

Who (Will) Eat Rice in the United States?

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Introduction

Rice plays a crucial role in global food and nutritional security, as more than half the global population consumes rice daily. While rice is particularly important across Asia, where more than 80% of global rice is produced and consumed, it is also of growing food-security and economic importance in parts of Africa and Latin America (Durand-Morat, Bairagi, and Mulimbi, 2023).

Rice is an important field crop in the United States, ranking fifth among all field crops, with a value of sold production of \$3.17 billion a year in 2021–2022 (USDA, 2024). Rice production is geographically concentrated in the Midsouth and California. Arkansas produces around half of the crop, followed by California and Louisiana with 16% of the crop each. Roughly 77% of the rice produced in the United States is long-grain rice, and the rest is primarily medium-grain rice.

The United States is a small rice producer globally (14th largest and 2nd largest outside Asia after Brazil) but an important exporter of rice. The United States exported around 42% of the production in the last 5 years (USDA, 2023a), making it the 5th largest rice exporter worldwide. Despite its net-exporting position, rice imports are growing, primarily in the segment of aromatic rice (jasmine and basmati) commonly used in eastern cuisines (Figure 1). Growing concerns about the rise of rice imports and challenges to maintaining export competitiveness highlight the importance of analyzing the drivers of demand for rice in the United States. To our knowledge, no studies have assessed the characteristics of rice demand in the United States, which seems odd given the significant changes in the demographic composition of the U.S. population and the importance of the domestic market.

How Much Rice Is Consumed in the United States? A Residual Estimation

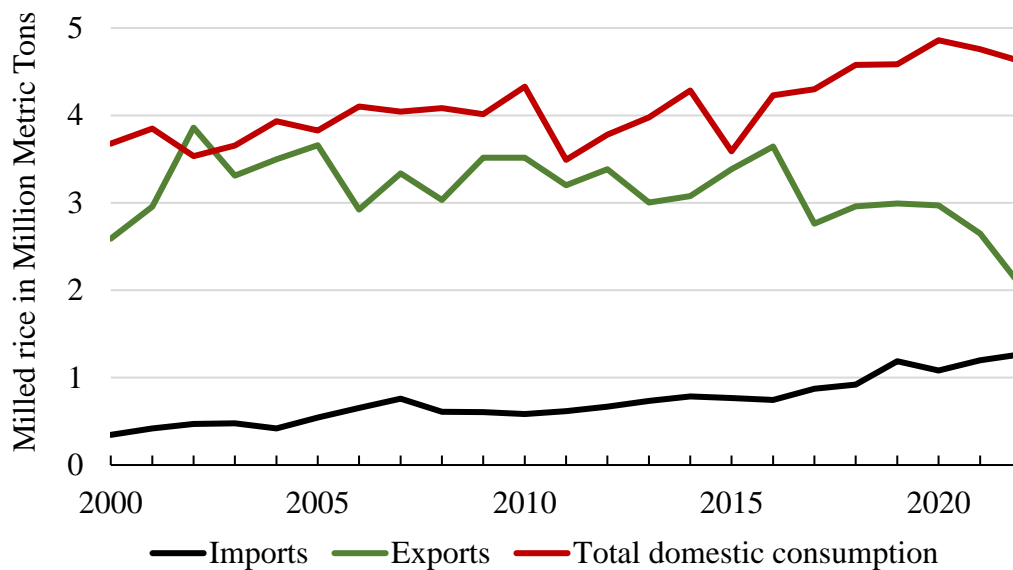
Rice economists, traders, and market modelers often employ per capita and total domestic rice consumption

to understand the global rice market and trade. There is a void of studies looking at the drivers of per capita rice consumption in the United States. The few studies include Grant, Beach, and Lin (1984), who look at factors affecting supply, demand, and prices of U.S. rice; Gao, Wailes, and Cramer (1995) on factors affecting U.S. rice demand; and Batres-Marquez, Jensen, and Upton (2009) describing U.S. rice consumers. Per capita and total rice consumption are influenced by several variables, including the traditional variables of price and income as well as other demographic variables that affect the preferences for rice. Given the lack of analysis, rice market analysts rely on a market accounting approach to estimate demand as supply (initial stocks + production + imports) minus exports minus ending stocks. This accounting approach to the estimation of rice demand is supported by the reliability of production, stocks, and trade estimates (imports and exports) from USDA and U.S. Customs. In this context, the “leftover” (residual volume of demand, also reported by USDA as “domestic and residual use” or “domestic disappearance”) is composed of a series of demand components that include demand for seed, industrial use (brewing and pet foods, for instance), and human consumption. Per capita consumption is simply estimated as total demand divided by population. The accounting nature of this estimation, based on leftover and not the real amount of rice consumed by the U.S. people, could be among plausible explanations of why U.S. historical per capita rice consumption has historically experienced significant ups and downs (Figure 2).

Estimating rice demand as a residual variable limits any further analysis of it. This study offers insights into the demographic drivers of rice demand that can be used to infer and project its behavior.

In ciphering rice demand, especially domestic rice consumption, one needs to consider the aspect of population diversity too. The U.S. population is a mix of people from various origins, cultures, and races. U.S. consumers and their families do not cook and eat foods such as rice meals the same way. Accounting for

Figure 1. Rice Market Trends in the United States, 2000–2022



Source: USDA (2023a).

population heterogeneity in terms of how the U.S. population has been evolving and becoming more ethnically diversified (Figure 3a) should help to create a more realistic picture of the U.S. rice consumers.

Regarding population diversity, the reader is invited to think about the increase in U.S. population of people originating from other parts of the world with very different rice-consumption habits and its future spillovers. In today's U.S. society, there is no need to be Asian to cook or enjoy sushi rice, Indian to go for some Chicken biryani, or even Cajun to delight in jambalaya rice. That is why understanding the U.S. rice consumers with its mosaic population reality is a way of integrating the cultural aspect surrounding rice consumption that affects the rice market.

Scientists, policy makers, and the general public must be updated on U.S. rice consumption, especially consumers' identity. Why? Because Americans assume they all eat rice the same way, forgetting they constitute a mosaic of eaters.

In this article, we discuss the rice-consumption question by connecting reportedly consumed rice-food items to the U.S. population using a 2017–2018 survey of the U.S. population. This analysis divides the U.S. population into rice and nonrice consumers, assesses ethnic heterogeneity, and summarizes and compares rice consumption across time. The main result, showing that rice is not part of the diet of the majority of white individuals, is consistent with previous evidence (Batres-Marquez, Jensen, and Upton, 2009). Nonwhite individuals—mostly those of Asian, Black, and Hispanic origins—account for most of the rice consumed in the United States. Moreover, we find that rice consumption is affected by food acculturation. For all ethnicities

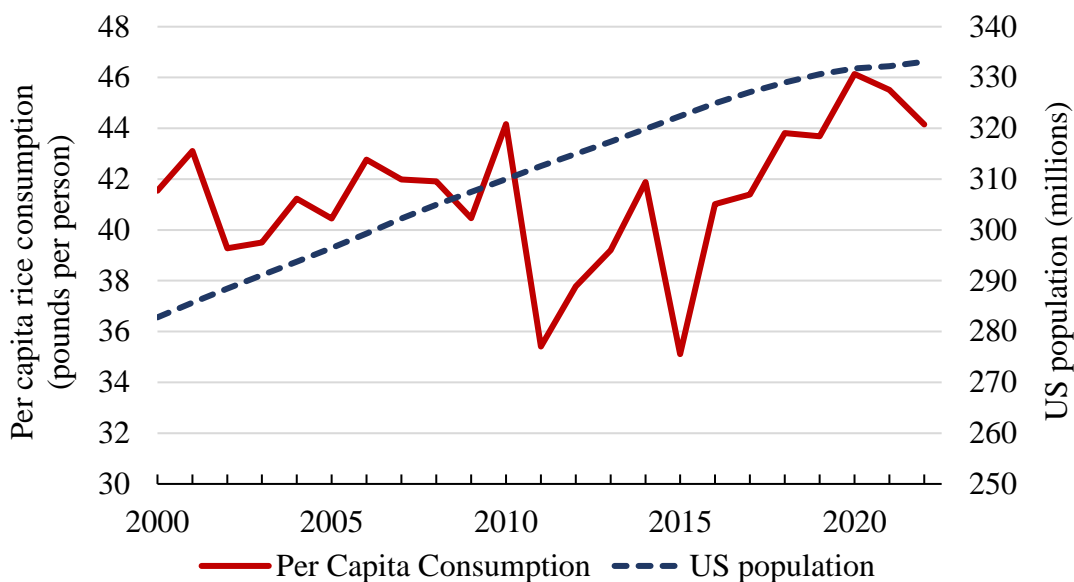
except Mexican Americans, the proportion of rice eaters is larger for those born outside the United States. Our finding emphasizes that the U.S. rice consumer characterization varies by ethnicity. When overlapping our findings with U.S. population projections, our analysis concludes in favor of future increased rice consumption driven by both population diversity and magnitude.

Identification of the Rice Consumers and Their Rice-Related Food

This analysis is based on information gathered from the National Health and Nutrition Examination Survey (NHANES). The NHANES provides publicly available data from a representative sample of the U.S. population. NHANES surveys are designed to collect U.S. adults and children's health and nutritional information, combining interviews and physical examinations. The NHANES interviews include demographic, socioeconomic, dietary, and health-related questions (Centers for Disease Control and Prevention [CDC], 2023).

Following Batres-Marquez, Jensen, and Upton (2009), we extracted and used all information on adult respondents aged 20 years and older. Additionally, we chose a conservative approach in sorting the data to exclude respondents who had missing information, answered "I don't know," or refused to answer any question related to income or education. We matched the food code from the NHANES food items with the USDA's Food and Nutrient Database for Dietary Studies (USDA, 2014a) to identify rice food items, and relied on the USDA's Food Patterns Equivalents Database (USDA, 2014b) to determine whether the food item

Figure 2. U.S. Population and Per Capita Rice Consumption in the United States, 2000–2022



Source: USDA (2023), U.S. Census Bureau (2023).

qualified as “containing rice.” One ounce of grain equivalent of cooked rice is 28.35 g of rice dry weight or one serving of cooked rice (Bowman et al., 2020). Similar to Batres-Marquez, Jensen, and Upton (2009), in this analysis, a food item reported by NHANES is considered “containing rice” when it consists of half or more than half a serving of cooked rice and the “rice consumer” qualification is assigned to the respondent eating that meal containing rice. Further, rice meals and other food items consumed were grouped per NHANES respondent to reflect individual consumption.

About the Variables of Interest

In constructing a basic typology of rice consumers that pictures their cultural food consumption behavior, our analysis involved a few demographics extracted from the NHANES. The variables in this analysis include race, birthplace, quantity consumed, and eating location. From the NHANES, race consists of six categories (Mexican American, Other Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and Other Race), while birthplace has two categories (born in the United States or otherwise). We created the *ethnicity* variable as a combination of race and birthplace, thus yielding 12 categories. The NHANES’ “others” racial group includes all non-Black, non-White-, non-Asian-, and non-Hispanic respondents, including multiracial individuals. The variable *ethnicity* has 12 levels named as Asian-born-in-the-United States, Asian-not-born-in-the-United States, Black-born-in-the-United States, Black-not-born-in-the-United States, White-born-in-the-United States, White-not-born-in-the-United States, Latino-born-in-the-United States, Latino-not-born-in-the-United States, Mexican-American-born-in-the-United States, Mexican-American-not-born-in-the-United States, Others-born-in-the-United States, and Others-not-born-in-the-United States. The

Mexican-American-born-in-the-United States ethnic group (commonly known as Chicano) used as a factor level for the ethnicity variable illustrates how *ethnicity* is a proxy that can internalize a consumers’ behavior known as food acculturation. Our general observation of the public, which could be biased, indicates that a Chicano (or Chicana) person tends to behave differently from their Mexican American parents or older relatives. As such, our framing of *ethnicity* can potentially unveil some shifts in rice consumption that could be or not be associated with consumers’ culture or environment. Further, our framing of *ethnicity* likely provides insights into the impact of migration on food consumption in U.S. society. The *eating location* variable states whether the respondent consumed the rice food at home or away from home. The *quantity consumed* is the amount of rice grain contained in the rice meals expressed in grams of rice dry weight. One should bear in mind that choosing these variables could bias our analysis and does not mean we are unaware of the variables commonly used in the food-consumption economic literature (Kearney, 2010; Salathe, 1979; Lin et al., 2003).

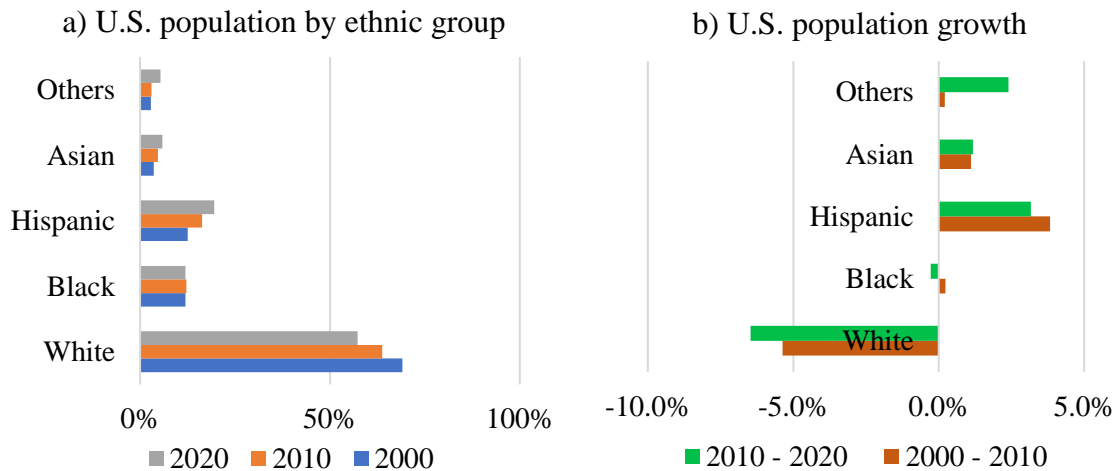
Lessons about U.S. Rice Consumers

Our findings are briefly discussed below regarding ethnicity, eating location, and the amount of rice consumed.

Who Are the U.S. Rice Consumers?

First, the data in hand show that from 2011 to 2018, on average, 26.5% of U.S. consumers ate rice. The proportion of rice and nonrice consumers by ethnicity and eating location across four cohorts of the NHANES between 2011 and 2018 varies significantly (as shown by chi-square test). In a separate analysis on the present

Figure 3. Share and Growth of Ethnic Groups in the U.S. Population



Source: U.S. Census Bureau (2023).

subject, we have already noticed significant differences in per capita consumption over time between cohorts. For the sake of brevity, this publication focused solely on the characteristics of US rice consumption in the latest NHANES cohort (2017–2018).

Second, as shown in Table 1, white individuals have the largest proportion of nonrice consumers (roughly 88% born in, and 82% born outside the United States), followed by Others born in the United States (84.9%) and Black born in the United States (82.46%). On the other hand, Asians born outside the United States have the largest proportion of rice eaters (57.4%), followed by Black not born in the United States (45.2%) and Others not born in the United States (40.5%). It is worth mentioning that a combination of Mexican Americans and all other Latinos in one group increases the proportion of Hispanic rice consumers. Looking at the U.S. population growth per major ethnic groups in the last decades (Figure 3b), we can expect that an increasing population of Asian and Hispanic individuals in the United States will increase rice demand in the future.

Third, the results in Table 1 reveal an interesting pattern that connects well with immigration and potentially food acculturation. The proportion of rice consumers born in the United States is always less than those not born in the United States except for Mexican Americans. A food consumption study comparing groups of individuals born in the United States to those not born in the United States used the term “food acculturation” to illustrate how, after 5 years, migrants’ food consumption converged toward an American diet (Gustavsen et al., 2021). At this stage, our findings tend to signal that the food acculturation shown by Gustavsen et al. (2021) on the consumption of meat, fruits, and vegetables seems

to apply to rice consumption in the United States, but with some differences across ethnicities. While the proportion of rice eaters is greater for Mexican Americans born in the United States than those not born in the United States, Asian, Black, White, Latino, and Others have each a lower proportion of rice consumers compared to their respective counterparts not born in the United States.

Where Do They Eat Rice Meals?

Considering our full NHANES 2017–2018 sample, we found that it is possible to split the data in terms of rice versus nonrice consumers but also look at their eating location behaviors. An interesting question we chose here was to look at how rice consumption is different from the consumption of all other food items in terms of location (at home or away from home). The NHANES survey asks consumers where (at or away from home) they consumed the food they declared. Figure 4 shows the share of rice and the share of nonrice meals eaten at home by U.S. consumers. The share of rice and the share of nonrice meals eaten away from home by U.S. consumers can be extrapolated from Figure 4 as for each NHANES respondent the share of total food items consumed at and away from home sums to 100%. The share of meals (rice vs. nonrice) is here used relative to eating location. We find no statistical differences between the share of rice and nonrice meals eaten at home for any ethnic group. Across ethnicities, a statistically significant difference ($p < 0.05$) in the share of rice meals eaten at home exists between Latinos not born in the United States and White individuals born in the United States. Overall, the findings suggest that rice consumption is not different from consumption of food at large when it comes to location.

Table 1. Rice Consumers by Ethnicity and Average Per Capita Consumption, 2017–2018

Rice consumer?		No (N=3329)	Yes (N=1006)
Ethnicity	(N)		
White bornUS	(1562)	88.1%	11.9%
White nonB-US	(62)	81.9%	18.1%
Black bornUS	(917)	82.4%	17.6%
Black nonB-US	(68)	54.8%	45.2%
Latino bornUS	(127)	70.7%	29.3%
Latino nonB-US	(249)	62.6%	37.4%
Asian bornUS	(81)	68.4%	31.6%
Asian nonB-US	(493)	42.6%	57.4%
Mexican American bornUS	(223)	73.3%	26.7%
Mexican American nonB-US	(330)	75.6%	24.4%
Others bornUS	(200)	84.9%	15.1%
Others nonB-US	(23)	59.5%	40.5%
U.S. total	(4335)	76.8%	23.2%
Daily per capita rice grain in 2017-2018 (in grams)			
Mean (SD)		-	40.5 (28.0)
Median [Min, Max]		-	34.6 [1.70, 337]

Notes: bornUS = individual born in the United States; nonB-US = individual not born in the United States

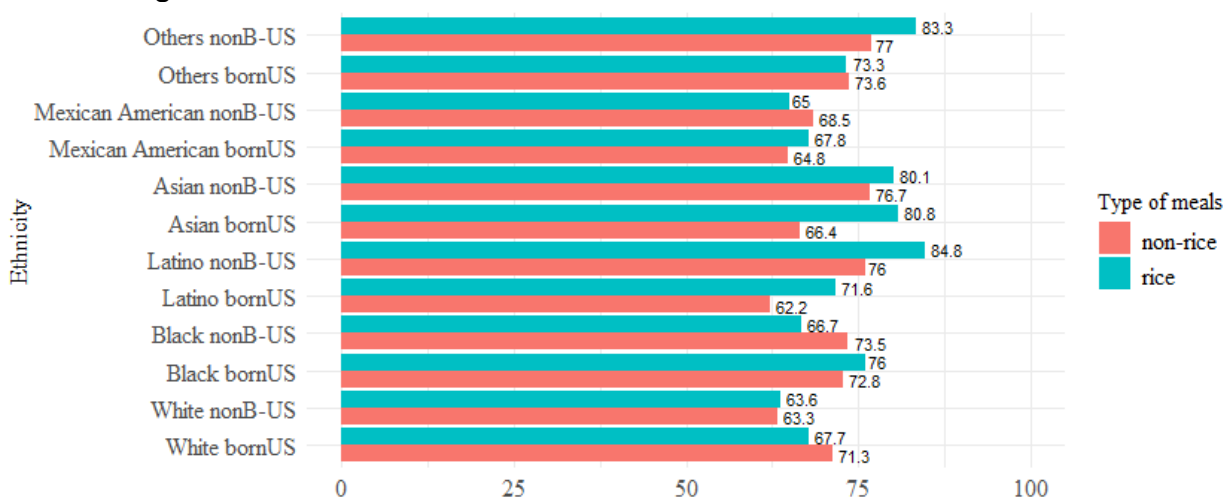
Source: NHANES surveys 2017–2018 (CDC, 2023)

How Much Rice Do They Eat?

Computed from the NHANES 2017–2018 survey, the average quantity of rice consumed per person by rice consumers within the U.S. population is 40.5 g (1.43 oz). The quantity of rice consumed per person from NHANES is the sum of all rice found from all food items containing rice declared by each NHANES survey respondent. We multiply the per capita consumption (which we computed from information NHANES collected on an average day) by the number of days per year a consumer ate rice to derive their annual per capita consumption. In Table 2, we estimated the daily and annual mean per capita consumption by ethnicity assuming rice is consumed

once a week, four times a week, and every day (meaning the daily per capita consumption converted to kilograms was multiply respectively by 52, 209, and 365 days to estimate an annual value). Table 2 results were obtained by averaging respondents' per capita rice consumption based on their ethnic group. From 2011 to 2018, USDA estimated the average per capita rice consumption to 12.55 kg per person in the United States (Figure 2). The average daily per capita consumption of 40.5 g estimated for 2017–2018 (Table 1) translates into 2.11 kg, 8.44 kg, and 14.77 kg of annual per capita consumption under the assumption of eating rice once, four times, and seven times a week, respectively.

Figure 4. Share of Rice and Share of Nonrice Meals Consumed at Home



Note: Share of meals consumed at home (displayed here) = 100% - Share of meals consumed away from home (not displayed here)
Source: NHANES surveys 2017-2018 (CDC, 2023)

A more striking result emerges from our rice food per capita consumption when explored across ethnicities for rice consumers (Table 2). We used a one-way analysis of variance approach to compare the average per capita consumption across ethnic groups. The unbalanced number of respondents across ethnicities led us to use the Games–Howell test for post hoc means comparison. Average per capita consumption varies from 49.5 g a day for Asians not born in the United States to 30.7 g a day for Mexican Americans not born in the United States. However, most mean per capita consumption values are statistically the same, except for the differences between Asian individuals not born in the United States and Black and Mexican Americans (born and not born in the United States) and Latinos not born in the United States.

Based on our results above (size of ethnic group, proportion of rice eaters per group, and per capita consumption per group), we estimate that Asian individuals (born in and outside the United States) account for 31% of the total rice demand, followed by Hispanics (including Latino and Mexican American born in and outside the United States) with 27%, White (born in and outside the United States) with 20%, and Black (born in or outside the United States) with 19%. Despite being the largest ethnic group in the country, White individuals, especially those born in the United States, are not an important segment of U.S. rice consumers

due to their low proportion of rice eaters (Table 1) and a declining population growth (Figure 3). It is important to highlight that future domestic rice demand would be affected by the Asian groups due to both their per capita consumption and growing population, the “other” subgroups due to their per capita consumption levels and Hispanic due to their growing population (Figure 3b).

Concluding Comments

To contribute to reducing the information gap regarding rice consumption in the United States, we used some key information from a representation of the U.S. population to suggest the typology of the U.S. rice consumer. This article draws the reader’s attention to the fact that, in estimating rice demand in the United States, one needs to be aware that some rice consumption patterns and behaviors vary with the consumers’ ethnicity and may be subject to food acculturation. We find that U.S. rice consumers are mostly of Asian and Hispanic origin, and that rice consumption is, for the most part, not different than consumption of nonrice food when it comes to location (at or away from home). Policy makers, rice economists, rice producers, and research scientists need to be aware of the increasing demand for rice and adjust the rice supply considering the influence of change in population structure.

Table 2. Annual Average Per Capita Rice Consumption by Ethnicity in the United States (2017–2018)

Ethnicity	Daily rice per capita consumption (grams)	Ranking	Annual consumption per capita (kilogram)		
			Once a week	Four times a week	Everyday
Asian nonB-US	49.50	1	2.58	10.32	18.07
Others bornUS	43.34	2	2.26	9.04	15.82
White bornUS ^{†‡}	41.51	3	2.16	8.66	15.15
Latino bornUS	39.71	4	2.07	8.28	14.49
Asian bornB	39.36	5	2.05	8.21	14.37
Others nonB-US	37.58	6	1.96	7.84	13.72
White nonB-US	36.49	7	1.90	7.61	13.32
Black bornUS [†]	35.37	8	1.84	7.38	12.91
Latino nonB-US [†]	35.23	9	1.84	7.35	12.86
Mexican American bornUS [†]	34.54	10	1.80	7.20	12.61
Black nonB-US [†]	31.69	11	1.65	6.61	11.57
Mexican American nonB-US ^{†‡}	30.70	12	1.60	6.40	11.21

Notes: bornUS = individual born in the United States | nonB-US = individual not born in the United States

[†] Significant difference at $p < 0.05$ found between Asian nonB-US and this group.

[‡] Significant difference at $p < 0.05$ between White bornUS and Mexican American nonB-US.

Source: NHANES surveys 2017–2018 (CDC, 2023).

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