Anti-Asian Discourse in Quora: Comparison of Before and During the COVID-19 Pandemic with Machine- and Deep-Learning Approaches

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Abstract
The current study attempts to compare anti-Asian discourse before and during the COVID-19 pandemic by analyzing big data on Quora, one of the most frequently used community-driven knowledge sites. We created two datasets regarding “Asians” and “anti-Asians” from Quora questions and answers between 2010 and 2021. A total of 1,477 questions and 5,346 answers were analyzed, and the datasets were divided into two time periods: before and during the COVID-19 pandemic. We conducted machine-learning-based topic modeling and deep-learning-based word embedding (Word2Vec). Before the pandemic, the topics of physical difference and racism were prevalent, whereas, after the pandemic, the topics of hate crime, the need to stop Asian hate crimes, and the need for the Asian solidarity movement emerged. Above all, the semantic similarity between Asian and Black people became closer; while the similarity between Asian people and other racial/ethnic groups was diminished. The emergence of negative and radical language, which increased saliently after the outbreak of the pandemic, and the considerably wider semantic distance between Asian and White people indicates that the relationship between the two

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races has been weakened. The findings suggest a long-term campaign or education system to reduce racial tensions during the pandemic.

**Keywords**
anti-Asian, hate crime, COVID-19, race and ethnicity, Quora, topic modeling, Word2Vec

Since the coronavirus disease-19 (COVID-19) was first discovered in late 2019 in Wuhan, China (Velavan & Meyer, 2020), anti-Asian hostility has spread worldwide. The number of hate crimes against Asian people increased by approximately 76% in 2020: from 158 cases in 2019 to 279 in 2020 in the U.S. (Barr, 2021). Moreover, given that anti-Asian hate crimes are often underreported (Kim et al., 2022; Lantz & Wenger, 2021), the actual number could be even higher. As the COVID-19 pandemic has been prolonged, hate crimes against Asian people have become more severe, increasing by more than 300% between 2021 and 2022 in the US nationwide and by an astonishing 833% in New York City from to 2019–2020 (Levin, 2021). In most cases, the targets of hate crimes were women and the elderly (Lyu et al., 2021).

Hatred against Asian people occurred not only in physical spaces but also in virtual spaces. Previous studies have observed that media exposure can influence beliefs and behaviors related to social biases (Cheah et al., 2020; Davidson & Farquhar, 2020). After former American president Donald Trump referred to the COVID-19 virus as “the Chinese virus” in a tweet (Trump, 2020) and reports of the virus/disease being called the “Wuhan virus,” “Chinese flu,” and “Kung Flu” circulated (Dubey, 2020; Reny & Barreto, 2020), the number of online anti-Asian hate speeches surged on various social media platforms, including Twitter, Facebook, and Instagram (He et al., 2021). In fact, over 40% of Americans have admitted to engaging in at least one discriminatory behavior toward Asian people (Dhanani & Franz, 2020). More than half of Chinese American parents with 4–18-year-old children reported experiencing vicarious online and direct offline racism and discrimination during the early phase of the COVID-19 pandemic (Cheah et al., 2020). According to Lantz and Wenger (2020), approximately 44% of Asian survey respondents knew someone who had been a victim of a hate crime during the COVID-19 pandemic.

Asian people reported experiencing greater perceived discrimination as a result of COVID-19 than other racial/ethnic groups (Liu et al., 2020). This is concerning as perceived racial discrimination and racism have been found to be negatively associated with both better physical (Gee et al., 2009; Misra et al., 2021) and mental health among racial/ethnic minorities (Cheah et al., 2020; Gee, Spencer, et al., 2007; Gee, RO, et al., 2009; Hwang & Goto, 2008; Nadal et al., 2015). During the COVID-19 pandemic, Asian Americans were more mentally vulnerable than their White counterparts due to the prevalent anti-Asian environment and violence in both online and
offline spaces, as well as the perceived discrimination and racism against them (Miconi et al., 2021; Wu et al., 2020).

Despite these pioneering studies on anti-Asian hate crimes during the COVID-19 pandemic, the evolution of the anti-Asian discourse over time on the Internet has been overlooked compared with the pre-COVID-19 pandemic era, which represents a gap in the literature that this study attempts to fill.

**Literature Review**

*Asian Hate Before and During the COVID-19 Pandemic*

Longstanding discrimination against Asian Americans has been expressed in various ways (Perry, 2002), such as vandalism, threats, intimidation, harassment, hate speech, and even hate crime. Hate speech “covers many forms of expressions which advocate, incite, promote or justify hatred, violence and discrimination against a person or group of persons for a variety of reasons,” (Council of Europe, 2022, first paragraph) such as race/ethnicity, religion, gender, and sexual orientation (Founta et al., 2018). The intensity and volume of hate speech and crimes against Asian people have increased in both physical and virtual spaces during the COVID-19 pandemic (Gover et al., 2020).

Anti-Asian sentiment and hate crimes against Asian people have been promoted and spread during viral pandemics; prior to the COVID-19 pandemic, severe acute respiratory syndrome (SARS) (Mason, 2015) and H1N1 flu (Cahill, 2010; Mason, 2015) were both considered to be a “Chinese virus,” fomenting anti-Asian hatred all over the world. Hate speech and hate crime, which have been identified in Asian people’s everyday lives, have surged and received more attention from the media and scholars, such as the 9/11 attack in 2001 (Hanes & Machin, 2014; Sherr & Montesino, 2009). Perceived hatred against Asian people, which is harmful to Asians’ collective self-esteem and identity, can lead to negative consequences, including outrage, fear, anger, stress, and depression (Boeckmann & Liew, 2002; Liu & Suyemoto, 2016).

Compared to the few studies that were conducted before pre-COVID-19, the scope of anti-Asian hate speech and hate crimes has broadened during the COVID-19 pandemic, including the consideration of these crimes as bias-motivated crimes of prejudice and stereotypes against Asian people, COVID-19 as a racialized disease (Gover et al., 2020), and the impact of misinformation (e.g., Trump’s tweet) on anti-Asian hate speech online (Kim & Kesari, 2021). During the COVID-19 pandemic, studies have also examined the negative impact of anti-Asian hatred on mental health among Asian Americans (Tessler et al., 2020), Asian Americans’ lower probability of reporting hate crime (0.29) compared to other racial/ethnic groups, such as non-Hispanic Whites (0.42), non-Hispanic Blacks (0.42), and Hispanics (0.39) (Lantz & Wenger, 2021), counter-speech of Asian people on social media (He et al., 2021), and reactive movements against anti-Asian hatred, such as STOP Asian American Pacific Islander (AAPI) Hate (Jeung et al., 2021).
Racial/Ethnic Relations with Asian Americans

Earlier literature on racial relationships among Asian Americans and other racial/ethnic groups stemmed from the “middleman minority” theory. Before the COVID-19 pandemic, a large volume of earlier studies on middleman minority theory, given the high self-employment rate of Asian Americans, examined the status of Asian Americans as entrepreneurs, in the middle of White landlords, Black customers, and Latino employees (Kitano, 1974; Min & Kolodny, 1994; Wong, 1985). Another major focus of previous research in the pre-pandemic era has been on dating patterns or intermarriage (Canlas et al., 2015; Fujino, 1997), with Asian Americans reporting the highest intermarriage rates (Pew Research Center, 2020).

Racial/ethnic relations in hate crime have been mostly understood in terms of majority-minority relations, such as the white racist/black victim stereotype (Goodey, 1998; Perry, 2002), in the context of racial hierarchy. Although the dynamics may differ, there has been insufficient research on minority-majority relations (e.g., black offenders and white victims) or minority-minority relations (e.g., Hispanic offenders and Asian victims) in hate crimes (Perry, 2002). As previously noted, (Zhang et al., 2021), there have been inadequate studies on anti-Asian hate crimes, except for a few studies on the Black-Korean relationship (Chang, 1996; Lee & Ulmer, 2000; Yi & Hoston, 2020), compared to hate crimes against Black or Hispanic people.

Additionally, despite the fact that non-Asians commit the majority of anti-Asian hate crimes (Ren & Feagin, 2021), it has been impossible to comprehend how Asian people and others interacted before the pandemic because most Asian hatred occurred online, where race and ethnicity are frequently hidden because of the Internet’s inherent anonymity (Shaw, 2011). By comparing the semantic similarities between Asian people and other racial/ethnic groups before and after the COVID-19 pandemic, the current study aims to bridge these gaps in the literature on racial/ethnic relations.

The Present Study

The study examines the discourse on anti-Asian hate through the lens of Quora, one of the most popular community-driven knowledge sites (CKS), to compare the pre- and during-COVID-19-pandemic periods. CKS is an excellent platform for finding and learning what others think about their sensitive or complicated concerns, such as racial issues (Bae & Yi, 2017). As previously noted, there have been methodological limitations in previous studies on anti-Asian hate or hate crime (Perry, 2002), most of which have used aggregated data or surveys that do not demonstrate true changes over time. We believe that the CKS, as the social field of “the wisdom of crowds” (Surowiecki, 2005, p. 3) could provide researchers with a better understanding of the changes in social norms regarding anti-Asian hate. We chose Quora because it is one of the most frequently used CKS (George et al., 2020), where we could observe questions and answers about intricate and specific topics or concerns. In comparison with social networks such as Facebook or Instagram, where their identities are
readily revealed, people can freely discuss concerns on Quora while maintaining their anonymity and privacy (Bae & Yi, 2017).

**Data**

The current study gathered data from the social Q&A community Quora, where users can search for questions (and answers) that others have asked and answered as well as pose their own questions to the community. This study used various keywords to obtain data about “Asian” and “Asian-hate” related questions. As Table 1 presents, for the Asian-related data set, the word “Asian” was used to find questions about Asian people. Asian hate-related questions required various search terms, including the following: “Anti-Asian,” “Asian-hate,” “Asian-crime,” and “Asian-violence.” For both “Asian” and “Asian-hate” datasets, we collected questions and answers and analyzed them separately to examine the general conversation themes regarding Asian and Asian hate (questions) and the responses of Quora users to each issue (answers). Although the Chinese have become the initial target of hatred during the early outbreak of the COVID-19 pandemic, previous studies have indicated that hate speech and hate crimes were committed not only against the Chinese but also Asians in general. Because of this, hatred during the COVID-19 pandemic should be understood in the broader Asian context (Ziems et al., 2020). Because of this, we included a broader term (Asian) rather than a narrower term (Chinese) to crawl the data. To gather the most and the most recent data from Quora, we tried to crawl as much data as possible from the start date of March 1, 2010 to the end date of October 31, 2021.

After retrieving questions with the given search terms, data were collected using an automated testing framework in Selenium WebDriver. This machine crawled 1,344 questions and 17,113 answers for the Asian dataset and 1,477 questions and 5,346 answers for the Asian hate dataset. We used two different analytical methods to analyze big data: machine learning-based, latent Dirichlet allocation (LDA) topic modeling, and deep-learning-based word embedding (via Word2Vec). For both analyses, the data were pre-processed. The present study used three pre-processing techniques: lowering the casing, tokenization, and lemmatization. These techniques normalize texts and convert them into a more standard and convenient form (Jurafsky & Martin, 2021). Tokenization splits sentences into token levels, and English words are usually split by white spaces. For example, by tokenization, the sentence, “They are discriminated” could be split into several tokens: “they,” “are,” and “discriminated.” By lemmatization, words are considered to have the same root; for example, “discriminate,” “discriminating,” and “discriminated” are all derived from the verb “discriminate” (Jurafsky & Martin, 2021). Such techniques are commonly utilized for unstructured or social media data (Pradha et al., 2019).

**Data Analysis: Language Processing with Machine and Deep Learning Models**

The present study used the machine learning-based and deep learning-based methods to reveal Quora users’ perceptions of Asian people and anti-Asian hate. Figure 1 shows
Table 1. Results of Topic Modeling for “Asian”: Pre-COVID-19.

| Topic Name | Topic proportion | Topic Terms | Example Questions |
|------------|------------------|-------------|-------------------|
| **[Topic 1]** Perception of Interracial Dating/ Distinguishing Appearance Between Asians and non-Asians | 31.7% | Think, people, white, guy, girl, east, look, men, American, like | • What do Asian guys think about Asian girls dating White guys? |
| **[Topic 2]** Difference Between Asian and American Culture | 21.2% | American, people, Asia, southeast, country, east, considered, white, child, culture | • Do Westerners wear outdoor shoes inside their homes as portrayed in TV and movies? Do they wear indoor slippers like Asians or others? |
| **[Topic 3]** Physical Difference and Racism | 23.3% | Country, American, like, southeast, east, people, eye, racist, half, European | • How can I tastefully describe the Asian-shaped eyes of a fictional character without sounding racist? Moreover, related to this, how would I describe Asian-toned skin and avoid the same concerns? |
| **[Topic 4]** Appearance and Dating | 23.8% | Woman, men, attractive, east, American, white, guy, people, south, girl | • What do White men think about dating brown-skinned South Asian women? Do they find South Asian women attractive or unattractive? |

The present study applied topic modeling to questions for the Asian and Asian hate datasets to determine which subjects had been questioned. After the topic was assigned to a question, content analysis was used to label its name. The combination of machine learning and content analysis enables the classification of questions based on topics and the allocation of subject labels. In this study, topic modeling was conducted via LDA, an unsupervised machine learning model that identifies latent topic information in large document collections (Hong & Davison, 2010). LDA models return a word list with a contribution percentage for each topic, and the model assigns topics to each
question. After setting the topics using the LDA model, topic names were labeled by analyzing the word list and the given questions. To begin the labeling process, three researchers labeled each topic individually using both the before and during the COVID-19 pandemic datasets. They then met weekly to compare labels and discuss them until they reached an agreement (Biel & Gatica-Perez, 2014).

Next, we used Word2Vec to understand users’ perceptions of Asian people by analyzing semantically close words with keywords in the Asian and Asian datasets. Word2Vec is an unsupervised learning model that can determine the semantic distance between words (Handler, 2014). By vectorizing words, Word2Vec enables the computation of the cosine similarity among words. The present study employed a continuous bag of words (CBOW) model to implement Word2Vec due to its reliability in analyzing high-frequency terms such as “Asians” and predicting semantically similar words to “Asians” by utilizing the context of the term (Wu & Wang, 2017).

Results

Figure 2 depicts the year-by-year changes in the number of questions and answers about Asian people and Asian hatred from 2010 to 2021. From 2010 to 2018, the number of questions and answers about Asian people increased steadily but has since decreased. In contrast, the number of questions and answers about Asian hatred increased until 2019 but has surged since 2020, following the COVID-19 outbreak.

The results of topic modeling with questions about Asian people before and after COVID-19 are shown in Tables 1 and 2. The three researchers agreed on four topics prior to the COVID-19 pandemic and nine topics following the COVID-19
pandemic and discovered several interesting findings. First, different topics emerged in both periods while the proportion of the same topic (interracial dating) decreased from 31.7% to 6.8% in both periods (pre- to post-COVID-19). The emerging topics during the pre-COVID-19 period were mostly appearance/physical differences and dating, and the four topics were evenly distributed. For example, as Table 1 shows, with key terms such as “think,” “people,” “white,” “boy,” “girl,” “east,” “look,” “men,” “American,” and “like,” the first topic was titled *Perception of interracial dating and distinguishing appearance between Asian people and non-Asian people* (31.7%). We labeled the second topic *Differences between Asian and American culture* (21.2%) as the following key terms emerged: “American,” “people,” “Asia,” “southeast,” “country,” “east,” “considered,” “white,” “child,” and “culture.” *Physical Difference and Racism* (23.3%) was the label for Topic 3, encompassing the keywords “country,” “American,” “like,” “Southeast,” “east,” “people,” “eye,” “racist,” “half,” and “European.” Finally, Topic 4, labeled *Appearance and Dating* (23.8%), included key terms such as “woman,” “men,” “attractive,” “east,” “American,” “white,” “guy,” “people,” “south,” and “girl.”

In addition to the topics that emerged about Asian people before COVID-19 (e.g., Asians’ physical appearance, dating, and racism), Table 2 shows that more diverse questions about Asian people were posed after the pandemic. For example, the following topics and key terms emerged around interracial dating or race based on physical appearances: Topic 1, *Interracial Dating* (6.8%), with the key terms “racist,” “attracted,” “men,” “sexualized,” “woman,” “ugly,” “date,” “country,” “love,” and “think”; Topic 2, labeled *Multiracial Asians* (11.0%), with key terms such as “like,” “raise,” “mixed,” “east,” “university,” “hate,” “count,” “turkey,” “southeast,” and “considered”; and Topic 3, *Distinction of skin color among Asian subgroups/Racial hierarchy* (5.5%), with key terms such as “America,” “equal,” “idea,” “pop,” “darkest,” “Indonesian,” “Japanese,” and “lightest.”

Additionally, Topic 4 (*Asian History and Tradition* (12.3%), with the key terms “American,” “born,” “son,” “southeast,” “living,” “history,” “know,” “ahead,” and
Table 2. Results of Topic Modeling for “Asian”: Post-COVID-19.

| Topic Name | Topic proportion | Topic Terms                                                                 | Example Questions                                                                 |
|------------|------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| [Topic 1] Interracial Dating | 6.8% | Racist, attracted, men, sexualized, woman, ugly, date, country, love, think | • How come Asian guys never find love? I never see girls on social media getting with an Asian guy. They always have boyfriends that are anyone but Asian. As an Asian teenager, should I kill myself (KMS) because no girl will ever love me? |
| [Topic 2] Multiracial Asians | 11% | Like, raise, mixed, east, university, hate, count, turkey, southeast, considered | • Do mixed-race Asians look better than non-mixed Asians? |
| [Topic 3] Distinction of Skin Color among Asian subgroups/Racial Hierarchy | 5.5% | America, equal, idea, pop, darkest, Indonesian, Japanese, lightest, homeless | • Are Japanese the lightest Asians and are Indonesians the darkest Asians? |
| [Topic 4] Asian History and Traditions | 12.3% | American, born, son, southeast, coding, living, history, know, ahead, historically | • What do Asian Americans think of non-Asians wearing traditional Asian clothing? |
| [Topic 5] Asian Culture | 2.7% | Interesting, one, culture, audition, pas, foreigner, pop, non, Asian, hate | • How do you pass a K-pop audition as a foreigner/non-Asian? |
| [Topic 6] Solidarity among Asian Ethnic Community/ Tension between Asian and Black Communities | 4.1% | Thought, told, west, different, Vietnamese, consider, racist, racially, immigrant, tension | • Why do so many Vietnamese want to be seen as East Asian? Why not be prouder of our Southeast Asian identity? I am Vietnamese and I feel a much stronger tie to Southeast Asia. |
| [Topic 7] Hate Crimes against Asians by Blacks | 16.4% | Black, people, African, what’s, American, half, girl, community, crime, racism | • What is with all the attacks on Asians from Blacks lately in the USA? |

(continued)
“historically,” and Topic 5 (Asian Culture (2.7%), with the key terms “interesting,” “culture,” “audition,” “foreigner,” “pop,” and “Asian,” were about Asian history and culture. Topic 6, Solidarity among Asian Ethnic Community/ Tension between Asian and Black communities (4.1%), included key terms such as “west,” “different,” “Vietnamese,” “racist,” “racially,” “immigrant,” and “tension.”

Furthermore, we discovered that the newly emerged topics after COVID-19 mostly concerned the Anti-Asian discourse or hate crimes against Asians (Topics 7–9), accounting for more than half (57.5%) of all questions on Quora: Topic 7 (Hate Crimes against Asians by Blacks) encompassed key terms such as “black,” “people,” “African,” “American,” “crime,” and “racism,” Topic 8 (Rise of the Need to Stop Asian Hate Crimes) had key terms such as “anti,” “hate,” “consider,” “white,” “beautiful,” “meal,” and “westerner,” and Topic 9 (Need for an Asian Solidarity Movement) had key terms such as “racism,” “people,” “stop,” “rare,” “Caucasian,” and “calling.”

Tables 3 and 4 compare the results of the Word2Vec analysis for answers about Asian people pre- and post-pandemic. Before the COVID-19 pandemic, answers about Asian people in Quora focused on the Asian race itself (e.g., East Asians, half-Asians, mixed-race, genetics, multiracial), identity (self-identity, Gaysians [gay + Asians]), and appearance (good-looking). In comparison, after COVID-19, there was a high frequency of words implying stereotypes against Asian people (e.g., model, minority, stereotype) and vulnerability (e.g., attacked, discriminated against, blamed, foreigners, citizens).
Tables 5 and 6 present the results of topic modeling for Asian hate-related questions before and after the COVID-19 pandemic, respectively. We included questions only—without answers—because we attempted to examine what aspects of anti-Asian hate people were curious about, while the answers were likely to be biased. Various topics emerged around anti-Asian hate before and after the COVID-19 pandemic.

### Before COVID-19

Four topics related to Asian hate-related questions emerged prior to the COVID-19 pandemic (Table 5). For Topic 1, labeled *Racism and Japanese War Crimes*, key terms emerged such as “hate,” “southeast,” “war,” “crime,” “Japanese,” “racist,” “country,” and other similar examples. Topic 2 was labeled *Perceptions about Interracial Dating and US-China Tension*, with key terms including “hate,” “people,” “country,” “black,” “woman,” “American,” “East,” “China,” “Chinese,” and “crime.” The label for Topic 3 was the *Anti-Asian Discourse in the US*, encompassing key terms such as “hate,” “people,” “American,” “European,” “South,” “Crime,” and “anti.” The last topic was labeled *Confusion of Asian Identity and Anti-Asian Sentiment in Africa*, with key terms such as “anti,” “white,” “country,” “hate,” “China,” “American,” “African,” and “people.”

### After COVID-19

Regarding anti-Asian hate-related answers after COVID-19, the three researchers completely agreed on labeling with ten topics, as presented in Table 6. Topic 1 was labeled as *Hate Crimes against Chinese*, with the key terms “hate,” “American,” “people,” “anti,” “crime,” “east,” “violence,” “country,” “China,” and “black.” Topic 2, labeled *Claims about Anti-Asian Sentiments*, included “crime,” “anti,”

### Table 3. Results of Word2Vec with Answers About “Asians”: Pre-COVID-19.

| Pre-COVID-19 (n = 16,232) | 2010.03.01–2019.12.31 |
|---------------------------|------------------------|
| Key term                  | Example                |
| Half-Asians               | “Okay, here’s some Asian-looking White people first: Nathan Adrian, Chloe Bennet, Olivia Munn. I lied. They’re all exactly 1/2 East Asian. Do you see them as being only East Asian too? Some half-Asians look more Asian.” |
| Gaysians                  | “Excuse me, I am good looking as a guy, not as your fetishized Asian boy. Maybe I didn’t grow up in America, so I don’t have any fantasy towards White gay guys like some Gaysians do; like, you have to get a White guy to prove your social status. For me, nope, hot is hot, and handsome is handsome, regardless of races…” |
| Mixed-race                | “My husband grew up as a mixed-race most likely half American/Korean orphan adopted by American parents of Anglo extraction, they were about as White as you can get.” |
| Good-looking              | “Big eyes, masculine, and tall are characteristics of good-looking Asian men. therefore, my preferences for Asian men are defined so.” |
| Self-identify             | “On the political side, there has been more ambiguity in the racial classification of South Asians than East Asians. Indians specifically have been variously classified as ‘white,’ ‘black,’ ‘Hindoo,’ and today, ‘Asian’ for census purposes. They are also more likely to self-identify as White, brown, or Black than East Asians are…” |

Tables 5 and 6 present the results of topic modeling for Asian hate-related questions before and after the COVID-19 pandemic, respectively. We included questions only—without answers—because we attempted to examine what aspects of anti-Asian hate people were curious about, while the answers were likely to be biased. Various topics emerged around anti-Asian hate before and after the COVID-19 pandemic.
Table 4. Results of Word2Vec with Answers About “Asians”: Post-COVID-19.

| Key term       | Example                                                                                                                                                                                                 |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Minority       | “I have seen enough stories to know about what is going on. A Chinese woman [was] raped and assaulted then died in the hospital. Another minority and elderly Asian was assaulted during a morning run in the Park, left to die on the streets. Vulnerable and elderly Asian women assaulted throughout America…” |
| Foreigner      | “… Trump followed in a long American history of using diseases to justify anti-Asian xenophobia, one that dates back to the 19th and 20th centuries and has helped to shape perception of Asian Americans as perpetual foreigners.” |
| Motivated      | “… Fearful of a coronavirus backlash, some Asian Americans are stocking up on guns. Outbreaks have motivated first-time gun buyers, many of them Asian Americans worried about racist attacks stemming from fears about the virus…” |
| Attacked       | “… the author blames Trump and his rhetoric. So to answer the questions: People are blaming Black people for racially motivated crimes against Asians because of videos or pictures they have seen of Black people who attacked Asian people, paired with the beliefs that Black people are inherently violent and hate Asian people…” |
| Discriminated  | “…Ultimately, Asians are not perceived as being deserving of any help. Contrast this against the perception of Black people, who are viewed as being deeply oppressed and discriminated against. There is overwhelming sentiment that they are in need of society’s help. Consequently, racism against Asians is largely ignored and society will find all kinds of excuses as to why it’s supposedly not actually racism…” |

“hate,” “white,” “black,” “people,” “east,” “man,” “America,” and “don’t” as key terms. An Increase in Anti-Asian Hate Crimes was the label for Topic 3, with key terms of “country,” “crime,” “American,” “hate,” “rise,” “southeast,” “anti,” “violence,” “friend,” and “China.” The researchers agreed on labeling Topic 4 Anti-Asian violence during the COVID-19 Pandemic, with key terms “people,” “American,” “hate,” “crime,” “violence,” “anti,” “country,” “black,” “racism,” and “COVID.” Including the key terms “hate,” “people,” “anti,” “country,” “crimes,” “racism,” “attack,” “American,” “black,” and “China,” Topic 5 was labeled Severity of Anti-Asian Crime. Topic 6, labeled Stop the Anti-Asian Hate Movement, encompassed the following key terms: “crime,” “American,” “anti,” “hate,” “violence,” “movement,” “immigrant,” “blame,” “thought,” and “black.” The label for Topic 7 was set as Anti-Asian Sentiment under the Trump Administration, with many related words emerging, including “American,” “anti,” “hate,” “black,” “crime,” “people,” “Trump,” “racism,” “violence,” and “Japanese.” Topic 8 was labeled Urging a Halt to Anti-Asian crime, as the key terms were critical of the media for not stopping Anti-Asian hate crime during the COVID-19 pandemic; it included key terms such
Table 5. Results of Topic Modeling for Asian Hate: Pre-COVID-19.

| Topic Name | Topic Terms | Example Questions |
|------------|-------------|-------------------|
| [Topic 1] Racism and Japanese War Crime | Hate, southeast, war, crime, Japanese, racist, country, world, people, don’t | • Why are Japanese war crimes (mostly against other Asians) not taught in Western public schools? |
| [Topic 2] Perceptions about Interracial Dating and the US-China Tension | Hate, people, country, black, woman, American, east, China, Chinese, crime | • As an Asian American, have you personally experienced an uptick in racism or anti-Asian sentiment since the recent rise in US-China trade tensions? |
| [Topic 3] Anti-Asian Sentiment in the US | Hate, people, American, European, south, crime, I’m, country, rate, anti | • Are anti-racists and people who are otherwise tolerant and open minded just as prejudiced against East Asians as racists are? |
| [Topic 4] Confusion about Asian Identity and Anti-Asian Sentiment in Africa | Anti, white, country, hate, lot, like, China, American, African, people | • How do I tell my family or Asian friends that I am only into White or Latino men without being labeled as a self-hating Asian? I am an Asian girl living in California. I Is there a lot of anti-Asian racism in East African countries, especially against South Asians like Indians? |

Table 7 and 8 present the results of the Word2Vec analysis of Asian hate-related answers on Quora before and after COVID-19. Before COVID-19, the following key terms emerged, suggesting that the discourse centered around Asian peoples’ physical traits, model-minority stereotypes, and interracial dating: “skinned,” “darker,” “westerners,” “equal,” “pale,” “racially,” “ignorant,” “traits,” “stereotypes,” and “dated.” After COVID-19, key terms that revealed a higher severity of anti-Asian hatred appeared as follows: “discriminated,” “innocent,” “perpetrated,” “oppressed,” “harassed,” “unarmed,” “vicious,” “assaulting,” “hostility,” and “attacking.”}

Figure 3 depicts the changes in cosine similarity relations between Asian people and other racial/ethnic groups, including White, Black, and Hispanic people, before and after the COVID-19 pandemic for all answers to Asian-related questions on Quora.
Table 6. Results of Topic Modeling for Asian Hate: Post-COVID-19.

| Topic Name | Topic Terms | Example Questions |
|------------|-------------|-------------------|
| [Topic 1] Hate Crimes against Chinese | Hate, American, people, anti, crime, east, violence, country, China, black | Is it true that the recent hate crime in a Chinese restaurant received little media coverage because most Westerners genuinely believe that Asian women are heavily mistreated and need to be rescued from the grasp of them? |
| [Topic 2] Claims about Anti-Asian Sentiments | Crime, anti, hate, white, black, people, east, man, America, don’t | I am sick and tired of the anti-Asian racism prevalent in the Black community. Why do politicians not address this issue? |
| [Topic 3] Increased Anti-Asian Hate Crimes | Country, crime, American, hate, rise, southeast, anti, violence, friend, China | Why is there a rise in hate crimes now against Asians because of coronavirus but there were not any against Blacks when Ebola was big? |
| [Topic 4] Anti-Asian Violence during the COVID-19 Pandemic | People, American, hate, crime, violence, anti, country, black, racism, COVID | A Chinese woman was attacked in New York for wearing a face mask. Will there be even more cases of Black-on-Asian violence now in the USA due to COVID-19? |
| [Topic 5] Severity of Anti-Asian Crimes | Hate, people, anti, country, crime, racism, attack, American, black, China | Is the mainstream news coverage of assault on Asians 2021 inflaming and advertising hate crimes, giving other criminals ideas and consequently spreading more Asian hate crimes around the world? |
| [Topic 6] Stop Anti-Asian Hate Movement | Crime, American, anti, hate, violence, movement, immigrant, blame, thought, black | In response to the recent spate of hate crimes against Asian Americans, will the community eventually initiate an Asian Lives Matter movement or something akin to the Black Lives Matter (BLM) movement for Asians? |
| [Topic 7] Anti-Asian Sentiment under the Trump Administration | American, anti, black, hate, crime, people, Trump, racism, violence, Japanese | How do you feel about Donald Trump being sued 22.9 million by a Chinese American civil rights group for his part in the spike in Asian American hate crimes stemming from the Chinese flu |

(continued)
Cosine similarity ranges from 0 (semantically unrelated) to 1 (semantically close). Cosine of the angle between two-word vectors is the most common way to measure similarity (Jurafsky & Martin, 2021). In the pre-COVID-19 pandemic era, Asians were the most semantically similar to White people, followed by Black and then Hispanic people, with a higher cosine similarity on the Y-axis indicating greater similarity. However, the semantic similarity between Asian and White people and Asian and Hispanic people decreased following COVID-19, whereas the semantic similarity between Asian and Black people increased. These results indicate that the racial/ethnic relationship between Asian and White people, as well as between Asian and Hispanic people, has shifted comparatively.

Prior to the COVID-19 pandemic, the discourse about racial/ethnic relations was broadly divided into two different frames: (1) white people vs. other racial/ethnic groups, including Asian people, or (2) Asian people vs. other racial/ethnic groups. The following quotes are representative examples from Quora. For example, answer [A] discusses the prejudice and discrimination against non-White minorities in a white-dominant society, whereas answer [B] depicts how Asians’ relations with other racial/ethnic groups may differ depending on Asian gender.

“In White-dominated societies, that prejudice is formed against Asian, Black, Muslim, Latino people, whoever doesn’t pass for White. People can be brainwashed so successfully that they literally hate their race. Internalized racism is fun stuff…” [A]
“…Most Asian men just shift gear to computer games, anime to kill time. I have seen this a lot when I was in high school where Asian women were hooking up with White/Black/Mexican guys all the time. While Asian guys on one hand just hit the books, study, talking about what PC or console games did they play…” [B]

After the COVID-19 pandemic, the relations between Asian and Black people appeared closer, which might be understood in two different aspects. First, as stated in [C], there was a shared similarity between the racial groups in that they were victims of hate crimes. As racial minorities, there was a growing bond between the two groups. This stemmed from mutual empathy as both groups were targets of racism for a long time, mostly by White people.

“Even though there have been more hate crimes against Asian, people are making a big deal about it, but there have been true crimes against Black people, and they have been in the US, and nobody seems to make a big deal about that. […] Thus, in a way I can understand why Asians feel pain and racism, Black people have been experiencing it for over four hundred years. White people do not feel this racism, because nobody really wants to mess with them in the first place; they are the ones that are actually racist, no matter how much they say they are not.” [C]

Second, as [D] illustrates, Black people are portrayed as predators in anti-Asian hate crimes. There have been several examples of black-on-Asian hate crimes posted on Quora, in various cities of the U.S., including New York, San Francisco, and Los Angeles. For black-on-Asian hate crimes in these major cities, Quora users noted that the victims were usually women or elderly people.

“The dirty secret of Black-on-Asian violence is out. The latest news article I read was about an assault that took place only a few days ago in New York. A 49-year-old African American man attacked a 61-year-old Chinese man who collected cans from behind. He repeatedly kicked and stomped on the head of a Chinese man.” [D]

Discussion

In the current study, we compared the answers to questions about Asian people and the anti-Asian hate on Quora, one of the most popular CKS for the pre- and post-COVID-19 periods. In line with previous research that showed that Asian hatred increased in both quantity and intensity (Barr, 2021; Levin, 2021), we found that the number of questions about “Asian hate” substantially increased on Quora after the COVID-19 pandemic. However, the number of answers to and questions about “Asians” in general has decreased, suggesting that Asians have been the focus of hate speech and crime during the COVID-19 pandemic.

Expanding our scope from Asians in general to anti-Asian hate-related questions, we observed questions and answers on new topics not discussed before the pandemic in Quora, including the need for an Asian solidarity movement as it appeared on
another social media platform (Jun et al., 2021), such as Twitter (Lee & Jang, 2021).

Finally, while the semantic similarity between Asian-Black remained stable, the semantic similarity between Asian-White and Asian-Hispanic diverged after COVID-19. This finding suggests that Asian hatred during the COVID-19 pandemic is likely to have influenced these relationships.

These findings are in line with previous studies that found an increased frequency and perception of anti-Asian sentiments and hate crimes against Asian people after COVID-19 (Barr, 2021; Levin, 2021; Liu et al., 2020). The findings of topic modeling

| Table 7. Results of Word2Vec with Answers About “Asian Hate”: Pre-COVID-19. |
|-----------------------------------------------|
| Pre-COVID-19 (n = 2000)                       |
| 2010.03.01–2019.12.31                        |
| Key term | Example                                                                 |
| Skinned  | “…It depends also on the race of the foreigner – Whites, half-Asians or lighter toned Asians are generally well accepted if they have assimilated well enough to the Korean culture, but if they were, say Hispanic, darker skinned Asians, or African Americans, they would definitely be shamed and discriminated against. Not just by the Korean public, but by their agency and maybe even their members in the beginning…” |
| Darker   | “…they hate it because they’re racist. Tons of them think the Vietnamese are beneath them because they have darker skins and are underdeveloped countries.” |
| Westerners | “…internal racism sucks, doesn’t it? And look all those Westerners telling you that you could just move to the West and be accepted by the community as a ‘working class man of the west.’ Gee, really (rolling my eyes). Unless you look ‘White passing,’ you’ll never be able to ‘just live a simple life as a working-class man in the West.’” |
| Equal    | “…There are multiple competing narratives, but one thing is for certain, they are not seen as equal to ‘us’ by Westerners. Islam is a popular religion in much of Asia…” |
| Pale     | “…White/pale skin is considered beautiful and represents the rich there. They also think that South Koreans, Japanese, and Chinese look down on their economy…” |
| Racially | “…Asian Americans have indeed been the target of racially motivated violence since the election.” |
| Ignorant | “…White Americans hate Asian Americans for no other reason than that they are of Asian descent. With ignorant terms coming out of their mouths, it is obvious that ignorance is at play here.” |
| Traits   | “…Culture is not a powerful explanatory factor because culture is directly an outcome of genetic differences. A more important question would be, can you argue that being higher in these traits automatically translates into superiority?” |
| Stereotypes | “…No one wants to discuss race issues, though, especially accusatory ones. But it’s not a stereotype if it’s true, I’m told…” |
| Dated    | “…For example, he went to the gym to overbuild his body (not just normally), dyed his hair blonde, ate typical American food while joking about Asian foods for being too small for him, dated White women only.” |
and Word2Vec analyses are consistent with previous studies that found that the stereotype of Asian Americans as “sojourners,” rather than “settlers,” was reinforced during the COVID-19 pandemic (Cheah et al., 2020; Foner, 1997; Man, 2020; Tessler et al., 2020; Yang, 1999, 2000). Our findings suggest that Asian Americans were still classified as “yellow peril” during the COVID-19 and as “perpetual foreigners” who will never be fully Americanized but will be treated as foreigners or outsiders even among second and later generation immigrants (Chang, 2004; Kawai, 2005; Kim, 1999), and it is difficult to distinguish this stereotype from Asian hatred during the pandemic (Tessler et al., 2020).

### Table 8. Results of Word2Vec with Answers About “Asian Hate”: Post-COVID-19.

| Key term     | Example                                                                 |
|--------------|-------------------------------------------------------------------------|
| Discriminated | “…Why are Asians always discriminated against? Asians are a large group, but the main population is of Chinese descent.” |
| Innocent     | “…I would be more concerned about who funds them than taking it out on individual innocent Asian Americans on the street.” |
| Perpetrated  | “…Given that many of these attacks have been perpetrated against elderly Asians, who most probably don’t speak English well, it’s no wonder the majority of them are unreported.” |
| Oppressed    | “…Are Asians who wear masks disciplinedly (sic) seen as a bunch of oppressed individuals by the mask-hating Westerners? Pre-COVID, it was not uncommon to see people in many Asian countries wearing masks.” |
| Harassed     | “…They [Asians] are especially vulnerable right now. Know your rights if you, God forbid, find yourself harassed by police, ‘lawyer’ is a word that makes them snap to attention.” |
| Unarmed      | “…There are times when you can and cannot use force, and you also need to know when someone is illegally using force against you. Even if you won’t carry a firearm, taking a CCW class is still a good idea since much of what you’ll learn about the law would apply to unarmed self-defense as well. In self-defense training and discussion…” |
| Vicious      | “…Viral videos have exposed several vicious attacks on elderly Asian subway riders and pedestrians in New York City since last fall…” |
| Assaulting   | “…Black-on-Asian violence does exist. One Black guy assaulting me (which has happened) means it exists.…” |
| Hostility    | “…I’m Asian American but not east Asian. But I live in a community, Fremont CA, which is majority Asian. I haven’t seen as much hostility here probably largely because people understand the difference between the acts of the Chinese government and the character of Chinese Americans, many of whom came to this country to get away from the CCP…” |
| Attacking    | “…Chesa Boudin, San Francisco’s Soros-supported D.A. and son of convicted Weather Underground terrorists, dropped robbery, elder abuse, and hate crime charges last year against a 20-year-old Black suspect caught on tape attacking an elderly Asian man…” |
The current study is one of the first attempts to examine the anti-Asian hate discourse before and after COVID-19 by analyzing big data using machine- and deep learning-based techniques. However, this study had several limitations. First, Quora users may not accurately reflect the entire US population and user characteristics may change over time. As the number of Quora users has increased (Roy, 2020), the number of questions and answers about Asians and Asian hate might also be inflated. Furthermore, given that only a few users create Asian hate content online (An et al., 2021), the actual number of Quora users who ask and answer questions about Asian people may be small. Second, based on previous research showing that Asian people during the COVID-19 pandemic are more concerned about anti-Asian hate (Lantz & Wenger, 2020; Liu et al., 2020), it is likely that people who asked questions about Asian people and anti-Asian hate were Asians themselves. Since it was not feasible to identify the demographic characteristics of Quora users, we were unable to verify this in the present study. Finally, significant differences in word similarity between Asian and White people and between Asian and Hispanic people after the pandemic compared with the pre-pandemic period indicate that the words describing Asian people and the two other races have changed significantly since then.

On the basis of these findings, however, it is difficult to pinpoint the specific causes or factors of the change in words that represent the three races. To understand the correlation related to such changes, it is necessary to perform a content analysis in future studies. Correlation analysis can contribute to a better understanding of this anti-Asian phenomenon. Above all, it will enrich the answers to the research questions to
triangulate the current data by additionally analyzing the data from Facebook, Twitter, or Instagram. This is because different topics about Asian hate might be discussed or expressed differently on other social media platforms, depending on their distinct nature and the different characteristics of users at each site (Shane-Simpson et al., 2018; Waterloo et al., 2018). In addition, the present study opens up several avenues for future research. Although we examined the changes in perceptions of Asian people and anti-Asian hate before and after COVID-19, future studies could examine the impact of discussions about the anti-Asian hate shared on Quora on the public. For example, did the answers or rich information about anti-Asian hate change the perceptions of Asian people? Did the answers promote the mobilization of the Asian solidarity movement? Finally, the Asian-Black relationship should be further investigated. As previously pointed out (Perry, 2002), the minority-minority relationship in criminology has received little attention. Our findings suggest that the Asian-Black relationship became closer after COVID-19 and that it appeared to be divided into (1) black predators vs. Asian victims and (2) black and Asian victims. Previous studies have confirmed these two aspects (Chang, 2020; Ruiz et al., 2020; Solomos, 2021). We were unable to determine which aspects contributed to the relationship between Asian and Black people, but future studies with qualitative methods, such as in-depth interviews or focus group interviews, could be helpful in better understanding the impact of COVID-19 on the changes in their relationship.

Building upon the conclusions of current research, it can be seen that there are many ways that policymakers might encourage the abolition of Asian hatred. Considering the impacts of social media that Twitter users have called for action to end Asian hatred using the hashtag #StopAsianHate, Quora users can look to follow suit and advocate for the formation of an Asian solidarity movement similar to the Black Lives Matter (BLM) movement by utilizing Quora. Given that people use Quora to search for information on Asian people and anti-Asian discourse based on its large number of questions and answers, the platform could be used as an effective channel to promote anti-Asian hatred campaign movements.

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