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PoSHAN Community Studies in Nepal Rationale, Design, Achievements and Lessons

Photo credit: PoSHAN Study Team

Photo Credit: LUANAR

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Baltimore, MD **on behalf of JHU and Nepal-based Nutrition Innovation Lab Teams**

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AGRICULTURE TO NUTRITION PATHWAYS

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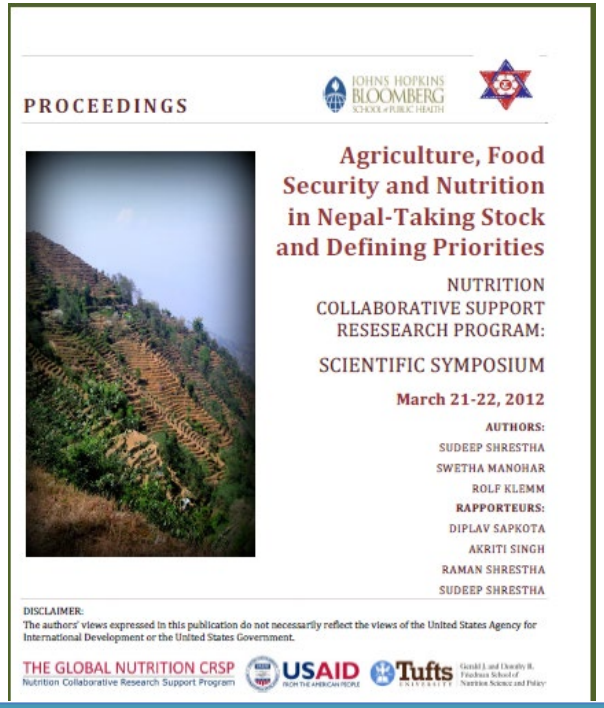
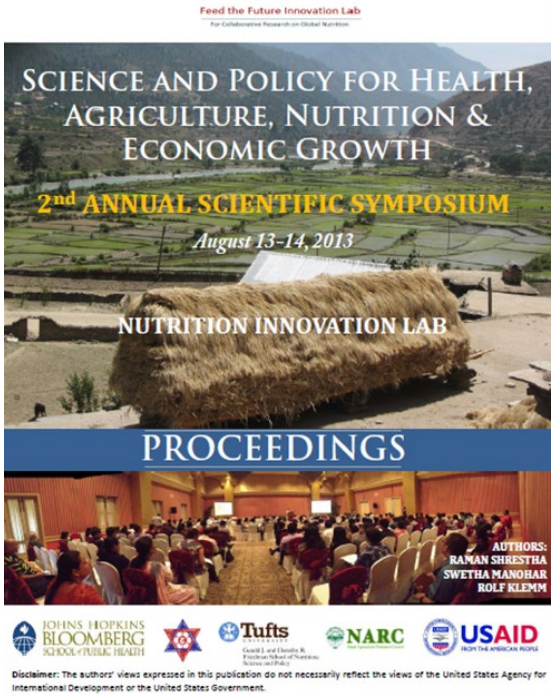
AGRICULTURE TO NUTRITION PATHWAYS SYMPOSIA: 2013-2019





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POSHAN COMMUNITY STUDIES: A NATIONAL SURVEY SYSTEM TO -

Assess – June to early Sept, 2013-2016, in a nationally representative sample of VDCs, including seasonally in "centroid" subset of sites:

- **Agricultural Practices**: types, amounts and disposition of foods grown (marketed and purchased); annual trends and seasonal patterns; programs reaching rural households
- **Household Food Security:** indexed, plus measures of SES
- **Diet:** dietary patterns of mothers and young children
- **Nutritional Status:** anthropometry, anemia, and morbidity among preschoolers & mothers
- **Pathways:** that may be improved in future via agricultural, marketing, nutrition and other public health programs

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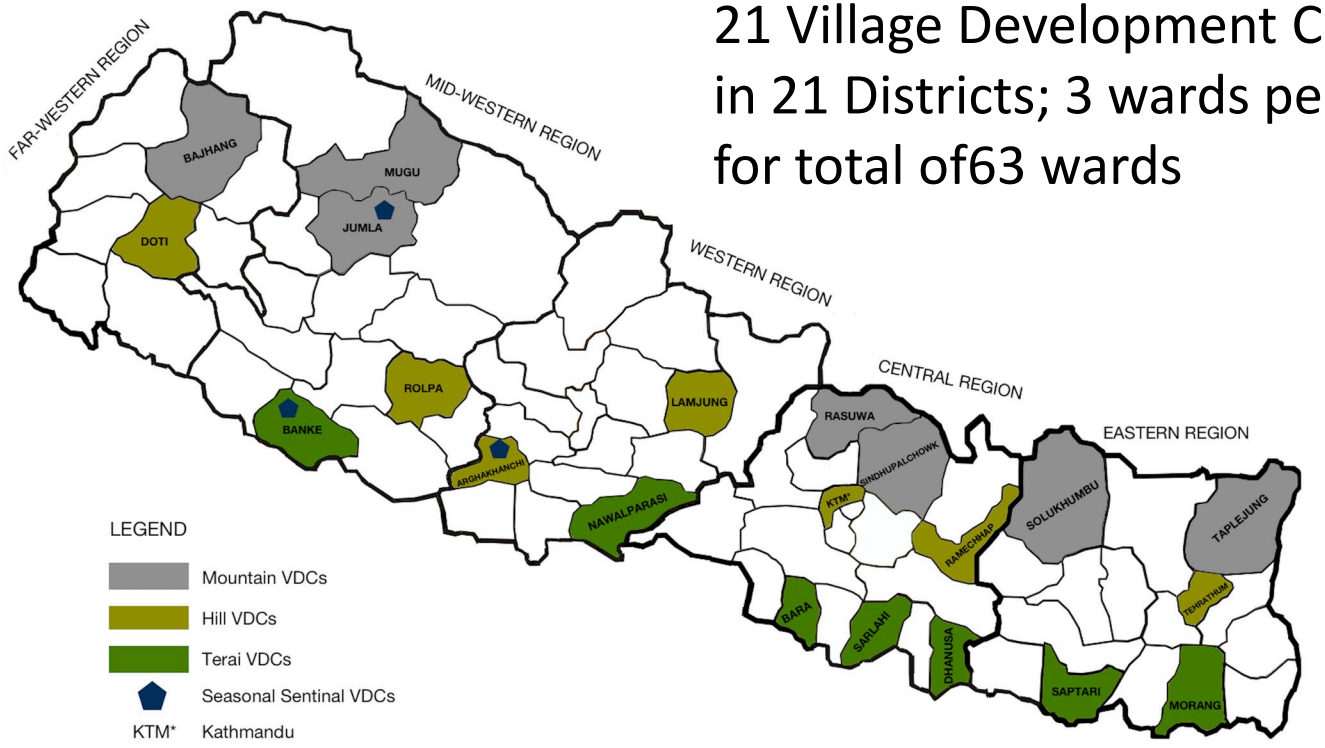
POSHAN COMMUNITY SURVEY SITES



21 Village Development Committees (VDCs), in 21 Districts; 3 wards per VDC, for total of63 wards

Klemm RDW et al. Pathways from Agriculture-to-Nutrition: Design and Conduct of the National PoSHAN Surveys of Nepal. *Journal of Food Security 2018;6:*79–89.

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TIERS OF DATA COLLECTION

Community

- Food prices
- Infrastructure
- Market Availability & Prices
- Outreach Services
  - Health
  - Nutrition
  - Crop extension
  - Husbandry
  - Microcredit

Household

- Assets owned
- Food Security
- Income
- Expenditure
- Farming Practices
- Food grown, sold & stored
  - Crops
  - Gardens
  - Animals
- Program participation

Individual

- Diet
- Nutritional Status
- Health
- Access to Services
  - Health
  - Nutrition
  - Growth Monitoring
- Health Knowledge
- Hygiene Practices

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POSHAN COMMUNITY STUDIES NOVEL CHARACTERISTICS

- Repeated mid-year (monsoon) assessments
- Balance across agro-ecological zones
- Proportionate to population self-weighting
- Control for seasonal and geographic influences
- Year-to year continuity in protocol execution
- Mixed cross-sectional & longitudinal database
- Capacity to examine stability vs change in prevalence, patterns and risk factors
- Survey databases are in public domain

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ACHIEVED SAMPLE SIZES PER YEAR

Annual National Surveys				
Total	**2013**	**2014**	**2015***	**2016**
Households screened	9316	10689	6687	12143
Eligible households	4379	5096	3256	5173
Households interviewed	4286	4947	3199	5097
Women interviewed	4509	5202	3436	5458
Children interviewed	5401	6418	4417	6706

* Survey limited to Terai VDCs and seasonal sites due to the 2015 Nepal earthquake

Seasonal "Centroid Site" Surveys (beyond mid-year survey)				
Total	**Sep 2013**	**Jan-Feb 2014**	**Aug-Sep 2014**	**Jan-Mar 2015**
Households interviewed	507	457	580	535
Women interviewed	518	458	606	560
Children interviewed	571	490	708	628

DIET, MALNUTRITION & THE NUTRITION TRANSITION

- Maternal dietary intakes
  - Infrequent consumption of nutritious foods
  - Low nutrient density, likely micronutrient deficiencies
- Food market purchase patterns
  - Vegetable oils, sugar, noodles and snacks
- Maternal body mass index trends
  - Higher BMI rising amidst persistent undernutrition

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MEDIAN (IQR) MATERNAL WEEKLY INTAKE FREQUENCIES IN NEPAL, MAY-AUGUST 2013-16

Foods	2013	2014	2016
Rice	**14 (14,18)**	**14 (14, 18)**	**14 (14, 18)**
Daal	**7 (4, 14)**	**7 (4, 14)**	**8 (4, 14)**
Vegetable Oil	**16 (14, 21)**	**21 (14, 21)**	**21 (14, 21)**
Meat/Poultry	**1 (0, 2)**	**1 (0, 2)**	**1 (0, 2)**
Dairy	**2 (0, 7)**	**1 (0, 7)**	**2 (0, 7)**
Egg	**0 (0, 1)**	**0 (0, 1)**	**0 (0, 1)**
DGLV	**2 (1, 4)**	**2 (0, 4)**	**3 (1, 5)**
Carotenoid Veg & Fruits	**1 (0, 4)**	**1 (0, 3)**	**0 (0, 3)**
Carrot	0 (0, 0)	0 (0, 0)	0 (0, 0)
Pumpkin, ripe	0 (0, 0)	0 (0, 0)	0 (0, 0)
Mango, ripe	0 (0, 3)	0 (0, 2)	0 (0, 2)
Papaya, ripe	0 (0, 0)	0 (0, 0)	0 (0, 0)
Jackfruit, ripe	0 (0, 0)	0 (0, 0)	0 (0, 0)

- N~5000 per year
- Same season (Monsoon)
- Same subdistrict, ward & household samples
- 7-day FFQ
- 42 food items
- Same protocol & training procedures

MEDIAN (IQR) MATERNAL WEEKLY INTAKE FREQUENCIES IN NEPAL, MAY-AUGUST 2013-16

Foods	2013	2014	2016
Other Vegetables	**5 (2, 10)**	**5 (2, 9)**	**5 (2, 9)**
Gundruk	0 (0, 0)	0 (0, 0)	0 (0, 0)
Green Beans	1 (0, 3)	0 (0, 2)	0 (0, 2)
Green Peas	0 (0, 0)	0 (0, 0)	0 (0, 0)
Gourd	1 (0, 4)	1 (0, 4)	1 (0, 4)
Okra	0 (0, 2)	0 (0, 2)	0 (0, 2)
Eggplant	0 (0, 0)	0 (0, 0)	0 (0, 1)
Cauliflower	0 (0, 0)	0 (0, 0)	0 (0, 0)
Other Fruits	**2 (0, 7)**	**2 (0, 8)**	**3 (0, 11)**
Guava	0 (0, 0)	0 (0, 0)	0 (0, 0)
Orange	0 (0, 0)	0 (0, 0)	0 (0, 0)
Apple	0 (0, 0)	0 (0, 0)	0 (0, 1)
Banana	0 (0, 0)	0 (0, 0)	0 (0, 1)
Tomato	0 (0, 4)	0 (0, 6)	0 (0, 7)
Snacks	2 (0, 4)	2 (0, 4)	2 (0, 5)

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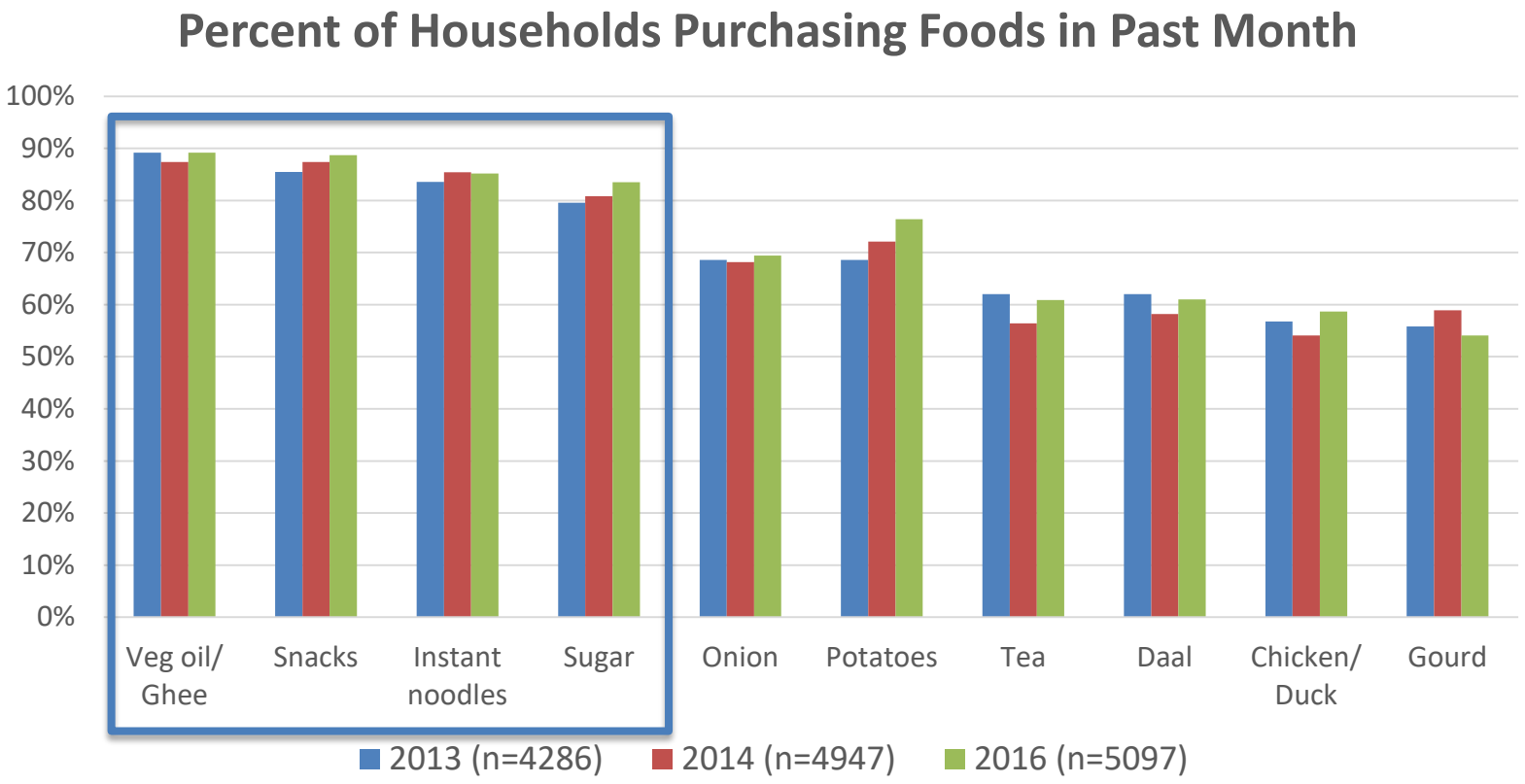
MARKET SURVEY FINDINGS 2013, 2014 & 2016



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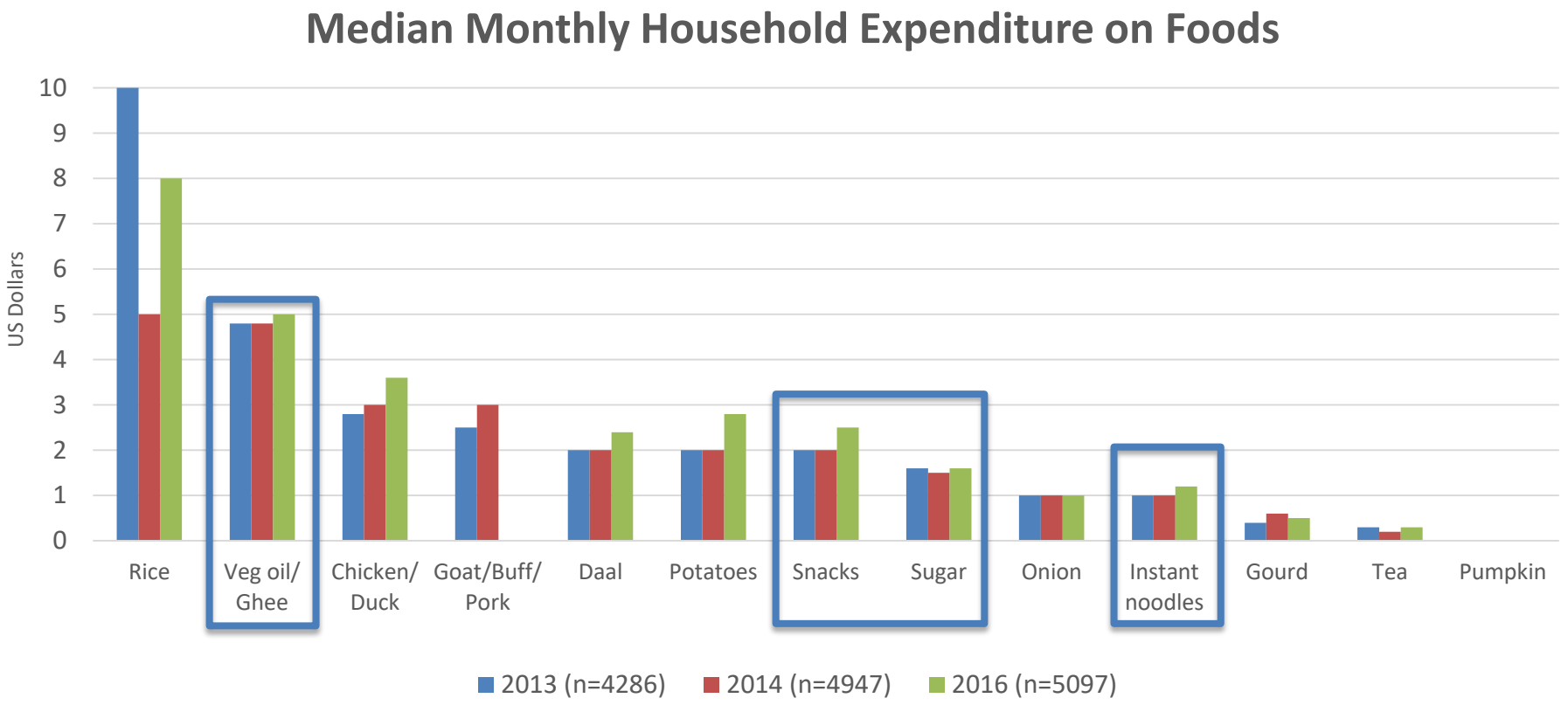
MARKET SURVEY FINDINGS 2013, 2014 & 2016



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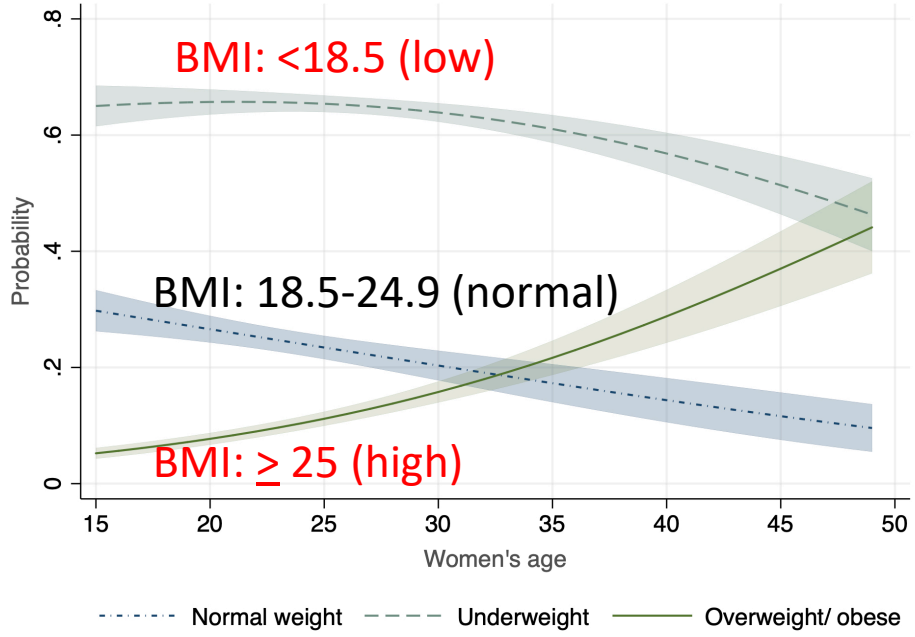
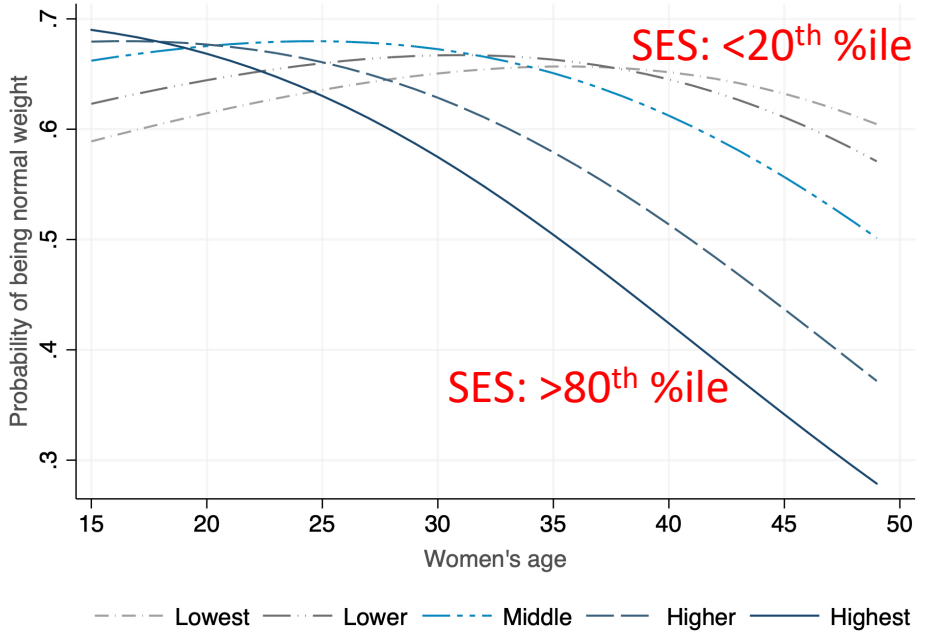
UNDERWEIGHT/OVERWEIGHT IN WOMEN BY AGE AND SES





- Normal BMI decreases with age
- Underweight and overweight "exchange" with age, but –
- Overweight is rising faster than underweight is decreasing

Household SES strongly affects probability of having a **normal** BMI by age

STATUS AND TRENDS IN UNDERNUTRITION AND ANEMIA

- Preschool stunting has decreased, plateaued
  - Steady decrease from turn of millennium to ~2013
  - Low HAZ remaining ~35%, even however post-earthquake
- Preschool wasting has remained at 10-15% for 40 years; less prominent is severe wasting
- Preschool child anemia is high, declined, rose again

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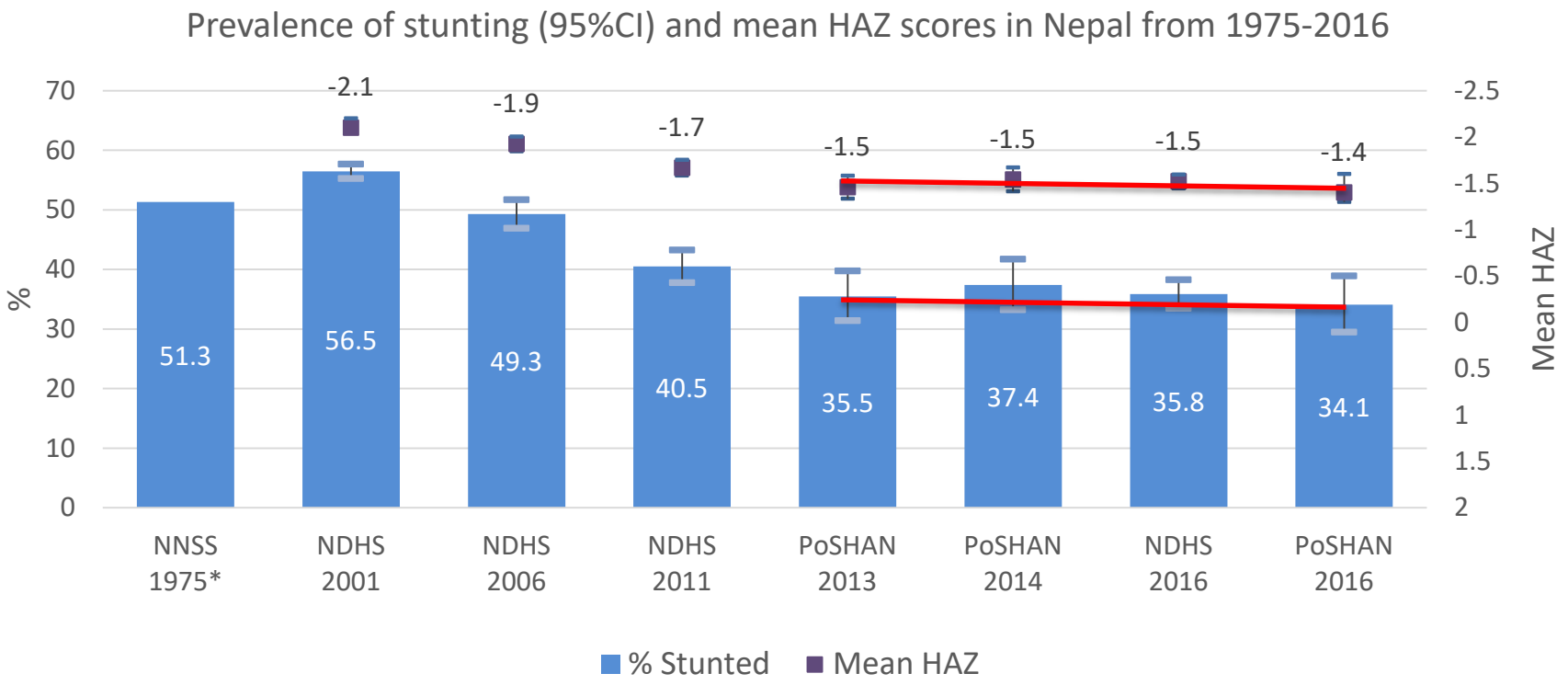
TRENDS IN PRESCHOOL CHILD STUNTING IN NEPAL



After a decade of steady decline, the prevalence of stunting leveled off from 2013 to 2016, remaining at ~35%

Shrestha S et al. Pre-earthquake national patterns of preschool child undernutrition and household food insecurity in Nepal in 2013 and 2014. Asia Pac J Clin Nutr 2018; Also, KC A et al., ms in final edits, 2019

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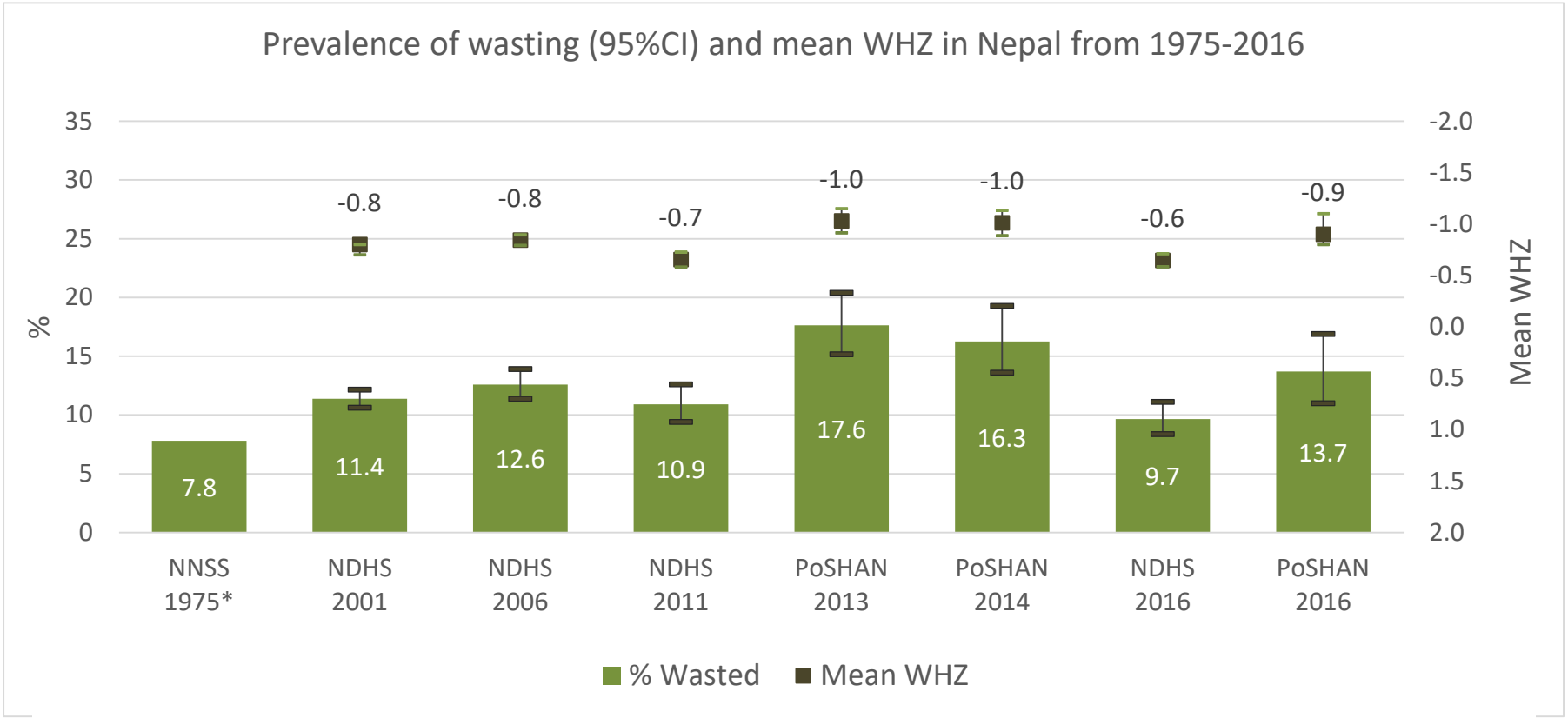
TRENDS IN PRESCHOOL CHILD WASTING IN NEPAL



Wasting has been variable, at ≥10%, without a trend. PoSHAN surveys have shown higher rates of wasting than the NDHS.

Shrestha S et al. Pre-earthquake national patterns of preschool child undernutrition and household food insecurity in Nepal in 2013 and 2014. Asia Pac J Clin Nutr 2018; Also, KC A et al., ms in final edits, 2019

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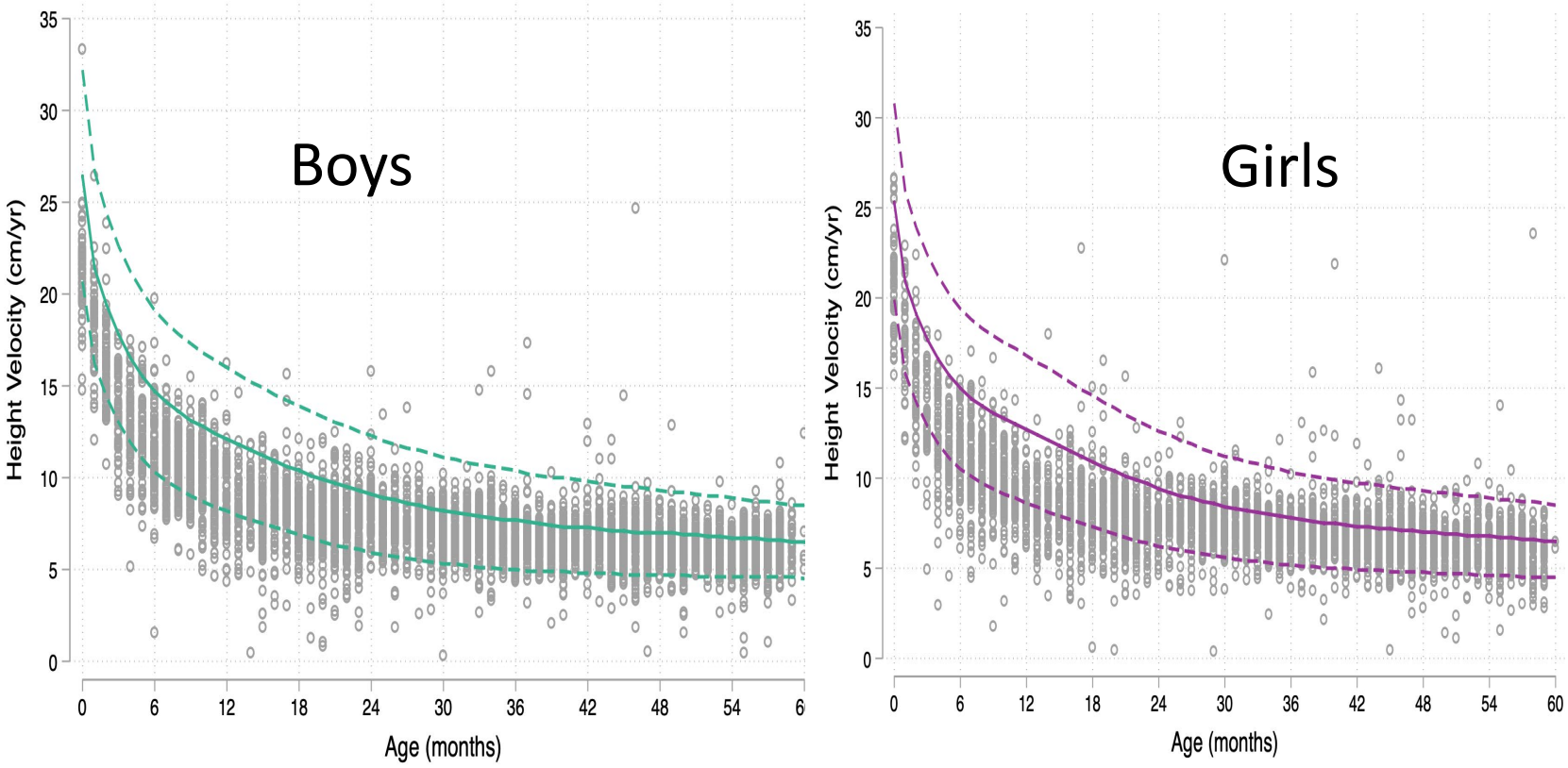
New Approach: Preschool Growth Velocity Assessment

Annualized linear velocity of Nepali pre-school aged children compared to a derived linear growth velocity reference curve*



* Based on merged Tanner & Whitehouse (1966) and WHO Growth Reference

Manohar S, Doctoral Dissertation, Johns Hopkins University, October 2019 (Defense)

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RISK FACTORS OF ANEMIA IN PRESCHOOL CHILDREN

	2013	2014	2016
Total children (6-59 mo)	786	757	834
% anemic (<11.0 g/dL)	**63.6**	**52.5**	**59.8**

Adjusted odds ratio of anemia among children 6-59 months

	2013	2014	2016
Child age <24 months	**0.26**	**0.20**	**0.31**
Having diarrhea	**1.59**	1.05	**1.77**
Having high fever	1.13	**1.73**	**1.33**
No goat or buff intake	**1.64**	**1.49**	0.82
No deworming treatment	1.02	**1.50**	**1.97**
Presence of animal feces/ rubbish	**1.40**	**1.33**	1.11
Open defecation	**1.38**	1.26	**1.36**

Pasqualino, M., Thorne-Lyman, A., Manohar, S., KC, A., Klemm, R., & West, K. P., Jr (2019). Anemia Among Preschool-aged Children in Nepal: Variations in National Prevalence and Strength of Associated Risk Factors from 2013 to 2016 (P10-049-19). *Current Developments in Nutrition*, *3*(Suppl 1), nzz034.P10-049-19. doi:10.1093/cdn/nzz034.P10-049-19

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RISK FACTORS OF ANEMIA: MOTHER-CHILD DYADS

Total mother child pairs	% Concordant Anemia
3684	34.4

Adjusted odds ratio of anemia concordance in mother-child dyads

	Odds of anemia concordance
Severe household food insecurity	1.99
Household's receipt of remittance	1.17 (?)
Mother's participation ANC visits	1.57
Child's febrile illness	1.33
Mothers having normal MUAC	0.78
Child's receipt of deworming treatment	0.73
Child's increased consumption of ASF	0.64
Mother's increased consumption of ASF	0.68
Residence in the Terai	3.95

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SEASONALITY OF CONSUMPTION OF NON-STAPLE MICRONUTRIENT-RICH FOODS AMONG YOUNG CHILDREN

Non-Staple Foods: Vitamin A-Rich Fruits & Vegetables

Mango

Pumpkin

Papaya

Leafy Greens

Non-Staple Foods: Animal Source Foods

Dairy

Eggs

Meat

Broaddus-Shea, E. T., Thorne-Lyman, A. L., Manohar, S., Nonyane, B., Winch, P. J., & West, K. P., Jr (2018). Seasonality of Consumption of Nonstaple Nutritious Foods among Young Children from Nepal's 3 Agroecological Zones. *Current developments in nutrition*, *2*(9), nzy058.

Photo credit: Elena Broaddus

LESSONS: IMPLEMENTATION

- There exists a steadily increasing capacity to conduct agricultural, public health, food security and nutrition research in Nepal.
- High passion and participation is the norm for symposium
- Formal linkages with national/local universities should be formalized in future research and provided for in budgets.
- Single time-point surveys allow comparisons across years; limited inter-season capability
- Multiple annual time points reveal findings that are stable or vary by year

LESSONS: PATTERNS & TRENDS

- Undernutrition persists amidst rising overweight
- Dietary diversity largely has not yet been achieved
- Low quality diet likely underlying micronutrient deficiencies
- Stunting has decreased. Leveling off may be reflecting a saltatory pause in decline
- New approaches are needed to assess growth deceleration and potentially modifiable risk factors
- More comprehensive, year-round assessment of agriculture and food system dynamic needed
- Expand nutrition and health assessment to omics biomarkers (incl inflammation), cognition and function

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ACKNOWLEDGEMENTS

- Respondents and their families across the Mountains, Hills and Terai
- District Offices and officials in 21 districts across Nepal
- Nepal-based PoSHAN Community Studies Research Team
- National Agricultural Research Center, Nepal
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- Nepal Technical Advisory Group (NTAG), Kathmandu Nepal
- Johns Hopkins Bloomberg School of Public Health Research Team (JHU)
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- Child Health Division, Ministry of Health, Government of Nepal
- National Planning Commission, Government of Nepal
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- USAID Bureau for Food Security, Wash DC
- USAID Mission, Kathmandu Nepal

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Thank you!

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