

## Development of a Food List to Assess the Diet of South Asians Living in the U.S.: Preliminary Results From a Formative Study



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**Introduction:** South Asians are an underrepresented population subgroup in the U.S., yet they have higher rates of chronic diseases. There is currently no tool that assesses the nutrition intake of South Asians in the U.S., despite their unique dietary profile that may be associated with disease outcomes. The objective of this preliminary study was to create a food list, inclusive of herbs and spices, that will be used in the development of the web-based South Asian Food Intake System for dietary assessment of South Asian adults living in the U.S.

**Methods:** Authors used a Qualtrics survey to collect sociodemographic information ( $n=66$ ), and 24-hour diet recall and Home Food Inventory interviews were conducted through Zoom ( $n=31$ ). Grocery store tours and cookbook and existing food frequency questionnaire review were conducted.

**Results:** A food list of 484 individual food items was generated. These items were sorted into 12 main food categories and condensed into 302 line items. Most respondents (68%) reported consuming South Asian meals regularly and utilizing herbs/spices during food preparation (83%).

**Conclusions:** This pilot study describes the data collection to develop a food list for the South Asian Food Intake System, which can be utilized by educators, clinicians, and researchers to more accurately collect information about dietary intake among South Asian Americans.

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## INTRODUCTION

South Asians are among the fastest-growing immigrant group in the U.S.,<sup>1</sup> with a health profile that places them at an increased risk for noncommunicable diseases.<sup>2</sup> Our understanding of the role of diet in this increased risk remains limited. Although there are several dietary assessment methods available to assess food intake in adults and many that assess South Asian diet intake around the globe, tools that specifically examine the dietary intake of South Asian adults living in the U.S. are

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2773-0654/\$36.00

<https://doi.org/10.1016/j.focus.2023.100073>

extremely limited. The consequence of inadequately assessing culturally relevant dietary practices severely limits the epidemiologic ability to comprehensively evaluate the diet–disease relationship.

*South Asians*, defined as people with family origins in Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka,<sup>2</sup> have a rich diversity of cultural practices that are not adequately captured in existing dietary assessment instruments. Considering the importance of accounting for both the food and nutrient dietary diversity within the South Asian population group and their greater disease risk when compared with that of other Asian subgroups and non-Hispanic Whites (NHWs) in the U.S.,<sup>2,3</sup> investigators require dietary assessment tools that are specifically designed to capture the unique South Asian American diet. Furthermore, this diet is characterized by the inclusion of herbs and spices that are extensively used in food preparation. A validated and reliable tool that captures both traditional and western food items and preparation practices is essential for South Asians. To our knowledge, there is 1 tool that can be used to evaluate the diet of South Asians in the U.S. The Study of Health and Risk in Ethnic (SHARE) group food frequency questionnaire (FFQ) was developed to study the habitual dietary intake of ethnic minority groups, including South Asians living in North America.<sup>4</sup> The SHARE FFQ, validated in Canada over 20 years ago, is broadly utilized for dietary assessment among South Asians in North America and is only available in a paper-based format.<sup>4</sup> Therefore, there is a need to develop updated tools for a more accurate diet assessment of this population.

Drawing on the experience of developing a Pediatric Food Intake Technology System (P-FITS) by our research group, the design and development of the South Asian Food Intake Technology System (SA-FITS) is underway. SA-FITS is a novel technology-based, self-administered, and validated dietary assessment tool that specifically includes and addresses the food items and dietary patterns of South Asians living in the U.S. The SA-FITS will use pictures of foods and portion-size options, minimizing respondent burden and linking to nutrition databases that will be used to generate detailed reports on food and nutrient intake that can be utilized by clinicians and researchers alike. P-FITS added several unique highly viewed additions to the validated Vio-Screen FFQ used by P-FITS participants, such as inserting introductions to sections, and these features will be incorporated into SA-FITS.<sup>5</sup> The SA-FITS tool is intended to combine food items from the traditional and western diets and to capture the use of herbs and spices that are commonly used in cooking. Another unique aspect of the tool is that it can be used for specific food

groups or nutrients, depending on the educator's or researcher's needs.

The objectives of this study were to generate a preliminary food list by collecting detailed dietary data on South Asian adults living in the U.S., including quantitative and qualitative information on usual dietary practices, an interviewer-administered 24-hour dietary recall, and virtually conducted home food inventories. The resulting food list will be utilized to develop an interactive web-based SA-FITS tool. We believe that this novel dietary assessment method will be instrumental in assessing nutrition behavior across research, clinical, and community settings, which would improve the accurate characterization and understanding of the influence of dietary practices on noncommunicable disease risk and outcomes, such as cardiovascular disease and Type 2 diabetes,<sup>2</sup> among South Asian Americans.

## METHODS

### Overview

This study describes the first formative step in developing a food list that can be used for the SA-FITS technology. Study respondents were asked to complete a Qualtrics survey that queried sociodemographic information, food security, smoking and alcohol habits, and South Asian food purchasing and preparation. All 66 study respondents were invited to participate in an interview administered over Zoom, during which trained study personnel asked participants about their current dietary intakes and practices, and administered a Home Food Inventory (HFI).

### Study Participants

Adults aged >18 years, self-identifying as South Asian living in the U.S., and proficient in speaking, reading, and writing in English were recruited through social media platforms (Facebook, Twitter, and Instagram) in October 2020. The recruitment goal was to include South Asians with family origins from across the Indian subcontinent. The recruitment announcement post included online informed consent and a link to a Qualtrics survey. Participants were asked for their contact information so that study personnel could schedule an interview to collect 24-hour dietary recall information and HFI through Zoom. Participants received a \$10 Amazon gift card for completion of both the online survey and interview. The study was approved by the IRB at New York University.

### Data Collection

Participants self-reported gender identity; age; years lived in the U.S.; birthplace; education attainment;

marital status; living arrangement; state of residence; annual household income; religion; and smoking, food security,<sup>6</sup> alcohol,<sup>7</sup> and physical activity<sup>8</sup> through the Qualtrics survey. Prevalence and frequency of South Asian meal preparation were assessed using the Qualtrics survey. Participants were asked who prepared food at home, how often South Asian meals were prepared at home, who makes food purchases, access to a South Asian food store, and frequency of South Asian herb and spice use.

### Participant Interviews

Three study personnel were trained to conduct interviews in English, including prompting questions to ask about specific diets, representation of typical diet, and timeline of dietary intake. Participants were scheduled for 24-hour dietary recall, with the script modeled after the Automated Self-Administered 24-hour Dietary Assessment Tool,<sup>9</sup> and an HFI assessment through Zoom. Consent for audio and visual recording was confirmed. Participants were asked about their dietary intakes during the previous 24 hours, including all food and drink items, with particular attention to herb and spice utilization. Before concluding the 24-hour dietary recall, dietary information collected was reviewed and confirmed by the participant.

The HFI was collected after completing the 24-hour dietary recall on the same Zoom recording. Participants were asked to show all food items in their house, including dry goods, produce, prepared foods, beverages, and condiments. The kitchen and other locations in which food items were stored were surveyed until all items were recorded. Participants were instructed to read item names/brand names and show items to the camera for recording. Before concluding the interview, probing questions were asked to ensure that no section was missed from the HFI.

Recordings from the 24-hour diet recall and HFI were reviewed and transcribed by study personnel, with individual items entered into a food list. The food list was expanded using information from visits to South Asian grocery stores, cookbook reviews, and information from other South Asian food frequency questionnaires.<sup>4,10</sup>

## RESULTS

A total of 66 people (54 female, 82%) provided quantitative information regarding sociodemographic characteristics, food security status, and diet and lifestyle habits. Participant characteristics are shown in Table 1. The median age of participants was 27 years (range=20–65 years). Approximately half of the participants reported living in the U.S. for their whole life (53%;  $n=35$ ), and

the majority had earned a bachelor's degree or greater (91%;  $n=60$ ). Participants reported origins from across the Indian subcontinent, including India, Pakistan, Nepal, and Bangladesh. Respondents currently reside in areas across the U.S., including the Northeast, Southeast, Midwest, and West.

Health behaviors, food security, and food preparation and purchasing habits are shown in Table 2. Most participants reported never smoking (91%;  $n=60$ ) and low alcohol intake (44%;  $n=29$  reported never drinking alcohol). Most participants met the criteria for high food security (88%;  $n=58$ ). When queried about food purchasing and meal preparation, most participants reported living near a South Asian food store (74%;  $n=49$ ) and reported consuming South Asian meals regularly, with 38% of participants consuming South Asian meals at home daily. In general, participants shared the food purchasing and preparation with other people with whom they lived.

There were 31 respondents (90% female; with median age=26 years, range=20–65 years) who participated in 24-hour dietary recall and HFI interviews. The interviews typically took about 45–60 minutes, with most of the time (>75%) devoted to performing the HFI and providing greater detail and clarification about food items that were typically consumed by individuals. Overall, 484 unique food items were collected during the interviews, FFQ reviews, and grocery store visits (Figure 1). These items were further sorted into 12 main food categories (beverages; eggs and dairy; vegetables; fruit; beans, legumes, and nuts; meat, fish, and poultry; grains; mixed dishes; desserts and sweets; miscellaneous and condiments; herbs, spices, and seeds; and fats and oils), which condensed individual foods into 302 line items (215 foods, 73 herbs and spices, 14 fats and oils). Figure 2 provides an example of how individual foods were categorized and collapsed into line items.

## DISCUSSION

The objective of this pilot study was to generate a food list by collecting dietary data from a sample of South Asian adults that will be used in the development of the novel web-based SA-FITS. SA-FITS will be designed as a tailored dietary assessment instrument to better capture the intake patterns of South Asians in the U.S. Recruitment through social media platforms with interviews conducted using Zoom will remain a tenable strategy for focus group recruitment in the next phase of data collection.

Development of the SA-FITS has the potential to transform the collection and utilization of dietary information in research and education. Although the FFQ is

**Table 1.** Sociodemographic Characteristics of Survey Respondents and Interview Participants (n=66)

Characteristics	All Survey respondents (n=66)	Interview respondents (n=31)
Female, n (%)	54 (82)	28 (90)
Age (years), median (range)	27 (20–65)	26 (20–65)
Lived in U.S. whole life, <sup>1</sup> n (%)	35 (53)	15 (48)
Years lived in U.S., <sup>2</sup> median (range)	19 (1–56)	21 (3–56)
Country of birth, <sup>3</sup> n (%)		
India	13 (20)	8 (26)
Pakistan	8 (12)	3 (10)
Bangladesh	5 (8)	3 (10)
Nepal	2 (3)	2 (6)
Other	8 (12)	3 (10)
Bachelors' degree or higher, n (%)	60 (91)	28 (90)
Married/living with a partner, n (%)	35 (53)	13 (42)
Living status, n (%)		
With spouse/significant other	27 (41)	12 (39)
With immediate family members	31 (47)	15 (48)
With nonrelated roommates or alone	8 (12)	4 (13)
Current residence, n (%)		
Northeast	37 (56)	18 (58)
Southeast	10 (15)	6 (19)
Midwest/Central	8 (12)	3 (10)
West (including Hawaii)	10 (15)	4 (13)
Annual income, n (%)		
<\$40K	8 (12)	4 (13)
\$40–100K	19 (29)	8 (26)
\$100–250K	25 (38)	15 (48)
>\$250K	12 (18)	2 (6)
Religion, n (%)		
Muslim	36 (55)	18 (58)
Hindu	17 (26)	6 (19)
Other	12 (18)	7 (23)

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a commonly used tool in nutritional epidemiology and especially observational studies owing to ease of use and lower participant burden than other methods,<sup>11,12</sup> it is well established that using an FFQ that is not representative of participant dietary patterns owing to differences from national intake largely risks misclassification and bias.<sup>12,13</sup> The most commonly used FFQs in the U.S., including the Block FFQ<sup>14</sup> and Willett FFQ,<sup>15</sup> were designed for the general population, with data derived from NHW or Black respondents to the second National Health and Nutrition Examination Survey,<sup>16,17</sup> or NHW female participants in the first Nurses' Health Study,<sup>18,19</sup> respectively. This significantly limits the inclusion of culturally relevant food items, restricting research to the population for which the FFQs are validated. Similarly, FFQs that are developed for use in South Asian countries are specific to the populations and practices in those countries<sup>10,20–23</sup> and may not be appropriate for

assessing intakes of South Asians in the U.S. The food list developed in this study is inclusive of both western food items that can be found on the Block and Willett FFQs and traditional South Asian food items. Although some of these items appeared on the SHARE FFQ, there are many items, such as herbs and spices, that have not previously been included in widely used FFQs.

Researchers have called for culturally appropriate, population-specific dietary assessment methods and instruments,<sup>11,24</sup> yet these diverse populations remain underrepresented in the development of such tools. Consequences of underdeveloped tools can range from inadequate data collection to inaccurate nutrition intervention because of poor characterization of the diet–disease relationship.<sup>12</sup> An opportunity in nutrition research is the leveraging of technology to more comprehensively assess dietary intake while also minimizing participant and researcher burden.<sup>5,25</sup>

**Table 2.** Health Behaviors, Food Security, and Food Preparation and Purchasing Habits of Survey Respondents and Interview Participants (n=66)

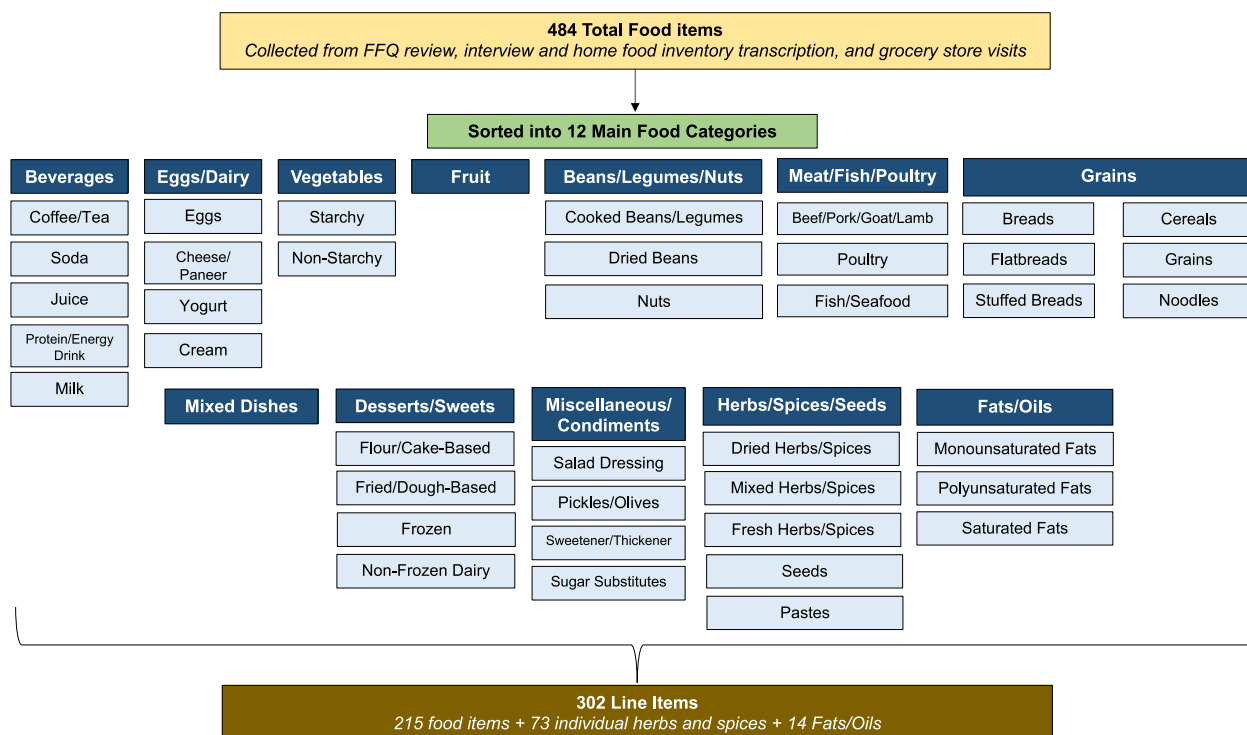
Characteristics	All survey respondents (n=66)	Interview respondents (n=31)
<b>Health behaviors</b>		
Smoking status, n (%)		
Former/occasional smoker	6 (9)	0
Never smoker	60 (91)	31 (100)
Alcohol frequency (drinks/week), n (%)		
0 drinks/week	29 (44)	15 (48)
<1 drink/week	13 (20)	7 (23)
1–7 drinks/week	18 (27)	7 (23)
>7 drinks/week	4 (6)	0
Food security, n (%)		
High food security	58 (88)	29 (94)
Low/very low food security	8 (12)	2 (6)
<b>Food preparation</b>		
Food Preparation at home, n (%)		
Participant	25 (38)	9 (29)
Spouse	4 (6)	1 (3)
Shared	16 (24)	10 (32)
Someone else	20 (30)	10 (32)
South Asian meals at home, n (%)		
Daily	25 (38)	14 (45)
5–6 times/week	6 (9)	3 (10)
3–4 times/week	14 (21)	5 (16)
1–2 times/week	18 (27)	8 (26)
Never	2 (3)	0
<b>Food purchasing</b>		
Who makes food purchases, n (%)		
Participant	21 (32)	11 (35)
Spouse	7 (11)	1 (3)
Shared	25 (38)	13 (42)
Someone else	12 (18)	5 (16)
Live near South Asian grocery store, n (%)		
Yes	49 (74)	24 (77)
No	16 (24)	6 (19)
Use of herbs and spices, n (%)		
Always	29 (44)	13 (42)
Very often	26 (39)	14 (45)
Sometimes	8 (12)	2 (6)
Rarely/never	2 (3)	1 (3)

### Limitations

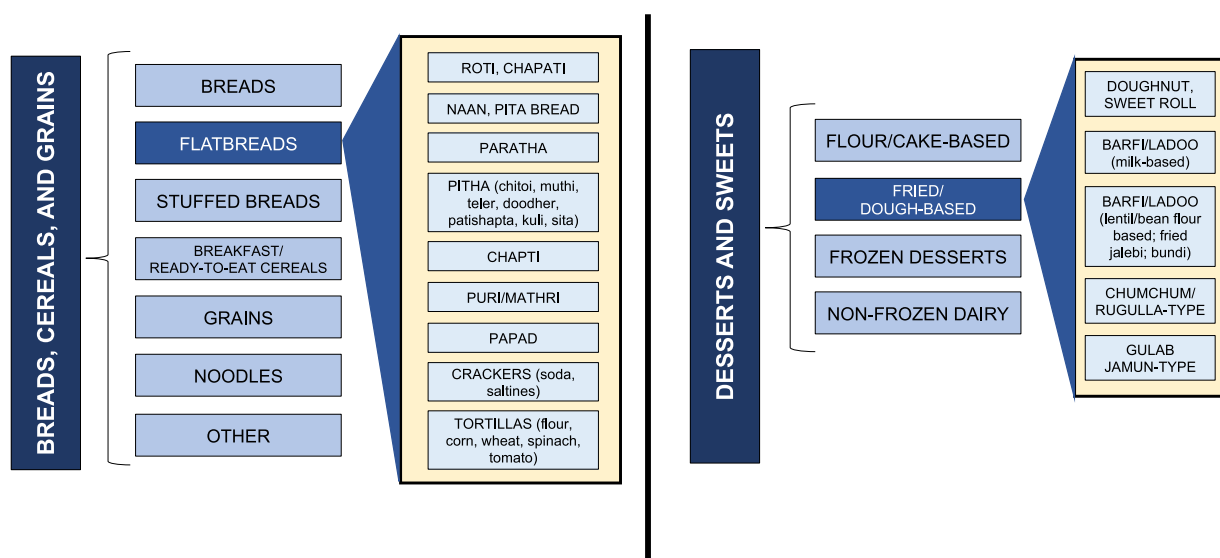
Our study should be interpreted in light of some limitations. This formative study is comprised predominantly female, younger adults with high educational attainment. All participants were proficient in English and were recruited through social media. The purpose of this first step of the project was to collect information on individual food items consumed by South Asians living in the U.S., creating a food list that will be modified and reviewed with additional participants in future steps of the process, as displayed in the Figures. Planned next

phases of the project will prioritize the inclusion of a more diverse sample, expanding the scope of recruitment to include more men, middle- to older-aged adults, and a broader range of occupations and educational attainment to ensure the sample is representative of South Asians living in the U.S. Recruitment methods, such as physical flyers, will be adjusted to support broader sample diversity.

This pilot study provides valuable information on the diversity of South Asian foods to develop a comprehensive food list and will inform the food line items to build



**Figure 1.** SA-FITS food list. Collection of a total of 484 individual items were done through FFQ reviews, study participant interviews, and grocery store visits, which were organized into 12 main food categories (39 subcategories) and condensed into line items. This panel shows the organization of food items into main food categories and subcategories. FFQ, food frequency questionnaire; SA-FITS, South Asian Food Intake Technology System.



**Figure 2.** Examples of food list items. Examples of main food categories, their subcategories, and individual line items within each subcategory. Line items are inclusive of both traditional South Asian fare and American food items. These will be used as line items in the SA-FITS.

SA-FITS, South Asian Food Intake Technology System.



the SA-FITS. The next phase of this project will optimize the available technology, including the use of skip patterns and automated food groupings, incorporating a wide range of food items without overwhelming participants. The SA-FITS tool will use photographs of food items with depictions of portions alongside text descriptions that will better inform participants as they complete the SA-FITS.

Our findings from the Qualtrics survey, 24-hour dietary recall, and HFI confirmed that South Asians in the U.S. practice food purchasing, preparation, and consumption that are inclusive of both traditional South Asian food items and cooking ingredients and products that are consistent with the American diet. Reflecting these dietary practices in the SA-FITS is essential for comprehensive assessment. The next phase of this project will include focus groups with a sample representing different regions of South Asia as well as a wider educational and income range, which will further enhance the development of the SA-FITS. This will ensure proper inclusion of food items, serving sizes, and regular use of included ingredients.

## CONCLUSIONS

To our knowledge, there are no technology-based interactive diet assessment tools that estimate the nutrient and food intake of South Asian Americans. This preliminary study describes data collection procedures to develop a comprehensive food list for this population group, providing valuable information on their dietary practices and behaviors. This list can also be used for educational purposes to characterize the food items and dietary practices of South Asian adults more broadly. This study shows a unique opportunity to revolutionize dietary data collection by leveraging technology. In doing so, information about diet patterns and intake will become more accessible, which will better define the role of diet in disease prevention and treatment. Our immediate next step is to retest and reproduce the food list among South Asian groups organized by cultural heritage, which will more robustly inform the organization of food items and the development of the SA-FITS.

## ACKNOWLEDGMENTS

Bridget Murphy Hussain was supported by the Cancer Epidemiology Education in Special Populations (CEESP) student program, funded by the National Cancer Institute (NCI), Grant Number R25CA112383. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NCI or the National Institutes of Health (NIH). Mrs. Hussain thanks the CEESP program for their support and mentorship. The Pediatric Food Intake Technology (P-FITS) project

informing the current project was funded by NIH Grant Number R43HD1035311. Dr. Rupak Shivakoti is supported by R00HD089753.

The authors would like to thank student volunteers, Mia Blatt, Emily Hoey, and Supriya Lal for their assistance during data collection. We thank the participants who took part in the study.

The study was approved by the IRB at New York University (FY2020-4223).

Declaration of interest: none.

## CREDIT AUTHOR STATEMENT

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