Measuring urbanicity and its influence on food security across Nepal's agroecological zones

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INTRODUCTION:

Urban residence has long been associated with positive health and food-related outcomes, but rapid urbanization, particularly in low-income settings, has been linked to negative health outcomes as well. Studying the links between urbanicity and food security is of particular importance for understanding where the most vulnerable reside, but measuring urbanicity remains a challenge, with limited binary assessments (urban vs rural). Nepal is one of the most rapidly urbanizing countries worldwide, with a third of its national gross domestic product coming from agriculture, produced primarily in the Terai (plains) agroecological zone. Still, Nepal

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RESULTS:

Final community urbanicity scale included 14 variables grouped within 8 domains, showing a Cronbach alpha of 0.82 and average interitem correlation of 0.24. Urbanicity scores for the 63 wards ranged between 13 - 69, out of a possible 80 points. Item-test correlations of the 8 domains showed good internal consistency (all values > 0.40), and intraclass correlation showed ~41% of the variance in scores was explained by differences between wards (vs districts). Construct validity was confirmed with a positive correlation between the urbanicity scale and housing quality index (0.55; p-value < 0.01; R-squared value of 0.47).

faces a high food insecurity prevalence compared to global averages, overall and within each of the agroecological zones (mountains, hills, Terai).

OBJECTIVE:

Assess the relationship between community urbanicity and household (HH) food insecurity in Nepal's agroecological zones using a novel urbanicity scale, and explore the interaction of agricultural occupation in this relationship.

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METHODS:

Household survey data came from the 2013 Policy and Science for Health, Agriculture and Nutrition (PoSHAN) community studies in Nepal, as well as the 2011 Nepal Census which informed one item (population density) of the novel urbanicity scale. Community urbanicity, the main exposure of interest, was measured using a novel urbanicity scale and applied to each of the 63 wards (21 wards per agroecological zone) in the analytical sample. Correlation matrices and Cronbach's alpha were run for individual variables and domains to assess variable inclusion and the grouping of items within domains. Scale performance was assessed using factor analysis and principal component analysis. Item-test correlations for domains were calculated to assess internal consistency. Construct validity was assessed by comparing the urbanicity scale against a housing quality index from the same dataset.

Table 1 Logistic regression, 10-unit change in urbanicity predicting HH food insecurity

	Unadjusted			Adjusted		
	Odds ratio	95% CI	P-value	Odds ratio	95% CI	P-value
Overall	.67	.5878	0.00	.82	.7194	0.00
Mountains	.65	.4985	0.00	.71	.5492	0.01
Hills	.59	.4674	0.00	.80	.64 - 1.00	0.05
Terai	.81	.64 - 1.02	0.08	.91	.74 - 1.13	0.40

A total of 4,284 households were included in the analytical sample. Over 40% of all HHs were categorized as mildly, moderately or severely food insecure. A majority of the agriculturally employed HHs in the mountains (67%) and hill (54.2%) zones were categorized as food insecure. A 10-unit increase in community urbanicity was found to be protective against HH food insecurity nationally, controlling for other factors (OR: .82; CI: .71 - .94; p-value < 0.05); stratified by agroecological zone, this relationship was significant in the mountain zone only (OR: .71; CI: .54 - .92; p-value < 0.05). No statistical difference was found between agroecological zones in fully adjusted model (p-value > 0.05). Agricultural occupation did not modify this relationship (OR: .89; CI: .78 – 1.00; p-value = 0.07), though Figure 3 shows HHs in agriculture faced lower probability of food insecurity (vs. other occupations) as urbanicity increased.



HH food insecurity, the outcome of interest, was measured using the HFIAS questionnaire, dichotomized by grouping mild, moderate and severely food insecure categories together, vs. food secure. Agricultural occupation was explored as a possible effect measure modifier. Multi-level mixed effects regression analyses were conducted to explore this relationship, controlling for: agroecological zone, HH's main water source, number of HH members, whether HHs produced any crops during the dry or rainy season, head of HH's age, sex, marital status, religion, ethnicity/ caste, occupation, and school years completed.



CONCLUSIONS:

Nepal's agroecological zones were comparable in urbanicity, a departure from how previous urban vs. rural assessments have suggested. Increasing community urbanicity predicted lower prevalence of HH food insecurity overall and within each agroecological zone. Agricultural occupation was protective in the Terai and a risk factor in the mountain and hills for HH food insecurity, though these modifications were not significant. A nuanced representation of urbanicity is possible with scales constructed and validated from publicly-available data, particularly important for rapidly urbanizing and geographically diverse contexts such as Nepal. Research and policy should look closer at agricultural livelihoods to understand pathways towards greater or worse food security, while recognizing the full gradient of urbanicity.

Overal Terai Figure 2 Violin plot (IQR, median) of urbanicity scores, overall and by Hills agroecological zone Mountains 70 50 60 80 20 40 Urbanicity score

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