



Predicting the Behavioral Health Needs of Asian Americans in Public Mental Health Treatment: A Classification Tree Approach

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Accepted: 19 March 2023 / Published online: 29 March 2023

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Abstract

Given the fact that experiencing pandemic-related hardship and racial discrimination worsen Asian Americans' mental health, this study aimed to identify unique characteristics of behavioral health needs among Asian Americans (N=544) compared to White Americans (N=78,704) and Black Americans (N=11,252) who received publicly funded behavioral health services in Indiana before and during the COVID-19 pandemic. We used 2019–2020 Adults Needs and Strengths Assessment (ANSA) data for adults eligible for Medicaid or funding from the state behavioral health agency. Chi-squared automatic interaction detection (CHAID) was used to detect race-specific differences among demographic variables, the pandemic status, and ANSA items. Results indicated that, regardless of age, gender, or pandemic status, Asian Americans who received behavioral health services, struggled more with cultural-related factors compared to White and Black individuals. Within this context, intersections among behavioral/emotional needs (psychosis), life functioning needs (involvement in recovery, residential stability, decision making, medical/physical health), and strengths (job history, interpersonal, and spiritual) further differentiated the mental health functioning of Asian from White and Black Americans. Classification tree algorithms offer a promising approach to detecting complex behavioral health challenges and strengths of populations based on race, ethnicity, or other characteristics.

Keywords Asian Americans · Culture-related factors · Behavioral health needs · Strengths · Classification tree model

Introduction

During the COVID-19 pandemic, collective public health initiatives, such as state and territorial actions on COVID-19, including mask mandates, social distancing, and vaccination efforts, contributed to a decreased risk of disease transmission. But unexpected consequences of the pandemic emerged. Pandemic-related stressors, traumatic events (e.g., isolation, fear, loss of loved one[s], economic

hardship), racial discrimination, race-specific hate crimes, and harassment aggravated existing mental health problems and created new challenges (Ćosić et al., 2020; Czeisler et al., 2020; Wu et al., 2020).

In June 2020, a panel survey representing the United States adult population suggested that 40.9% of respondents reported at least one mental health condition, including anxiety or depressive disorder (30.9%) and trauma- or stress-related disorders (26.3%). Additionally, 13.3% of respondents stated that they had started or increased substance use to cope with COVID-19-related emotions or stress, and 10.3% reported having suicidal ideation or plans within the past 30 days (Czeisler et al., 2020). Many respondents also reported experiencing psychological struggles that affected sleep (36%), eating (32%), alcohol consumption or substance use (12%), or worsening chronic conditions (12%; Panchal et al., 2020).

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Racial Discrimination and Harassment of Asian Americans

During the COVID-19 pandemic, racial discrimination and harassment against Asian Americans were on the rise (Oh & Litam, 2022), with xenophobic rhetoric connected to “China’s virus.” Hate crimes included verbal assault, property vandalism, coughing, and physical assault (Cheng, 2020). In 2020, the number of hate crimes against Asian Americans increased by 145% compared to the previous year, while hate crimes dropped nationally by 6% (Center for the Study of Hate and Extremism, 2021). Similarly, the number of Asian Americans who reported acute discrimination during the pandemic was about 2.5 times higher than for White Americans (Wu et al., 2020).

Racial discrimination and harassment have been linked with poor mental health conditions, adversely contributing to psychological and physical health (Carter, 2007; Carter et al., 2017; Halim et al., 2017; Pieterse et al., 2012). Asian Americans who experienced race/ethnicity-related adverse events were at significantly higher risk of deleterious behavioral health issues (e.g., anxiety, depression, somatic symptoms, smoking, drinking, and illicit drug use; Borrell et al., 2007; Chen & Yang, 2014; Hunte & Barry, 2012; Shi & Hall, 2020; Vines et al., 2017; Yoo et al., 2009). During the pandemic, Asian Americans experienced disproportionate increases in depression and anxiety related to racial discrimination (Lee & Howard, 2022; Oh & Litam, 2022).

Mental Health Service Utilization

Historically, Asian Americans, the fastest-growing racial group in America, have been underrepresented in the mental health system because they were less likely to utilize mental health services (Chu & Sue, 2011; Kim & Lee, 2022; Lee et al., 2020; Sue et al., 2012). Compared with other racial/ethnic groups, Asian Americans, have the lowest level of mental health service utilization (Lee et al., 2020). For Asian Americans, low utilization of mental health services was not related to the prevalence of mental illness (Lee et al., 2020; Park et al., 2021).

Research has illustrated the complexity of factors related to Asian Americans’ utilization of treatment services (Kalibatseva & Leong, 2011). Although all minority groups have been less likely to perceive mental illness regardless of severity, differences in recognizing serious mental illness (SMI) differed notably for individuals who were Asian or Hispanic compared to White Americans (Breslau et al., 2017). The underrepresentation of Asian Americans in utilizing behavioral health services has been associated with immigration-related factors such as cultural and linguistic

diversity and nativity (Gong & Xu, 2021; Kalibatseva & Leong, 2011; Kim et al., 2015).

Mental health literacy, knowledge, and beliefs about mental health problems and services varied widely among Asian Americans (Na et al., 2016). Some Asian languages have no words related to mental illness. In other Asian languages (e.g., Korean and Japanese), words for anxiety and depression are seldom used (Wang, 2019). Related studies found that many Eastern Asian immigrants preferred seeking help from family and relatives or spiritual help instead of mental health treatment but were less likely than westerners to talk to anyone. Internalized and social stigma about experiencing mental illness has been associated with shame at not being able to meet family obligations or being a burden on others, and it is a common barrier to seeking help (Na et al., 2016). Help-seeking tendencies, mental health service use, and stigma varied by ethnicity, generation, culture, and seriousness of mental illness (Breslau et al., 2017; Chu & Sue, 2011; Kim & Lee, 2022; Lee et al., 2015; Ting & Hwang, 2009).

Variable rates of psychosis existed among Asian American immigrants. DeVlyder and associates (2013) found evidence that acculturation stress was associated with visual and auditory hallucinations among Asian immigrants. They suggested that differences between immigrants who integrated easily into a new culture and those who encountered hostility and discrimination accounted for variability in psychotic symptoms. Lin et al. (2012) discussed prevalence and symptoms, including culture-related symptoms, misdiagnosis, and differential diagnoses for Asian Americans. Previously, Foulks (2004) recognized the significance of race in the psychiatric diagnostic process and treatment decisions. Depression and mood disorders were more frequently diagnosed in White and Asian Americans than in Black and Hispanic Americans. Psychosis was more often diagnosed in Black and Asian Americans than in White Americans.

Culturally Consistent Protective Factors

Research has begun to document the protective role of culturally consistent help-seeking strategies among Asian Americans. As with Hispanic and Black Americans, many Asian Americans engaged with friends and family for support in times of stress (Snowden, 2007; Villatoro et al., 2014). During the pandemic, higher levels of social engagement with family and friends were associated with fewer depressive symptoms and decreased the frequency of depression for Asian Americans (Al et al., 2022; Islam, 2021). However, negative family interactions increased the risk of depression and substance use disorders (SUD). Although perceived discrimination increased the risk of all mental illness, family

cohesion weakened the relationship between discrimination and anxiety (Al et al., 2022).

Following self-help (e.g., exercise, reaching out to friends and family), spirituality is a common coping factor for Asian Americans (Chen et al., 2015; Gong & Xu, 2021; Na et al., 2016). Regular attendance at religious services lowered the likelihood of a SUD (Al et al., 2022). Some Asian Americans talked with religious leaders about emotional, mental, or personal problems (Yang et al., 2019).

Coping with stress, influenced by ethnic identity and cultural values, was explored as a possible moderator between discrimination and mental health. By leveraging personal, social, or cultural resources to handle life stressors and challenges, coping served as a protective factor, decreasing the relationship between discrimination and mental health distress (Oh & Litam, 2022). Despite numerous studies about mental health service utilization, cultural considerations, discrimination, coping strategies, and emerging studies related to the pandemic, the research provided limited information about Asian Americans with SMI.

Considering mental illness as multi-dimensional, including a range of protective factors, symptoms, and other factors that may impact perspectives and treatment utilization (e.g., values, English fluency, ability to acculturate) could inform behavioral health prevention and treatment services for Asian Americans (Kalibatseva & Leong, 2011). Examining the intersectionality of race, gender, the pandemic year, behavioral health needs, and strengths could improve knowledge about Asian Americans' behavioral health (Chu & Sue, 2011; Lee et al., 2015; Ting & Hwang, 2009). Few studies have attempted to detect associations among such factors for Asian American adults with SMI. Additionally, although evidence of racial differences in perceived mental illness, disparate diagnosis of psychosis, and service utilization have emerged, few studies examined differences in behavioral health and protective factors by race (Breslau et al., 2017; Villatoro et al., 2014).

As concurrently experiencing racial discrimination and pandemic-related hardship could worsen Asian Americans' mental health, this study aimed to identify Asian American-specific behavioral health and functional needs compared to those of non-Asian Americans by detecting the intersectionality of race, gender, the initial pandemic year, behavioral health and other functional needs, and strengths.

Methods

Study Sample and Data Source

The study sample included adults, aged 18 or older, eligible for Medicaid or living below 200% of the poverty

level, who self-identified as Asian, non-Hispanic White (White), or non-Hispanic Black (Black) Americans receiving publicly funded behavioral health services in Indiana. To address identified limitations in the literature, the study focused on comparing Asian Americans to White or Black Americans. In addition to comparing Asian Americans and Whites, Black individuals were included to identify similar and divergent predictors for Asian Americans and the largest racial group within people of color receiving mental health services. Participants were either actively involved in behavioral health services (open episode of care) or had completed an episode of care during the calendar year 2019 or 2020.

The state mental health and addiction authority's database included demographic, diagnostic, assessment, and treatment service information. Retrieved data included the last assessment data completed during 2019 and 2020.

Participants' diagnoses varied by race. Asian Americans experienced (psychosis [27.4%], depression/mood disorders [59.1%], anxiety [58.6%], substance use [15.8%], and eating disturbance [4.2%]). White adults endorsed (psychosis [13.9%], depression/mood disorders [61.2%], anxiety [63.1%], substance use [24.2%], and eating disturbance [3.9%]). Diagnoses for Black individuals included (psychosis [32.2%], depression/mood disorders [56.8%], anxiety [56.6%], substance use [25.2%], and eating disturbance [3.5%]).

Clinical, supportive, and intensive behavioral health services were provided based on patterns of needs that interfered with an individual's functioning and preferences. An array of outpatient services focusing on specific identified needs, included medication management, cognitive behavioral therapy, motivational enhancement therapy, peer support, supported housing, supported employment, assertive community treatment, addiction treatment, care coordination, and skill development services.

This study was approved by the Institutional Review Board at the researchers' university (#10,202). Study procedures followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline (von Elm et al., 2014).

Measures

The Adult Needs and Strengths Assessment (ANSA; Lyons, 2009b) was completed with all participants. The ANSA is a comprehensive assessment of psycho-social factors that identify the strengths and functional needs of individuals with mental health and/or substance use challenges to support clinical decisions and monitor outcomes. Six ANSA domains included: (1) strengths (12 items), (2) life functioning (17 items), (3) cultural factors (4 items), (4) caregiver

needs and resources (6 items), (5) behavioral/emotional needs (10 items), and (6) risk behaviors (7 items). See Table 1 for items in each domain.

Each ANSA needs item was rated on a 4-point scale (0 - no evidence of a need; 1 - a significant history of the need or a need not currently impacting functioning; 2 - a need that interferes with functioning; or 3 - a dangerous or disabling need). Strength items were rated based on the usefulness of the strength in a plan to address identified needs and to support well-being (0 - a strength that was essential in planning; 1 - a strength that could be used in planning to address needs; 2 - a strength that must be developed to become useful; or 3 - no strength was identified). In this study, ratings of 2 or 3 on *need*-related items were recoded as actionable (= 1; intervention required [e.g., treatment, support]). Similarly, ratings of 2 or 3 were recoded as non-actionable (= 0; intervention not required). Ratings of 0 and 1 on *strengths* items were recoded as actionable (= 1; useful strengths). Similarly, ratings of 2 or 3 were recoded as non-actionable (= 0; no useful strengths).

Ratings were determined through interviews with individuals, significant others, and other sources (e.g., referral information, screening tools, and clinical records). Patterns of ratings were utilized to recommend service intensity. Periodic assessments (every six months) reflected progress to inform and update intervention plans. Although consistent with diagnostic criteria, the ANSA is not a diagnostic tool. For need items, details about related behaviors or symptoms and their functional impact were documented in clinical records.

Behavioral health service providers were required to complete online training and maintain certification to utilize the ANSA tool. The state behavioral health data collection system monitored certification status, only accepting assessment ratings from clinicians with current test reliability of 0.70 or higher (intraclass correlation coefficient). To support the implementation of the ANSA, local coaches and trainers participated in additional training and were certified at a higher level, at least 0.75 and 0.80, respectively. In the state fiscal year of 2019, the statewide mean ANSA test reliability for agencies contracting with the state mental health and addiction authority was 0.83.

The ANSA evolved from the Severity of Psychiatric Illness (SPI; Anderson & Lyons, 2001). The SPI was enhanced with strength items to become the ANSA (Lyons, 2009a). With inpatient and residential populations, adequate psychometric properties of the ANSA were established, but additional research was recommended to establish the instrument's sensitivity with new populations (Anderson, 2009; Nelson & Johnson, 2008). A transition-age youth version added parenting, completing education, employment, and community involvement (Lyons & Jackson, 2015). As

the ANSA was first utilized in community-based behavioral health services statewide in Indiana, subsequent exploratory factor analysis identified five factors with adequate to good internal consistency ($\alpha=0.733\text{--}0.880$): personal recovery, trauma and stress-related problems, substance use risks, self-sufficiency, and cultural-linguistic considerations which reflected subpopulations of individuals receiving mental health services, the role of strength items, and cultural considerations (Walton & Kim, 2018). Implications of this study informed standardization of the instrument. For example, Indiana's gambling item evolved into addictive behavior (Lyons & Fernando, 2020).

Four demographic variables (i.e., age, gender, race, and assessment year) were also considered in our study. Gender was categorized as male, female, or transgender. The year variable served as a proxy for the COVID-19 pandemic impact. Race compared Asian Americans with non-Hispanic White and non-Hispanic Black Americans.

Analytical Plans

First, demographic and assessment ratings were compared using Bonferroni-adjusted comparisons among the three racial groups. Chi-squared automatic interaction detection (CHAID), a machine learning-based data mining algorithm, was utilized to detect race-specific differences among ANSA items for which Asian Americans were coded as "1" and non-Hispanic White and Black Americans were coded as "0."

CHAID was used to build classification trees by detecting intersectionality and structural linkages among predictors (Fielding & O'Muircheartaigh, 1977; Kass, 1980). Data mining, the process of identifying unobserved patterns from massive raw data (Sookoian & Pirola, 2012), predicted relationships (Campagni et al., 2015). Data mining made it possible to handle the vast number of predictors and integrate them in non-linear and highly interactive ways that focused on risk algorithms rather than on risk factors (Franklin et al., 2017; Mullainathan & Spiess, 2017; Obermeyer & Emanuel, 2016).

CHAID results included a classification tree model, which identified the strongest linkages between a set of predictors for Asian Americans by examining how the predictors were best merged to explain behavioral health-related needs and strengths of Asian Americans ($N=544$), White Americans ($N=78,704$), or Black Americans ($N=11,252$) in behavioral health treatment. Considering sample size differences by racial group, we used a balance node provided by SPSS Modeler to correct imbalances among racial groups. The balancing process was necessary to have a better classification model where a binary target variable was not equally distributed (Wendler & Gröttrup, 2021). The process

Table 1 Characteristics of the participants and their responses to Adults Needs and Strengths Assessment items

		Asian Americans (a) (n = 544)	White Americans (b) (n = 78,704)	Black Americans (c) (n = 11,252)	Column comparison: Statistical significance
Age		M = 39.6 (SD = 13.7)	M = 41.9 (SD = 14.2)	M = 43.4 (SD = 14.5)	a < b < c
Gender	Male	45.6%	43.3%	50.6%	b < c
	Female	54.0%	55.6%	48.3%	(a = b) > c
	Transgender	0.2%	0.2%	0.2%	a = b = c
	Preferred not to answer	0.2%	0.6%	0.9%	b < c
Behavioral Emotional Needs	Adjustment to Trauma (adjtotrauma)	35.5%	36.4%	32.0%	b > c
	Anger Control (angercontrol)	15.7%	18.8%	24.1%	b < c
	Antisocial Behavior (antisocial)	4.2%	4.6%	7.2%	(a = b) < c
	Anxiety (anxiety)	58.6%	63.1%	56.6%	b > c
	Depression/mood disorders (depression)	59.1%	61.2%	56.8%	b > c
	Eating Disturbance (eatingdist)	4.2%	3.9%	3.5%	a = b = c
	Impulse Control (impulse)	24.1%	29.0%	32.2%	a < b < c
	Interpersonal Problems (interpersonal)	21.2%	21.5%	21.7%	a = b = c
	Psychosis (psychosis)	27.4%	13.9%	32.2%	(a = c) > b
	Substance Use (substanceuse)	15.8%	24.2%	25.2%	a < (b = c)
	Cultural Factors	Cultural Identity (culturalidentity)	12.7%	0.4%	0.9%
Cultural Stress (cultralstress)		16.9%	0.7%	2.4%	a > c > b
Language (language)		22.7%	0.2%	0.4%	a > c > b
Traditions & Rituals (traditionrituals)		8.5%	0.3%	0.5%	a > c > b
Caregiver Needs & Resources	Family Stress (familystress)	18.8%	14.5%	14.3%	a = b = c
	Physical/Behavioral Health (physicalbehavioral)	7.8%	6.1%	7.5%	a = b = c
	Involvement with Care (involveincare)	5.6%	5.2%	7.5%	b < c
	Knowledge (knowledge)	10.0%	5.7%	7.8%	b < c
	Safety (safety)	3.8%	2.3%	2.5%	a = b = c
Life Functioning	Social Resources (socialresources)	11.4%	6.4%	9.5%	b < c
	Decision Making (decisionmaking)	42.6%	42.1%	47.5%	b < c
	Developmental/Intellectual (developmentalintellectual)	6.6%	5.8%	6.7%	b < c
	Employment (employment)	36.9%	33.3%	40.3%	b < c
	Family Functioning (family)	41.0%	47.4%	44.5%	(a = c) < b
	Independent Living Skills (independentliving)	25.4%	21.6%	27.6%	b < c
	Involvement in Recovery (involveinrecovery)	23.3%	23.3%	33.4%	(a = b) < c
	Legal (legal)	18.6%	24.0%	24.8%	a < (b = c)
	Medical/Physical (medicalphysical)	35.3%	41.6%	41.9%	a < (b = c)
	Medication Involvement (medication)	18.8%	14.2%	23.2%	b < a < c
	Parental/Caregiver Role (parentalcargiver)	4.6%	8.2%	6.2%	(a = c) < b
	Recreational (recreational)	41.5%	43.0%	49.3%	(a = b) < c
	Residential Stability (residentialstability)	9.7%	13.9%	18.4%	a < b < c
	Self-Care (selfcare)	23.0%	22.4%	25.1%	b < c
	Sexuality (sexuality)	3.9%	2.1%	2.8%	(a = c) > b
Sleep (sleep)	43.4%	46.7%	44.5%	b > c	
Social Functioning (socialfunctioning)	49.7%	49.8%	54.2%	b < c	
Transportation (transportation)	20.0%	16.4%	21.2%	b < c	

Table 1 (continued)

	Asian Americans (a) (n = 544)	White Americans (b) (n = 78,704)	Black Americans (c) (n = 11,252)	Column comparison: Statistical significance
Age	M=39.6 (SD=13.7)	M=41.9 (SD=14.2)	M=43.4 (SD=14.5)	a < b < c
Risk Behaviors				
Criminal Behavior (criminalbehavior)	9.1%	15.0%	15.0%	a < (b = c)
Danger to Others (dangertothers)	2.4%	1.9%	3.1%	b < c
Exploitation (exploitation)	4.6%	5.5%	6.3%	b < c
Gambling (gambling)	0.7%	0.4%	0.7%	b < c
Other Self Harm (otherselfharm)	5.3%	5.3%	4.9%	a = b = c
Self-Injurious Behavior (selfinjurious)	3.9%	2.7%	1.9%	(a = b) > c
Sexual Aggression (sexualaggression)	0.4%	0.2%	0.4%	b < c
Strengths				
Community Connection (community)	65.8%	65.0%	67.4%	b < c
Educational (education)	62.9%	60.2%	64.8%	b < c
Family Strengths (family)	38.6%	43.7%	43.6%	a = b = c
Job History (jobhx)	52.9%	52.2%	61.4%	(a = b) < c
Natural Supports (natrualsupports)	56.5%	53.1%	59.2%	b < c
Optimism (optimism)	44.3%	45.8%	42.7%	b > c
Resiliency (resiliency)	45.7%	43.0%	45.2%	b < c
Resourcefulness (resourcefulness)	44.4%	37.2%	42.6%	(a = c) > b
Social Connectedness (socialconnect)	57.2%	55.0%	59.2%	b < c
Spiritual/Religious (spiritual)	44.3%	55.2%	44.7%	(a = c) < b
Talents/Interests (talentsinterests)	52.9%	48.0%	54.5%	b < c
Volunteering (volunteering)	75.4%	75.6%	78.2%	b < c

Note. (c) indicates a variable name coded for the machine learning approach; Post-hoc tests were used in column comparisons for age and the Bonferroni method was used for other variables

increased the number of under-sampled Asian Americans to an equal number of White or Black Americans.

In two CHAID analyses, factors related to Asian American mental health were separately compared with factors related to Whites and Blacks. Whites and Blacks were recoded as ‘non-Asian’ in the classification tree models. Asian (1) and non-Asian (0) were set to create ‘parental’ nodes that would be split into ‘child’ nodes to form branches of the resulting decision tree. Each predictor variable in the classification tree was considered as the input field to predict the value of the target. The predictor with the lowest *p*-value was the first split; the split process continued recursively until the terminal node was reached. The recursive splitting process, called repeated group separation, enabled the detection of the least significant predictor for Asian Americans by repeatedly splitting child nodes until the results were no longer statistically significant. As the dependent variable was categorical, chi-squared tests for repeated node separation were based on the Bonferroni-adjusted *p*-value < 0.05. The classification tree grew to four levels. All descriptive analyses were conducted using SPSS 26, and CHAID was run using IBM SPSS Modeler subscription version 1.0 (George & Mallery, 2019; IBM Corporation, 2022; McCormick et al., 2013).

Results

Characteristics of the Study Sample

Of the sample (N = 90,500), 544 (0.6%) were Asian Americans, 78,704 (87%) were White Americans, and 11,252 (12.4%) were Black Americans (see Table 1). Asian Americans, on average, were younger (M = 39.6 years; SD = 13.7) than White Americans (M = 41.9) or Black Americans (M = 43.4), and the proportion of female Asian Americans (54.0%) was higher than that of Black Americans (48.3%). Asian Americans were also significantly more likely to report functional needs related to cultural factors (e.g., cultural identity, cultural stress, language barriers, and tradition/rituals) than White or Black Americans.

Psychosis was more likely to be identified for Asian Americans and Black Americans. Asian Americans were less likely to endorse impulsivity or SUD than White American or Black Americans. More Asian Americans and White Americans were involved in recovery than Blacks. Medical/physical issues, housing problems (residential stability), legal system involvement, and criminal behavior were less common for Asian Americans. Sexuality issues were identified more often for Asian Americans and Black Americans.

Non-suicidal self-injurious behavior was more common for Asian Americans and White Americans.

Useful family strengths and caregiver needs were similar for all groups. Useful job history rates were lower for Asian Americans and White Americans than for Black Americans. Asian Americans and Black Americans were more resourceful than White Americans. Fewer spiritual/religious strengths were endorsed by Asian Americans and Black Americans than White Americans.

Asian Americans Compared with Non-Hispanic White Americans

The CHAID analysis findings on the effects of various variables such as race, pandemic, functional needs, strengths, and cultural factors for Asian Americans or White Americans in the public mental health system are presented in Fig. 1.

Language was found to be the best predictor variable in terms of predicting the race of adults receiving mental health services ($\chi^2_{(1, 1517416)} = 19690.960, p = 0.000$). Of the balanced sample, 11.5% had linguistic challenges, primarily

for Asian Americans (99.1%). Cultural stress, the second most influential predictor, affected 3.1% of individuals without language issues, of which 90.1% were Asian Americans ($\chi^2_{(1, 139307)} = 4387.806, p = 0.000$). For adults without cultural stress or psychosis, the third strongest predictor impacted 15.4% of the sample, of which 55.6% were Asian Americans ($\chi^2_{(1, 134488)} = 2243.054, p = 0.000$). Psychosis also emerged as a predictor for Asian Americans with language problems who were not impulsive but spiritual.

Other predictor variables emerged for individuals without language problems: medical/physical health, interpersonal problems, and cultural identity. For individuals without cultural stress or psychosis, 70.1% of the sample with medical/physical issues were White Americans ($\chi^2_{(1, 110296)} = 1993.320, p = 0.000$). Interpersonal problems were associated with psychosis for 4.3% of the sample, with 43.1% being Asian Americans ($\chi^2_{(1, 24219)} = 580.125, p = 0.000$). More than half of those who experienced cultural stress also had cultural identity issues, of which 94.4% were Asian Americans ($\chi^2_{(1, 4819)} = 116.510, p = 0.000$). For individuals with language problems, impulse control issues, spiritual/religious strength, and cultural rituals/traditions

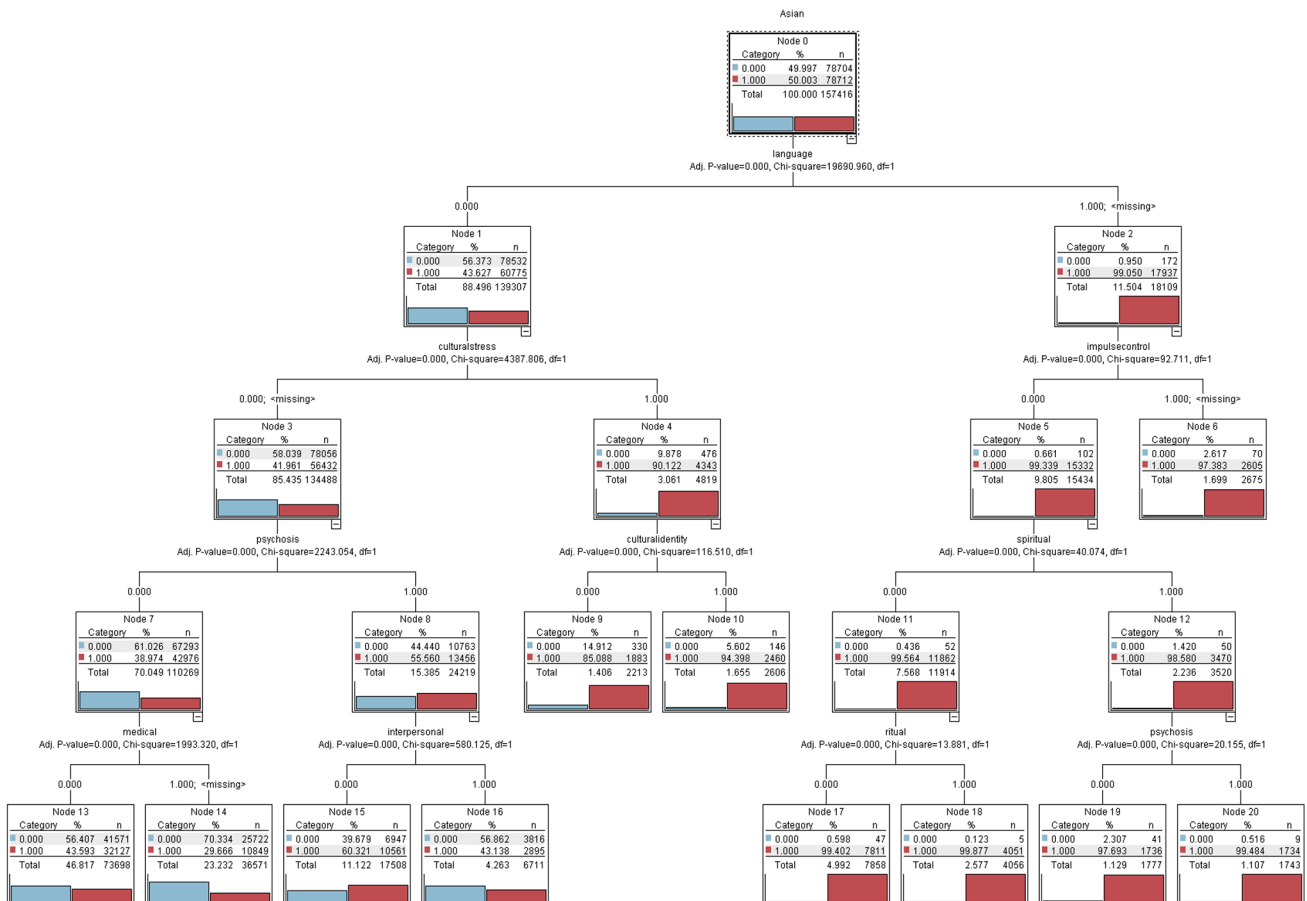


Fig. 1 CHAID decision tree depicting Asian Americans (1) rates compared to non-Hispanic White Americans (0)

for individuals without spiritual strengths were associated primarily with Asian Americans. Pandemic year, age, and gender were not found to have significant effects on predicting race.

The importance of specific variables in the prediction and/or classification algorithm was determined by calculating the reduction in target variance attributable to each predictor through sensitivity analysis (IBM, 2021). In this manner, the predictor importance value (PIV) was an estimate of each predictor’s importance, the relative importance of each predictor, in predicting the target output. Generally, the highest PIV means that the association level between a specific variable and the target output is the highest compared to other associations. The sum of PIVs is 1. The most important predictors in making a classification of being Asian Americans were language (PIV=0.55), cultural stress (PIV=0.29), psychosis (PIV=0.09), medical/physical (PIV=0.04), interpersonal problems (PIV=0.01), cultural identity (PIV=0.01), spiritual/religious (PIV=0.01), impulse control (PIV=0.01), and traditions/rituals (PIV=0.01).

Asian Americans Compared with Non-Hispanic Black Americans

The CHAID analysis findings on the effects of various variables such as race, pandemic, functional needs, strengths, and cultural factors for Asian or Black Americans receiving mental health services are presented in Fig. 2.

While the strongest predictor of race was language ($\chi^2_{(1, 21,826)} = 2651.412, p = 0.000$), statistically significant results emerged for adults without language problems. Of those who endorsed cultural identity problems (2.9% of the sample), 86.1% were Asian Americans ($\chi^2_{(1,19290)} = 475.717, p = 0.000$). Of individuals without cultural identity issues (85.5% of the sample), 57.7% were Black. Over 63% of Black adults without language or cultural identity issues had a useful job history compared to 36.6% of Asian Americans ($\chi^2_{(1,18662)} = 314.727, p = 0.000$). Residential stability also differentiated the groups for individuals with a job history ($\chi^2_{(1,10,430)} = 107.176, p = 0.000$). About 10% of the overall sample, of which 73% were Black, had housing problems.

For those without a job history, involvement in recovery differentiated Black and Asian Americans. Black individuals

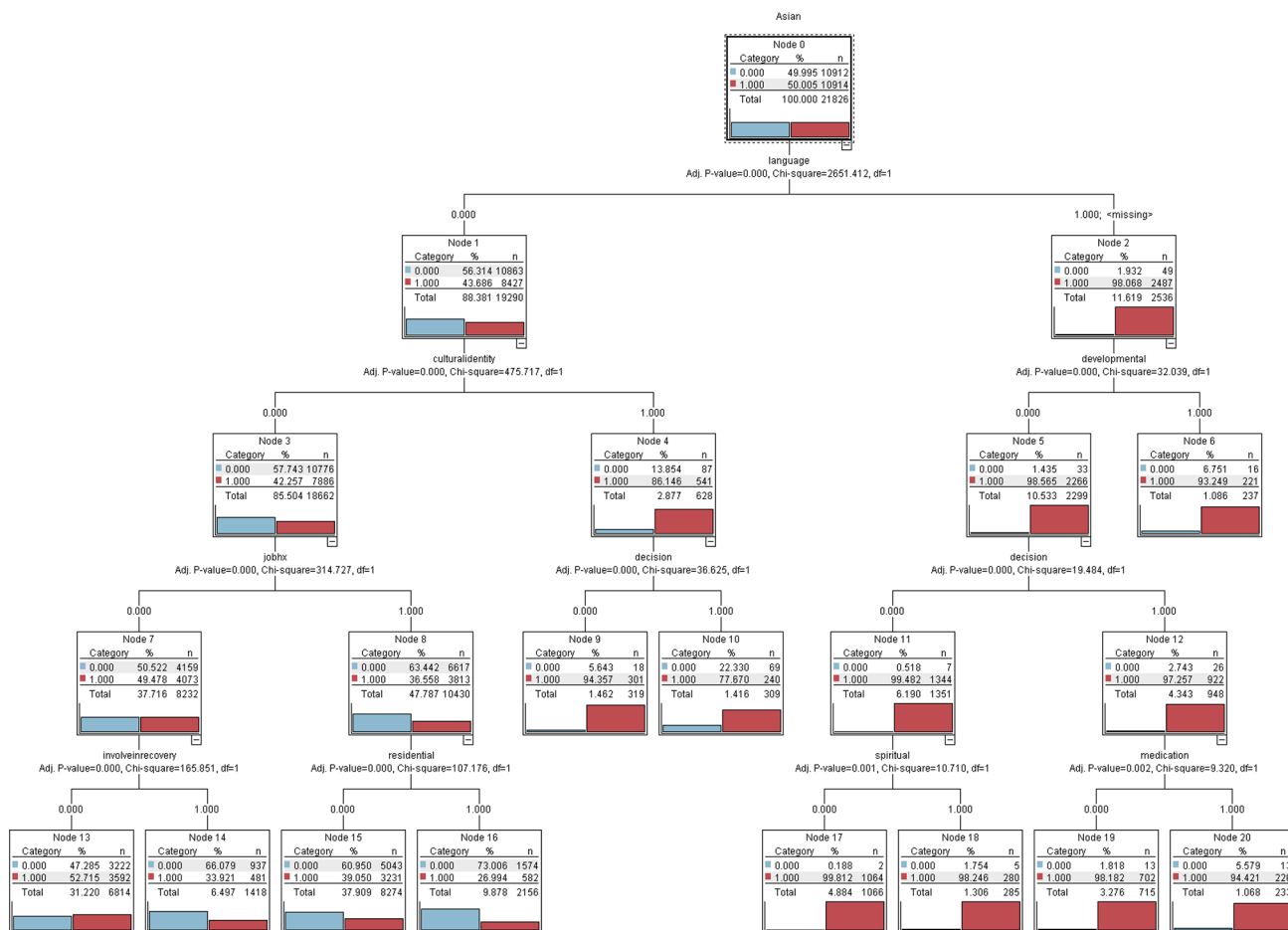


Fig. 2 CHAID decision tree depicting Asian Americans (1) rates compared to non-Hispanic Black Americans (0)

(66.1%) were more likely to be actively involved in planning and managing their health care ($\chi^2_{(1,8232)} = 165.851$, $p = 0.000$).

Among those who had language needs, medication involvement affected 25% of individuals with decision making limitations, primarily Asian Americans ($\chi^2_{(1,4343)} = 9.320$, $p = 0.002$). Developmental/intellectual functioning, decision making, and spiritual made minor contributions to the algorithm. Gender, age, and pandemic year did not predict differences between Asian Americans and Black in mental health treatment.

The most important predictors that differentiated behavioral health needs and strengths of Asian Americans and Black were language (PIV=0.59) by cultural identity (PIV=0.25), job history (PIV=0.05), involvement in recovery (PIV=0.04), residential stability (PIV=0.04), decision-making (PIV=0.01), spiritual/religious (PIV=0.01), developmental/intellectual (PIV=0.01), and medication involvement (PIV=0.004).

A CHAID classification algorithm with an area under the ROC curve (AUC), a graphic plot indicating the diagnostic ability of a binary classifying system above 0.70 was acceptable for research (Srikureja et al., 2005). In this study, the overall AUCs with CHAID were 0.71 for Asian Americans compared to White Americans and 0.70 for Asian Americans compared to Black Americans.

Discussion

The current study examined how demographic characteristics, year, behavioral health functional needs, and strengths significantly predicted Asian Americans in behavioral health services. The findings provide evidence that Asian Americans who participated in publicly funded behavioral health services faced unique challenges. Asian Americans with behavioral health needs were more likely than White or Black Americans to endorse language, cultural stress, and cultural identity needs that interfered with their functioning. Among individuals with language issues, psychiatric challenges (psychosis and impulse control) were more common among Asian Americans than White Americans. This study demonstrates how a machine learning model can identify unique factors associated with Asian Americans as compared with other racial groups, regardless of age, gender, and pandemic year.

Consistent with previous research findings, cultural factors (language, identity, rituals/traditions, and stress) emerged as significant factors predicting Asian Americans among individuals receiving mental health services. In the ANSA, language refers to the ability of individuals to understand and express themselves in the predominant language,

English fluency. First generation Asian immigrants may not speak the primary language where they live or have a limited vocabulary or understanding of the nuances of the language (Lyons & Fernando, 2020). In Indiana, 69% of heads of Asian American households were born in another country (US Census Bureau, 2021). Advanced English literacy is related to increased rates of treatment for perceived mental health issues (Lee et al., 2020). Language issues are ideally addressed by a congruent provider who speaks the native language (dialect). In the absence of this resource, culturally competent healthcare providers familiar with working with interpreters are recommended (McHenry et al., 2016).

Cultural identity becomes an actionable need when there is uncertainty, related conflicts, or the individual is not connected with others with the same perspective. Rituals/traditions refer to access to activities consistent with one's cultural identity. Cultural stress reflects experiences and uncomfortable feelings or distress from real or perceived tension between one's cultural identity and the predominant culture (Lyons & Fernando, 2020). Although children of immigrant families have no problem speaking English, they may face difficulties fitting in with the predominant culture. Immigrant and US-born Asian Americans describe their experiences as an Asian in America, navigating a dual cultural environment. Major themes raised (or shared?) include blending two cultures, being an Asian as part of how individuals see themselves, adjusting to life in America, balancing individualistic and collective thinking, mixed ties to heritage, and treatment by others (Ruiz et al., 2022). Tensions between generations related to cultural identity can also result in cultural stress.

Discrimination, perceived threats, and reports of increased violence against Asian Americans during the pandemic potentially heightened fearfulness (Wu et al., 2020). However, no differences in the level of cultural stress before and during the early pandemic emerge in this study. Asian Americans report heightened levels of cultural stress than White individuals prior to and after the pandemic began.

Although paranoia and delusions are common across all populations, the content often reflects social/cultural backgrounds. In communities with strong religious and spiritual traditions, delusions often reflect religious themes or content (Lin et al., 2012). This phenomenon helps explain the association in this study between spirituality/religion and psychosis for individuals who have language problems but no impulse control issues.

Job History, a useful strength, differentiates between Black and Asian Americans without language or cultural identity issues. Compared to Black Americans, a smaller percentage of Asian Americans with SMI had a useful job history. For the same reasons that Asian Americans and their families tend not to seek mental health treatment services,

they may not access employment services. That could limit opportunities to develop employment skills, experience, and a chance for employment. It is puzzling that these findings were related only to the comparison with Black, but not White Americans. Additional research is needed to better understand factors related to job history and employment for Asian Americans.

Interpersonal problems reflect limited social and relationship skills, regardless of a person's current social functioning (Lyons & Fernando, 2020). The intersection of race, cultural factors, and psychosis found fewer relational (social skills) deficits among Asian Americans than White individuals with psychosis. This finding may be additional evidence that the high prevalence of psychosis for Asian Americans may reflect culturally related symptoms and/or misdiagnosis (Lin et al., 2012). Additional research is needed to confirm results, better understand emerging clues, and determine practice implications.

Involvement in recovery focuses on the level of a person's active participation in treatment and self-management of behavioral health needs (Lyons & Fernando, 2020). For individuals without a job history, involvement in recovery differentiates Black and Asian Americans. Asian Americans (34%) are more likely to be actively involved in planning and managing their health care than Black Americans. An ability to exercise choice over services and supports is considered central to behavioral health recovery (Substance Abuse and Mental Health Administration [SAMHSA], 2012). Being empowered and provided resources to make informed decisions and build on strengths helps individuals initiate recovery and build resilience. Provider's attention to culturally sensitive engagement while offering timely access to interpreters and explanation of the rationale for medically trained interpreters and treatment could improve service access and involvement in recovery (McHenry et al., 2016).

Residential stability reflects an individual's current and likely future housing situation. An actionable need indicates unstable housing or homelessness (Lyons & Fernando, 2020). Of people without language or cultural identity issues and with useful job histories, Asian Americans are less likely to have housing problems than Black Americans. In Asian culture, it is acceptable for people with a disability (including SMI) to stay with their families, even if the relative with a disability is an adult. When you have a disability, interdependence takes more priority over independence. Effective interventions should recognize and incorporate family interdependence into health care (Mehta & Leng, 2006).

Decision Making identifies the person's ability to make decisions and understanding of choices and consequences (Lyons & Fernando, 2020). For persons with language but no

developmental problems, Asian Americans are more likely than Black individuals to have decision making issues. In the absence of language issues, Asian Americans with cultural identity challenges are also more likely than Blacks to have decision making challenges. More research is needed to understand relationships among language, acculturation, and the ability to make decisions.

Medical/Physical need identifies acute or chronic physical health conditions that require medical attention. In this study, for persons without language or cultural stress, or psychosis, White Americans are more likely to have identified physical health needs than Asian Americans. Differences in healthcare systems, language barriers, wait times, and different healthcare expectations require that healthcare providers become competent in engaging and providing culturally informed services for specific groups of Asian Americans (McHenry et al., 2016).

Similarly, Medication Involvement, a person's ability to manage prescribed medication and the impact on their physical and/or mental health symptoms and functioning, is more likely to be an issue for Asian Americans with language and decision-making issues than for Black Americans. Although Medication Involvement is among the least influential in the differentiating patterns by race, for affected individuals, the findings have implications for interventions.

This is the first attempt to use a machine learning-based classification tree algorithm to detect Asian American-specific associations with ANSA items in Indiana's statewide behavioral health services system. The classification tree algorithm allows us to explore unobserved associations of Asian Americans or non-Asian Americans with predictors that were not reported in the previous studies driven by a limited set of hypotheses and datasets (Gradus et al., 2017). Regardless of the pandemic, age, or gender, Asian Americans receiving mental health services struggle with race-specific factors.

Two significant implications for practice and research emerge from this study's findings. First, a race-informed, culturally sensitive therapeutic approach is needed that meets behavioral health needs among Asian Americans. For example, Comas-Díaz (2016) presents three clinical models of treating race-based trauma that highlight reprocessing the traumatic incidents, promoting psychological decolonization, and strengthening social action against race-related trauma. Additional research may be required to determine if and how effective and culturally responsive treatment of real or perceived race-based trauma (cultural stress) differs from addressing exposure to other types of potentially traumatic events (Comas-Díaz, 2016; Miller, 2009).

Second, classification tree algorithms offer a promising approach to detecting complex behavioral health challenges and strengths of populations based on race, ethnicity, or

other characteristics. For example, Asian Americans with language challenges were more likely to have medication involvement, decision making, developmental/intellectual needs, and useful spiritual/religious strengths than Black individuals. This machine learning approach could eventually support the development of a race-specific culturally based mental health recovery model. Further research is needed to explore relationships between behavioral health needs, strengths, and recovery. Comparative evaluation of classification tree algorithms will strengthen the pathways to improve accuracy and sensitivity. Such efforts could support the development of efficient ways to overcome barriers and challenges in developing racial/ethnicity-informed mental health recovery models.

Limitations

Despite the promising findings of these classification tree algorithms, several limitations should be considered. First, this study utilizes secondary administrative data in one publicly funded behavioral health service system. They may not show a complete picture of mental health service needs and strengths because public services focus on adults living below 200% of the poverty level. Relevant factors, such as education level and diagnoses, are not considered. Additionally, individuals using other insurance to receive mental health services and the general population of Asian Americans are not included.

The sample is also limited by its size, absence of ethnic/immigration information and educational level and not representative of the state's population. In 2010, about 2% of the state's population was Asian. Although most Asian Americans resided in urban counties, only the populations of two counties, home to universities, were more than 5% Asian (Strange, 2013). That year, the poverty rate for Asian Americans was 19% compared to 16% for the total state population. By 2018, immigrants made up 5% of the state population, including individuals born in India (9%), China (7%), Myanmar (3%) and the Philippines (3%) (Contreras, 2021). By 2020, 3.1% of the state's 6,785,528 population was Asian Americans, including about 18,500 Burmese immigrants in two urban areas (Budiman, 2021; Contreras, 2021; US Census Bureau, 2021). This study's Asian American sample, 0.6% of adults receiving mental health services, consistent with earlier service utilization research, does not represent the state's population.

To better understand Asian Americans' behavioral health, additional research with more representative samples is needed, but it remains challenging. Given the underrepresentation of Asian Americans in the state mental health system, the national mental health services survey (N-MHSS) and the national survey of substance abuse treatment

(N-SSATS) could be utilized to extend the current study, controlling for poverty and other socioeconomic factors. However, although extending research to a national sample, treatment-related data would not capture the perspectives and behavioral health experiences of Asian Americans in the general population. The National Survey of Drug Use and Health (NSDUH), a comprehensive household survey, provides relevant information but acknowledges low precision and the inability to report some data for Asian Americans (SAMHSA, 2022).

Second, the primary focus of this study was a race but not ethnicity. The COVID-19 pandemic might differently influence ethnic groups, such as people who are Hispanic-Latinx, Middle Eastern, or different Asian ethnicities. Their experiences and behavioral health needs could be different before and during the pandemic. In this regard, further studies need to explore the extent each different ethnic group was influenced by pandemic-specific factors. Third, the findings are based only on one state, so they may not be generalizable to other states or regions.

Fourth, the absence of detailed findings about common behavioral health needs (e.g., depression and anxiety) in the CHAID, due to similar percentages of individuals identified with depression and anxiety across racial groups (Table 1), suggests the need for additional research focused solely on Asian Americans. A better understanding of how stress and mental illness are perceived, experienced, and expressed by Asian Americans could inform the development of effective culturally appropriate interventions. Using a multi-cultural perspective that encompasses nationality, ethnicity, immigration status, religion, language, education, gender, age, and related values could provide meaningful information.

In summary, this study's findings suggest that Asian Americans have unique factors associated with behavioral health needs and strengths that differ from White and Black Americans, regardless of age, gender, and the COVID-19 pandemic. Language proficiency, cultural stress, cultural identity, and traditions/rituals are race-specific factors that differentiate Asian Americans from non-Asian Americans receiving mental health services in the publicly funded behavioral health system. Within this context, intersections among behavioral/emotional needs (psychosis), life functioning needs (involvement in recovery, residential stability, decision making, medical/physical health), and strengths (job history, interpersonal, and spiritual) differentiate mental health functioning of Asian Americans from Black and White Americans. Classification tree algorithms offer a promising approach to detecting complex behavioral health challenges and strengths of populations based on race, ethnicity, and other characteristics.

Acknowledgments This work was funded by the Division of Mental Health and Addiction, Indiana Family & Social Service Administration

(A55-5-49-15-UE-0203), and Indiana University's Racial Justice Research Fund. The authors thank all the support that made the study possible.

Funding This project was supported by funding from Indiana University's Racial Justice Research Fund (#88269688). The content is solely the responsibility of the authors and does not necessarily represent the official views of Indiana University.

Declarations

Ethical Approval Study procedures followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Informed Consent This study was deemed exempt by the Institutional Review Board at the researchers' university (#10202). Data used in this secondary analysis came from one.iu.edu/task/iu/all-irb-services identifier: #10202.

Conflicts of Interest Each author completed the ICMJE Form for Disclosure of Potential Conflicts of Interest, and none were reported.

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