

Validation of photographic food atlas in Dhanusha and Mahottari districts of Nepal



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Why do we need a food atlas?



We need to measure diets

27 - 41% of the S Asian population underweight;
8 - 41% overweight

(Black et al 2008; WHO 2011)



Food diaries?

Low literacy rates (51% women cannot read a sentence in Central Terai) (DHS Nepal)



Weighed methods?

Expensive – limits the scope

Intrusive

Inappropriate?

(Gibson 2005; Panter-Brick 1993)



Recall methods?

- E.g. 24 hour dietary recall, FFQ
- Portion estimation errors, 20 - 50% (Bingham 1987)



Portion sizes?

- Limited benefit from food models (Godwin et al 2004)
- Computerised methods are costly (with little added accuracy) (Williamson et al 2003)
- Photo atlas!



Atlas validation?

- Limited South Asian validation (Thoradeniuya 2012)



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Research aims

1. Describe the methods and associated challenges of creating and validating the atlas in Dhanusha and Mahottari districts in Nepal.
2. Measure the error associated a locally-made photographic food atlas

Development of the atlas

Options for all foods, 40 food items

Food preparation

- Local cooks & vendors
- Expensive food in office

Portion sizes

- Up to 6 portions
- Based on data and communication with locals.

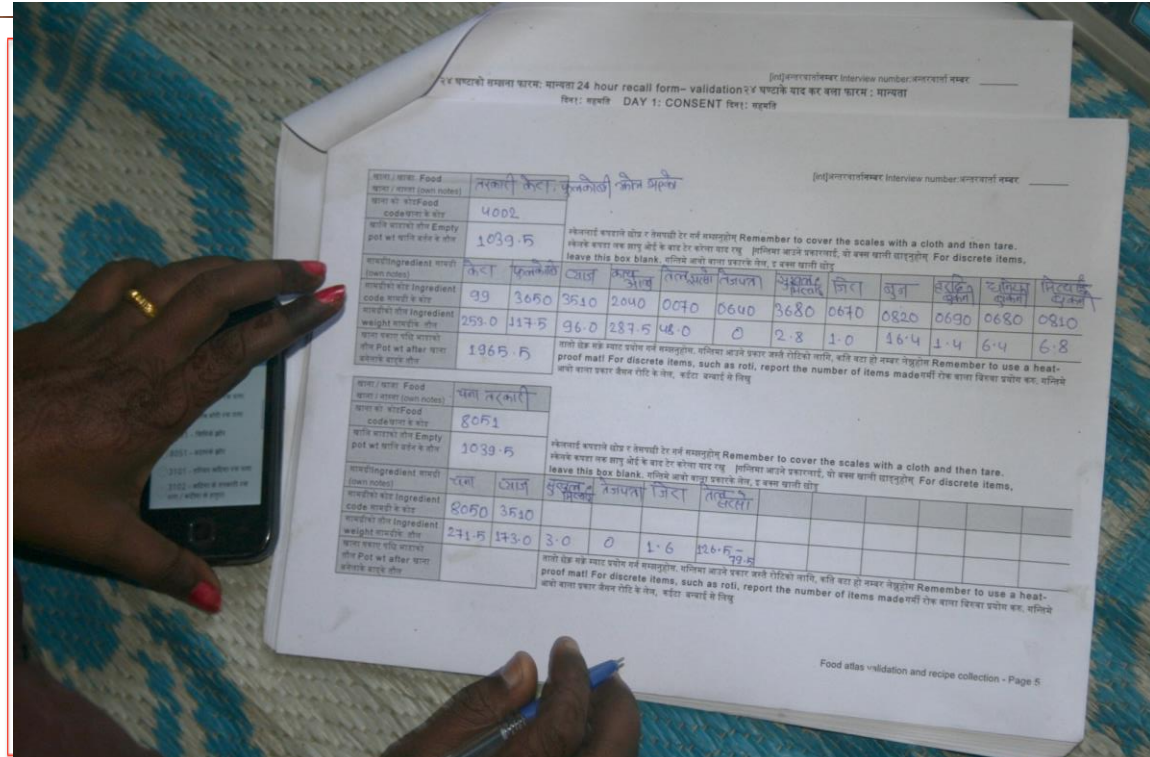
Images

- 45° angle, life size
- Comparison item (rupee coin)?



Validation process

- March – June 2014
- 3 HH members in 48 HHs (n 101)
- Random sample from LBWSAT, 3rd trimester women.
- 7 days of training to 3 VDCIs and 6 pilots each



Day 1: Weighing



Day 2: Recall



Dhanusha and Mahottari districts

Guests

Jutho food

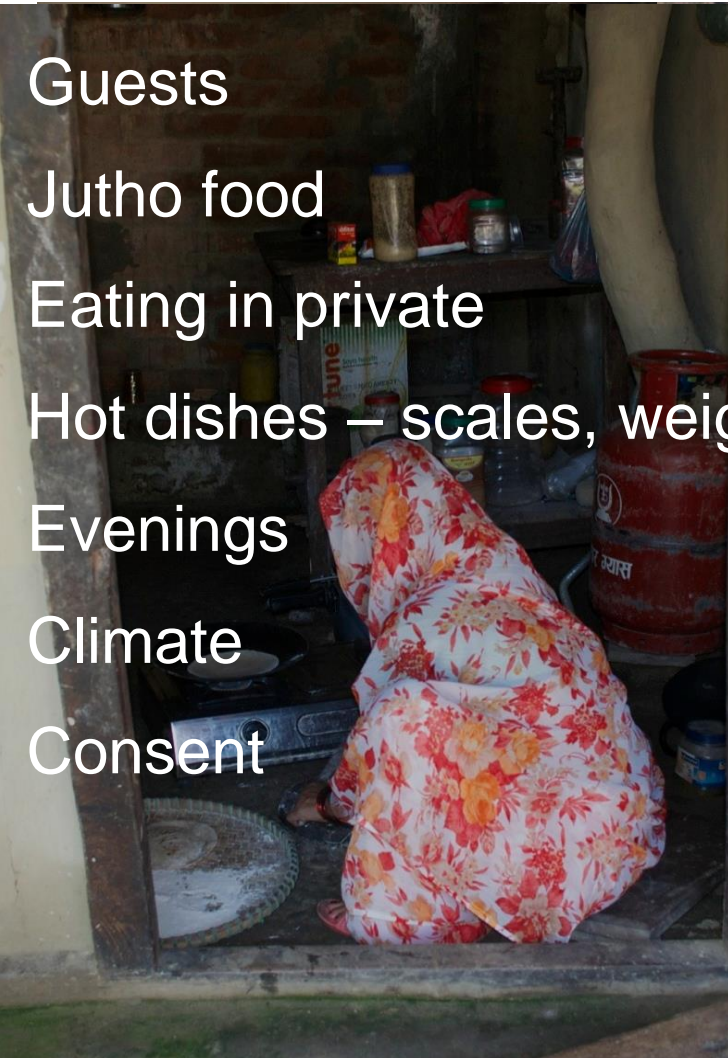
Eating in private

Hot dishes – scales, weights & photos

Evenings

Climate

Consent





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Respondent characteristics

Demography and anthropometry	N= 101
Age, mean (SD)	35.2 (15.5)
Gender, % female (n)	76.2
Years of schooling, mean (SD)	2.3 (3.6)
Mid-upper arm circumference, mean (SD)	24.6 (3.0)
Body mass index, kg / m ² , mean (SD)	20.7 (4.5)

Respondent characteristics

	Total	Pregnant woman	Household head	Mother-in-law
Experienced illness during reference period, % (n)	6.3 (9)	6.3 (9)	0 (0)	0 (0)
Ate foods outside of the home, % (n)	19.8 (20)	16.7 (9)	27.3 (6)	19.4 (6)
Self-reported activity levels, % (n)				
- Mild	24.2 (23)	22.9 (11)	11.1 (2)	34.5 (10)
- Moderate	45.3 (43)	68.8 (33)	27.8 (5)	17.2 (5)
- Strenuous	30.5 (29)	8.3 (4)	61.1 (11)	48.3 (14)



Respondent characteristics

Intra-household characteristic				
Main income earner in household, % (n)	16.0 (16)	2.1 (1)	63.6 (14)	3.2 (1)
Serving order in household, mean (SD)	2.9 (2.2)	3.0 (2.3)	2.8 (2.8)	2.8 (1.7)
Fasting during reference period, % (n)	3.0 (3)	2.1 (1)	4.6 (1)	3.2 (1)
Experienced illness during reference period, % (n)	6.3 (9)	6.3 (9)	0 (0)	0 (0)
Ate foods outside of the home, % (n)	19.8 (20)	16.7 (9)	27.3 (6)	19.4 (6)
Self-reported activity levels, % (n)				
- Mild	24.2 (23)	22.9 (11)	11.1 (2)	34.5 (10)
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% error

$$= (\text{estimated} - \text{weighed}) / \text{weighed} * 100$$

Table 3: Percentage error using photographic atlas compared with weighed portion sizes

Food type	n	Weighed portion size, mean (SD)	Estimated portion size, mean (SD)	% error (SD)
Cooked rice	83	498.8 (199.2)	400.7 (214.9)	-14.1 (46.6)
<i>Dal</i>	53	218.6 (75.4)	134.5 (52.5)	-34.9 (27.4)
Vegetable curry	54	144.5 (72.8)	160.2 (88.4)	27.9 (93.7)
<i>Sag</i>	11	49.4 (24.3)	50.9 (30.2)	40.1 (116.0)
<i>Bhujiya</i>	10	94.7 (96.3)	60.3 (11.0)	-83.6 (29.0)
<i>Roti</i>	8	217.9 (82.8)	151.3 (93.3)	-26.4 (36.9)
Total	245	-	-	-4.6 (67.8)

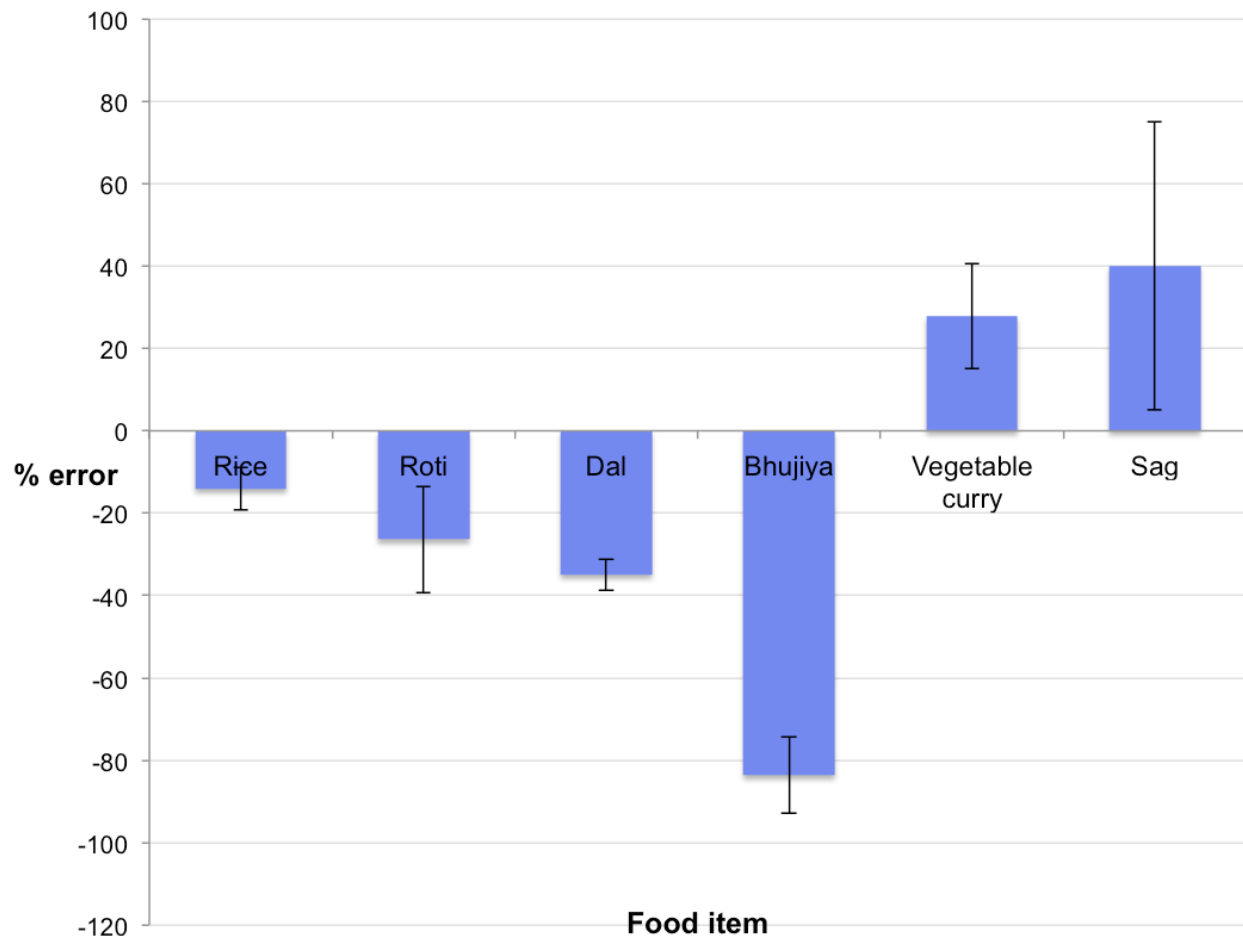
Low mean error overall



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% error

$$= (\text{estimated} - \text{weighed}) / \text{weighed} * 100$$



- Rice: staple
- Dal: Protein source for vegetarians
- Curry: More options?

Small samples, but...

- Bhujia: Consistent underestimate
- Sag & roti: Oh dear!

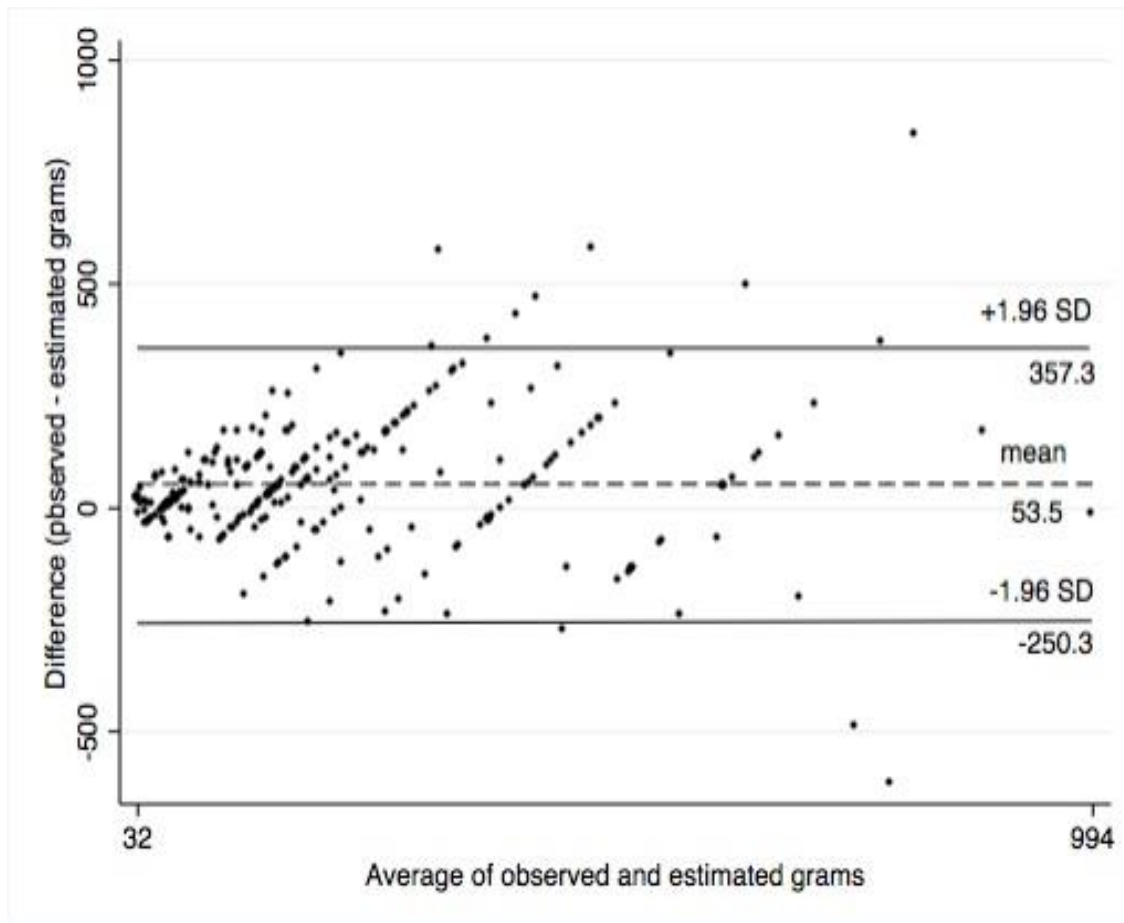
Difference between selected and best photo

Table 4: Difference between the selected photograph number and the best photograph number

Food type	N	% subjects with selection error of n photographs				
		0	± 0.5	± 1.0	± 1.5	± 2 or more
Cooked rice (6 photographs; 200 g intervals)	73	15.1	34.3	30.1	9.6	10.9
<i>Dal</i> (3 photographs; 50 g intervals)	33	21.2	27.3	39.4	12.1	0
Vegetable curry (4 photographs; 90 g intervals)	50	28.0	30.0	18.0	10.0	14.0

- Around half of respondents choose the correct portion
- > 3/4 choose correct portion to within one option bigger or smaller

Bland-Altman plot of agreement



Mean underestimation of 53.5g

95% of observations within the limits of agreement (-250.3, 357.3g).

Less agreement with bigger servings.



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Discussion

- >3/4 choose correct image to within 1 bigger or smaller, similar to others.
- Levels of error also similar

Strengths & limitations

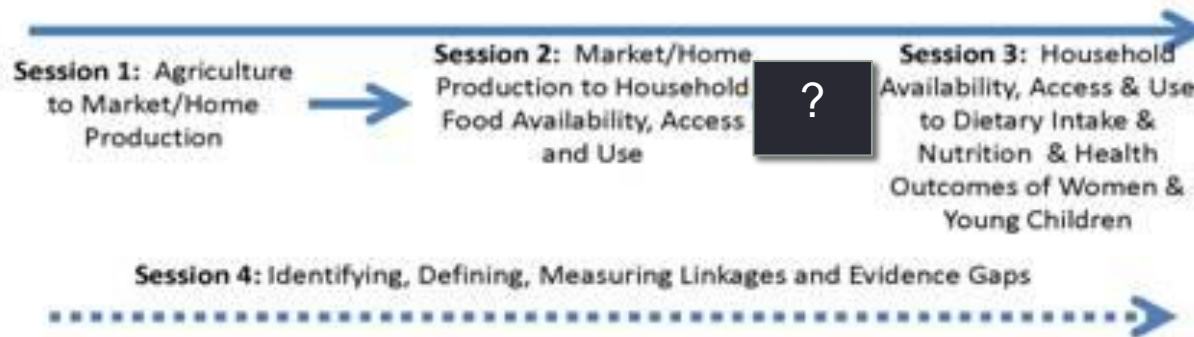
- Community response
- Real conditions.
- Lots of food items
- Sample size – MUAC, age, gender & education
(crude analysis showed no significant association)
- Rare / seasonal food
- Human error – Data entry

Future work

- Office study for rare items.
- Immediate vs 24 hour recall (Turconi et al 2005).
- Re-validation of edited photos

Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action

Agriculture to Nutrition Pathway



1. Quality of data
2. Scores are limited – characterise the diet (caste/ vegetarians?)
3. Disconnect between household food security and nutritional status in Terai



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Intra-household food allocation

Inequity? We need dietary intake data to find out!

Evidence for gender bias in calorie adequacy is **limited**.
(2)

A review of five studies on the same dataset found **contradictory findings** in the level and direction of discrimination (1).

Average intakes reveal

no systematic intra-household discrimination,
with possible exception of iron and calcium (3)

No evidence of sex bias, even in areas of acute sex differentials in mortality
(4)

In general, (from 33 studies adjusting for requirements) there is **gender-neutrality** of intra-household allocations, although a slight male bias persists. (5)



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Thank you

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References

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