



# Online Grocery Shopping Behaviors and Attitudes Among Asian Americans

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## Abstract

How online grocery shopping behaviors differ among Asian American (AA) ethnic subgroups and acculturation level is unknown. From June 9–15, 2020, we administered an online survey to a nationally-derived nonprobability sample of 2,895 AA adults, including 1,737 East, 570 South, and 587 Southeast Asian adults, assessing online grocery shopping (yes/no, frequency, reasons). We used logistic regression to compare responses by subgroup and acculturation score, controlling for sociodemographics. Thirty-percent of participants reported shopping online for groceries in a typical month, with a higher percentage among South (45%) versus East Asian adults (23%). Participants with low (vs. high) acculturation scores were more likely to report a lack of special foods (OR=0.7; 95% CI: 0.5–0.98) and poor food quality (OR=0.6; 95% CI: 0.4–0.7) as preventing them from shopping online. Online grocery shopping has the capacity to address inequities in health, potentially via culturally-tailored programs designed for less-acculturated AA adults.

**Keywords** Asian Americans · Health Equity · Acculturation · Online Grocery · Cultural Influence

## Introduction

There is considerable heterogeneity in diet behaviors among Asian American (AA) ethnic subgroups. For example, saturated fat intake is lower and sodium intake is higher among Chinese, Korean, and Japanese adults, relative to non-Hispanic White adults in the U.S.; whereas, intake of saturated fats and refined carbohydrates is higher among Asian Indian adults [1]. Prior research also suggests that acculturation is an important influence on diet among AA adults, such as higher intake of nutrient-poor, energy-dense foods and lower consumption of fruits and vegetables consumption with longer duration in the U.S. [2]. However, the extent to which food purchasing behaviors differ between AA ethnic subgroups or those of different acculturation levels remains unclear. This research is critical for addressing issues related to food

purchasing behaviors via intervention (e.g., offering healthy, culturally-specific grocery items in online retail settings).

The COVID-19 pandemic and other recent events have fueled an increase in incidents of discrimination among AA adults [3], which may contribute to anxieties about leaving home to shop for groceries and spur AA consumers to shop online. Previous surveys suggest that internet use is higher among English-speaking AA adults relative to other race/ethnic groups [4], but there is a dearth of disaggregated data about online food purchasing behaviors and attitudes from AA adults. In our previous work, we explored changes in diet and food shopping behaviors among AA adults due to COVID-19 [5], but we did not explore online shopping practices in general or differences by acculturation score. For example, online retailers may be an important source for culturally-specific (e.g., produce indigenous to Asia) or culturally-preferred foods (e.g., specific brands of seasonings) among AA adults, but this may differ across the spectrum of acculturation. To address these gaps, we sought to examine differences in online grocery shopping behaviors among AA adults using data disaggregated by AA ethnic subgroup and levels of acculturation.

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**Table 1** Sociodemographic characteristics of a nationally-derived nonprobability sample of 2,894 Asian American adults, overall and by Asian American subgroup (n = 2,984)

	Total		East Asian		South Asian		Southeast Asian	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
Total	2894	-	1737	57.6%	570	18.9%	587	19.4%
<i>Gender</i>								
Male	1355	46.8%	820	47.2%	282	49.5%	253	43.1%
Female	1536	53.1%	914	52.6%	288	50.5%	334	56.9%
Other/Refused/Missing	3	0.1%	3	0.2%	0	0.0%	0	0.0%
<i>Age group (years)</i>								
18–24	437	15.1%	212	12.2%	110	19.3%	115	19.6%
25–34	604	20.9%	285	16.4%	170	29.8%	149	25.4%
35–44	565	19.5%	305	17.6%	128	22.5%	132	22.5%
45–54	498	17.2%	334	19.2%	66	11.6%	98	16.7%
55–64	367	12.7%	272	15.7%	45	7.9%	50	8.5%
65–99	406	14.0%	323	18.6%	45	7.9%	38	6.5%
Refused/Missing	17	0.6%	6	0.3%	6	1.1%	5	0.9%
<i>Country of origin, at least one parent</i>								
United States	1148	39.7%	777	44.7%	186	32.6%	185	31.5%
Outside of the United States	1746	60.3%	960	55.3%	384	67.4%	402	68.5%
Other/Don't know/Refused/Missing	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<i>Country of origin, self</i>								
United States	1628	56.3%	1101	63.4%	222	38.9%	305	52.0%
Outside of the United States	1152	39.8%	592	34.1%	301	52.8%	259	44.1%
Other/Don't know/Refused/Missing	114	3.9%	44	2.5%	47	8.2%	23	3.9%
<i>Educational attainment</i>								
Less than 9th grade	10	0.3%	5	0.3%	1	0.2%	4	0.7%
9th to 12th grade - No diploma	54	1.8%	26	1.5%	10	1.6%	18	3.0%
GED or equivalent	176	5.9%	85	4.8%	32	5.2%	59	9.7%
Some college, no degree	364	12.6%	203	11.7%	68	11.9%	93	15.8%
Associate's degree	213	7.4%	129	7.4%	33	5.8%	51	8.7%
Bachelor's degree	1203	41.6%	738	42.5%	220	38.6%	245	41.7%
Graduate or Professional degree	866	29.9%	546	31.4%	205	36.0%	115	19.6%
Don't know/Refused/Missing	8	0.3%	5	0.3%	1	0.2%	2	0.3%
<i>Household size</i>								
1	540	18.7%	392	22.6%	71	12.5%	77	13.1%
2	883	30.5%	592	34.1%	137	24.0%	154	26.2%
3	594	20.5%	343	19.7%	136	23.9%	115	19.6%
4	599	20.7%	299	17.2%	156	27.4%	144	24.5%
5	177	6.1%	76	4.4%	33	5.8%	68	11.6%
>5	96	3.3%	32	1.8%	36	6.3%	28	4.8%
Don't know/Refused/Missing	5	0.2%	3	0.2%	1	0.2%	1	0.2%
<i>Household income<sup>a</sup></i>								
Mean (SD)	\$111,679	\$103,685	\$116,458	\$102,697	\$114,621	\$112,761	\$94,824	\$91,022
Refused/Missing/Implausible	510	17.6%	303	17.4%	132	23.2%	151	25.7%
Less than \$20,000	179	6.2%	86	5.0%	46	8.1%	47	8.0%
\$20,000 or more	2527	87.3%	1549	89.2%	481	84.4%	497	84.7%
Don't know/Refused/Missing/Implausible	188	6.5%	102	5.9%	43	7.5%	43	7.3%
<i>Relationship status</i>								
Married	1500	51.8%	879	50.6%	340	59.6%	281	47.9%
Widowed	40	1.4%	25	1.4%	11	1.9%	4	0.7%
Divorced	138	4.8%	103	5.9%	18	3.2%	17	2.9%
Separated	33	1.1%	18	1.0%	11	1.9%	4	0.7%
Never Married	1018	35.2%	613	35.3%	170	29.8%	235	40.0%
Living with Partner	127	4.4%	75	4.3%	15	2.6%	37	6.3%
Don't know/Refused/Missing	38	2.7%	24	2.8%	5	2.2%	9	2.9%

**Table 1** (continued)

	Total		East Asian		South Asian		Southeast Asian	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
<i>Occupational status</i>								
Working at a job or business	1539	53.2%	946	54.5%	295	51.8%	298	50.8%
Working at a job or business but not at work	153	5.3%	96	5.5%	29	5.1%	28	4.8%
Looking for work	258	8.9%	121	7.0%	70	12.3%	67	11.4%
Not working at a job or business	615	21.3%	431	24.8%	86	15.1%	98	16.7%
Part-time or full-time student	278	9.6%	127	7.3%	70	12.3%	81	13.8%
Don't know/Refused/Missing	51	1.8%	16	0.9%	20	3.5%	15	2.6%
<i>Do you or anyone in your household currently get SNAP?</i>								
Yes	218	7.5%	100	5.8%	61	10.7%	57	9.7%
No	2529	87.4%	1578	90.8%	460	80.7%	491	83.6%
Don't know/Refused	147	5.1%	59	3.4%	49	8.6%	39	6.6%
Acculturation score (10–50)	36.0	8.0	37.0	7.8	33.2	8.1	35.6	7.8

SNAP = Supplemental Nutrition Assistance Program; East Asian = Chinese/Cantonese, Hmong/Mong, Iwo Jiman, Japanese, Korean, Laohmong, Nipponese, Okinawan, or Taiwanese; South Asian = Asian Indian, Bangladeshi, Bengalese, Bharat, Bhutanese, Burmese, Dravidian, East Indian, Goanese, Maldivian, Nepalese, Pakistani, or Sri Lankan; Southeast Asian = Cambodian, Filipino, Indochinese, Indonesian, Laotian, Madagascar/Malagasy, Malaysian, Siamese, Singaporean, Thai, or Vietnamese

<sup>a</sup>Excludes <\$100.0 and >\$1000000.5

## Methods

We administered an online survey to a nationally-derived nonprobability sample of 3,084 AA adults from June 9–15, 2020 using Dynata, an online surveying company that recruits volunteer research participants [6]. The sample was recruited to approximately match the distribution of gender and age of Asian adults residing in the U.S. [7] Potential participants completed an online consent, followed by a brief pre-screening questionnaire. Eligibility criteria included identifying as Asian, being age 18 years and older, and being able to read and speak English.

Open REDCap, an online survey platform, was used to create and distribute the survey. The survey was designed to assess sociodemographics, health status, diet behaviors, and food shopping behaviors, using questions described elsewhere.[5] A 10-item version of questions adapted from the Marin Short Acculturation Scale was also included in the survey, which yields a total acculturation score ranging from 10 to 50 [8]. All procedures were approved as exempt by the Institutional Review Board. Duplicate responses (n=37) and implausible skip patterns (n=29) and participants who identified as more than one of the three ethnic subgroups (defined by country of origin) (n=124) were excluded. The final sample included 1,737 East Asian, 570 South Asian, and 587 Southeast Asian (n=2,894) adults. The median completion time for the survey was 17.4 minutes (IQR: 12.1, 25.3).

We used logistic regression to compare differences in online grocery shopping (yes/no) by Asian ethnic subgroup

(East Asian as referent) and acculturation score (dichotomized using median score). We also examined responses to questions regarding participants' primary grocery store (type, reasons); shopping for Asian grocery items (yes/no, store type, reasons); shopping for online groceries (yes/no, frequency, location, type of groceries, reasons, intentions), including Asian grocery items; and whether there were other ways they were getting food at home that they were not using before COVID-19 (none, online orders, neighbors, family, food delivery business, food from my child's school to eat at home). We controlled for age, gender, household income (<\$20,000 vs. ≥\$20,000), educational attainment (high school or less vs. more than high school), and household size (1, 2, 3, ≥4). We used a two-sided alpha of 0.05 as the threshold for statistical significance. Stata version 15.1 (StataCorp LP, College Station, TX) was used for all analyses.

## Results

In our sample, the average age was 43.2 (SD=16.5) years, 60% reported having at least one foreign-born parent, 39.8% reported being born outside of the U.S., 87.3% reported annual household income above \$20,000, and 78.9% of respondents reported having a post-secondary education degree (Table 1). Approximately 29.2% of participants reported shopping online for groceries in a typical month, and 36.4% of those adults shop online for groceries at least once a week (Table 2). About 6% of participants reported

**Table 2** Grocery shopping behaviors and attitudes (%) of a nationally-derived nonprobability sample of 2,894 Asian American adults, overall and by Asian American subgroup (n = 2,984)<sup>a</sup>

	Total		East Asian		South Asian		Southeast Asian	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
Total	2894	-	1737	60.0%	570	19.7%	587	20.3%
<i>Primary store type</i>								
Supermarket	1733	59.9%	1128	64.9%	266	46.7%***	339	57.8%
Online retailer or store	113	3.9%	48	2.8%	51	8.9%***	14	2.4%
Small or ethnic grocery store	163	5.6%	85	4.9%	48	8.4%	30	5.1%
Convenience store	86	3.0%	29	1.7%	35	6.1%**	22	3.7%
Discount or big box store like Target or Walmart	241	8.3%	105	6.0%	56	9.8%*	80	13.6%***
Wholesale club like BJ's, Costco, or Sam's Club	509	17.6%	311	17.9%	104	18.2%	94	16.0%
Other/Don't know/Refused	49	1.7%	31	1.8%	10	1.8%	8	1.4%
<i>Do you shop for online groceries in a typical month?</i>								
Yes	844	29.2%	407	23.4%	259	45.4%***	178	30.3%*
No	1978	68.3%	1299	74.8%	290	50.9%***	389	66.3%*
Don't know/Refused/Missing	72	2.5%	31	1.8%	21	3.7%	20	3.4%
<i>Do you shop online for Asian grocery items?</i>								
Yes	392	13.5%	174	10.0%	128	22.5%***	90	15.3%*
No	2428	83.9%	1531	88.1%	415	72.8%***	482	82.1%
Don't know/Refused	74	2.6%	32	1.8%	27	4.7%	15	2.6%
<i>Online grocery shopping, frequency</i>								
At least once a week	307	36.4%	141	34.6%	113	43.6%	53	29.8%
Every other week or less often	524	62.1%	260	63.9%	144	55.6%	120	67.4%
Don't know/Refused/Missing	13	1.5%	6	1.5%	2	0.8%	5	2.8%
<i>Online groceries, types of groceries purchased<sup>b</sup></i>								
Fresh produce	493	58.4%	247	60.7%	165	63.7%	81	45.5%*
Canned produce	328	38.9%	159	39.1%	91	35.1%	78	43.8%
Frozen produce	316	37.4%	151	37.1%	99	38.2%	66	37.1%
Dairy products	391	46.3%	186	45.7%	128	49.4%	77	43.3%
Soda or other sweetened drinks	234	27.7%	102	25.1%	69	26.6%	63	35.4%*
Bottled water	277	32.8%	138	33.9%	77	29.7%	62	34.8%
Coffee or tea (unsweetened)	319	37.8%	161	39.6%	82	31.7%	76	42.7%
Hot or cold cereals	252	29.9%	121	29.7%	75	29.0%	56	31.5%
Bread, rice, or other types of grains	388	46.0%	204	50.1%	112	43.2%	72	40.4%
Beans, lentils, or pulses	242	28.7%	96	23.6%	106	40.9%***	40	22.5%
Sauces or condiments	269	31.9%	134	32.9%	74	28.6%	61	34.3%
Fresh meat, poultry, or fish	288	34.1%	158	38.8%	65	25.1%**	65	36.5%
Frozen meat, poultry, or fish	240	28.4%	128	31.4%	64	24.7%	48	27.0%
Other frozen food	165	19.5%	87	21.4%	48	18.5%	30	16.9%
Desserts, snacks, or candy	320	37.9%	159	39.1%	88	34.0%	73	41.0%
Other/Don't know/Refused	51	6.0%	25	6.1%	12	4.6%	14	7.9%
<i>Factors motivating participant to shop online for groceries in a typical month<sup>c</sup></i>								
Low prices	353	41.8%	153	37.6%	113	43.6%	87	48.9%*
Variety of goods	339	40.2%	156	38.3%	109	42.1%	74	41.6%
Variety of special foods	263	31.2%	110	27.0%	90	34.7%	63	35.4%
Good quality food	304	36.0%	122	30.0%	118	45.6%***	64	36.0%
Online convenience	485	57.5%	240	59.0%	141	54.4%	104	58.4%
Other language options	50	5.9%	15	3.7%	23	8.9%	12	6.7%
Other/Don't know/Refused	47	5.6%	32	7.9%	10	3.9%	5	2.8%
<i>Factors preventing participant from online grocery shopping in a typical month<sup>d</sup></i>								
High prices	609	30.8%	391	30.1%	97	33.4%*	121	31.1%
Lack of variety of goods	323	16.3%	197	15.2%	63	21.7%	63	16.2%
Lack of variety of special foods	331	16.7%	191	14.7%	58	20.0%	82	21.1%

**Table 2** (continued)

	Total		East Asian		South Asian		Southeast Asian	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
Poor quality food	233	11.8%	134	10.3%	51	17.6%	48	12.3%
Lack of social interaction	139	7.0%	74	5.7%	29	10.0%	36	9.3%
Lack of interaction with food itself	775	39.2%	531	40.9%	98	33.8%***	146	37.5%
No loyalty/frequent shopping program	149	7.5%	92	7.1%	28	9.7%	29	7.5%
Extra delivery fee for frozen/fresh foods	682	34.5%	443	34.1%	90	31.0%***	149	38.3%
Other language options	21	1.1%	10	0.8%	7	2.4%	4	1.0%
Other/Don't know/Refused	448	22.6%	325	25.0%	49	16.9%	74	19.0%
<i>Factors that would motivate participant to shop online for groceries<sup>d</sup></i>								
Free shipping	1217	61.5%	804	61.9%	157	54.1%***	256	65.8%
Lower prices	1078	54.5%	717	55.2%	140	48.3%***	221	56.8%
Accepts EBT	81	4.1%	39	3.0%	18	6.2%	24	6.2%
Greater variety of goods	652	33.0%	412	31.7%	109	37.6%**	131	33.7%
Greater variety of special foods	349	17.6%	215	16.6%	58	20.0%*	76	19.5%
Higher quality food	686	34.7%	442	34.0%	114	39.3%**	130	33.4%*
Other language options	39	2.0%	21	1.6%	10	3.4%	8	2.1%
Other/Don't know/Refused	467	23.6%	338	26.0%	59	20.3%	70	18.0%

\* $P < 0.05$ ;  $P < 0.01$ ;  $P < 0.001$  <sup>a</sup>We used logistic regression to compare differences in survey responses by Asian ethnic subgroup (East Asian as referent group) and acculturation score (dichotomized using median score), controlling for age, gender, household income (<\$20,000 vs.  $\geq$ \$20,000), educational attainment (High School or less vs. more than High school), and household size (1, 2, 3,  $\geq$ 4). We used a two-sided alpha of 0.05 as the threshold for statistical significance.

<sup>b</sup>Participants could select more than one response, so the denominator reflects unique non-missing responses.

<sup>c</sup>Among participants who reported shopping online for groceries.

<sup>d</sup>Among participants who did not reported shopping online for groceries

shopping online for groceries at iFresh or another type of Asian online retailer (Table 3). A higher percentage of South Asian adults (45.4%) reported shopping online for groceries in a typical month compared to Southeast (30.3%) and East Asian adults (23.4%). Southeast (vs. East) Asian adults had lower odds of buying fresh fruits and vegetables (OR = 0.7; 95% CI: 0.5, 0.97) and higher odds of buying sugar-sweetened beverages (OR = 1.5; 95% CI: 1.02, 2.3) online.

Among participants who did not shop online for groceries, South Asian adults had lower odds of reporting high prices (OR = 0.7; 95% CI: 0.6, 0.9) and extra delivery fees (OR = 0.6; 95% CI: 0.4, 0.7) as preventing them from starting; and lower odds of reporting free shipping (OR = 0.5; 95% CI: 0.4, 0.6) and lower prices (OR = 0.5; 95% CI: 0.4, 0.6) as what would motivate them to start shopping online for groceries (Table 3). The pattern was opposite for the variety and quality of goods online, with a higher prevalence of South Asian adults reporting them as potential motivating factors. We also observed higher odds of reporting shopping online for groceries among those who reported getting food via online orders (OR = 4.8; 95% CI: 3.0, 7.8) and food delivery businesses (OR = 3.0; 95% CI: 1.7, 5.2) for the first time since COVID-19.

The acculturation score of the overall sample was moderate [36.0 (SD = 8.0)]. Compared to East Asian adults [37.0

(SD = 7.8)], we observed a lower acculturation score among Southeast [35.6 (SD = 7.8)] and South [33.2 (SD = 8.1)] Asian adults (Table 1). Participants with a high (vs. low) acculturation score had higher odds of reporting shopping online for groceries due to low prices (OR = 1.6; 95% CI: 1.1, 2.3) and lower odds of reporting shopping online for groceries due to the variety of special foods, such as Asian grocery items (OR = 0.7; 95% CI: 0.5, 0.98) (Table 3). Participants with a high acculturation score also had lower odds of reporting poor quality foods as preventing them from shopping online for groceries (OR = 0.6; 95% CI: 0.4, 0.7). Participants with a high acculturation score were not less likely to buy groceries on the internet, but they had lower odds of reporting shopping online for Asian groceries specifically (OR = 0.7; 95% CI: 0.5, 0.9).

## Discussion

We found that almost 30% of AA adults shop online for groceries in a typical month, which is slightly lower than the 39% of participants in the Nielsen National Consumer Panel who reported ever shopping online for groceries in July 2020 [9]. Our results also suggest that less-aculturated AA adults are more likely to shop for Asian grocery items

**Table 3** Grocery shopping behaviors and attitudes (%) of a nationally-derived nonprobability sample of 2,894 Asian American adults, overall and by Asian American subgroup

	Total		East Asian		South Asian		Southeast Asian	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
Total	2894	-	1737	60.0%	570	19.7%	587	20.3%
<i>Are you the main person responsible for food shopping in your household?</i>								
Yes	1957	67.6%	1197	68.9%	379	66.5%	381	64.9%
No	478	16.5%	285	16.4%	77	13.5%	116	19.8%
No one person is responsible	411	14.2%	239	13.8%	91	16.0%	81	13.8%
Don't know/Refused	48	1.7%	16	0.9%	23	4.0%	9	1.5%
		81.8%						
<i>Are you the main person responsible for food preparation in your household?</i>								
Yes	1708	59.0%	1062	61.1%	316	55.4%	330	56.2%
No	778	26.9%	451	26.0%	161	28.2%	166	28.3%
No one person is responsible	365	12.6%	208	12.0%	77	13.5%	80	13.6%
Don't know/Refused	43	1.5%	16	0.9%	16	2.8%	11	1.9%
		71.6%						
<i>Transportation mode to primary store?</i>								
Drive own car	2316	80.0%	1443	83.1%	393	68.9%	480	81.8%
Use someone else's car	54	1.9%	20	1.2%	15	2.6%	19	3.2%
Someone else drives me or I use a ridesharing app	84	2.9%	37	2.1%	22	3.9%	25	4.3%
Walk	205	7.1%	134	7.7%	44	7.7%	27	4.6%
Bus	57	2.0%	31	1.8%	15	2.6%	11	1.9%
Metro	27	0.9%	9	0.5%	15	2.6%	3	0.5%
Taxi	11	0.4%	2	0.1%	7	1.2%	2	0.3%
Ride bicycle	8	0.3%	5	0.3%	1	0.2%	2	0.3%
Other/Don't know/Refused/Missing	132	4.6%	56	3.2%	58	10.2%	18	3.1%
<i>Minutes to get to primary store</i>								
Between 0 and 15 min	1691	58.4%	1083	62.3%	267	46.8%	341	58.1%
Between 15–30 min	724	25.0%	431	24.8%	143	25.0%	150	25.6%
Between 30–45 min	177	6.1%	93	5.3%	50	8.7%	34	5.8%
Between 45 min – 1 h	97	3.4%	43	2.5%	30	5.3%	24	4.1%
Between 1–2 h	55	1.9%	22	1.3%	19	3.3%	14	2.4%
Between 2–3 h	14	0.5%	7	0.4%	4	0.7%	3	0.5%
More than 3 h	7	0.2%	4	0.2%	2	0.4%	1	0.2%
Don't Know/Refused/Missing	129	4.5%	54	3.1%	55	9.6%	20	3.4%
<i>Miles from home to primary store</i>								
Less than 0.5 miles	237	8.2%	144	8.3%	46	8.1%	47	8.0%
Between 0.5–1 miles	423	14.6%	259	14.9%	74	13.0%	90	15.3%
Between 1–2 miles	517	17.9%	319	18.4%	98	17.2%	100	17.0%
Between 2–3 miles	447	15.4%	284	16.4%	84	14.7%	79	13.5%
Between 3–4 miles	352	12.2%	209	12.0%	67	11.8%	76	12.9%
Between 5–10 miles	540	18.7%	321	18.5%	114	20.0%	105	17.9%
Between 10–15 miles	114	3.9%	62	3.6%	21	3.7%	31	5.3%
Between 15–20 miles	53	1.8%	33	1.9%	6	1.1%	14	2.4%
More than 20 miles	27	0.9%	15	0.9%	4	0.7%	8	1.4%
Don't know/Refused/Missing	184	6.4%	91	5.2%	56	9.8%	37	6.3%
<i>Reasons for shopping at primary store?<sup>a</sup></i>								
Low Prices	1247	43.1%	720	41.5%	239	41.9%	<b>288</b>	<b>49.1%</b>
Produce Selection	1083	37.4%	670	38.6%	213	37.4%	200	34.1%
Meat Department	660	22.8%	395	22.7%	<b>95</b>	<b>16.7%</b>	<b>170</b>	<b>29.0%</b>
Variety of foods	1298	44.9%	786	45.3%	241	42.3%	271	46.2%
Variety of special foods	622	21.5%	337	19.4%	148	26.0%	137	23.3%
Close to home	1475	51.0%	915	52.7%	<b>239</b>	<b>41.9%</b>	<b>321</b>	<b>54.7%</b>
Loyalty/Frequent Shopper Program	578	20.0%	344	19.8%	100	17.5%	<b>134</b>	<b>22.8%</b>

Table 3 (continued)

	Total		East Asian		South Asian		Southeast Asian	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
Online convenience	188	6.5%	75	4.3%	<b>75</b>	<b>13.2%</b>	38	6.5%
Other/Don't know/Refused/Missing	81	2.8%	48	2.8%	17	3.0%	16	2.7%
<i>Do you shop for Asian grocery items?</i>								
Yes	2316	80.0%	1393	80.2%	446	78.2%	477	81.3%
No	508	17.6%	314	18.1%	101	17.7%	93	15.8%
Don't know/Refused	70	2.4%	30	1.7%	23	4.0%	17	2.9%
<i>Primary store type for Asian grocery items<sup>a</sup></i>								
Supermarket	610	26.3%	419	30.1%	62	13.9%	129	27.0%
Online retailer or store	25	1.1%	9	0.6%	13	2.9%	3	0.6%
Convenience store	37	1.6%	8	0.6%	15	3.4%	14	2.9%
Discount or big box store like Target or Walmart	19	0.8%	8	0.6%	7	1.6%	4	0.8%
Wholesale club like BJ's, Costco, or Sam's Club	29	1.3%	18	1.3%	6	1.3%	5	1.0%
Small or ethnic grocery store	747	32.3%	421	30.2%	165	37.0%	161	33.8%
Other/Don't know/Refused	1427	61.6%	854	61.3%	302	67.7%	271	56.8%
<i>Primary store for Asian grocery items, location<sup>a</sup></i>								
My primary grocery store/market	814	35.1%	486	34.9%	169	37.9%	159	33.3%
Other grocery store/market	1484	64.1%	898	64.5%	274	61.4%	312	65.4%
Don't know/Refused	596	25.7%	353	25.3%	127	28.5%	116	24.3%
<i>Primary store for Asian grocery items, frequency<sup>a</sup></i>								
1 time last month	564	24.4%	346	24.8%	107	24.0%	111	23.3%
2–3 times last month	553	23.9%	326	23.4%	104	23.3%	123	25.8%
1 time per week	288	12.4%	174	12.5%	53	11.9%	61	12.8%
2 times per week	51	2.2%	28	2.0%	11	2.5%	12	2.5%
3–4 times per week	18	0.8%	10	0.7%	2	0.4%	6	1.3%
5–6 times per week	8	0.3%	7	0.5%	0	0.0%	1	0.2%
Don't know/Refused/Missing	1412	61.0%	846	60.7%	293	65.7%	273	57.2%
<i>Minutes to get to primary store for Asian grocery items?<sup>a</sup></i>								
Between 0 and 15 min	524	22.6%	324	23.3%	80	17.9%	120	25.2%
Between 15–30 min	599	25.9%	364	26.1%	117	26.2%	118	24.7%
Between 30–45 min	219	9.5%	134	9.6%	40	9.0%	45	9.4%
Between 45 min – 1 h	74	3.2%	39	2.8%	18	4.0%	17	3.6%
Between 1–2 h	40	1.7%	23	1.7%	7	1.6%	10	2.1%
Between 2–3 h	4	0.2%	2	0.1%	1	0.2%	1	0.2%
More than 3 h	1	0.0%	1	0.1%	0	0.0%	0	0.0%
Don't know/Refused	1433	61.9%	850	61.0%	307	68.8%	276	57.9%
<i>Miles from home to primary store for Asian grocery items?<sup>a</sup></i>								
Less than 0.5 miles	63	2.7%	37	2.7%	9	2.0%	17	3.6%
Between 0.5–1 miles	115	5.0%	66	4.7%	23	5.2%	26	5.5%
Between 1–2 miles	189	8.2%	111	8.0%	38	8.5%	40	8.4%
Between 2–3 miles	171	7.4%	99	7.1%	32	7.2%	40	8.4%
Between 3–4 miles	157	6.8%	97	7.0%	33	7.4%	27	5.7%
Between 5–10 miles	362	15.6%	228	16.4%	63	14.1%	71	14.9%
Between 10–15 miles	164	7.1%	99	7.1%	30	6.7%	35	7.3%
Between 15–20 miles	96	4.1%	61	4.4%	14	3.1%	21	4.4%
More than 20 miles	109	4.7%	67	4.8%	17	3.8%	25	5.2%
Don't know/Refused	1468	63.4%	872	62.6%	311	69.7%	285	59.7%
<i>Reasons for purchasing Asian grocery items from primary store?<sup>a</sup></i>								
It has the best prices	437	18.9%	247	17.7%	90	20.2%	100	21.0%
It has the best food quality	459	19.8%	262	18.8%	107	24.0%	90	18.9%
It is clean	260	11.2%	133	9.5%	71	15.9%	56	11.7%
It is easy to find the items and brands that I like/need	740	32.0%	436	31.3%	148	33.2%	156	32.7%

**Table 3** (continued)

	Total		East Asian		South Asian		Southeast Asian	
	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD	N or mean	% or SD
It carries items and brands that I like to buy	1061	45.8%	655	47.0%	186	41.7%	220	46.1%
It is near or on the way to a place I frequently go to	327	14.1%	181	13.0%	75	16.8%	71	14.9%
It is convenient, for example, it saves me time or offers delivery services	208	9.0%	103	7.4%	52	11.7%	53	11.1%
It is not crowded	172	7.4%	84	6.0%	37	8.3%	51	10.7%
The staff are friendly or I know them	148	6.4%	59	4.2%	49	11.0%	40	8.4%
It has good service	164	7.1%	79	5.7%	51	11.4%	34	7.1%
Another reason	29	1.3%	14	1.0%	6	1.3%	9	1.9%
Don't know/Refused	19	0.8%	12	0.9%	2	0.4%	5	1.0%
<i>Online grocery shopping, retailer type<sup>b</sup></i>								
Amazon Prime Pantry	510	60.4%	232	57.0%	170	65.6%	108	60.7%
Peapod	89	10.5%	32	7.9%	38	14.7%	19	10.7%
Fresh Direct	113	13.4%	46	11.3%	42	16.2%	25	14.0%
iFresh	38	4.5%	15	3.7%	13	5.0%	10	5.6%
Other	261	30.9%	148	36.4%	62	23.9%	51	28.7%
<i>Online grocery shopping, language used on website<sup>b</sup></i>								
English	821	97.3%	394	96.8%	251	96.9%	176	98.9%
Language other than English	18	2.1%	12	2.9%	5	1.9%	1	0.6%
Don't know/Refused	5	0.6%	1	0.2%	3	1.2%	1	0.6%
<i>Online groceries, mostly delivery or pick-up<sup>b</sup></i>								
Home	527	62.4%	264	64.9%	164	63.3%	99	55.6%
Physical store location	298	35.3%	135	33.2%	89	34.4%	74	41.6%
Don't know/Refused/Missing	19	2.3%	8	2.0%	6	2.3%	5	2.8%
<i>Order groceries online for other people who do not live in your household?<sup>b</sup></i>								
Yes	268	31.8%	106	26.0%	99	38.2%	63	35.4%
No	549	65.0%	290	71.3%	151	58.3%	108	60.7%
Don't know/Refused/Missing	27	3.2%	11	2.7%	9	3.5%	7	3.9%
<i>Online groceries, how likely over next 6 months?</i>								
Very likely	490	16.9%	242	13.9%	144	25.3%	104	17.7%
Somewhat likely	607	21.0%	298	17.2%	178	31.2%	131	22.3%
Neither likely nor unlikely	597	20.6%	347	20.0%	111	19.5%	139	23.7%
Somewhat unlikely	432	14.9%	293	16.9%	58	10.2%	81	13.8%
Very unlikely	768	26.5%	557	32.1%	79	13.9%	132	22.5%
<i>Other ways you are getting food at home that you were not using before COVID-19?</i>								
None	146	25.3%	83	27.6%	39	24.4%	24	20.9%
Online orders	160	27.8%	81	26.9%	49	30.6%	30	26.1%
Neighbors	47	8.2%	19	6.3%	20	12.5%	8	7.0%
Family	69	12.0%	27	9.0%	26	16.3%	16	13.9%
Food delivery business	72	12.5%	39	13.0%	15	9.4%	18	15.7%
Food from my child's school to eat at home	20	3.5%	10	3.3%	6	3.8%	4	3.5%
Other/Refused	24	4.2%	11	3.7%	8	5.0%	5	4.3%

<sup>a</sup>Among participants who reported shopping for Asian grocery items.

<sup>b</sup>Among participants who reported shopping online for groceries.

<sup>c</sup>Among participants who reported that they or anyone from their household had not gone to the store for food in the last week.

online, potentially due to the availability of special foods. South Asian adults were the least acculturated subgroup in our sample, for example, and they were also more likely than other subgroups to purchase Asian grocery items online. It is possible that less-acculturated South Asian adults may be

able to find culturally-preferred foods (e.g., spices) in popular online retail websites, whereas, less-acculturated East and Southeast Asian adults may be able to find preferred items in their primary brick-and-mortar stores (e.g., soy sauce, fish sauce).



The variety and quality of goods were more likely to motivate South Asian adults to start shopping online for groceries; whereas, Southeast Asian adults, who reported lower income levels, were more likely to shop online due to low prices. Southeast Asian adults were also more likely to report buying sugar-sweetened beverages online, and less likely to report buying fresh fruits and vegetables online. Taken as a whole, these findings suggest that initiatives and changes designed to promote healthy food purchases among AA adults should be tailored to the food shopping considerations of ethnic subgroups. These findings echo our recent report examining changes in diet and food shopping behaviors among AA adults due to COVID-19, wherein a higher percentage of Southeast Asian adults reported not having sufficient financial resources to safely acquire an adequate supply of food compared to other AA adults [5].

Our work has important limitations. Because we recruited participants from an online panel, responses may be more generalizable to adults who are proficient at using the internet. Respondents also had higher levels of income and education than the total AA population in the U.S., so results are less generalizable to those with lower food budgets. However, we observed wide variation in generational status and acculturation score in our sample, and we had a large sample size overall. We also collected data disaggregated by country of origin, which allowed us to compare responses by ethnic subgroup.

Given the capacity for online grocery shopping to address racial/ethnic inequities in health, including mitigating disparities in food access and protecting individuals during emergencies [10], our work highlights which issues related to online shopping could be addressed by interventions and for whom these changes would have the greatest impact. For example, offering high-quality and culturally-specific grocery items may increase the use of online grocery shopping among less-acculturated AA adults, similar to other culturally-tailored programs. Our findings also strengthen the argument that disaggregating responses by racial/ethnic subgroup is an essential next step in survey research. Future researchers may want to explore differences in the availability of culturally-preferred food items and brands in online versus brick-and-mortar stores, and how the availability of Asian-specific online retailers influences online food purchasing behaviors.

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**Authors Contribution** PR, LT, and SY conceived of the study design. PR analyzed and interpreted the data. SA and JK were involved in the literature search and development of survey questions. All authors were involved in writing the paper and had final approval of the submitted and published versions.

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