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Local tastes and global flavors: food choice in the context of the nutrition transition in South India

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Abstract

This study aimed to quantify familiarity with and consumption of local, national, and global foods among adults in a newly globalizing district in India and to identify patterns of preferences for local or non-local foods. A sample of households with school-going children was selected in an urban, third-tier city and a rural village in Karnataka State, India. One man and one woman (*n* 937) aged 18 years or older from each of these households were interviewed with a bespoke quantitative survey instrument focused on nutrition and food choice. The results from the study showed that, across six major food groups, at least 80% of respondents reported local items as the most frequently eaten, compared to national (3.0-18.1%) and global (0-9.5%) items. Accessibility was reported as the prominent driver of food choice, with taste and healthfulness as the next most reported considerations. When presented with hypothetical food choice scenarios, including taste, hunger, and health, most participants opted for the local food option over non-local options: less than 17% of respondents switched preferences from local to non-local items. Men more often consumed global drinks and condiments than women; women more often reported having seen global food items advertised than men. Urban residents had higher odds of switching from local to non-local items than rural residents across all choice scenarios except if very hungry. As non-local food items are introduced into the consciousness and diets of people living outside of India's large metropolitan areas, understanding food choices may help inform efforts to improve nutrition.

Keywords Food choice · Food preference · Nutrition transition · India · Drivers of food choice

1 Introduction

Globalization is leading to changes in food environments everywhere, including availability, accessibility, and affordability of foods; these factors shape food choices (Glanz et al., 2007; Herforth & Ahmed, 2015). In turn, these food choices determine the nutritional content of what is bought, cooked, and consumed These processes may have far-reaching implications for health: the nutritional environment can entail disparities in health and globalizing food environments may be associated with a rise in NCDs (Glanz et al., 2005, 2007; Shetty, 2002). Examining food choices in the context of the nutrition transition can indicate how diets are maintained or altered with the introduction of new foods and changing markets.

India has been experiencing a nutrition transition concomitant with urbanization and globalization, and new, global foods are proliferating (Mattei et al., 2012; Misra et al., 2011b; Popkin, 2002, 2015; Satija et al., 2015; Shetty, 2002). This transition is shifting diets from traditional (local) staple foods toward global (non-local) foods that are prevalent in "westernized" diets; these are often characterized by refined carbohydrates, sugars, and fats (Gayathri et al., 2017; Misra et al., 2011b). Over a 20-year period, nationally representative surveys in India have shown a decreasing intake of cereals, pulses, and fiber and increasing intake of meat and oils, as well as of foods from outside of India (Satija et al., 2015; Shetty, 2002). Indian households on average have increases in disposable income due to national economic growth, entailing increasing disposable income spent on novel, global, and non-basic food items (Bishwajit, 2015). In India, people spend on average 3.5% of their income on a simple meal compared to 0.6% of a person's income in New

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York (UN World Food Programme, 2020). This disparity in food costs highlights the need for access to affordable food even as disposable income increases in India.

The retail industry in India has also been experienced growth of approximately 50% from 2012 to 2020, with the food and grocery category being the largest sector (IBEF, 2021; India 2022). In recent years, in addition to the local neighborhood *kirana* stores, food and groceries are sold at modern supermarkets and convenience stores, which have a larger assortment of products available in a single retail outlet (Panda, 2013). As there is an increasing confluence of local and non-local (national or global) foods in the regions undergoing a nutrition transition, it is important to understand people's food choices.

Over the past few decades, mass media, including television series and movies, has been attributed with facilitating the introduction of national and global (non-local) foods to a larger audience who may not have previously encountered those items in person (Gayathri et al., 2017). In addition, media and advertising promote prepared foods (Misra et al., 2011a, b), and these are being adopted and consumed by high socioeconomic status families as well as working class families (Misra et al., 2011a). Some studies propose that these dietary shifts, along with decreased physical activity, may lead to nutrition-related diseases, especially among urban and high-income people (Delisle, 2008; Jayalakshmi & Kannan, 2019; Misra et al., 2011b; Popkin et al., 2001).

Studies from India and elsewhere have indicated gender differences in conceptualizations of food and in food consumption. For example, studies have noted that women more frequently eat fruits and fiber and less frequently eat salt, fat, and meat compared to men (Wardle et al., 2004; Westenhoefer, 2005). Women more frequently consider eating healthy to be important, compared to men (Wardle et al., 2004; Westenhoefer, 2005). In Mysore, India, women considered healthfulness, sensory appeal, and convenience as more important in their food choice than did men (Sushma et al., 2014). There are gender differences in what is considered healthy, tasty, and convenient (Rappoport et al., 1993).

This study examined food choices among adults in South India to understand how people select among comparable items which are local or non-local, that is, brought from other parts of the country or from international sources. We considered patterns of familiarity with local and non-local items and with consumption of these items. We also compare eating patterns and food selection between men and women, as well as between rural and urban respondents, contextualized in India's changing food environment. The study is set in two communities: one urban community, where non-local food items have been increasingly available over the past decade, both from other parts of India and from global food markets; the other, a rural community, where these items are just starting to arrive.

2 Materials & methods

2.1 Study setting & population

To examine food choices in communities where the nutrition transition is unfolding, data were collected over 8 months in 2019 in a remote Northern district in Karnataka State, South India. Study participants were drawn using parallel representative samples of households with school-going children aged 13–21 years, third-tier city and in a rural village in the district. In each household, an adult man and an adult woman were invited to participate in the study. Of the 274 urban households sampled, 265 participated, resulting in a 97% response rate. Of the 225 rural households sampled, 222 participated, resulting in a 99% response rate. Across the 487 households sampled, there were 427 adult participants from rural households and 509 adult participants from the urban households.

2.2 Survey instrument

We developed, pre-tested, and piloted a bespoke survey instrument to be administered by trained interviewers. A sociodemographic module collected data on age, gender, education, occupation, household income and assets, and eligibility for the Public Distribution System, India's food security system. The food choice module drew on a previously developed database we created of over 1,000 foods and beverages available in Northern Karnataka. We categorized items in the database into 6 food groups: (a) fruits and vegetables; (b) cereals and pulses; (c) snacks; (d) animal products; (e) oils, sweeteners, condiments; and (f) drinks (Appendix, Table 8). Each item was classified as local, national, and global, based on our previous research and experiences of local team members (Shaikh et al., 2016). Local items are those that are considered common and have a long history of being eaten in this district. National items are foods that are commonly consumed in India, but have only recently been brought to the district by integrating food markets or by migrating tradespeople. Global foods are from outside of India, having newly arrived through integrating international food markets. A nuanced example of this classification can be noted with soft drinks, which we categorized as national food items in our study, as they have been in India for decades, whereas diet soft drinks, we categorized as global foods due to their novelty in India. From the database, 12 of the most common items from each food group were selected, for a total of 72 items. Each item was printed onto a laminated, colored picture card and was shown to respondents as part of the food choice module. For example, a respondent could be shown 3 fruits and vegetables cards: one showing banana (local), one showing apple (national), and one showing dragon fruit (global). See

Appendix Table 8 for more details regarding the classification of the food items. All study instruments, consent forms, and participant information sheets were translated to Kannada, the local language, and then back-translated to English to ensure correct interpretation.

2.3 Data collection

Data collection took place from January to October of 2019. Data were collected through in-person home visits by a team of 8 interviewers and 2 supervisors. Four teams, each consisting of 2 interviewers, 1 man and 1 woman, were created to visit each sampled household; one to conduct the interview and the other to note the responses. The 2 supervisors observed interviews and facilitated interview appointments.

The interviewers were trained in the local language, Kannada, by one of the authors (Co-PI) who is from the local institute in the study area, along with 2 research assistants, who also served as supervisors. The team carried out pilot testing on 50 adults who were visiting patients in the nearby hospital and retraining conducted prior to final field data collection.

In each household, one respondent, usually the household head, reported household socioeconomic information. The same adult respondent and an additional adult household member of the opposite gender each completed the food choice module separately. All interviews were conducted in Kannada after receiving consent from participants and lasted approximately 45 min. Some households required 2–3 visits to complete interviews from both adult respondents.

Data were entered by 2 data entry persons after checking for data errors with field supervisors to ensure data quality. Data errors were corrected and data were deidentified prior to analysis.

2.4 Variables

One respondent reported on each household member's age, relation to head of household, gender, marital status, education, and occupation (categorized for analysis as cultivation, herdsman, agricultural wage labor; non-agricultural wage labor; craftsman/independent work, petty shop/small business, organized trade/business of more than five employees; salaried employees, professional; housewife; other). The respondent also provided information on household size, caste (collapsed for analysis as General Caste, Other Backward Caste, and Scheduled Caste/Scheduled Tribe), religion (dichotomized for analysis as Hindu and non-Hindu), monthly household income (categorized for analysis as < INR 5000, INR 5000–10,000, INR 10,001–20,000, INR 20,001–30,000, and > INR 30,001 (1 EUR = 77.761 INR (Indian Rupees) as of October 2019), source of income (categorized as salary from employment, owning a business, pension, rent, government welfare program, waged labor,

agriculture income, animal husbandry, other source), home ownership (categorized as owns house vs. rents house), land ownership (categorized as neither owned nor leased land, owned land, or leased land for cultivation), and water supply (dichotomized as yes or no for having a separate water supply to the house). Respondents' location is categorized as rural or urban.

The sampled man and woman in each household individually responded to a food choice module, which collected information on familiarity with, consumption of, and preferences for local, national, and global foods.

To reduce respondent burden, each respondent was randomized to only 3 of the 6 food groups and then for each of the 3 food groups, the respondent was randomized to 3 picture cards (one local, one national, one global) (Appendix, Fig. 1). For example, a respondent could be shown 3 drinks cards: one showing buttermilk (local), one showing lassi (national) and one showing energy sport drinks (global). To identify familiarity of a food item, respondents were asked whether they had ever seen it at home, at the market, advertised on TV, or at a friend's house, with multiple responses possible. Respondents were asked which of the 3 items in the set (such as buttermilk, lassi, or energy sport drink) they consume most frequently and which of the following 5 factors was the main reason the selected item was the most frequently consumed: (a) is cheap, (b) is easy to find, (c) gives energy, (d) is healthy, and (e) is tasty. The food choice questions were repeated for 2 more food groups, so respondents were asked about 9 picture cards in total.

Respondents were then asked questions posing 5 hypothetical food choice scenarios: which of the 3 items shown to them on the picture cards from each food group they would choose if they (i) had an additional 250 Indian Rupees (INR) to spend (equivalent to 3.21 EUR as of October 2019); (ii) wanted something tasty; (iii) wanted to select something for health reasons; (iv) were very hungry; or (v) had very little time to prepare food. See Appendix, Fig. 1 for an example of the food choice question sequence.

For each of the 6 food groups, we calculated the proportion of respondents who chose a local item (such as chakli, a local snack) as the one they most frequently consumed and then chose a non-local item (such as pastries, a global snack) in a hypothetical choice scenario, rather than choosing the local food item in each instance. Similarly, we calculated the proportion of respondents who chose a non-local food item as their most frequently consumed item and then chose a local food item in a hypothetical choice scenario, rather than staying with the non-local food item. From these we identified (1) *changing preference* from local to non-local items, (2) *changing preference* from non-local to local items and (3) *maintenance in preference* for local or non-local items. See Appendix, Table 8 for more details regarding the classification of the food items.

2.5 Statistical analysis

Descriptive statistics were estimated to examine the distribution of variables and associations between them. T-tests, Pearson's chi-square, and Fisher's exact tests were run to compare differences in familiarity and consumption of local, national, and global food items between men and women, as well as preference for non-local (national or global) food items versus local food items and whether they differ by food group and between men and women. We estimated a logistic regression model for the odds of changing from local to non-local food items for each choice scenario, adjusting for gender, age, location, education, and food group dummy variable. The analyses were conducted at Emory University using the statistical analysis software Stata, version 16.0.

3 Results

Individual and household characteristics are shown in Table 1. Respondents had a mean age of 45 years and 52% were women. Nearly 32% had never attended school, 28.4% worked in the agricultural sector, and 73.2% identified as Hindu. The average household size was approximately 6 people and about 50% of households owned land. A third of households had a monthly income between INR 5,000–10,000 (32.4%) and 54% had a monthly income of more than INR 10,000 (equivalent to 128.60 EUR as of October 2019). Approximately two-thirds of respondents reported PDS use (63.0%). Just under half of respondents live in a rural location (45.6%). The majority of households owned their house (84.6%) and had a separate water supply to their house (88.1%).

Across the 6 food groups, the most frequently eaten items were local items (Table 2): almost 100% of respondents reported consuming local items, with slightly lower consumption for animal products (91%) (Table 2). National items were also consumed by most respondents, ranging from 98% for fruits & vegetables to 54% for animal products. Consumption of global foods was lower; the most commonly eaten global items were animal products, with 53% of respondents having ever eaten from among these.

For three items in each of the 6 food groups, respondents were asked whether they had ever seen it and whether they had ever consumed it. Of the three items, one was local, one national, and one global, and they were asked which of the three they most frequently consumed. See Appendix, Fig. 1 for details regarding how food choice questions were asked. Table 2 shows the percentage of adults who had ever seen and ever consumed items. Also shown is the percentage of adults who most frequently consumed the local, national, and global items within each food group (Table 2). Across all 6 food groups, local and national items were most commonly

Table 1 Sociodemographic characteristics of adults and their households in Northern Karnataka, India

	% or mean value
Adult characteristics (*n* 937)	
Age (years)	44.9
Gender	
Man	48.2%
Woman	51.8%
Education	
Never attended	31.6%
Pre/primary school	22.5%
High school	16.8%
PUC/Diploma	12.4%
Degree and above	16.8%
Occupation	
Cultivation, herdsman, agricultural wage labor	28.4%
Non-agricultural wage labor	10.8%
Craftsman, small business, large business	13.2%
Salaried employees, professional	17.1%
Housewife	26.5%
Others	4.1%
Religion	
Hindu	73.2%
Muslim, Christian, Jain	26.8%
Household characteristics (*n* 487)	
Household size	5.7
Monthly household income (INR)[a]	
Less than Rs. 5000/-	14.4%
Between Rs. 5000 to 10,000/-	32.4%
Between Rs. 10,001 to 20,000/-	23.8%
Between Rs. 20,001 to 30,000/-	10.5%
More than Rs. 30,000/-	18.9%
PDS use[b]	63.0%
Location	
Rural	45.6%
Urban	54.4%
Owns house	84.6%
Owns land	50.3%
Separate water supply	88.1%

[a] INR = Indian Rupees (1 EUR = 77.761 INR, October 2019)

[b] PDS = Public Distribution System. PDS refers to India's food security system, which provides food and non-food items at subsidized prices for households in need

seen at the market (62.9–100.0% for local and 70.5–99.6% for national foods) and at home (77.3–98.8% for local and 17.1–76.6% for national foods). Few items were seen advertised, but global items were the most often recognized from television or store advertisements: 0.4–18.4%, compared to 0-1.4% for local items and 0-3.5% for national items. Of the local, national, and global items across all 6 food groups, respondents were more often reporting having local fruits

Table 2 Familiarity and consumption of local, national, and global food items among adults in Northern Karnataka, India, by gender

Characteristic	Fruits & vegetables (%)		Cereals & pulses (%)		Snacks (%)		Animal products (%)		Oils, sweeteners, condiments (%)		Drinks (%)	
	W n 231	M n 230	W n 255	M n 248	W n 276	M n 234	W n 210	M n 176	W n 200	M n 187	W n 283	M n 281
Ever consumed												
Local/traditional[a]	99.1	100.0	100.0	100.0	99.6	99.6	88.1	94.3*	100.0	99.5	98.2	99.6
National/mixed	100.0	97.8*	80.8	85.5	85.1	84.2	53.3	55.7	76.5	77.5	78.8	90.8*
Global/modern	17.3	17.0	32.2	28.6	51.5	42.7*	52.9	54.0	8.5	19.8*	9.2	22.4*
Most frequently eaten												
Local/traditional	89.2	87.4	91.8	91.9	81.2	86.8	77.1	84.1	96.5	91.4	87.3	82.6
National/mixed	10.4	12.6	6.7	6.9	18.1	12.0	10.5	8.5	3.0	7.5	12.0	15.7
Ever seen												
Local/traditional												
Advertised on TV/for sale	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.4	0.0
Had it with a friend	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.1	0.0
Seen it at market	100.0	90.8*	89.8	75.0*	75.7	84.2*	86.2	79.6	86.5	80.8	62.9	71.5*
Have it at home	96.5	80.9*	98.8	95.2*	93.8	90.6	82.4	77.3	98.5	89.3*	91.9	89.7
National/mixed												
Advertised on TV/for sale	0.0	0.0	0.0	0.0	1.1	0.0	1.4	0.0	3.5	0.0*	1.1	0.0
Had it with a friend	0.4	0.0	0.8	0.8	4.4	1.3	5.2	1.1*	0.0	0.0	0.0	0.0
Seen it at market	99.6	95.7*	95.3	91.5	90.9	90.6	70.5	77.8	89.0	89.3	95.4	97.5
Have it at home	76.6	60.9*	53.3	42.3*	55.4	41.0*	28.1	17.1*	51.5	32.1*	44.2	19.6*
Global/modern												
Advertised on TV/for sale	3.5	0.4*	18.4	4.8*	13.0	2.1*	1.9	0.6	7.0	1.1*	8.8	3.2*
Had it with a friend	0.4	0.0	0.4	0.0	1.5	0.0	1.4	0.6	0.5	0.0	0.4	0.4
Seen it at market	39.8	45.2	51.8	54.8	75.4	73.9	77.1	73.9	33.0	49.2*	33.6	45.9*
Have it at home	14.7	7.8*	30.6	16.9*	34.8	23.1*	16.7	11.9	7.5	4.8	7.1	5.7

W woman, *M* man

*p < 0.05

[a] Local refers to items considered common and that have a long history of being eaten in the study region. National refers to items that are commonly consumed in India but have only recently been brought to the district. Global refers to items from outside of India that have newly arrived. Advertised includes on television or at a store

and vegetables, cereals and pulses, snacks, drinks, and oils, sweeteners, and condiments at their homes.

Comparing food recognition for men and women, local snacks (75.7% v. 84.2%) and drinks (62.9% v. 71.5%) were reported to be seen at the market less frequently by women than by men. Across all food groups, women identified national items as being found at home more often than men. Women also reported having national animal products at home (28.1%) and having seen these at a friend's place (5.2%) more often than did men (17.1% and 1.1%). Women reported having ever seen global fruits and vegetables (3.5%), cereals and pulses (18.4%), snacks (13.0%), drinks (8.8%), oils, sweeteners, and condiments (7.1%) advertised on TV or for sale more often than did men (0.4%, 4.8%, 2.1%, 3.2%, and 1.1% respectively). Men reported having ever seen drinks (45.9% v. 33.6%) and oils, sweeteners, and condiments (48.9% v. 32.8%) at the market more than women.

Men more often consumed non-local items: they reported having ever consumed national (90.8%) and global (22.4%) drinks and global oils, sweeteners, and condiments (19.8%) more than did women. Women reported consuming global snacks (51.5%) more often than did men (42.7%).

When asked about the reasons for frequently eating the most frequently consumed item, the main reason given for most food groups was that the item was easy to find; this reason was especially common for fruits and vegetables (50.5%) and cereals and pulses (82.9%) (Table 3). Other frequently cited reasons were healthfulness (for cereals and pulses, animal products, and drinks) and taste (for snacks, fruits and vegetables, and oils, sweeteners, and condiments). Price was infrequently cited as the primary reason guiding food selection – it was mentioned for fruits and vegetables, but only by 1.7% (Table 3). These findings are consistent even when stratified by PDS use (Appendix, Table 9). Men

Table 3 Reason for choosing most frequently eaten item among adults in Northern Karnataka, India

Characteristic	Fruits & vegetables (%)	Cereals & pulses (%)	Snacks (%)	Animal products (%)	Oils, sweeteners, condiments (%)	Drinks (%)
	n 461	n 503	n 510	n 386	n 387	n 564
Cheap	1.7	1.0	0.6	1.3	1.6	1.2
Easy to find	50.5	82.9	43.9	41.7	56.6	44.3
Energy	2.6	3.4	0.6	12.2	1.6	1.4
Healthy	22.1	7.8	0.8	28.0	3.6	26.6
Tasty	22.6	4.8	53.7	15.3	35.4	26.1
Other	0.4	0.2	0.0	0.3	1.0	0.0
None eaten	0.0	0.0	0.4	1.3	0.3	0.4

Each respondent was asked about 3 randomly selected food groups, therefore the total number of respondents per food group is noted under each food group

less often mentioned "easy to find" as the main reason for choosing foods than women.

Table 4 shows the proportion choosing local, national, and global foods under hypothetical choice scenarios. Across the 6 food groups, when respondents wanted something healthy, local items were the most popular choice, ranging from 49.8% (fruits and vegetables, women) to 81.3% (animal products, men). Local items were also commonly the preferred option if the respondent was hungry, had additional money, or wanted something tasty. Comparing men and women's choices in these scenarios, women chose local items more frequently than men under most scenarios. Some exceptions to these patterns were for cereals and pulses: when feeling hungry or when there was little time to prepare food, women less often than men chose local grains.

Table 5 shows the prevalence of changing from selecting a local item to a non-local item and the likelihood of changing from selecting a non-local item to a local item in hypothetical choice scenarios, by gender. Change in preference refers to the calculated proportion of respondents who chose a local food item as their most frequently consumed item and then chose a non-local food item in a hypothetical choice scenario, compared to those who chose local food items in each instance. In the scenario of having additional money, respondents more often switched from local to non-local food items rather than switched from non-local to local foods when considering most foods: fruits and vegetables, cereals and pulses, animal products, and drinks. If respondents wanted something tasty, they more often switched from local to non-local items than from non-local to local items in all food groups except oils, condiments, and sweeteners. Women were 10.7 percentage points more likely than men to switch from a local to non-local cereals and pulses if they had additional money to spend. When it came to choosing something healthy among animal products, men and women switched at least 32 percentage points more frequently from non-local to local than from local to non-local. Men were more likely to switch than women from non-local to local

cereals and pulses if they were feeling very hungry. If there was little time to prepare food, women were 16.4 percentage points more likely than men to switch from local to non-local cereals and pulses.

Table 6 compares among people living in an urban and a rural location, the prevalence of changing from selecting a local item to a non-local item and the likelihood of changing from selecting a non-local item to a local item in hypothetical choice scenarios. Regardless of location, if the respondents had additional money, they more often switched from local to non-local when considering most foods: fruits and vegetables, cereals and pulses, animal products, and drinks, which is consistent with the results by gender in Table 5 for the same choice scenario. When it came to wanting something tasty, rural respondents were 20.4 percentage points less likely than urban respondents to switch from non-local to local snacks. If respondents wanted something healthy among snacks and oil, sweeteners, and condiments, rural respondents were at least 10.8 percentage points more likely to switch from local to non-local than their urban counterparts. Rural respondents were at least 7.4 percentage points more likely to switch from non-local to local drinks and fruits and vegetables than urban respondents if they were hungry. If there was a little time to prepare food, rural respondents were 2.3 percentage points less likely to switch from local to non-local fruits and vegetables and 9.6 percentage points less likely to switch from local to non-local drinks compared to urban respondents.

Table 7 shows the odds of changing from local to non-local food items after adjusting for gender, age, education, and food group dummy variable, which was created using food groups as predictors to ensure that the logistic regression model factored only the 3 applicable food groups per respondent. Multivariate models were used to identify factors associated with changing preference in hypothetical choice scenarios. The models were only applied to those who had reported that their most frequently consumed food was a local item, and the outcome variable was whether the respondent stayed with the local item

Table 4 Preference for local, national, or global food items among adults in Northern Karnataka, India, by hypothetical choice scenario

Characteristic	Fruits & vegetables (%)		Cereals & pulses (%)		Snacks (%)		Animal products (%)		Oils, sweeteners, condiments (%)		Drinks (%)	
	W	**M**	**W**	**M**	**W**	**M**	**W**	**M**	**W**	**M**	**W**	**M**
	n 231	*n* 230	*n* 255	*n* 248	*n* 276	*n* 234	*n* 210	*n* 176	*n* 200	*n* 187	*n* 283	*n* 281
Scenario: if…												
…had an additional Rs. 250												
Local/traditional[a]	48.5	53.5	41.6	52.0*	51.1	53.0	51.5	59.7	65.5	68.5	33.9	38.8*
National/mixed	46.8	42.2	31.8	30.7*	31.5	26.9	21.0	18.8	23.5	22.5	55.5	55.9*
Global/modern	3.5	3.0	18.0	10.9*	9.1	9.4	16.7	14.2	5.0	3.7	1.8	3.2*
…wanted something tasty												
Local/traditional	55.4	52.2	56.5	64.1*	64.9	67.5	50.5	59.7*	65.5	68.5	33.9	38.8*
National/mixed	42.9	43.5	32.2	30.2*	27.5	27.4	21.0	18.8*	23.5	22.5	55.5	55.9*
Global/modern	0.9	3.9	11.4	5.2*	6.2	3.4	16.7	14.2*	5.0	3.7	1.8	3.2*
…wanted something healthy												
Local/traditional	49.8	53.9	59.2	54.4	62.0	62.4*	75.2	81.3	62.5	58.3	55.8	52.7
National/mixed	43.7	41.7	37.7	44.0	27.2	17.5*	13.3	8.5	28.5	27.3	42.1	43.1
Global/modern	6.5	4.4	3.1	1.2	6.2	8.6*	11.0	8.5	3.5	8.6	1.8	3.6
…very hungry												
Local/traditional	43.3	41.3	55.3	66.9*	71.0	75.2	59.5	67.6	53.5	44.4*	68.6	71.9
National/mixed	51.1	56.1	27.1	22.2*	21.4	18.8	15.2	15.3	30.5	17.7*	30.4	26.0
Global/modern	5.6	2.2	16.5	10.5*	5.8	3.0	16.2	10.2	6.5	6.4*	0.0	1.1
…had little time to prepare food												
Local/traditional	45.9	43.5*	43.5	60.9*	69.2	74.8	61.9	71.6	50.0	43.3*	69.3	75.8*
National/mixed	46.8	54.4*	32.2	22.2*	21.0	16.2	11.4	8.0	32.0	17.1*	26.9	21.7*
Global/modern	5.6	2.2*	22.0	15.7*	6.9	6.0	17.1	11.9	6.0	5.9*	0.4	1.8*

Each respondent was asked about 3 randomly selected food groups, therefore the total number of respondents per food group is noted under each food group

W woman, *M* man

*p < 0.05

[a] Local refers to items considered common and that have a long history of being eaten in the study region. National refers to items that are commonly consumed in India but have only recently been brought to the district. Global refers to items from outside of India that have newly arrived

or selected a non-local item under the scenarios. The hypothetical choice scenarios were used as stratifying variables. Across all hypothetical choice scenarios, at least 82% stayed local. The most common reason for switching from local to non-local items was the availability of additional money (17.3%). When they imagined having more money, respondents had lower odds of changing from local to non-local for snacks [OR = 0.58, 95% (0.35, 0.95)] but higher odds of changing for oils, condiments, and sweeteners [OR = 1.61, 95% (1.02, 2.57)]. Urban respondents had higher odds of changing from local to non-local food items compared to rural respondents across all choice scenarios except if they were very hungry. Respondents had higher odds of changing from local to non-local across all food groups if they wanted something tasty and across all but the oils, sweeteners, and condiments group, if they wanted something healthy. Respondents had lower odds of changing from local to non-local items if they were very hungry for all food groups compared to cereals and pulses.

4 Discussion

This study described men's and women's familiarity, consumption, and preferences for local and non-local food items in Northern Karnataka, India. We examined the conditions under which local items were selected over non-local (national and global) foods and beverages. To assess under what conditions people change their food selection, we asked respondents what they would select in 5 scenarios: if they had additional money, wanted something tasty, needed to eat something healthy, were very hungry, or had little time to prepare food.

Local food items were the most frequently consumed across all food groups. When presented with the hypothetical scenarios, most adults still preferred the local food items over the non-local options. Regardless of the choice scenario, a higher proportion of rural and urban respondents switched from local to non-local items than from non-local to local

Table 5 Change in preference from local to non-local (versus local to local) or non-local to local (versus non-local to non-local) food items among adults in Northern Karnataka, India, by gender and hypothetical choice scenario

Characteristic	Fruits & vegetables (%)		Cereals & pulses (%)		Snacks (%)		Animal products (%)		Oils, sweeteners, condiments (%)		Drinks (%)	
	W n 231	M n 230	W n 255	M n 248	W n 276	M n 234	W n 210	M n 176	W n 200	M n 187	W n 283	M n 281
Would change selection if…												
…had an additional Rs. 250												
Local to non-local[a]	46.8	41.9	52.6	41.9*	40.9	38.3	30.4	26.8	28.2	23.6	58.3	53.3
Non-local to local	16.0	27.6	25.0	23.5	42.0	44.0	8.3	12.5	14.3	33.3	8.6	6.3
…want something tasty												
Local to non-local	40.0	42.0	39.7	32.6	27.7	25.3	30.8	23.8	32.8	32.1	32.2	34.6
Non-local to local	20.8	13.8	14.3	30.0	38.5	25.9	12.8	23.1	42.9	40.0	20.0	8.3
…want something healthy												
Local to non-local	47.1	45.3	40.2	44.1	31.5	25.6	17.3	12.9	33.0	35.6	40.7	41.1
Non-local to local	24.0	48.3	52.4	40.0	50.0	46.2	50.0	56.0	42.9	40.0	31.4	25.0
…very hungry												
Local to non-local	54.4	55.5	39.8	31.3	22.3	17.2	23.2	20.7	39.1	32.8	26.1	20.4
Non-local to local	24.0	20.7	9.5	50.0*	49.0	41.4	17.1	33.3	14.3	41.7	37.1	39.6
…had little time to prepare food												
Local to non-local	52.5	53.2	52.2	35.8*	21.7	17.7	21.9	14.6	41.4	31.3	23.9	16.9
Non-local to local	40.0	20.7	9.5	31.6	41.2	41.4	26.5	37.5	14.3	33.3	41.2	43.8

Each respondent was asked about 3 randomly selected food groups, therefore the total number of respondents per food group is noted under each food group. Change in preference refers to the calculated proportion of respondents who chose a local food item as their most frequently consumed item and then chose a non-local food item in a hypothetical food choice scenario compared to those who chose local food items in each instance, and likewise with change from non-local to local food items

W woman, *M* man

*$p < 0.05$

[a] Non-local includes national and global items

items when it came to fruits and vegetables. A higher proportion of urban residents switched from a non-local to a local snack if they wanted something tasty compared to rural respondents. The preference for a tasty local snack over a non-local snack may be due to the familiarity of foods one grew up eating. If they had more money, a higher proportion of people changed their selection from local to non-local food items compared to non-local to local foods for most food groups, except snacks – which is true whether stratified by gender or location. A higher proportion of urban respondents compared to rural respondents switched from local to non-local drinks in the scenario that they had little time to prepare food; non-local items which are generally available for purchase at food stalls or shops, especially in urban areas.

Men more often than women reported to have ever seen local snacks and drinks, and global drinks and oils, sweeteners, and condiments at the market. Women more often than men were reported to have seen a national animal product in a friend's house. In this community, women cook and therefore have greater awareness of the items at home, whereas men are usually in charge of shopping (Rajivan, 1999). The

men may not have seen the items individually even if they are in dishes that they eat. On the other hand, men reported seeing processed items more than women.

There was a higher proportion of adults who had seen global food and beverages advertised on TV or for sale compared to local or national food items. Women more often than men reported to have seen global items advertised, perhaps because men tend to work outside the home while women are indoors to see advertisements on TV. Another study, in metropolitan India, noted that women more often reported being influenced by recommendations from family or friends and advertisements compared to men (Mediratta & Mathur, 2023). Research from Mysore, India revealed that among adult respondents aged 20–40, their mothers had the greatest influence on respondents' purchasing processed foods, with media and television advertisements as the second greatest factor (Prakash, 2015). Previous research from across India has noted the use of advertising for non-local, processed foods, especially by transnational fast food and soft drinks companies, and attributed mass media with influencing the process of food globalization (Gayathri et al.,

Table 6 Change in preference from local to non-local (versus local to local) or non-local to local (versus non-local to non-local) food items among adults in Northern Karnataka, India, by location and hypothetical choice scenario

Characteristic	Fruits & vegetables (%)		Cereals & pulses (%)		Snacks (%)		Animal products (%)		Oils, sweeteners, condiments (%)		Drinks (%)	
	R	U	R	U	R	U	R	U	R	U	R	U
	n 203	n 257	n 241	n 262	n 225	n 283	n 178	n 200	n 172	n 213	n 253	n 308
Would change selection if…												
…had an additional Rs. 250												
Local to non-local[a]	44.8	43.8	51.7	43.1*	39.1	40.1	27.9	29.3	27.6	24.9	52.0	59.2
Non-local to local	24.0	20.7	20.0	27.3	44.4	41.0	13.5	4.5	33.3	23.1	13.3	3.8
…want something tasty												
Local to non-local	49.7	34.4	39.3	33.3	30.2	23.8	22.7	31.0	36.1	29.6	31.2	35.5
Non-local to local	16.0	17.9*	31.3	16.0	24.3	44.7*	20.0	12.0	33.3	46.2	10.0	15.1
…want something healthy												
Local to non-local	52.3	41.2	40.6	43.5	34.9	24.1*	16.2	14.5	41.3	28.5*	42.3	39.8
Non-local to local	48.0	27.6*	50.0	44.0	47.4	50.0	58.5	42.3	33.3	35.6	20.0	32.1
…very hungry												
Local to non-local	52.3	57.3	33.0	38.0	17.7	21.5	17.7	25.5	36.4	36.2	37.1	39.6
Non-local to local	28.0	17.2*	37.5	24.0	40.0	52.5	27.8	17.4	44.4	20.0	43.3	35.9*
…had little time to prepare food												
Local to non-local	51.4	53.7*	41.0	47.0	20.1	19.5	16.9	19.8	35.6	38.6	15.3	24.9*
Non-local to local	28.0	31.0	25.0	16.7	43.9	38.5	37.1	21.7	44.4	10.0	43.3	42.3

Each respondent was asked about 3 randomly selected food groups, therefore the total number of respondents per food group is noted under each food group. Change in preference refers to the calculated proportion of respondents who chose a local food item as their most frequently consumed item and then chose a non-local food item in a hypothetical food choice scenario compared to those who chose local food items in each instance, and likewise with change from non-local to local food item

R rural, *U* urban

*$p < 0.05$

[a] Non-local includes national and global items

2017; Misra et al., 2011a). Indeed, most had never seen local or national item advertised on TV.

Women more often switched from local to non-local if they had more money or if they had little time to prepare food than men. Since the non-local food items tend to be more processed than local food items, this change in preference from local to non-local items among women may be attributed to convenience as more of these products become available. One study in India found that when it comes to food choice, women find convenience more important than men (Sushma et al., 2014). Research from the United States found that men and women rate the convenience of food items similarly although they may have different meanings for what is considered convenient (Rappoport et al., 1993).

Accessibility was reported as the main reason for choosing the most frequently eaten item for all food categories except snacks. Women most often considered accessibility as the main reason for their choices. Taste and healthfulness were the next most reported reasons for choosing the most frequently eaten items. A study conducted in New Delhi, India reported that adults felt brand of the food product was

their most important criterion for selection, followed by nutritive value and taste (Mediratta & Mathur, 2023). These findings contrast previous research conducted in the United States, in which found taste and cost were the primary and secondary influences on food decisions, respectively (Glanz et al., 1998). This sheds light on global differences in food choices and warrants further research.

While other studies have examined shifts in food consumption, this study provides information on how people may change their food choice under different conditions. In discussions in our study communities, we conceptualized with interlocutors local foods as items that their grandparents would have commonly eaten when they were young in this part of the country; national foods were conceptualized as items that have been available in India even at the time of their parents' youth; they include items originating in Northern India, like samosas, and items that were brought to India through colonialization and earlier waves of globalization, such as tea biscuits and white bread. We selected food cards to incorporate into data collection used in the food choice module from a database of over 1,000 foods and beverages

Table 7 Odds of changing from local to non-local food items among adults in Northern Karnataka, India, by hypothetical choice scenario (*n* 937)

Choice scenario	…had an additional Rs. 250	…want something tasty	…want something healthy	…very hungry	…had little time to prepare food
Descriptive					
Local to local	*82.7%*	*89.1%*	*91.1%*	*92.2%*	*90.7%*
Local to non-local[a]	17.3%	10.9%	8.9%	7.8%	9.3%
Model	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Gender (ref. Woman)					
Man	1.16 (0.82, 1.72)	1.05 (0.66, 1.67)	0.73 (0.43, 1.14)	1.01 (0.59, 1.71)	1.67 (1.00, 2.79)
Age (years)	1.01 (0.99, 1.03)	1.02 (1.00, 1.05)*	1.01 (0.98, 1.03)	1.04 (1.01, 1.07)*	0.99 (0.97, 1.03)
Location (ref. Urban)					
Rural	0.99 (0.65, 1.53)	0.69 (0.41, 1.15)	0.76 (0.44, 1.31)	1.17 (0.63, 2.17)	0.97 (0.56, 1.70)
Education (ref. Never attended)					
Pre/primary school	0.69 (0.42, 1.15)	0.79 (0.47, 1.57)	0.56 (0.33, 1.07)	0.86 (0.42, 1.75)	0.86 (0.44, 1.70)
High school	0.37 (0.23, 0.62)*	0.39 (0.21, 0.71)*	0.82 (0.40, 1.69)	0.96 (0.43, 2.15)	0.52 (0.27, 1.02)
PUC/Diploma	0.73 (0.39, 1.36)	1.01 (0.42, 2.43)	1.48 (0.56, 3.95)	0.59 (0.26, 1.36)	0.69 (0.31, 1.56)
Degree and above	0.54 (0.30, 0.92)*	0.52 (0.25, 1.11)	1.00 (0.43, 2.35)	0.40 (0.18, 0.89)*	0.44 (0.20, 0.95)*
Food group (ref. Cereals & Pulses)					
Fruits & Vegetables	0.92 (0.57, 1.48)	1.19 (0.68, 2.15)	1.44 (0.79, 2.73)	0.70 (0.35, 1.38)	1.27 (0.68, 2.36)
Snacks	0.58 (0.35, 0.95)*	1.12 (0.64, 2.06)	1.37 (0.74, 2.64)	0.90 (0.45, 1.79)	1.80 (0.96, 3.35)
Animal Products	0.82 (0.53, 1.27)	1.08 (0.63, 1.83)	1.78 (0.98, 3.24)	0.84 (0.44, 1.57)	0.93 (0.53, 1.65)
Oils, Sweeteners, Condiments	1.61 (1.02, 2.57)*	1.44 (0.86, 2.55)	0.97 (0.55, 1.73)	0.68 (0.36, 1.27)	0.85 (0.48, 1.50)
Drinks	0.84 (0.54, 1.31)	1.25 (0.75, 2.13)	1.20 (0.68, 2.13)	0.97 (0.53, 1.77)	1.34 (0.76, 2.36)

Each column is a separate logistic regression model. The logistic regression model used food group dummy variables and was adjusted for gender, age, and education

*$p < 0.05$

[a] Non-local = national/mixed or global/modern

available in Northern Karnataka and based on preliminary work. Due to the globalization and economic change in Northern Karnataka, it is an ideal location to assess food familiarity, consumption behaviors, and food preferences now so it can be compared to itself in a few years.

Previous studies contributing to research on the nutrition transition have focused on healthfulness of items that are traditionally available compared with those recently arrived. In this paper, we took a novel approach to the nutrition transition, with a focus on community perceptions and preferences of items that are local and non-local. This approach contributes beyond the discussion of healthfulness because, through our ongoing work in India, we noted that there is not a perfect alignment between healthfulness and place of origin. While many global items are indeed unhealthy, such as crisps and ready-to-eat items, they also include new fruits and vegetables, such as kiwi or broccoli. At the same time, traditional foods also include items that are deep-fried and heavy with sugar and ghee. It is important to note that many of our respondents were aware of the healthfulness of the items they considered. Indeed, when prompted to consider healthfulness, a higher proportion changed their selection from non-local to local food items when it came to cereals and pulses, snacks, and animal products compared to switching from local to non-local foods.

In addition to healthfulness, an important consideration for studies engaging with the nutrition transition is the impact of non-local items for local growers and the carbon footprint of non-local items. For example, even healthy items, like quinoa or kiwi can increase the diversity of foods consumed locally, which can be positive for health, but could reduce the demand for locally grown crops, perhaps discouraging farmers away from growing these crops. Shipping food items also uses fuels and generates packaging waste, with negative environmental implications.

This study is subject to some limitations. Due to its cross-sectional design, we cannot make causal inferences. The results are only generalizable to adults in households with school-going children at our two study sites. An experimental study would be necessary to observe respondents' actual choices in real life choice scenarios. We are unable to make direct comparisons among all respondents' local

versus non-local food choices in hypothetical choice scenarios because participants were randomly asked about only 3 of the 6 food groups and they were not all asked about the same 3 food groups. Since our choice experiment restricted choice of an item to the same food group instead of different food groups, we cannot say if the respondent would have chosen a different food group item in hypothetical scenarios.

5 Conclusions

Our findings suggest that non-local foods and beverages are being introduced into the consciousness and diets of people living outside of India's large metropolitan areas. Non-local foods are often perceived to be tastier than local foods and are likely to be the preferred choice if additional monetary resources are available. However, local foods are perceived to be healthier than non-local foods. As people are introduced to new non-local foods, the perception of what is considered the "healthier" food item can be redefined to help people make informed food choices about what is healthy, whether they are the local or non-local option. Accessibility, taste, and healthfulness were the top reasons for choosing the most frequently eaten item. The food environment plays a role in people's food choices and in turn, their health. As such, it is important to consider how drivers of food choice can be factored into health promotion efforts to increase access to and promote selection of healthy foods.

Appendix 1

Table 8 Food card classification with food item name

Food group	Food category					
	Food card number	Local food items	Food card number	National food items	Food card number	Global food items
Fruits & vegetables	AL1	Banana	AN1	Corn	AG1	Dragon fruits
	AL2	Ber	AN2	Potato	AG2	Kiwi
	AL3	Green leafy vegetables (spinach/fenugreek)	AN3	Apple	AG3	Broccoli
	AL4	Ladies finger	AN4	Orange	AG4	Red and yellow bell pepper
Cereals & pulses	BL1	Rice	BN1	Multigrain flour	BG1	Breakfast cereals
	BL2	Millets (bajra/jowar)	BN2	Rajma	BG2	Oats/masala oats
	BL3	Peanuts	BN3	Chickpeas	BG3	Buns/breads
	BL4	Dal	BN4	Other nuts (almond/pista)	BG4	Pasta
Snacks	CL1	Indian sweets (laddu/barfi/peda)	CN1	Chips	CG1	Pizza/burger
	CL2	Chakli	CN2	Wadapav	CG2	Pastries
	CL3	Poha	CN3	Chats (bhelpuri/paanipuri)	CG3	Noodles
	CL4	Chiwda	CN4	Indian sweets (rasmali/rasagulla)	CG4	Chocolates
Animal products	DL1	Milk	DN1	Kulfi	DG1	Ice cream
	DL2	Curd	DN2	Chicken/meat/seafood	DG2	Flavored milk
	DL3	Butter/ghee	DN3	Cheese	DG3	Frozen chicken nuggets/prawns
	DL4	Eggs	DN4	Paneer	DG4	Cream/milk powder
Oils, sweeteners, condiments	EL1	Salt	EN1	Sauce	EG1	Chilli sauce/dark soy sauce
	EL2	Chutney/pickles	EN2	Fruit jam	EG2	Mayonnaise
	EL3	Oils	EN3	Masala packets	EG3	Peanut butter
	EL4	Sugar jaggery	EN4	Honey	EG4	Sugar free sweetners
Drinks	FL1	Tea/coffee	FN1	Lassi	FG1	Iced coffee
	FL2	Nimbhu pani	FN2	Soft drinks	FG2	Diet soft drinks
	FL3	Sugar cane juice	FN3	Coconut water	FG3	Energy sport drinks
	FL4	Buttermilk	FN4	Milkshake	FG4	Green tea

Table 9 Reason for choosing most frequently eaten item among adults in Northern Karnataka, India, by PDS use

Characteristic	Fruits & vegetables (%)		Cereals & pulses (%)		Snacks (%)		Animal products (%)		Oils, sweeteners, condiments (%)		Drinks (%)	
	PDS[a] n 284	No PDS n 177	PDS n 321	No PDS n 182	PDS n 318	No PDS n 192	PDS n 238	No PDS n 148	PDS n 259	No PDS n 128	PDS n 344	No PDS n 220
Cheap	2.1	1.1	0.9	1.1	0.6	0.5	1.3	1.4	2.3	0.0	1.5	0.9
Easy to find	52.1	48.0	83.2	82.4	42.8	45.8	40.8	43.2	55.6	58.6	46.8	40.5
Energy	2.1	3.4	4.4	1.7	0.6	0.5	13.9	9.5	1.2	2.3	0.9	2.3
Healthy	21.8	22.6	6.2	10.4	0.3	1.6	27.3	29.1	3.9	3.1	26.2	27.3
Tasty	21.8	23.7	5.3	3.9	55.0	51.6	14.7	16.2	36.3	33.6	24.1	29.1
Other	0.0	1.1	0.0	0.6	0.0	0.0	0.4	0.0	0.4	2.3	0.0	0.0
None eaten	0.0	0.0	0.0	0.0	0.6	0.0	1.7	0.7	0.4	0.0	0.6	0.0

Each respondent was asked about 3 randomly selected food groups, therefore the total number of respondents per food group is noted under each food group

[a] PDS = Public Distribution System. PDS refers to India's food security system, which provides food and non-food items at subsidized prices for households in need
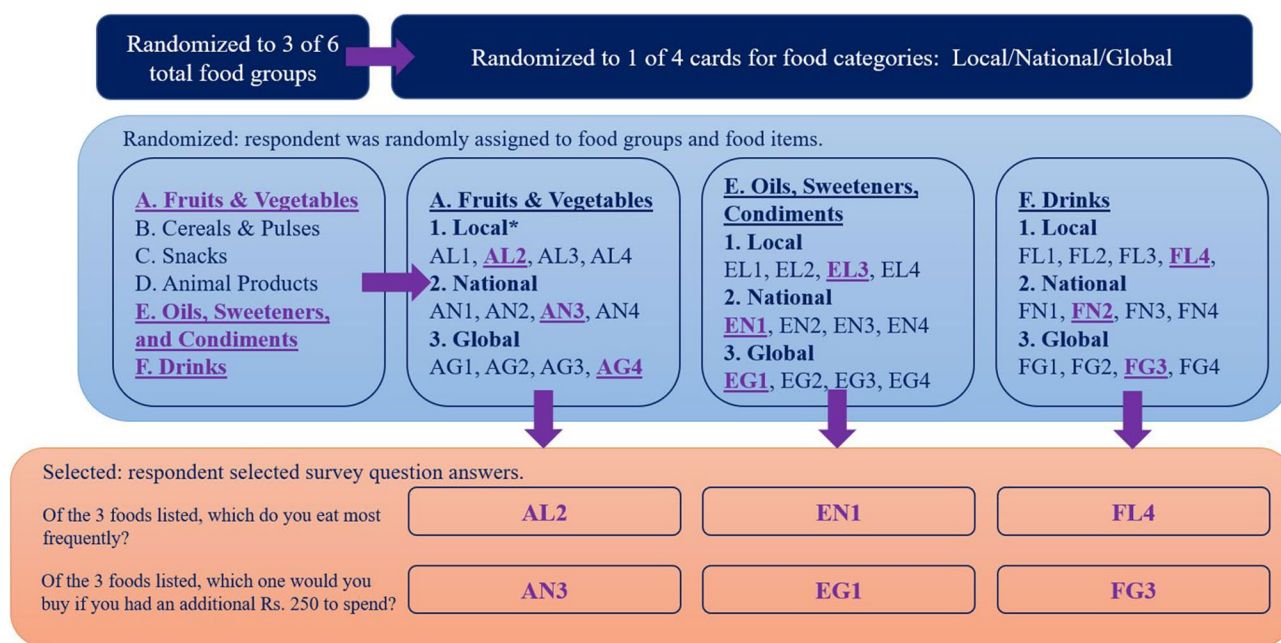
*See Appendix Table 8 for more details regarding food items

Fig. 1 Example of food choice question breakdown

Declarations

The authors declare no conflict of interest, financial or otherwise, with the research and findings presented in the manuscript.

Consent to participate Informed consent was obtained from all participants in the study.

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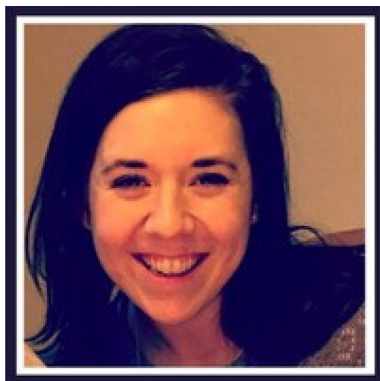

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