

Characteristics of a healthy food environment in South Asia

Food availability, diversity, and density of retail stores of in south Asia

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Objectives

- Assess the healthiness of the food environments (FE) to which consumers are exposed
- Identify the regional/community socio-economic drivers that shape neighbourhood food environments



Data and Sampling

- Cross-sectional data from Transforming Agrifood Systems in South Asia (TAFSSA) (December 2022 - April 2023)
- Study location- 3 rural districts : Nalanda (India), Rangpur (Bangladesh) and Rajshahi (Bangladesh)

Market Census & Survey

- Census- Density of retail food shops
- Survey – Availability, Prices, infrastructure, regulation, marketing etc.

Community Survey

- Community/Village level socio-demographic factors
- Respondent type adult - village head or Gram Sabha member, village traders, and agents/middlemen from each village

Food environment indicators

1. Density of retail shops
2. Relative density of retail food shops / modified retail food environment (mRFEI)

$$mRFEI_i = \frac{\textit{Number of healthy retail shops in the village}}{\textit{Total number of retail shops in the village}} \times 100$$

3. Healthy food availability (HFAI)

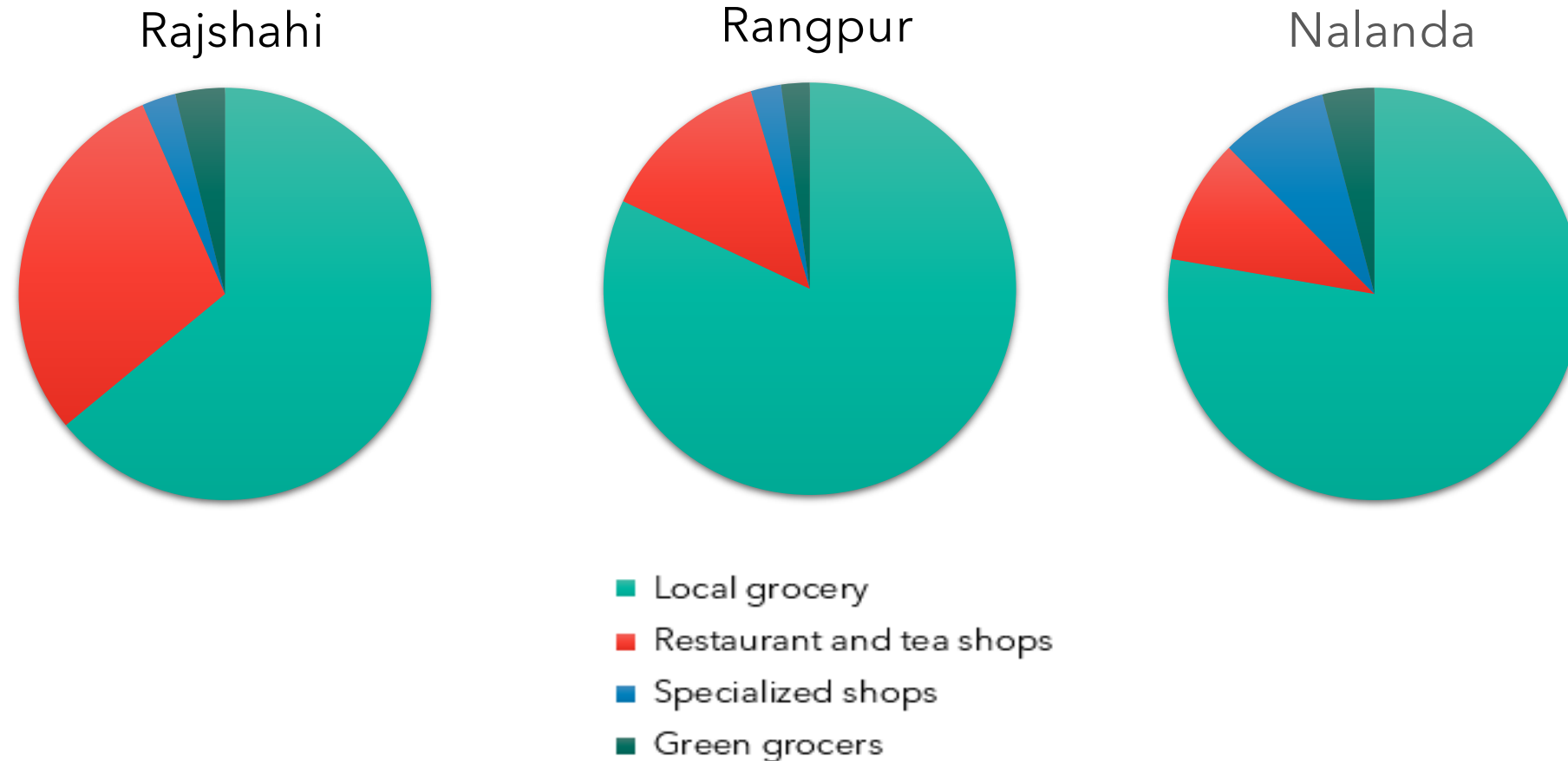
Methods

- Negative binomial regression & fractional probit regression models
- Dependent variable- density of retail shops, relative density or mRFEI and HFAI
- Community/neighbourhood characteristics - village level socio demographic (village area, population density, distance to nearest town, literacy rates and wage rates) and socio-economics development indicators (village facility index, farmland conversions, and farm mechanization)
- Store level attributes - Store typology and retailers' socio-demographic characteristics (including age, years in business, gender, bank account status)

RESULTS



Distribution of store typology in each village



Food environment indicators at village level

Variable	Rajshahi	Rangpur	Nalanda	Total
Green grocers	0.8 (0.3-1.3)	0.4 (0.1-0.7)	0.7 (0.3-1.1)	0.7 (0.4-0.9)
Local grocery	13.5 (10.3-16.7)	14.3 (12.3-16.4)	13.2 (11.1-15.4)	13.7 (12.2-15.1)
Specialized shops	0.6 (0.2-0.9)	0.4 (0.0-0.9)	1.4 (0.7-2.2)	0.8 (0.5-1.1)
Restaurant and tea shops	6.2 (4.8 -7.7)	2.3 (1.5-3.2)	1.7 (0.8-2.5)	3.5 (2.8-4.2)
Total retail shops	21.3 (16.2-26.4)	17.6 (14.8-20.4)	17.5 (13.8-21.1)	18.9 (16.6-21.2)
mRFEI	0.54 (0.46-0.61)	0.37 (0.31-0.43)	0.32 (0.27-0.38)	0.41 (0.37-0.45)
HFAI (0-28)	3.51 (0-10)	3.79 (0-13)	5.04 (0-12)	4.08 (0-13)

Source: TAFSSA Local Agri-Food Systems Survey (2023); Data presented as mean (95% confidence interval)

Association of retail shops density and mRFEI with neighbourhood characteristics

Variables	Model 1: Density of retail shops		Model 2: mRFEI	
	IRR	Std error	AME	Std error
Density of retail shops per village			-0.01***	0.00
Log of area in acres	1.107**	0.051	-0.02	0.01
Population density (person/250 m ²)	1.016***	0.003	0.002***	0.00
Distance to nearest town (in kms)	0.995 **	0.002	-0.0004	0.00
Population literacy rates	1.466	1.444	0.24***	0.04
Wage rate (non-ag, men, in USD)	1.044	0.036	0.02***	0.00
Village facility index (ref: quartile 1) Quartile 2	1.165***	0.126	-0.03	0.06
Quartile 3	1.722***	0.111	-0.01	0.02
Quartile 4	2.085	0.291	-0.06	0.06
Number of tractors in a village	0.999	0.003	0.002***	0.00
Farmland converted to residential area in last 5 years	1.036	0.063	-0.04***	0.01
Study district (ref: Rajshahi) Rangpur	0.881***	0.020	-0.18***	0.00
Nalanda	0.806	0.110	-0.29***	0.02
Constant	5.210**	4.268		

Model 1 Negative Binomial regression; Model 2 Fractional Probit; IRR-incidence rates ratio ; AME-marginal effects (dy/dx) reported at means;

Observations – 140; Robust standard errors in adjusted for country effects; *** p<0.01, ** p<0.05, * p<0.1

Association of HFAI with neighbourhood characteristics and store attributes

Variables	Model 3: HFAI	
	IRR	Std error
Density of retail shops per village	0.999**	0.000
Village facility index (ref: quartile 1) Quartile 2	1.043*	0.027
Quartile 3	0.988***	0.004
Quartile 4	1.031	0.026
Distance to nearest town (in kms)	0.998***	0.000
Type of retail shop (ref: green grocers) Local grocery store	0.813***	0.030
Specialized shop (meat, milk, fish, egg etc)	0.529***	0.079
Restaurants and tea stalls	0.402***	0.040
Shop size (large, distinct items = 51 to 200)	1.357***	0.004
Age of shop owner/manager	0.963	0.029
Gender of shop owner/manager (Male)	1.080***	0.003
Number of years in business	1.005***	0.000
Bank account of shop owner (Yes)	1.043**	0.018
Study district (ref: Rajshahi) Rangpur	0.988	0.018
Nalanda	1.307***	0.010
Constant	6.512***	0.288

Conclusion

- Retail FE in rural South Asia is dominated by the presence of unhealthy food stores. To promote the consumption of healthy food, FE interventions aimed at increasing the availability of healthy foods such as F&V and monitoring the sales of unhealthy foods may facilitate healthier diets.
- Future research is necessary to investigate the effective policies and interventions which may transform the food environment to be healthier and more sustainable.

THANK YOU



Retail shop type and food items sold

Retail Shop type	Food items sold
Local grocery stores	Sell a variety of food and non-food items, including household staples, packaged and dry foods, and a limited selection of fresh produce
Vegetable/fruit shops (greengrocer)	Sell only perishable food items, including fresh fruits, vegetables, roots, and tubers
Specialized shops	Sell exclusively meat, fish, or dairy products.
Restaurants and tea stalls	Sell prepared food items (usually snacks that can be quickly consumed) and tea/coffee.

Descriptive statistics of community/neighborhood characteristics

Variables	Rajshahi	Rangpur	Nalanda	Total
Area of village (in acres)	1699	1312	1072	1366
Population per village	3436	4650	6744	4949
Population density (person/250m ²)	0.8	2.7	0.4	1.2
Distance to nearest town (in kms)	14.9	15.5	8.2	12.7
Village facility index (quartiles)	2.5	2.3	2.5	2.5
Non- Agriculture wage rate for men (USD)	4.9	4.9	4.4	4.7
Population literacy rates	0.5	0.5	0.5	0.5
Number of Tractors in a village	1.4	3.7	22.4	9.4
Farmland converted to urban area in last 5 years (Yes/no)	82.5%	97.9%	21.1%	65.8%

Source: TAFSSA Local Agri-Food Systems Survey (2023); Data presented as mean .

Descriptives of retailers' characteristics

Variables	Rajshahi	Rangpur	Nalanda	Overall
Age of retailer (%)				
<25 years	9.7	6.6	11.8	9.4
25-45 years	58.6	61.8	52.1	57.5
45-60 years	24.7	24.1	24.8	24.5
>60 years	7.0	7.5	11.3	8.5
Gender of retailer (Female, %)	6.4	17.0	26.6	16.1
Education of retailer (in years)	3.7	3.4	4.3	3.8
Years in business	9.4	8.3	8.5	8.8
Bank account of retailer (Yes, %)	29.9	30.4	95.1	50.8

Source: TAFSSA Local Agri-Food Systems Survey (2023); Data presented as mean .

Healthy and unhealthy Food categories

Healthy Food	Unhealthy food
Whole grains; seeds and nuts; legumes; liquid oils; green leafy vegetables; orange vegetables; cruciferous vegetables; other vegetables; orange fruits; other fruits; fish; meat; egg; dairy	Refined grains/baked goods; sweet and ice creams; sugar sweetened beverages; Deep fried food;

Source Bromage et al., 2021 (with authors modification based on the study type and location)