders compared to Whites, at least partially due to their heightened exposure to pandemic-related discrimination. Also, using longitudinal data from the National Health Interview Survey (third through fourth quarters of 2019–2020), Lee and Howard (2023) investigate self-reports of diagnosed depression and anxiety disorder and find that Asian Americans experienced a disproportionate increase in mental health conditions during the COVID-19 pandemic. They attribute this to COVID-19-related discriminatory behaviors against Asian Americans. Ho et al. (2023) also find that discrimination has a significant negative effect on health. In a recent study of over 5,000 Asian and Pacific Islander adults, Ormiston et al. (2024) found that even infrequent experiences of everyday discrimination, occurring as little as once per month, were significantly associated with elevated risks of anxiety, depression, and loneliness.

As previously noted, the extant literature offers insights into the mental health consequences of anti-Asian discrimination during COVID-19. However, little attention has been given to the overall health effects of this exposure. Many of the past studies have relied on small samples, limiting the generalizability of their findings. Furthermore, a significant portion of this health literature focuses on correlation and does not seek to derive causal inferences. Moreover, few studies have compared the health status of Asians with that of other racial groups, making it difficult to assess the relative impact of COVID-19-related discrimination. Finally, most past research has focused on the acute phase of the pandemic, with limited attention to the potential longer-term implications of this exposure.

This study aims to address these gaps. Specifically, we investigate the causal effect of anti-Asian discrimination on the overall health of Asians, using both a subjective measure (self-reported health status) and an objective indicator (presence of physical health difficulties). Self-reported health status is a widely used and validated measure that predicts various health outcomes, including mortality (Idler & Benyamini, 1997; Chen & Yang, 2014). By examining overall health using a DD framework, this research advances the existing literature beyond mental health, contributing to a more comprehensive understanding of the potential immediate and delayed overall health effects of racialized trauma.

3 Conceptual Framework: Linking Discrimination to Mental and Physical Health Why should COVID-19 differentially affect Health Status of Asians?

While the effect of discrimination on health-related outcomes has been explored in the economic literature by Johnston and Lordan (2021) and provides a valid foundation as to why we should expect the rapid increase in anti-Asian discrimination from the onset of COVID-19 to affect health, we briefly explore the link between discrimination and health in the past literature to reiterate this pathway.

Stress increases with discrimination, and racial discrimination has been identified as a psychosocial stressor that negatively affects health (Paradies, 2006; Williams & Mohammed, 2009). This stress can arise from direct personal experiences or indirectly through vicarious exposure—such as hearing about or witnessing discrimination against others in the same racial group. According to Minority Stress Theory (Harrell, 2000; Meyer, 2003; Carter, 2007), experiences of discrimination can be deeply distressing, especially when perceived as sudden, uncontrollable threats to one's emotional or physical well-being. Such experiences can lead to emotional trauma or even post-traumatic stress. These psychological reactions trigger the body's stress response systems, specifically the sympathoadrenal system and the hypothalamic–pituitary–adrenal (HPA) axis (Goosby et al., 2018). In the short term, this leads to acute physiological changes such as increased cortisol levels, elevated heart rate, and higher blood pressure.

When this stress response is activated repeatedly over a long period—such as during a prolonged period of racial discrimination, it can lead to chronic stress. Chronic activation of these systems results in allostatic load, which refers to the cumulative "wear and tear" on the body's regulatory systems (McEwen & Stellar, 1993). Allostatic load affects both mental and physical health. Over time, the allostatic load can lead to psychological issues like anxiety and depression that affect mental health. It can also create physiological problems, including cardiovascular disease, weakened immune function, and other chronic health conditions (Myers et al., 2003; Johnson & Lordan, 2012). These psychological conditions, alongside mental health decline, affect an individual's general health, which is reflected in

changes to reported health status over time. The link between mental health decline and general health can be delayed. Aarons et al. (2009) found that early mental health problems significantly predicted physical health deterioration two years later. They suggest that psychological stress and mental health disorders can lead to physical health problems over time. Similarly, Lie et al. (2021) show that behavioral responses to discrimination—such as poor diet, sleep disturbances, and substance use, can further erode physical health over time.

The link between discrimination, stress, and mental and physical health in the past literature provides the framework for us to hypothesize that the rise in anti-Asian discrimination during the COVID-19 pandemic, which led to increased stress among Asians, can also be a precursor to physical health consequences. We hypothesize that, in addition to the general effect of COVID-19 on all groups, there will be a disproportionate decrease in overall health for Asians (i.e., a double whammy effect). Also, given the past literature that suggests a potential delay in the physical health effects of exposure to discrimination, we also posit a lagged/delayed effect of the exposure on overall health and well-being and test for this in our empirical analysis.

4 Description of Data and Summary Statistics

To address our question of interest, we make use of data from the March Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS). The CPS is a monthly U.S. household survey conducted jointly by the U.S. Census Bureau and the Bureau of Labor Statistics. The ASEC supplement is collected in March and contains the Annual Demographic File and Income Supplement. We derive multi-stage stratified samples of the March CPS from the Integrated Public Use Microdata Series (IPUMS) from 2015–2024 (see Flood et al., 2024).

We present summary statistics using both Table 1 and Figures (1)–(4). Table 1 summarizes the key variables used in our analysis, based on the CPS data sample extracted from IPUMS. Our key dependent variable is health status. Health status is a measure of general health and is measured on a Likert scale, which is a numerical rating system. Individuals are asked the question, "Would you say your health in general is excellent, very good, good, fair,

or poor?" The original rating assigned values from 1 to 5 to these responses, respectively. To allow an ordinal ranking where higher values correspond to better health, the numbering was recoded in reverse so that those who report poor health are given a rank of 1, fair health a rank of 2, good health a rank of 3, very good health a rank of 4, and excellent health a rank of 5. The mean health score for the sample is 3.8, which is higher than good health but lower than very good health.

Given the potential limitation of our measure of health status, as it is an individual's subjective assessment of their overall health and well-being, we also make use of an alternative dummy variable that captures health-related outcomes. The ASEC survey asks respondents a series of questions related to physical and cognitive difficulties. These dummy variables are also summarized in Table 1. As described on the IPUMS website, these questions capture: *whether the respondent is deaf or has serious difficulty hearing; whether the respondent is blind or has serious difficulty seeing even with corrective lenses; whether the respondent has cognitive difficulties (such as remembering, concentrating, or making decisions) because of a physical, mental, or emotional condition; whether the respondent has serious difficulty walking or climbing stairs; whether the respondent has any physical, mental, or emotional condition that makes it difficult or impossible to perform basic activities outside the home alone; and whether the respondent has any physical or mental health condition that makes it difficult for them to take care of their own personal needs, such as bathing, dressing, or getting around inside the home.*

We include dummy variables that capture these various health conditions in our empirical analysis as potential predictors of reported health. However, an alternative measure of health we employ in our analysis is a dummy variable also found in the ASEC data, which captures whether a respondent has "Any difficulty." This dummy variable indicates whether the respondent has any physical or cognitive difficulty. An individual is assigned a value of 1 if they give an affirmative response to at least one of the CPS's six physical or cognitive difficulties questions highlighted above. Table 1 shows that 9.1% of the sample have at least one of these difficulties. This dummy variable, which serves as our alternative measure of health, has limitations linked to its restrictive definition of what qualifies as a health difficulty. Its advantage, however, lies in its being an objective, though somewhat restrictive

measure of health.

Table 1: Descriptive Statistics for Demographic and Economic Variables

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Health Status	1695242	3.836	1.054	1	5
Excellent/Good Health	1695242	0.645	0.478	0	1
Difficulty Any	1695242	0.091	0.287	0	1
Difficulty Hearing	1695242	0.026	0.16	0	1
Difficulty Vision	1695242	0.013	0.115	0	1
Difficulty Remembering	1695242	0.029	0.169	0	1
Difficulty physical	1695242	0.051	0.22	0	1
difficulty Mobility	1695242	0.032	0.175	0	1
Difficulty Personal Care	1695242	0.016	0.124	0	1
White Non Hispanic	1695242	0.588	0.492	0	1
Black	1695242	0.119	0.324	0	1
White Hispanic	1695242	0.181	0.385	0	1
Asian/Pacific Islander	1695242	0.068	0.252	0	1
Native American	1695242	0.016	0.125	0	1
Mixed Race	1695242	0.028	0.164	0	1
Age	1695242	37.4	22.961	0	85
Health Insurance	1695242	0.91	0.287	0	1
Sex	1695242	0.486	0.5	0	1
Years of Schooling	1331521	13.239	3.114	0	21
Number of Children	1695242	.598	1.046	0	9
Family Size	1695242	3.378	1.721	1	16
Pandemic Dummy	1695242	0.187	0.39	0	1
Immigrant	1695242	0.137	0.343	0	1
Real wage	1331521	21812.509	40787.324	0	1352399.4
Real Interest Income	1331521	960.475	5188.126	0	182560
Real Total Family Income	1695242	63376.846	73787.181	-20570.004	1925753.9
Real Total Income	1331521	29005.348	45062.586	-11191.44	1899993.9
Real Dividend Income	1331521	355.244	5110.937	0	651999.38
Real HH Income	1695242	68835.22	75363.674	-20570.004	2290198
Married Spouse Present	1695242	0.408	0.491	0	1
Divorced/Separated	1695242	0.09	0.286	0	1
Widowed	1695242	0.043	0.202	0	1
Single	1695242	0.459	0.498	0	1
U.S born	1695242	0.863	0.343	0	1
Naturalized	1695242	0.065	0.247	0	1
Not a Citizen	1695242	0.072	0.258	0	1
Pre Pandemic	1695242	0.642	0.479	0	1
Pandemic	1695242	0.187	0.39	0	1
Post Pandemic	1695242	0.171	0.377	0	1
2015	1695242	0.117	0.322	0	1

Variables	Obs	Mean	Std. Dev.	Min	Max
2016	1695242	0.109	0.312	0	1
2017	1695242	0.11	0.312	0	1
2018	1695242	0.106	0.308	0	1
2019	1695242	0.106	0.308	0	1
2020	1695242	0.093	0.291	0	1
2021	1695242	0.096	0.295	0	1
2022	1695242	0.09	0.286	0	1
2023	1695242	0.086	0.281	0	1
2024	1695242	0.085	0.279	0	1

While Table 1 presents summary statistics for the overall population, our identification strategy relies on comparing Asian/Pacific Islander and non-Hispanic White individuals before the onset of COVID-19 and from COVID-19 onward.

Accordingly, two key variables in our analysis are a pandemic period indicator and a dummy variable for Asian/Pacific Islander individuals. As shown in Table 1, over the 10-year period covered by our sample, non-Hispanic White individuals constitute 58.8% of the sample, Black individuals 11.9%, Hispanic individuals 18.1%, and Asian/Pacific Islanders 6.8%. Native American and mixed-race individuals represent smaller portions of the sample, at 1.6% and 2.8%, respectively.

Figure 1 presents bar graphs showing mean health status for Asians and Whites over the 10-year period of our analysis. Notice that, pre-COVID, the mean health status for Asians was slightly higher than that for Whites (approximately 3.9 vs. 3.84). In the COVID and post-COVID period, there is a decline for both groups, which is not surprising given the documented health effects of the pandemic. While we cannot tell from this figure which group experienced a greater decline, we hypothesize—based on our conceptual framework—that we will find, using our empirical methodology, a disproportionate decrease in health for Asians compared to Whites. This disproportionate effect of the pandemic on Asians would provide evidence of an Asian "chilling effect." We will attempt to estimate the existence and size of this effect through our econometric analysis.

In Figure 2, we highlight period trends for our second health measure—a binary indicator for reporting excellent or very good health. Prior to the pandemic, a higher proportion of

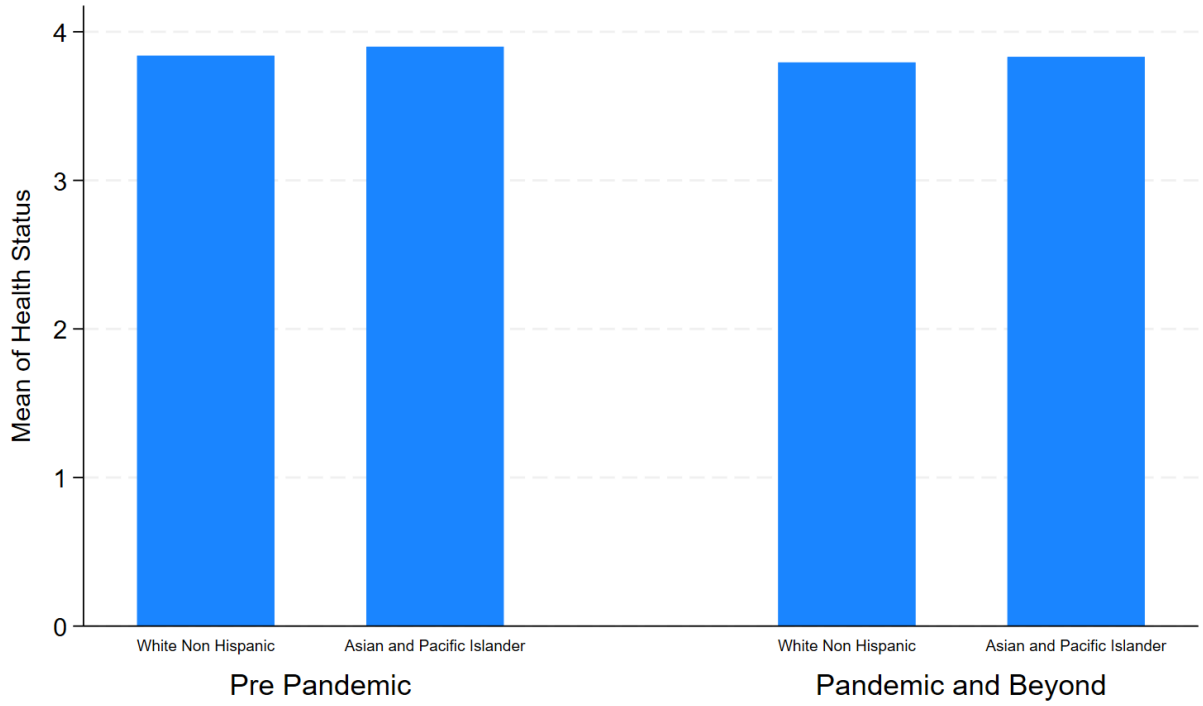

Figure 1: Mean Health Status (Asian vs White)

Asians reported excellent or very good health (66.34%) compared to Whites (65.36%). From the onset of the pandemic onward, both groups experienced declines in this health measure, with the share dropping to 63.75% for Asians and 63.69% for Whites. This represents a decline of 2.59 percentage points for Asians and 1.67 percentage points for Whites. The larger decline provides suggestive evidence of a disproportionate impact on health for Asians beyond the decline attributed to the pandemic. We hypothesize that this disproportionate decline in health among Asians is driven by increased discrimination they experienced during the pandemic.

Figure 3 presents our third measure of health in a similar manner to Figures 1 and 2. The measure in Figure 3 is the percentage of the population with one or more health difficulties. While most people do not report any health difficulty, note first the clear difference for Whites compared to Asians in the pre-pandemic period [10.8% vs. 4.48%]. Also note the increase in the share of the population with at least one health difficulty for both groups from the pandemic onward [11.2% for Whites and 5.24% for Asians]. It is again worth noting that the increase for Asians is greater than for Whites [0.4 percentage points for Whites versus 0.76 percentage points for Asians]. This disproportionate decrease in physical health for

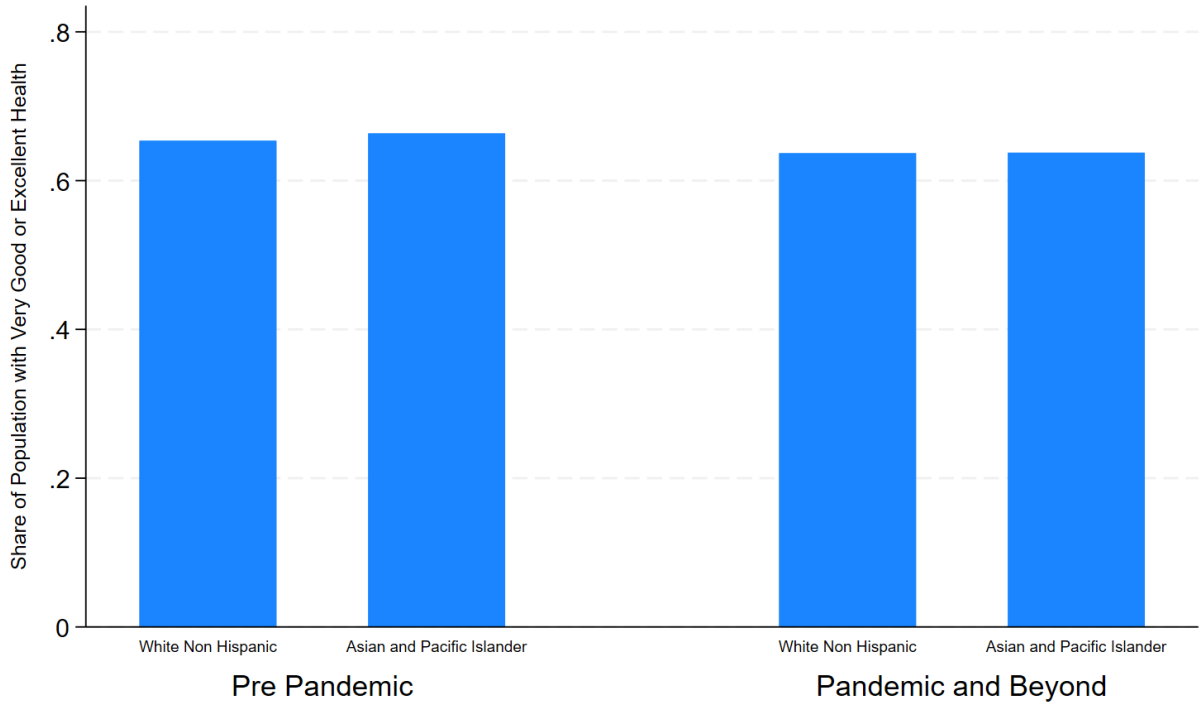

Figure 2: Reported Share of Individuals with Very Good/Excellent Health (Asian vs White)

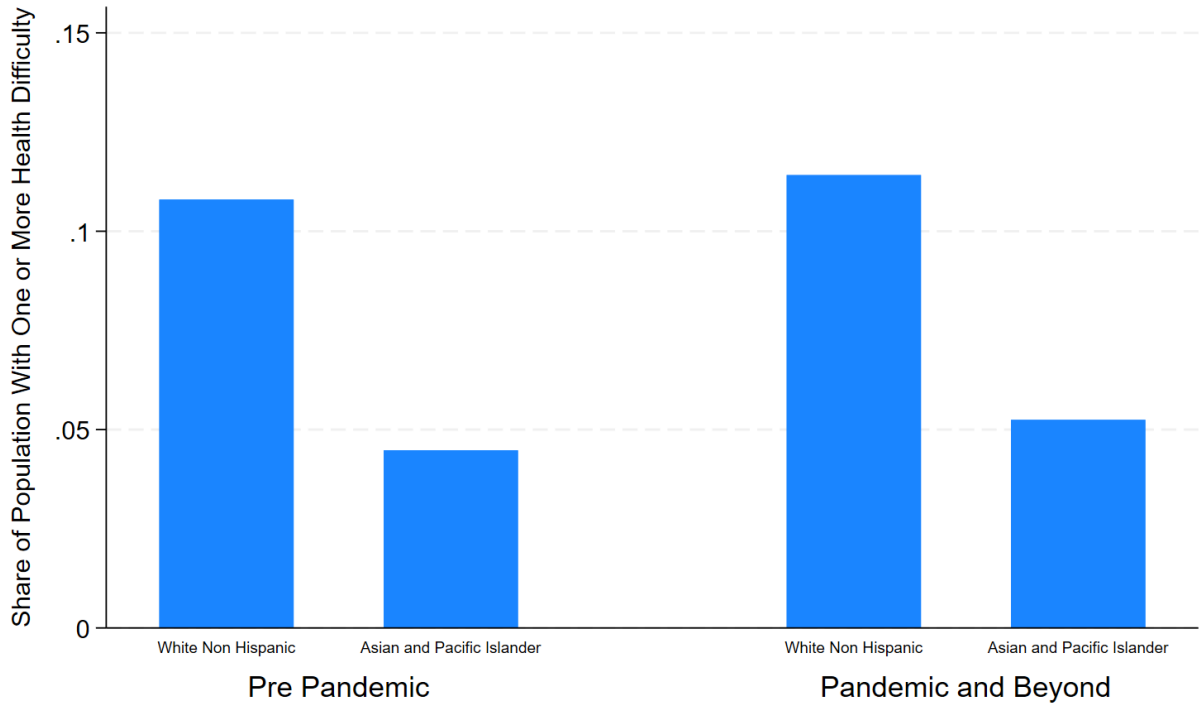

Figure 3: Reported Share With One or More Reported Health Difficulties (Asian vs White)

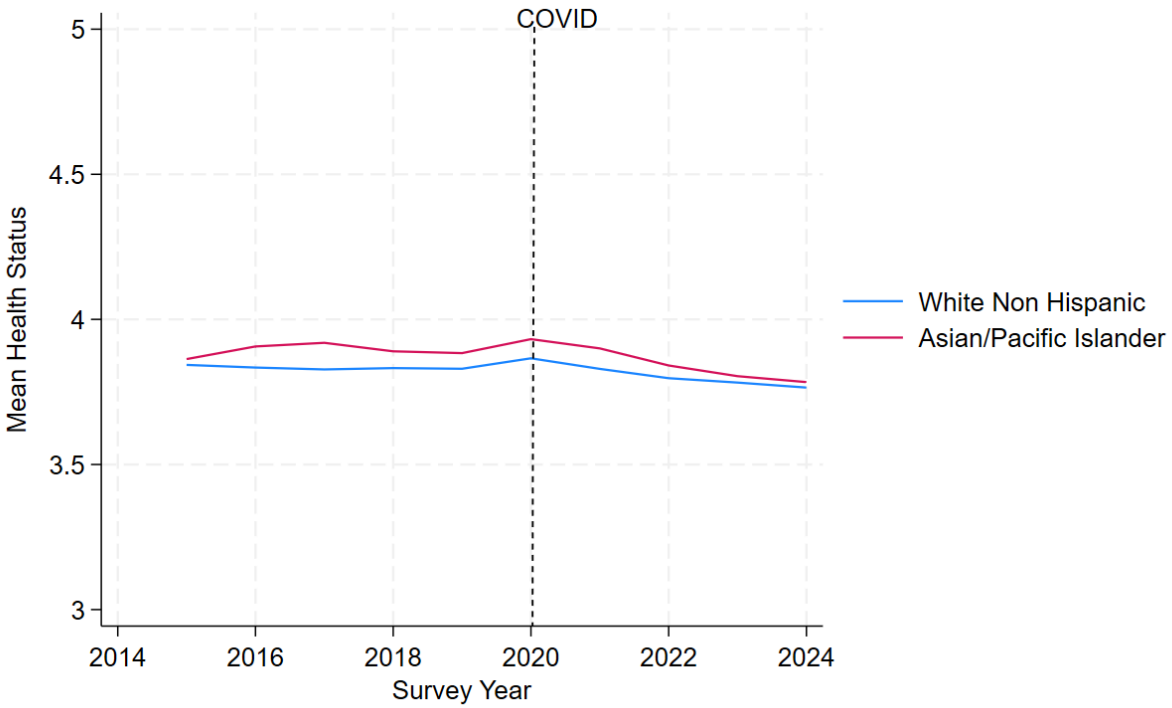

Figure 4: Trends in Mean Health Status 2015-2024

Asians compared to Whites serves as prima facie evidence of a possible effect of exposure to discrimination on health. This effect is separate from the general effect on health linked to the broader health crisis triggered by the pandemic.

While Figures 2 and 3 suggest a disproportionate decrease in health for Asians compared to Whites, and we posit this is driven by exposure to discrimination, it is possible to argue that Asians may have already been on a systematic health decline prior to the pandemic and that the pandemic has only exacerbated this decline. Figure 4 suggests this is not the case. We present trends in mean health status for both Asians and Whites from 2017 to 2024. Notice that the trend in mean health status was quite stable until 2020, the year the pandemic started. While there is a slight increase in the gap between Whites and Asians between 2015 and 2017 and a slight decrease between 2017 and 2018, there is no systematic decline in the health of Asians in the pre-COVID period. In contrast, note that beyond COVID, there is a steeper decline for Asians compared to Whites and a convergence of both trend lines, highlighting the sharper decline for Asians. This steeper decline supports our hypothesis that Asians' exposure to discrimination created an additional health effect beyond the pandemic. While Figure 4 appears consistent with a "chilling effect" on Asians

from the pandemic onward, econometric analysis is needed to confirm whether there is a valid causal link. In particular, the goal of our paper is to estimate the effect of exposure to anti-Asian discrimination from the pandemic onward on health.

5 Empirical Framework

To estimate the impact of COVID-19-related anti-Asian discrimination on the self-reported physical health of Asians, we employ a difference-in-differences (DD) model. See Equation (1).

$$Health_i = \alpha + \beta_1 Asian_i + \beta_2 COVIDandBeyond_i + \beta_3(Asian_i \times COVIDandBeyond_i) + \theta' X_i + \rho_s + \lambda_t + \varepsilon_i \quad (1)$$

Where $Health_i$ denotes a binary or ordinal indicator of self-reported physical health for individual i, where lower values indicate worse health outcomes. As noted above, we make use of three measures of health. The first is health status, constructed from a five-item scale. The second is a binary variable that indicates if an individual reports excellent or very good health, derived from the health status variable—$Health_i = 1$ if the individual selected "excellent" or "very good" health; $Health_i = 0$ otherwise. The third measure of health is a binary indicator denoting the presence of any functional difficulty or specific physical limitation. This alternative measure allows us to supplement more subjective health assessments with a more objective health measure to assess the consistency of our findings across health indicators.

$Asian_i$: A binary indicator equal to 1 if the respondent identifies as Asian or Pacific Islander, and 0 if non-Hispanic White.[4]

$COVIDandBeyond_i$: A binary indicator equal to 1 for the COVID and post-COVID period (2021–2024), and 0 for the pre-COVID period (2015–2020).[5]

[4]Going forward, we refer to the Asian and Pacific Islander group as "Asian" for simplicity and non-Hispanic Whites as "White."

[5]The ASEC for 2020 is included in the pre-COVID period because the data were collected before the active COVID-19 period, which began after March.

$Asian_i \times COVIDandBeyond_i$: The interaction term between the Asian dummy and the COVID/post-COVID period dummy. This is our variable of interest and captures the differential effect of exposure to discrimination on the health outcomes.

X_i: A vector of individual-level controls including age, marital status, gender, education level, citizenship status, health insurance coverage, and income. In certain regressions, we also incorporate into X_i a set of indicators for functional difficulties (e.g., difficulty hearing, seeing, remembering), as described in the data section.

We include state fixed effects ρ_s to control for time-invariant unobservable characteristics specific to each state and year fixed effects λ_t to capture time-specific shocks or trends common across all states.

The logic behind the DD estimation strategy is that, in the absence of the event (i.e., the surge in discrimination), the differences in health outcomes between the treatment and control groups should remain constant over time. The DD framework thus allows us to compare changes in health outcomes for Asians (treatment group) before and after the onset of COVID-19 relative to changes for Whites (control group). Without the discrimination-related event, we would expect both groups to be similarly affected by the pandemic, and the difference would remain unchanged (i.e., $\beta_3 = 0$).

When our dependent variable (health status) is ordinal, we estimate the model using ordinary least squares.[6] For the two binary health outcomes, we use a probit model, as linear probability models may generate estimated probabilities outside the [0,1] interval.[7]

6 Results

Table 2 presents the results of our original DD regression estimation. In column (1), we present the DD estimates in a regression without any controls as a baseline. In column (2), we add the standard explanatory variables for health and well-being, such as age, a dummy for health insurance, years of schooling, number of children, family size, log of family income, state dummies, and year fixed effects. In column (3), we add to the controls

[6] In all regression estimations, we adjust standard errors for heteroskedasticity and apply survey weights to account for sampling limitations in the ASEC.

[7] In the probit model, the probability that an event occurs is modeled as a function of the independent variables using the cumulative distribution function (CDF) of the standard normal distribution.

in column (2) dummies for marital status, given past research suggesting that marital status can affect health. The base group for comparison is those who are married. In the regression summarized in column (4), we additionally include controls for citizenship status— U.S. born individuals are the base group in this case. Past research has suggested that the selective nature of immigrants makes them, on average, healthier. For the regression summarized in column (5), in addition to the variables in column (4), we include health-related variables that could affect an individual's reported health status. We highlighted these variables in our data description section. Specifically, we include binary variables for hearing difficulty, vision difficulty, difficulty remembering, physical difficulty, mobility difficulty, and personal care difficulties.

Our results from Table 2, column (5), which includes the strongest set of controls, suggest that pre-pandemic, Asians had about a 0.066 lower mean health status than their comparable White counterparts. We also find from this regression a general health effect of the pandemic: a mean decrease of 0.036 in individuals' health status. In terms of our question of interest, our DD estimation shows evidence of a "chilling effect" on Asians. In particular, the estimated coefficient of the interaction term β_3 in column (5) shows that discrimination against Asians led to a decrease in their health status by 0.023 of a point on the 1–5 Likert scale compared to the reference group, Whites. If we do not control for the health difficulties, this treatment effect increases to a 0.029 decrease in health status compared to Whites.

In the regressions summarized in Table 2, we analyzed data from 2015–2024. It is possible to argue that, given the slight divergence in health status for Asians and Whites from 2015–2017, our results are capturing pre-existing downward trends. While this argument is flawed given the lack of any systematic trend in Figure 4, we nevertheless test for the potential time sensitivity of our results. We do this by re-estimating the models summarized in Table 3, restricting the data sample to 2017–2024. By restricting the sample to 2017 onward, we eliminate the period of slight divergence between the two groups. This setup also has other advantages, as it provides us with four years of March Annual Social and Economic Supplement (ASEC) pre-pandemic data (2017–2020), which we compare with four years from the pandemic onward (2021–2024), using the March ASEC.

While the coefficient estimates in Table 3, columns (1)–(5), are different in most cases, the

results are very similar to those in Table 2, columns (1)–(5). In particular, for our estimates of β_3, we find larger coefficients in each regression summarized in Table 3, columns (1)–(5), but the differences may not be statistically significant compared to those in Table 2. For example, for the regression without the health difficulty dummies—column (4)—we estimate –0.031 in Table 3 versus –0.029 in Table 2. Similarly, when we include these controls in the regression column (5), we estimate –0.025 in Table 3 versus –0.023 in Table 2.

Our conclusion in both cases are similar. We find a negative impact of exposure to discrimination on reported health status for Asians. Hence, our results provide evidence of an Asian "chilling effect" in reported health status from the pandemic onward. Table 4 summarizes our regressions using alternative measures of health: a dummy for excellent/very good health and a dummy for any difficulty. In columns (1) and (2), the results using the dummy for any difficulty are summarized. In column (1), no controls are included, and in column (2), relevant control variables for our dependent variable are included. For the regressions with the health measure—any difficulty, we cannot include the different health dummies that capture individual health difficulties, given that this binary variable is a combination of these six dummies. In columns (3)–(5), we summarize our second alternative health measure, which is the dummy for reporting very good or excellent health. In column (3), we present the results without controls. In column (4), we add explanatory variables identical to those included in the regression summarized in column (2). In the regression summarized in column (5), we include the health difficulty dummies, in addition to other controls. As noted in our empirical framework, given that these two measures of health are binary variables, we estimate probit models using a maximum likelihood estimator. For ease of interpretation, we present the marginal effects of all coefficients in the model in Table 4.

The results corroborate our earlier findings; again, our focus is on the interaction term β_3. For example, we find from column (2) that exposure to discrimination increases the probability of Asians having a health difficulty by 0.9 percentage points compared to Whites. The results in column (4) also suggest a 1.2 percentage point decrease in the probability that Asians report excellent or very good health from the pandemic onward compared to Whites, whereas the results in column (5) suggest a 1 percentage point decrease in probability. Again, as in Tables 2 and 3, we attribute the significant decrease in reporting excellent/very

good health for Asians to exposure to discrimination. Notice from Table 4 that, prior to the pandemic, being Asian decreased the probability of having any health difficulty by 4.1 percentage points relative to Whites (column 2), and in general, there was a 1.4 percentage point increase in the probability of having any health difficulty during the pandemic and onward period compared to the pre-pandemic period for both groups. What we are capturing with the estimate of our interaction term, β_3, is the additional effect on health during this period that selectively affected Asians due to the increased hate/discrimination.

Falsification and Robustness Tests

As noted above, our identification strategy to estimate the impact of Asians' exposure to discrimination from the pandemic relies on a DD strategy. The validity of the DD estimator rests on the parallel trends assumption. In particular, in the absence of the COVID-19 shock and associated anti-Asian discrimination, the health trends of Asians would have followed the same trajectory as those of the comparison group (Whites).

In addition, the presence of confounding factors could erode our ability to derive consistent estimates of the impact of exposure to discrimination on health. To bolster the credibility of our results, we first conduct falsification tests to check the validity of the parallel trends assumption. We then conduct additional robustness checks to rule out alternative explanations for our results.

To provide clear evidence that the decline in health is not simply a systematic downward trend for Asians over time, and not related to the discrimination Asians faced during COVID, we run several falsification tests. In particular, we estimate placebo treatments at different breakpoints over time. First, we restrict the data used for estimation to all years prior to 2020. Then we randomly choose placebo treatment periods. For the first placebo test, we assume a pre-treatment period of 2015–2016 and set our treatment period as 2017–2019. If the effects we find for Asians are driven by a systematic downward trend in health for this group, distinct from a parallel trend with Whites, then our interaction term from the DD estimation (when the dependent variable is health status or the health dummy) would be a significantly negative coefficient. In contrast, when the dependent variable is the dummy for having any health difficulty, the interaction term would be positive and significant. The

results of this placebo test are summarized in Section A of Table 5. We also explore restricting our data to a smaller sample of only four years. To ensure a more balanced comparison between treatment and non-treatment periods, we restrict our analysis to a narrower four-year sample: 2015–2016 (pre-treatment) and 2017–2018 (post-treatment). The results of these placebo tests are also summarized in Section B of Table 5.

The results in Table 5 provide evidence supporting the parallel trends assumption—meaning that there is no systematic downward trend in Asian health. Notice that the interaction term is either insignificant or, in the case of columns (2) and (5), positive and only barely significant (at the 10% level). Hence, the discrimination treatment on Asians we posit from 2020 onward is not simply capturing a systematic downward trend in Asian health over time.

We also tested an alternative break-point with 2015–2018 as the pre-treatment period and 2019–2020 as the treatment period, yielding similar results to those in Table 5.[8] Specifically, we find no significantly negative coefficient for the DD interaction term when the model is estimated with the dependent variable as health status or the health dummy, and we find a non-positive coefficient for the interaction term when the dependent variable is the dummy for having any difficulty.[9]

Next, we conduct additional robustness checks to rule out alternative explanations for our results other than the anti-Asian working hypothesis. One potential concern is that our results may reflect an immigrant selection effect. This is because past literature suggests that immigrants were significantly affected during the pandemic, and a majority of individuals of Asian descent in the U.S. are immigrants (Chen et al., 2020; Krogstad & IM, 2025).

While we control for immigration status in all our prior analyses, we re-estimate our main models by dropping all immigrants from the sample as a robustness check. We report the

[8]Results are not reported here but are available upon request.

[9]It is worth noting that while mean health status was relatively stable for both Whites and Asians over this period, as noted in Figure 4, it slightly decreased between 2017 and 2019 for Asians/Pacific Islanders. This decline was not systematic, and mean health status increased in 2020 before COVID-related shutdowns. For Whites, there was also a slight decrease between 2018 and 2019, followed by an increase in 2020. Given this decrease, it is not surprising that if we construct a treatment period as 2018–2019 and a pre-treatment period as 2016–2017, a negative interaction term is noted when the dependent variable is health status. This finding for the health status measure does not cast doubt on the validity of the intervention period, as it reflects a mean trend in health status around that time. The falsification test holds for the other two health measures using the same treatment construction. Hence, we conclude that we are not capturing a trend effect but rather a discrimination treatment effect in the 2021 onward treatment period.

results of the three regressions using our three measures of health, excluding all immigrants from the estimation sample, in Table 6. In column (1), we summarize the results when the dependent variable is health status, and in columns (2) and (3), we present the marginal effects from the probit estimations of the two health dummy variables. Notice that the results are actually stronger when we exclude immigrants from the sample. In particular, the results in Table 6 suggest that Asian discrimination led to a decline of 0.049 in reported health status for Asians (relative to Whites), compared to 0.025 when we estimate the model using the full sample, almost double. Similarly, this discrimination led to a 2.5 percentage point decrease in the probability that Asians report excellent or very good health, compared to a 1 percentage point decrease when we estimate the full sample, more than double. Furthermore, the results for our third health measure in Table 6 suggest that exposure to discrimination from COVID onward led to an increase in the probability of having any health difficulty by 1.1 percentage points for Asians compared to Whites. In contrast in the full sample, we estimated a 0.9 percentage points increase.

Second, while it is clear from past research and our own findings that the COVID period led to lower health outcomes for all groups, it is possible to argue that the effects we noted are simply a majority- minority group treatment effect versus the effect of exposure to anti-Asian discrimination. There is no doubt that minority groups were more disproportionately affected by the pandemic (Mackey et al., 2021; CDC, 2021; Tai et al., 2022). However, other research shows that the worse health outcomes for minorities can be partially explained by socioeconomic factors such as income, education, family structure and marital status (Franks et al., 2003; Lee & Singh, 2021). Hence, when we control for these factors, the interaction term for each minority group in the DD model should be 0 when compared to the base group -Whites except for the Asian one, if the significance of the interaction terms is solely driven by discrimination. If not, then there could be a majority-minority effect. To test for this alternative explanation as part of our robustness checks, we estimate a model such as equation 2.

$$\begin{aligned} Health_i = \alpha + \beta_1 Asian_i + \beta_2 Black_i + \beta_3 Hispanic_i + \beta_4 COVIDandBeyond_i \\ + \delta'(\text{Race/Ethnic Group}_i \times COVIDandBeyond_i) + \theta' X_i + + \rho_s + \lambda_t + \varepsilon_i \end{aligned} \tag{2}$$

Where: δ is a vector capturing coefficients that capture the differential change in health outcomes for Asians, Blacks and Hispanics for COVID-19 and beyond relative to pre-COVID-19 in comparison to the White group.

$Black_i$ is a dummy for an individual reported as being Black.

$Hispanic_i$ is a dummy for an individual reported as being White Hispanic.

$Racial/EthnicGroup_i$: captures a vector of dummies for Hispanic, Black and and Asian individuals (Whites are the omitted category).

All the other variables in equation (2) are similar to equation (1).

If the significance of the interaction term for Asians*COVID effects we noted in Table (2)-(6) is driven by the anti-Asian exposure, then the interaction terms for Blacks and Hispanics in the vector δ should not be negative and significant when we estimate effects on health status and the excellent/very good health dummy. Similarly, the interaction terms should be non-positive when the dependent variable is the any difficulty dummy. In contrast, it should be negative and significant for Asians for the first two health measures and positive and significant for the third measure.

The result of this robustness check exercise can be found in Table 7. In columns (2) and (4), we include with other controls a set of dummies that capture different health difficulties while in columns (1), (3) and (5) we do not include these dummies. In columns (3), (4) and (5), we present marginal effects of the estimated probit model since the dependent variables are dummy variables. In columns (1) and (2), we summarize results from models estimated using health status as the dependent variable, while in columns (3) and (4), the dependent variable is the dummy for excellent/very good health. In column (5), the dependent variable is the dummy for any difficulty. The results from this robustness check exercise summarized Table 7 rules out the majority-minority explanation. Notice that the interaction term is 0 for Hispanics signaling the effect was solely on Asians. For Blacks, we find a positive coefficient for the two health status related measures, which again is consistent with not finding a negative interaction for any other minority group. For the any difficulty dummy the coefficient is 0 just as it is for Hispanics.

These results confirm that the COVID-19 triggered discrimination faced by Asians, is the source of the noted effect, not a majority- minority argument. It is worth noting the

positive coefficient on the Black interaction term for the two health status related variables. However, readers should be cautious in interpreting this results as an indication that Blacks health status improved relative to Whites during or after the pandemic period. One possible explanation for this positive coefficient could be a change in the composition of the Black sample, potentially due to increased mortality during COVID-19.

Gawthrop (2023) reports that as of September 2023, 157,169 Black Americans had died from COVID-19. Nationally, Black Americans accounted for 13.7% of all COVID-19 deaths, despite making up only 12.6% of the U.S. population. Hence, given the significant proportion of Black fatality during the Pandemic, it is possible that the left tail of the Black sample with the lowest health status are no longer represented in the sample. As a result, the remaining trunctated Black sample may, by construction, appear healthier on average. If this pattern differs from that of Whites, it could lead to an artificially positive coefficient on the interaction term. We plan to look at this possibility more closely and try to better understand the rationale for this positive coefficient for health status of Blacks during COVID-19 and beyond in future work.

In addition to the alternative explanations for our results mentioned above, it is possible to argue that these results are driven by the uniqueness of the 2020 sample. It is important to note that because we use the March ASEC data, which is collected in February and March (i.e., prior to March 15th shut down order in the USA and the active COVID pandemic), the year 2020 should be included in our pre-pandemic sample. This means that our COVID-19 and beyond period is based on March 2021 to March 2024 ASEC data and our pre-pandemic period is from March 2015 to March 2020. However, some could argue, that the pandemic may have started before the shut down in the U.S., thus including 2020 data in the pre-pandemic period is problematic. Also, the response rates for CPS monthly data collection were lower through the year beginning in March, so it is possible to conclude that the 2020 sample may be a little different from other years and this difference could affect the consistency of the estimated effect.

Although we do not believe including data from 2020 creates a significant issue with our estimates, we nonetheless, exclude year 2020 observations from the sample and re-estimate our main OLS regression and probit models to rule out any potential selectivity bias. The

results are reported in Table 8. Again, in the regression results summarized in columns (1), (3) (4), we do not include the dummy variables for the various health difficulties. Whereas these controls are included in the results summarized in columns (2) and (5). The results in Table 8 are very similar to those from the full sample presented in Tables 2 and 4. Hence, the results are nonsensitive to dropping the data from 2020.

Another potential alternative explanation for our results is that it is somehow driven by a booming aging population. It is well known that mortality risk increases with age and during the pandemic there were a significant number of pandemic related deaths among older individuals in the U.S. (Lekamwasam & Lekamwasam, 2020).

We quell this concern by dropping all observations of those who are 65 and above (i.e., retirement age), and re-estimate our various health measures using the sample of those below 65. The results are summarized in Table 9. As with other tables, the regressions summarized in columns (1), (3) and (5) do not include dummies capturing health difficulties, while the regressions summarized in columns (2) and (4) do. Dropping the sample of those above 65 largely maintains our prior finding even though the estimate on the interaction term changes. Specifically, while there is a decline in the magnitude of the coefficient of estimated interaction term for the health status measure (0.23 vs 0.18), the marginal effect estimate on the interaction term for the dummy for excellent/very good is only 0.1 percentage point lower (0.01 vs 0.009). For both these measures the DD interaction term remains statistically significant whereas the interaction term in the regression where the dependent variable is a dummy for any health difficulty becomes insignificant.

Even though we control for age in our earlier results, this slight decline when we restrict our sample to those below 65 years suggests that exposure to discrimination may have been more pronounced among the elderly.[10]

It could be argued that the negative, significant coefficient on the interaction term for the health status variables with Whites, along with the positive coefficient for the any difficulty variable, reflects Asians disproportionately suffering from the biomedical consequences of

[10]Given the heterogeneity across gender in fatalities during the pandemic (see Danielsen et al 2022) we also explore heterogeneity in the effect of the exposure to discrimination across gender noting stronger impacts for men than women for the health status related measures. These results are not reported but available upon request.

COVID-19 itself rather than from exposure to discrimination. This interpretation is flawed. Unlike other racial and ethnic minority groups who experienced higher rates of infection, hospitalization, and mortality, Asians did not. In fact, studies show that Asians had infection, hospitalization, and mortality rates comparable to or lower than those of non-Hispanic Whites (Mackey et al., 2021; Tai et al., 2022). Moreover, Asian Americans had the highest vaccination rates among all racial and ethnic groups (Tai et al., 2022; Ndugga et al., 2022).

The battery of falsification and robustness tests presented above further support our conclusion that the observed decline in health status among Asians is attributable to pandemic-induced discrimination rather than differential biomedical outcomes.

Testing for Delayed Effects

In our examination of the past literature we noted that discrimination creates stress, worry, anxiety that over time affects mental health, physiological health and ultimately affects an individuals overall well being. As discussed earlier, this process takes time to manifest, making a delayed effect plausible. Aarons et al. (2009), for example, document this delayed pattern in a longitudinal study of adolescents, showing that mental health disorders increase the risk of physical health problems two years later. We therefore hypothesize that this is the pathway through which anti-Asian discrimination has impacted the health status of Asians during and beyond the COVID-19 pandemic.

To test for a delay in the effects of the anti-Asian discrimination on health status, and explore the timing of these effects, we divide the post-COVID period into two intervals: 2021–2022 (Period 1) and 2023–2024 (Period 2). Given the delayed nature of the health impact of discrimination, we expect the interaction effects to be stronger in Period 2.

Table 10 presents the results of this analysis. As in previous tables, columns (1), (3), and (5) summarize regressions that exclude dummy variables for specific health difficulties, while columns (2) and (4) include them. The results support the hypothesis of delayed effects. While the interaction terms for Period 1 are negative across the four regressions using health status and the dummy for excellent/very good health as dependent variables, none of these coefficients are statistically significant. In contrast, the interaction terms for Period 2 are both negative and statistically significant in columns (1) through (4), and

positive and significant in column (5), where the dependent variable is a dummy for any health difficulty. Moreover, the magnitude of the Period 2 coefficients is larger than when the post-COVID period is analyzed as a single block. For instance, in column (2), the effect is -0.044, compared to –0.023 in Table 2. Similarly, the marginal effect in column (5) is 0.013 (a 1.3 percentage point increase), whereas Table 4 reports a smaller effect of 0.009 (a 0.9 percentage point increase).

The regressions in Table 10 also confirm our earlier findings from Tables 2 and 4. Controlling for key health determinants, we find that even prior to the pandemic, Asians with similar observable characteristics to Whites had lower health status but were 4.1 percentage points less likely to report a health difficulty compared to Whites. In addition, health status declined for both Asians and Whites during the pandemic, and the decline was more pronounced in the 2023–2024 period than in 2021–2022. This pattern suggests that health continued to deteriorate even after the peak of the pandemic. This finding is consistent with the existence of longer-term, delayed health effects of the pandemic-induced discrimination.

For example, in column (4) of the probit model, the estimated marginal effect indicates a 2.6 percentage point decline in the likelihood of reporting excellent or very good health in 2021–2022 compared to the pre-pandemic period, which increases to a 3.2 percentage point decline in 2023–2024—a difference of 0.6 percentage points. Similarly, in column (2) for the health status measure, the decline from the pre-pandemic period to 2021–2022 is 0.038, whereas the decline in 2023–2024 is 0.061. This implies a further average decline of 0.023 in health status from the active pandemic period to the later post-pandemic period for both Asians and Whites. Taken together, these results suggest that the negative health effects of the pandemic not only persisted but also deepened in the post-pandemic period, pointing to delayed and prolonged (or accumulated) consequences on health status.

In terms of the interaction term from our DD estimation, our result in column (2) suggests that, in comparison to White non Hispanics, exposure to anti-Asian discrimination is associated with a delayed negative effect on Asians' health status, with a reduction of 0.044. For the health dummy, the exposure to discrimination led to a 1.7 percentage point decrease in the probability of Asians reporting excellent or good health compared to Whites. In addition, the results in column (5) suggest that by 2023–2024, Asians experienced a 1.3

percentage point increase in the probability of reporting any health difficulty relative to Whites.

The results for Table 10 confirm the effects of exposure of Asians to pandemic-related discrimination albeit suggesting a delayed effect consistent with a pathway of discrimination elevating stress leading to mental and physiological consequences progressively overtime.

7 Summary, Implications, Limitations and Conclusion

The COVID-19 pandemic has had significant impacts on both economic and health outcomes globally. A growing body of literature has explored the pandemic's effects across multiple dimensions. In this paper, we contribute to that literature by examining how pandemic-related anti-Asian discrimination has potentially impacted the overall health of Asians. We measure overall health using both objective and subjective indicators. To causally identify the impact of this exposure on health, we use a difference-in-differences (DD) analysis. Our estimation strategy also allows us to test whether the widely observed "chilling effect" on Asians during the pandemic extends to overall health. Specifically, we investigate how exposure to discrimination and anti-Asian hate, coinciding with the onset of the pandemic, influenced self-reported health among Asians in the United States, compared to non-Hispanic Whites, during and after the pandemic's peak.

Our findings suggest that exposure to anti-Asian discrimination during and after the onset of the COVID-19 pandemic led to a 0.023-point decline on a 1-5 self-rated health scale, relative to non-Hispanic Whites. This corresponds to a -0.59% change from the baseline mean and -0.022 standard deviations when standardized by the pre-period control Standard deviation. While modest per person, this implies a sizable population-level shift.[11] We also find a 0.9 percentage point increase in the probability that Asians report physical health difficulties compared to Whites. This represents an 18% increase relative to the baseline probability, which is substantial. Regarding the probability of reporting excellent or very good health, we observe a 1 percentage point decrease for Asians relative to Whites. This is equivalent to a 1.5% decline from baseline. Together, these findings provide strong evidence

[11] This conclusion is based on estimating a population-level translation of our estimated effect on the 24.8 million APIs in the U.S.

of a "chilling effect" on health within the Asian community, linked to increased discrimination during this period. We further explore the possibility of delayed health impacts and find that our results are consistent with this hypothesis. The observed differential effect remains robust across a range of identification checks and model specifications.

To strengthen the validity of our causal interpretation, we evaluate alternative explanations. One possibility is that our findings reflect an immigrant-specific effect. However, the results become even stronger when immigrants are excluded from the sample. We also consider whether our findings reflect a general minority group effect rather than one specific to anti-Asian discrimination. The evidence instead suggests that the COVID-19-driven rise in discrimination specifically targeting Asians is the primary driver of the observed health impacts.

These results are particularly troubling in light of the "model minority" stereotype frequently applied to Asians, who have historically exhibited relatively strong health outcomes compared to other racial groups, including Whites. In both academic and public discourse, Asians are often portrayed as a "model minority," particularly in health and socioeconomic domains. The erosion of this pre-pandemic health advantage in the face of rising racial discrimination underscores the harmful effects of racialized stress and stigma.

This study adds to the growing literature exploring the negative health consequences of COVID-19-related discrimination against Asians. While prior research has largely documented increases in stress and declines in mental health among Asians in the U.S. during the pandemic, often citing discrimination as a possible explanation, research focused on the impact of this discrimination on the general health of Asians has been limited. Moreover, most prior studies rely on small samples and methods that limit causal inference. Our paper attempts to fill this gap by not only identifying causal impacts but also leveraging a large, nationally representative dataset- CPS. To the best of our knowledge, we are the first to examine the effect of exposure to COVID-19-related discrimination on the overall health of Asians in the U.S. Furthermore, our study provides evidence that the "chilling effect" on Asians extends beyond social and economic domains into general health and well-being.

Why do these results matter? It is important to draw attention to the negative health impacts of discrimination on Asians, especially since the widespread perception that Asians

are "doing well" can hinder or delay policy and programmatic responses aimed at mitigating the adverse effects of COVID-19-related anti-Asian discrimination. The disproportionate decline in overall health among Asians during and after the pandemic, as documented in this study, reflects broader public health consequences of racialized discrimination.

Given that this paper provides concrete evidence linking racial discrimination to health, and prior research shows that the adverse health effects of hate crimes are often more severe than those experienced by victims of other types of crimes (Wenger et al., 2022), it is critical to highlight these findings and the potential long-term implications of discrimination. Furthermore, these results call for a rethinking of public health preparedness and equity strategies, ensuring that protection from racialized harm becomes an explicit component of health system resilience in times of crisis. Additionally, there is the need for greater public discourse and more proactive government intervention to address racial discrimination and the hate crimes that often accompany it.

Finally, our findings raise the possibility that similar health impacts may have occurred among Asian populations in other Western countries. Future research should explore whether comparable patterns exist in other national contexts, particularly in countries with significant Asian minority populations.

Table 2: Average Treatment Effect of COVID Asian Discrimination on Health Status

	(1)	(2)	(3)	(4)	(5)
	β/SE	β/SE	β/SE	β/SE	β/SE
Asian/Pacific	0.061***	-0.044***	-0.049***	-0.053***	-0.066***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
COVIDnAfter Dummy	-0.045***	-0.035***	-0.034***	-0.034***	-0.036***
	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)
Asian*COVIDnAfter	-0.023***	-0.030***	-0.030***	-0.029***	-0.023***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)
Age		-0.019***	-0.019***	-0.019***	-0.016***
		(0.000)	(0.000)	(0.000)	(0.000)
Health Insurance		0.006	0.003	0.005	0.042***
		(0.005)	(0.005)	(0.005)	(0.005)
Male		-0.004	-0.007***	-0.008***	-0.012***
		(0.002)	(0.002)	(0.002)	(0.002)
Estimated years of Schooling		0.042***	0.041***	0.041***	0.032***
		(0.000)	(0.000)	(0.000)	(0.000)
Number of own children		0.030***	0.032***	0.032***	0.027***
		(0.002)	(0.002)	(0.002)	(0.002)
Family Size		-0.028***	-0.033***	-0.033***	-0.029***
		(0.001)	(0.001)	(0.001)	(0.001)
Adj Ln Real Family Income		0.329***	0.319***	0.320***	0.277***
		(0.002)	(0.002)	(0.002)	(0.002)
Divorced/Separated			-0.108***	-0.107***	-0.063***
			(0.005)	(0.005)	(0.004)
Widowed			-0.042***	-0.042***	0.097***
			(0.006)	(0.006)	(0.006)
Never Married			-0.017***	-0.015***	0.033***
			(0.004)	(0.004)	(0.004)
Naturalized				-0.031***	-0.044***
				(0.006)	(0.006)
Non-Citizen				0.056***	0.046***
				(0.006)	(0.006)
Hearing difficulty					-0.056***
					(0.007)
Vision difficulty					-0.139***
					(0.011)
Difficulty remembering					-0.443***
					(0.008)
Physical difficulty					-0.654***
					(0.007)
Disability limiting mobility					-0.284***
					(0.010)
Personal care limitation					-0.086***
					(0.013)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Constant	3.839***	0.359***	0.519***	0.500***	0.968***
	(0.002)	(0.025)	(0.027)	(0.027)	(0.026)
R^2	0.001	0.184	0.185	0.185	0.238
N	1112867	891299	891299	891299	891299

Note: .
Robust standard errors in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1

Table 3: Average Treatment Effect of COVID Asian Discrimination 2017-2024

	(1)	(2)	(3)	(4)	(5)
	β/(SE)	β/(SE)	β/(SE)	β/(SE)	β/(SE)
Asian/Pacific	0.067***	-0.040***	-0.044***	-0.050***	-0.063***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
COVIDnAfter Dummy	-0.045***	-0.043***	-0.042***	-0.042***	-0.041***
	(0.003)	(0.006)	(0.006)	(0.006)	(0.005)
Asian*COVIDnAfter	-0.030***	-0.033***	-0.032***	-0.031***	-0.025***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Age		-0.018***	-0.018***	-0.018***	-0.015***
		(0.000)	(0.000)	(0.000)	(0.000)
Health Insurance		0.011*	0.007	0.010	0.046***
		(0.006)	(0.006)	(0.006)	(0.006)
Gender		-0.004	-0.008***	-0.008***	-0.011***
		(0.003)	(0.003)	(0.003)	(0.003)
Estimated years of Schooling		0.040***	0.039***	0.039***	0.031***
		(0.001)	(0.001)	(0.001)	(0.001)
Number of own children		0.028***	0.029***	0.029***	0.025***
		(0.002)	(0.002)	(0.002)	(0.002)
Family Size		-0.025***	-0.030***	-0.030***	-0.027***
		(0.001)	(0.001)	(0.001)	(0.001)
Log Real Family Income		0.333***	0.322***	0.323***	0.281***
		(0.003)	(0.003)	(0.003)	(0.003)
Divorced/Separated			-0.109***	-0.108***	-0.064***
			(0.005)	(0.005)	(0.005)
Widowed			-0.054***	-0.053***	0.084***
			(0.007)	(0.007)	(0.007)
Never Married			-0.021***	-0.019***	0.029***
			(0.005)	(0.005)	(0.004)
Naturalized Dummy				-0.030***	-0.043***
				(0.006)	(0.006)
Non-Citizen Dummy				0.058***	0.048***
				(0.007)	(0.007)
Hearing difficulty					-0.054***
					(0.008)
Vision difficulty					-0.144***
					(0.013)
Difficulty remembering					-0.431***
					(0.009)
Physical difficulty					-0.639***
					(0.008)
Disability limiting mobility					-0.275***
					(0.011)
Personal care limitation					-0.092***
					(0.015)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Constant	3.839***	0.302***	0.477***	0.457***	0.907***
	(0.002)	(0.028)	(0.030)	(0.030)	(0.029)
R^2	0.001	0.182	0.183	0.183	0.234
N	860004	690878	690878.	690878	690878

Note: Robust standard errors in parentheses.
Significance levels *** p<0.01, ** p<0.05, * p<0.1

Table 4: Treatment Effect of COVID Asian Discrimination-Alternative Health Measures (Reporting Marginal Effects)

	(1)	(2)	(3)	(4)	(5)
	Difficulty Any		Excellent/Very Good Health Dummy		
	dfdx/se_{dfdx}	dfdx/se_{dfdx}	dfdx/se_{dfdx}	dfdx/se_{dfdx}	dfdx/se_{dfdx}
Asian/Pacific	-0.083***	-0.041***	0.010***	-0.030***	-0.034***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
COVIDnAfter==1	0.006***	0.014***	-0.017***	-0.034***	-0.032***
	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)
AsianPacific*COVIDnAfter	0.008***	0.009***	-0.009***	-0.012***	-0.010***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Age		0.004***		-0.007***	-0.006***
		(0.000)		(0.000)	(0.000)
Health Insurance		0.037***		0.019***	0.029***
		(0.002)		(0.002)	(0.002)
Gender		0.012***		-0.005***	-0.006***
		(0.001)		(0.001)	(0.001)
Years of Schooling		-0.010***		0.017***	0.014***
		(0.000)		(0.000)	(0.000)
Number of own children		-0.016***		0.015***	0.013***
		(0.001)		(0.001)	(0.001)
Family Size		0.008***		-0.016***	-0.015***
		(0.000)		(0.001)	(0.001)
Divorced/Separated		0.042***		-0.031***	-0.018***
		(0.001)		(0.002)	(0.002)
Widowed		0.063***		-0.007***	0.030***
		(0.001)		(0.003)	(0.003)
Never Married		0.054***		-0.009***	0.005***
		(0.001)		(0.002)	(0.002)
Naturalized		-0.026***		-0.020***	-0.025***
		(0.002)		(0.003)	(0.003)
Non Citizen		-0.050***		0.018***	0.013***
		(0.003)		(0.003)	(0.003)
Adj Ln Real Family Income		-0.063***		0.129***	0.113***
		(0.001)		(0.001)	(0.001)
Hearing difficulty					-0.027***
					(0.003)
Vision difficulty					-0.054***
					(0.005)
Difficulty remembering					-0.162***
					(0.004)
Physical difficulty					-0.219***
					(0.003)
Disability limiting mobility					-0.086***
					(0.004)
Personal care limitation					0.011*
					(0.006)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	1112867	891299	1112867	891299	891299

Note: Robust standard errors in parentheses.
Significance levels *** p<0.01, ** p<0.05, * p<0.1

Table 5: Placebo Tests: Testing Parallel Trend Assumption

	Falsification A [2015-16 VS 2017-19]			Falsification B [2015-16 VS 2017-18]		
	(1)	(2)	(3)	(4)	(5)	(6)
	Health Status	Health Dummy	Difficulty Dummy	Health Status	Health Dummy	Difficulty Dummy
	OLS	Probit	Probit	OLS	Probit	Probit
	β/SE	dfdx/se_{dfdx}	dfdx/se_{dfdx}	β/SE	dfdx/se_{dfdx}	dfdx/se_{dfdx}
AsianPacific	-0.069***	-0.037***	-0.038***	-0.069***	-0.036***	-0.038***
	(0.009)	(0.004)	(0.004)	(0.009)	(0.005)	(0.004)
Fakecovidbeyond Periods	-0.024***	-0.014***	0.003*	-0.025***	-0.011***	0.003*
	(0.005)	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)
AsianPacific*fakecovid	0.008	0.009*	-0.004	0.016	0.009*	-0.005
	(0.010)	(0.005)	(0.004)	(0.011)	(0.005)	(0.005)
R^2	0.250			0.254		
N	485828	485828	485828	391109	391109	391109

Note: Robust standard errors in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1.
The regressions reported in columns (1), (2), (4), and (5) include the same set of controls as in Table 4, column (5), as well as state and year fixed effects. By contrast, the regressions in columns (3) and (6) include all controls except the dummies capturing health difficulties.

Table 6: Robustness Check: DD estimates Excluding All Immigrants

	(1)	(2)	(3)
	Health Status	Excellent/Very Good Health Dummy	Any Difficulty Dummy
	OLS	Probit	Probit
	β/SE	dfdx/se_{dfdx}	dfdx/se_{dfdx}
Asian/Pacific	-0.049***	-0.026***	-0.046***
	(0.008)	(0.004)	(0.004)
COVIDnAfter==1	-0.090***	-0.034***	0.015***
	(0.006)	(0.003)	(0.002)
AsianPacific*COVIDnAfter	-0.046***	-0.025***	0.011**
	(0.012)	(0.006)	(0.005)
R^2	0.241		
N	798611	798611	798611

Note: Robust standard errors in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1.
The regressions reported in columns (1), (2) include the same set of controls as in Table 4, column (5), as well as state and year fixed effects. By contrast, the regressions in column (3) include all controls except the dummies capturing health difficulties.

Table 7: Robustness Checks: Testing for a Minority Majority Effect

	(1)	(2)	(3)	(4)	(5)
	Health Status		Excellent/Very Good Health Dummy		Any Difficulty
	OLS	OLS	Probit	Probit	Probit
	β/SE	β/SE	dfdx/se_{dfdx}	dfdx/se_{dfdx}	dfdx/se_{dfdx}
Black	-0.142***	-0.137***	-0.066***	-0.065***	-0.005***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.001)
White Hispanic	-0.065***	-0.075***	-0.040***	-0.034***	-0.040***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.001)
Asian	-0.094***	-0.094***	-0.048***	-0.040***	-0.057***
	(0.005)	(0.005)	(0.003)	(0.002)	(0.002)
COVIDnAfter	-0.035***	-0.037***	-0.030***	-0.030***	0.011***
	(0.005)	(0.005)	(0.002)	(0.002)	(0.001)
Black*COVIDnAfter	0.024***	0.024***	0.007**	0.007**	-0.003
	(0.007)	(0.006)	(0.003)	(0.003)	(0.002)
Hispanic*COVIDnAfter	0.003	0.004	0.002	0.001	0.003
	(0.005)	(0.005)	(0.002)	(0.002)	(0.002)
Asian*COVIDnAfter	-0.026***	-0.021***	-0.009**	-0.010***	0.009***
	(0.008)	(0.007)	(0.004)	(0.004)	(0.003)
R^2	0.183	0.232			
N	1282627	1282627	1282627	1282627	1282627

Note: Robust standard errors in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1.
The regressions reported in columns (2) and (4) include the same set of controls as in Table 4, column (5), as well as state and year fixed effects. By contrast, the regressions in columns (1), (3) and (5) include all controls except the dummies capturing health difficulties.

Table 8: Robustness Checks: Treatment Effect of COVID Asian Discrimination-Excluding 2020

	(1)	(2)	(3)	(4)	(5)
	Health Status		Any Difficulty	Excellent/Very Good Health Dummy	
	OLS		Probit	Probit	
	β/SE	β/SE	dfdx/se_{dfdx}	dfdx/se_{dfdx}	dfdx/se_{dfdx}
AsianPacific==1	-0.052***	-0.065***	-0.041***	-0.02 9***	-0.033***
	(0.006)	(0.006)	(0.002)	(0.003)	(0.003)
COVIDnAfter==1	-0.063***	-0.062***	0.014***	-0.03 4***	-0.032***
	(0.005)	(0.005)	(0.002)	(0.003)	(0.003)
AsianPacific1*COVIDnAfter	-0.029***	-0.023***	0.009** *	-0.013***	-0.011***
	(0.008)	(0.008)	(0.003)	(0.004)	(0.004)
R^2	0.185	0.238			
N	1112867	891299	1112867	891299	891299

Note: Robust standard errors in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1.
The regressions reported in columns (2) and (5) include the same set of controls as in Table 4, column (5), as well as state and year fixed effects. By contrast, the regressions in columns (1) (3) and (4) include all controls except the dummies capturing health difficulties.

Table 9: Robustness Checks: Are results driven by the elderly?

	(1)	(2)	(3)	(4)	(5)
	Health Status		Excellent/Very Good Health Dummy		Any Difficulty
	OLS	OLS	Probit	Probit	Probit
	β/SE	β/SE	dfdx/se_{dfdx}	dfdx/se_{dfdx}	dfdx/se_{dfdx}
AsianPacific==1	-0.060***	-0.071***	-0.030***	-0.034***	-0.029***
	(0.006)	(0.006)	(0.003)	(0.003)	(0.002)
COVIDnAfter==1	-0.124***	-0.115***	-0.045***	-0.042***	0.016***
	(0.006)	(0.006)	(0.003)	(0.003)	(0.002)
AsianPacific*COVIDnAfter	-0.017**	-0.018**	-0.010**	-0.009**	0.001
	(0.008)	(0.008)	(0.004)	(0.004)	(0.003)
R^2	0.144	0.199			
N	703092	703092	703092	703092	703092

Note: Robust standard errors in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1.
The regressions reported in columns (2) and (4) include the same set of controls as in Table 4, column (5), as well as state and year fixed effects. By contrast, the regressions in columns (1), (3) and (5) include all controls except the dummies capturing health difficulties.

Table 10: Potential Pathways: Was the Effects on Health Immediate or Delayed?

	(1)	(2)	(3)	(4)	(5)
	Health Status		Excellent/Very good Health Dummy		Any Difficulty Dummy
	OLS	OLS	Probit	Probit	Probit
	β/SE	β/SE	dfdx/se_{dfdx}	dfdx/se_{dfdx}	dfdx/se_{dfdx}
AsianPacific==1	-0.053***	-0.066***	-0.030***	-0.034***	-0.041***
	(0.006)	(0.006)	(0.003)	(0.003)	(0.002)
period==1	-0.037***	-0.038***	-0.027***	-0.026***	0.008***
	(0.005)	(0.005)	(0.003)	(0.003)	(0.002)
period==2	-0.064***	-0.061***	-0.034***	-0.032***	0.014***
	(0.006)	(0.005)	(0.003)	(0.003)	(0.002)
AsianPacific*period==1	-0.005	-0.001	-0.003	-0.002	0.004
	(0.010)	(0.009)	(0.005)	(0.005)	(0.004)
AsianPacific*period==2	-0.051***	-0.044***	-0.020***	-0.017***	0.013***
	(0.010)	(0.009)	(0.005)	(0.005)	(0.004)
R^2	0.185	0.238			
N	891299	891299	891299	891299	891299

Note: Robust standard errors in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1.
The regressions reported in columns (2) and (4) include the same set of controls as in Table 4, column (5), as well as state and year fixed effects. By contrast, the regressions in columns (1), (3) and (5) include all controls except the dummies capturing health difficulties.

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