# Infant and Young Child Feeding Practices as Associated with Child Nutritional Status in Nepal: Analysis of the 2011 Nepal Demographic Health Survey

*Saba Mebrahtu, PhD*
*Jennifer Crum,*
*Pradiumna Dahal*
*Rajkumar Pokharel*
*John Mason*

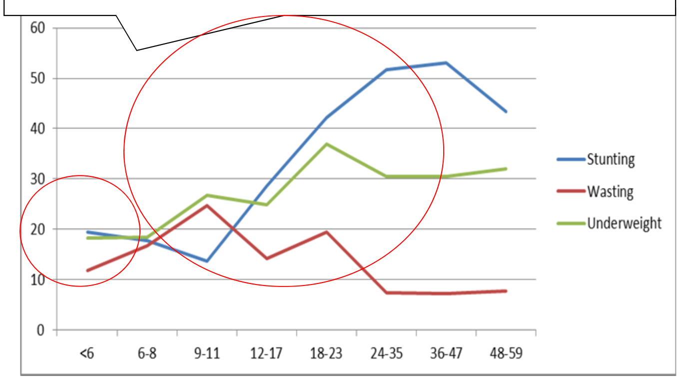
*"Science and Policy for Health, Agriculture, Nutrition & Economic Growth"*
*NUTRITION INNOVATION LAB:*
*2nd Scientific Symposium*
*Kathmandu, Nepal 13-14 August 2013*

## OUTLINE

- BACKGROUND
- OBJECTIVES
- METHODS
- MAJOR RESULTS
- CONCLUSIONS

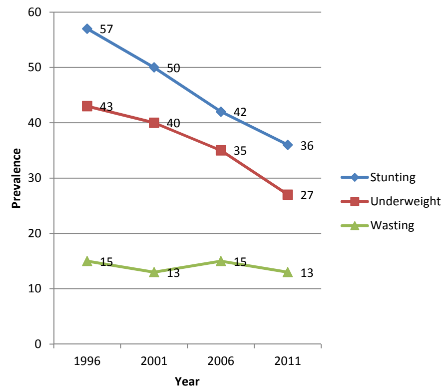
# BACKGROUND

## GROWTH FALTER STARTS BEFORE BIRTH AND CONTINUES ON UNTIL 35 MONTHS OF AGE IN NEPAL (NDHS, 2011)

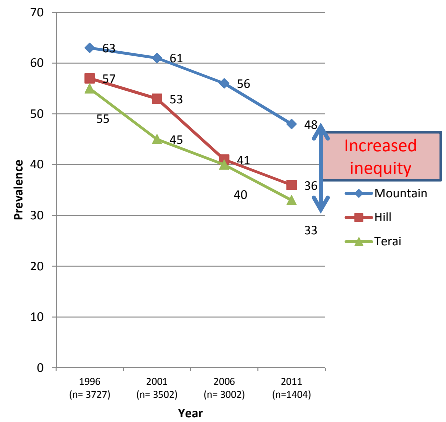



*Source: NDHS 2011*

## NATIONAL TREND IN CHILD UNDERNUTRITION, 0-35 MONTHS OF AGE

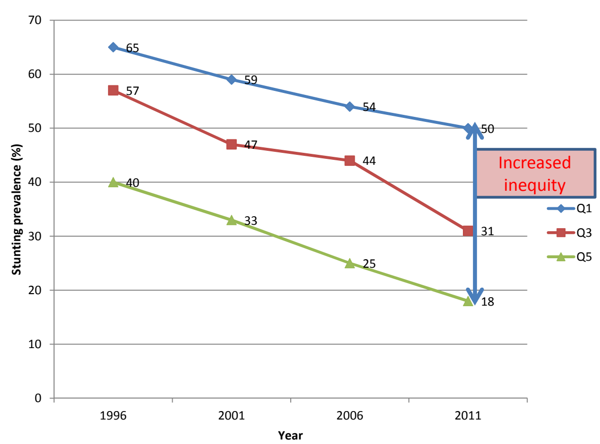



## TREND IN CHILD STUNTING BY ECOLOGICAL ZONE, 0-35 MONTHS OF AGE




*Source: Further analysis of the NDHS 1996-2011*

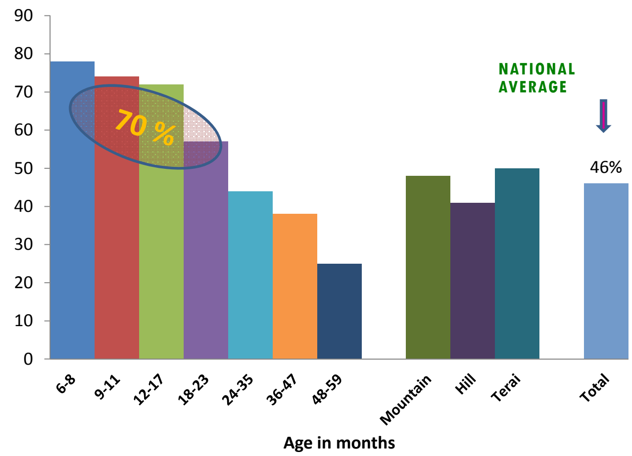
## CHANGE IN STUNTING THROUGH TIME BY WEALTH QUINTILE, 0-35 MONTHS OF AGE




*Source: Further analysis of the NDHS 1996-2011*

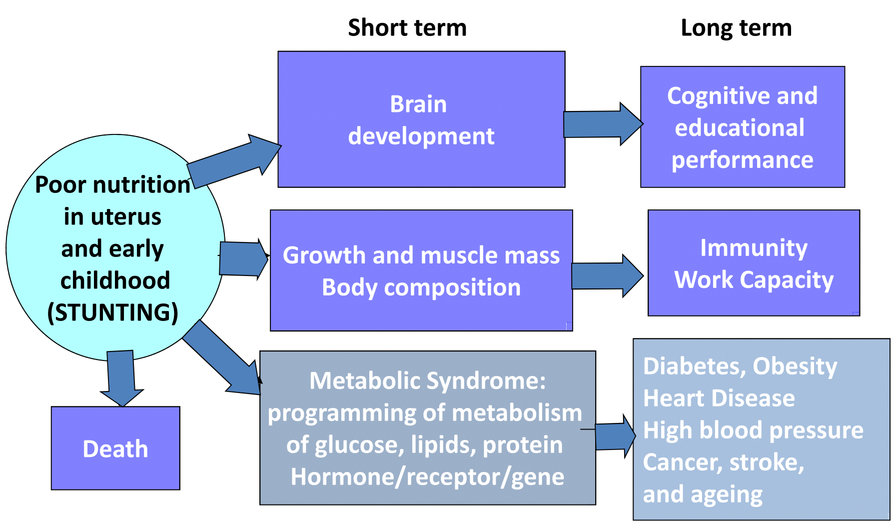
- Stunting improved significantly within all wealth quintiles
- However, this was more rapid among the richest, involving 22 ppts reduction in stunting, as compared to 15 ppts reduction among the poorest.
- The gap is higher in 2011 (32 ppts ) as compared to 1996 (25 ppts)

## ANEMIA PREVALENCE HIGH IN < 5 CHILDREN: THE PROBLEM IS SERIOUS AMONG 6-23 MONTHS CHILDREN



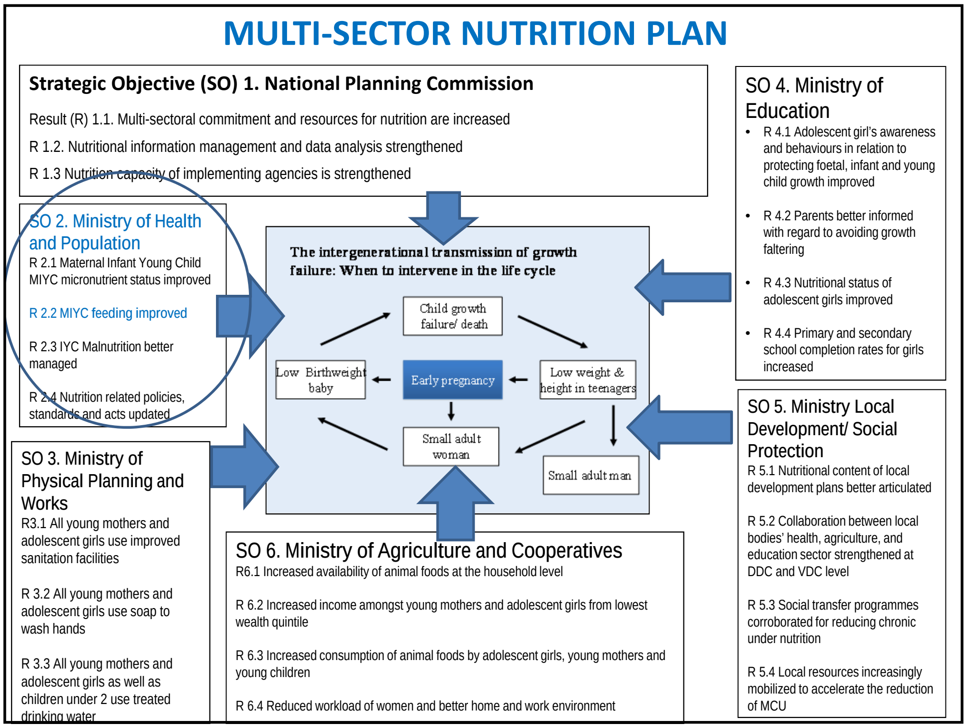

*Source: NDHS 2011*

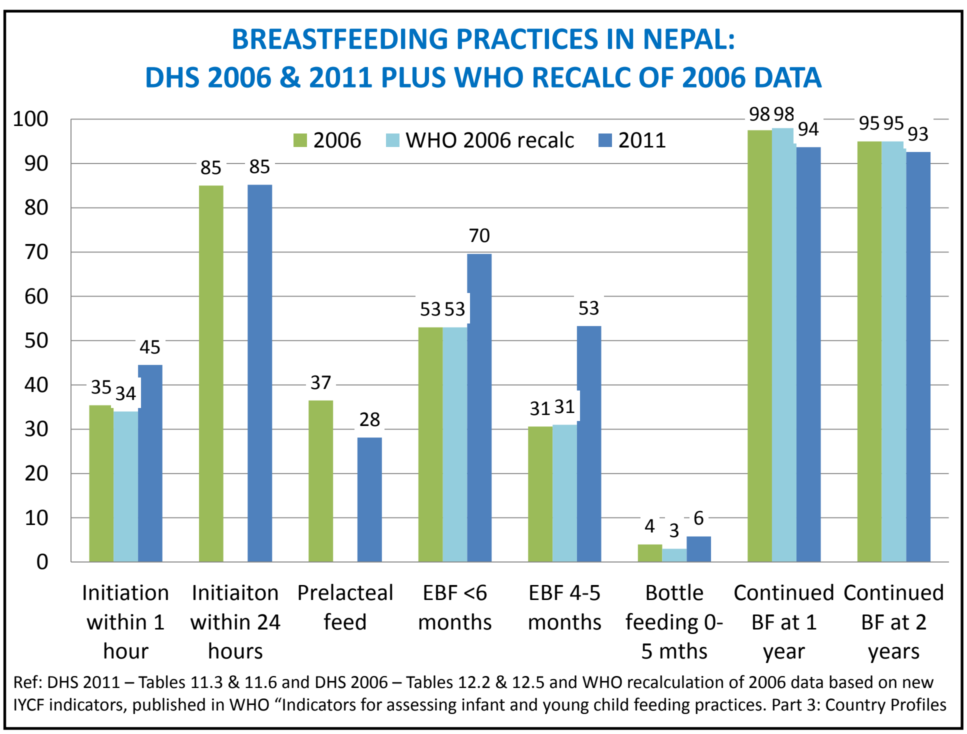
## LIFE LONG CONSEQUENCES OF MATERNAL AND CHILD UNDERNUTRITION

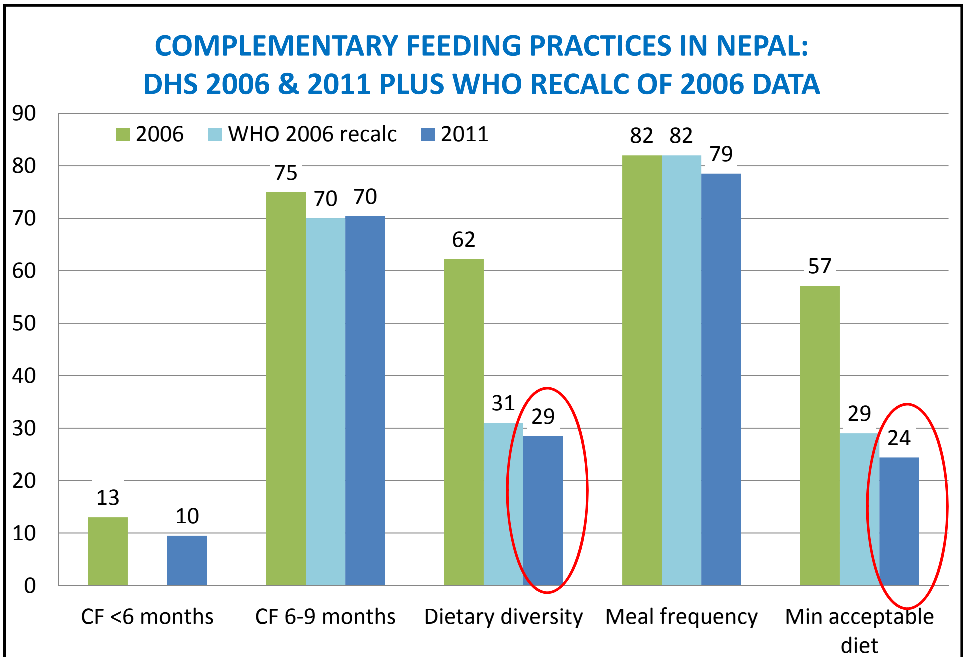



(James et al 2000)

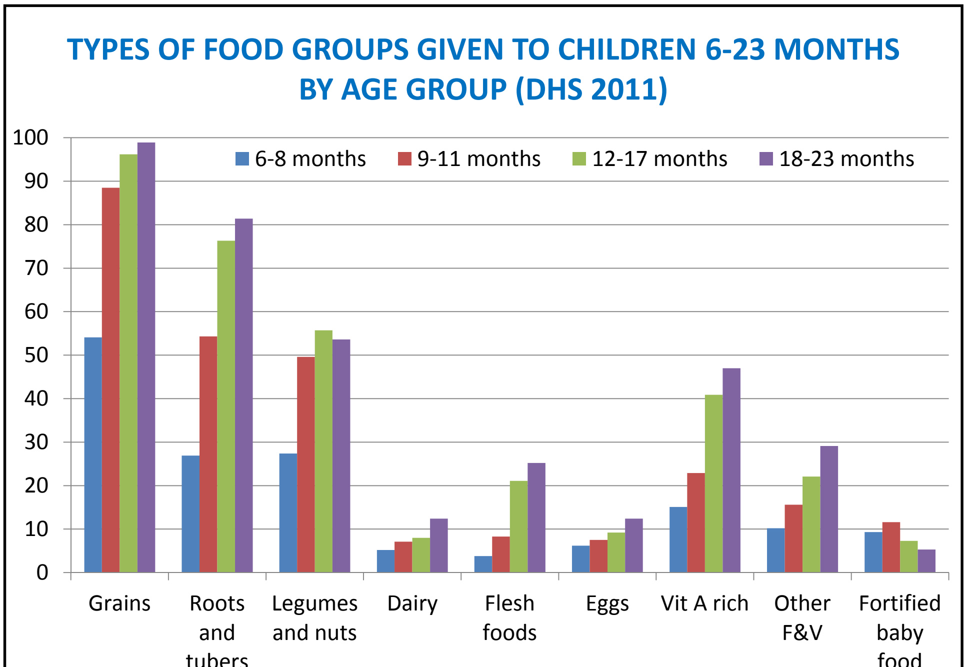
8


MULTI-SECTOR NUTRITION PLAN
Strategic Objective (SO) 1. National Planning Commission
Result (R) 1.1. Multi-sectoral commitment and resources for nutrition are increased
R 1.2. Nutritional information management and data analysis strengthened
R 1.3 Nutrition capacity of implementing agencies is strengthened
SO 2. Ministry of Health and Population
R 2.1 Maternal Infant Young Child MIYC micronutrient status improved
R 2.2 MIYC feeding improved
R 2.3 IYC Malnutrition better managed
R 2.4 Nutrition related policies, standards and acts updated
SO 3. Ministry of Physical Planning and Works
R3.1 All young mothers and adolescent girls use improved sanitation facilities
R 3.2 All young mothers and adolescent girls use soap to wash hands
R 3.3 All young mothers and adolescent girls as well as children under 2 use treated drinking water
The intergenerational transmission of growth failure: When to intervene in the life cycle
Child growth failure/ death
Low Birthweight baby
Early pregnancy
Low weight & height in teenagers
Small adult woman
Small adult man
SO 4. Ministry of Education
R 4.1 Adolescent girl's awareness and behaviours in relation to protecting foetal, infant and young child growth improved
R 4.2 Parents better informed with regard to avoiding growth faltering
R 4.3 Nutritional status of adolescent girls improved
R 4.4 Primary and secondary school completion rates for girls increased
SO 5. Ministry Local Development/ Social Protection
R 5.1 Nutritional content of local development plans better articulated
R 5.2 Collaboration between local bodies' health, agriculture, and education sector strengthened at DDC and VDC level
R 5.3 Social transfer programmes corroborated for reducing chronic under nutrition
R 5.4 Local resources increasingly mobilized to accelerate the reduction of MCU
SO 6. Ministry of Agriculture and Cooperatives
R6.1 Increased availability of animal foods at the household level
R 6.2 Increased income amongst young mothers and adolescent girls from lowest wealth quintile
R 6.3 Increased consumption of animal foods by adolescent girls, young mothers and young children
R 6.4 Reduced workload of women and better home and work environment


BREASTFEEDING PRACTICES IN NEPAL:
DHS 2006 & 2011 PLUS WHO RECALC OF 2006 DATA
2006
WHO 2006 recalc
2011
100
90
80
70
60
50
40
30
20
10
0
35
34
45
85
85
37
28
53
53
70
31
31
53
4
3
6
98
98
94
95
95
93
Initiation within 1 hour
Initiaiton within 24 hours
Prelacteal feed
EBF <6 months
EBF 4-5 months
Bottle feeding 0-5 mths
Continued BF at 1 year
Continued BF at 2 years
Ref: DHS 2011 – Tables 11.3 & 11.6 and DHS 2006 – Tables 12.2 & 12.5 and WHO recalculation of 2006 data based on new IYCF indicators, published in WHO "Indicators for assessing infant and young child feeding practices. Part 3: Country Profiles




Ref: DHS 2011 – Tables 11.3 & 11.6 and DHS 2006 – Tables 12.2 & 12.5 and WHO recalculation of 2006 data based on new IYCF indicators, published in WHO "Indicators for assessing infant and young child feeding practices. Part 3: Country Profiles

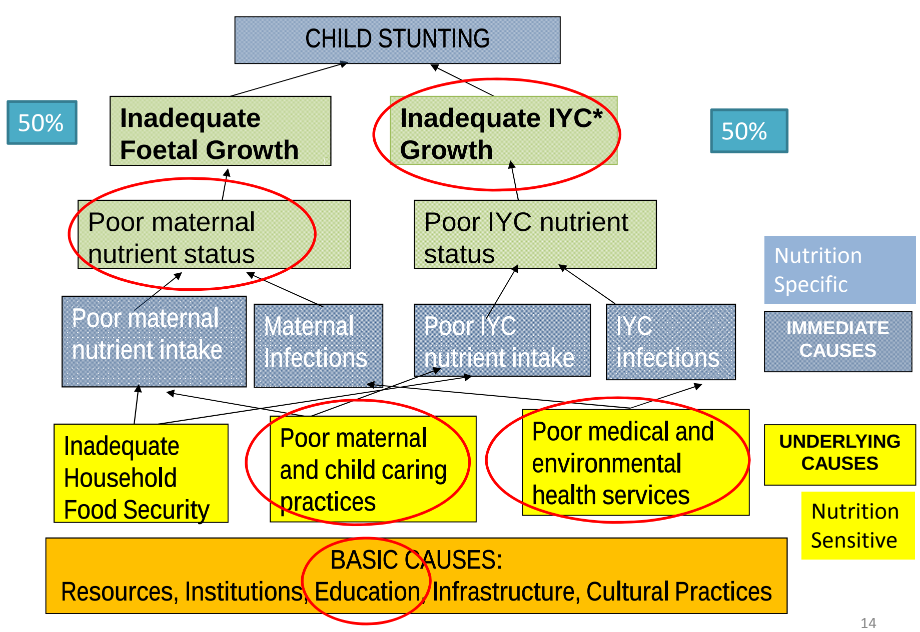



Ref: DHS 2011 Table 11.5

## THE OBJECTIVES

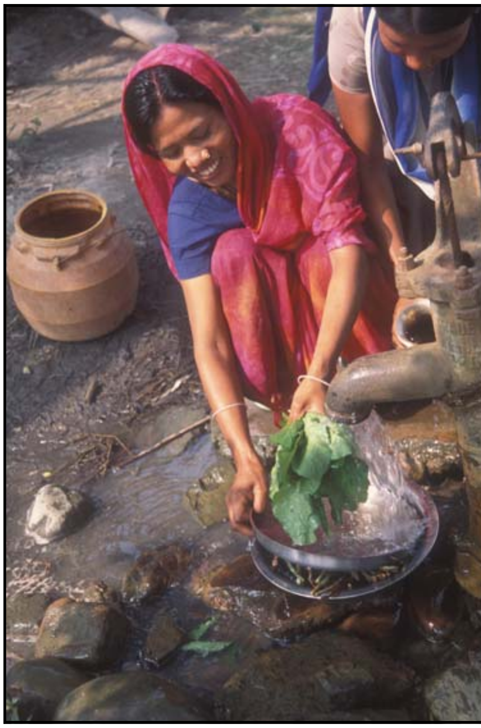
- Analyze association between core selected IYCF practices with nutritional outcome, in terms of stunting, underweight and anemia in Nepal (NDHS, 2011)
- Disaggregate results by population subgroups, which can suggest potential targeting options.
- Examine associations of IYCF indicators with causal factors, which can be used to identify appropriate content of interventions.
- The results aim to contribute inputs to the national IYCF strategy, in line with GoN's Multi-Sector Nutrition Plan for accelerated reduction of undernutrition.

## NUTRITION DATA ANALYSIS USING DATA FROM THE 2011 NDHS




14

* IYC = Infant and young child



# METHODS

## DATA SOURCE

- Data obtained from Nepal Demographic and Health Surveys (NDHS) conducted in Nepal in 2011.
- Variables used for analysis were from household-level and child-level files.
- Variables from household-level files were merged into the child-level files, for individual years, by using household and case identification variables for matching.
- These datasets were then used to create a merged child-level file consisting of data from all survey years which was used for analysis.

## ANALYSIS METHODS

- All analyses were first performed using the entire (national) sample.
- Data was then disaggregated by ecological zone to study associations within three distinct geographical areas: Ecological zones – mountains, hills, and terrai; Regions – Eastern, Central, Western, Mid-western, and Far-western; and Ethnicity.
- All analyses were conducted using SPSS or STATA.
- Mean and prevalence values reported were weighted by sample weights to provide population estimates.
- OLS models controlled for complex survey design (clustering) and stratification by urban/rural location.

## VARIABLE DERIVATIVES

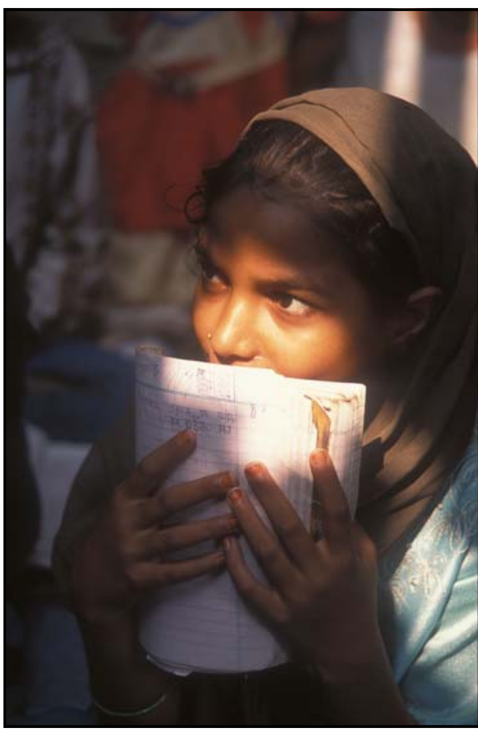
Dependent Variables

- **Height-for-age (HAZ), weight-for-age (WAZ)** and **weight-for-height (WHZ)** had been calculated as continuous variables using World Health Organization (WHO) standards for 2011 NDHS.
- **Hemoglobin (Hgb)** estimates were made on children using the HemoCue system for capillary blood testing. Hgb was used to calculate the prevalence of anemia based on the following standards:
  - less than 11g/dl for children.
- Hgb measures were adjusted for altitude and smoking status (if data available) as described in the NDHS methods.
- Child anemia is assessed within two age categories; 6-59 months in order to describe overall change in anemia status in Nepal, and 6-23 months to allow analysis of anemia among children currently targeted by Nepal’s micronutrient program.

## VARIABLE DERIVATIVES (2)

**Independent Variables**

- Selected IYCF indicators – **dietary diversity**, **minimum meal frequency**, and **minimum acceptable diet**, and **early breastfeeding initiation** were examined in relation to child growth and anemia.
- By their association with child outcomes, other independent factors were included for controlling association between IYCF core indicators and child nutritional outcomes – such as maternal education, child's age and gender**.**
- **Establishment of comparabilit**y between samples – across the survey years.
  - **Age heaping -** particular problem, mothers tend to report ages of children as approximations based upon major months (e.g. 6 months, 12 months), or from a national calendar including country-specific events rather than actual month of age.
  - Heaping of age was visually represented by the number of cases for each age month.
  - The degree of age heaping was assessed for each year using a metric developed for this purpose, calculated by the following steps.
    - Data from the child-level file was first aggregated by child age (in months).
    - The number of cases for each month of age was then regressed on age, with the unstandardized residuals saved into the aggregated file.
    - The absolute value of residuals was summed and then divided by the total number of cases, resulting in a standardized measure of age heaping independent of sample size. This metric was 0.098 for 1996, 0.102 for 2001, 0.098 for 2006 and 0.149 for 2011.
    - The degree of age heaping was considered sufficiently thus allowing for reasonable comparison of child outcomes among all survey years.



## MAIN RESULTS

## Mean HAZ by child age and diet diversity status

| Age in months | Adequate diversity HAZ (n) | Inadequate diet diversity HAZ (n) | p-value |
|---|---|---|---|
| 6-11 | -0.37 (41) | -0.96 (198) | 0.006 |
| 12-17 | -1.27 (80) | -1.59 (177) | 0.071 |
| 18-23 | -1.54 (77) | -1.79 (136) | 0.206 |
| Total | -1.19 (198) | -1.40 (512) | 0.065 |

- **HAZ** was also significantly higher among children **receiving an adequately diverse diet** versus those not, for ages 6-11 months, 12-17 months, and 6-23 months. **In contrast to underweight, the significant effect was in the youngest age group (6-11).**
- Minimum meal frequency was not associated with HAZ (not reported).

## Mean Hgb by child age and diet diversity status

| Age in months | Adequate diversity Hgb (n) | Inadequate diet diversity Hgb (n) | p-value |
|---|---|---|---|
| 6-11 | 10.4 (42) | 10.1 (181) | 0.187 |
| 12-17 | 10.3 (84) | 10.2 (175) | 0.710 |
| 18-23 | 10.8 (79) | 10.6 (133) | 0.361 |
| Total | 10.5 (204) | 10.3 (490) | 0.049 |

## Anemia prevalence by child age and diet diversity status - weighted

| Age in months | Adequate diversity % anemia (n) | Inadequate diet diversity % anemia (n) | Total | p-value |
|---|---|---|---|---|
| 6-11 | 66 (42) | 78 (181) | 76 (223) | 0.106 |
| 12-17 | 70 (84) | 73 (175) | 72 (259) | 0.658 |
| 18-23 | 53 (79) | 58 (133) | 56 (212) | 0.455 |
| Total | 63 (204) | 71 (490) | 68 (693) | 0.038 |

- **Higher mean Hgb** was found among children ages 6-23 months **receiving adequately diversified** diet versus those with inadequate dietary diversity.
- A similar association was found for anemia prevalence.
- 63% of children ages 6-23 months with adequately diverse diets were anemic versus 71% for those with inadequate diversity
- Minimum meal frequency was not associated with HAZ (not reported).

## Regression models showing differences in mean HAZ by selected indicators of IYCF practices; overall and by category of child age

*In cells: Coefficient (B) (t, p-value)*

*Models controlled for education, child age and gender.*

*(*) denotes significance at p< 0.10; (**) at p< 0.05; (+) combines diet diversity and minimum meal frequency.*

| Age of child (months) | Dependent variable=HAZ | | | |
|---|---|---|---|---|
| | Diet Diversity | Minimum meal frequency | Minimum+ acceptable diet | Early initiation of breastfeeding |
| 0-5 | -- | -- | -- | 0.032 |
| | | | | (0.18, 0.859) |
| N | | | | 209 |
| 6-11 | 0.657** | 0.135 | 0.716** | 0.062 |
| | (2.97, 0.003) | (0.74, 0.458) | (3.18, 0.002) | (0.37, 0.709) |
| N | 236 | 234 | 236 | 235 |
| 12-17 | 0.151 | -0.008 | 0.138 | 0.024 |
| | (0.84, 0.402) | (-0.04, 0.971) | (0.75, 0.456) | (0.14, 0.888 |
| N | 226 | 223 | 227 | 224 |
| 18-23 | 0.037 | 0.023 | 0.147 | 0.430** |
| | (0.18, 0.858) | (0.09, 0.929) | (0.71, 0.480) | (2.12, 0.035) |
| N | 211 | 203 | 211 | 212 |
| Total (6-23) | 0.229** | 0.056 | 0.278** | -- |
| | (2.00, 0.046) | (0.45, 0.651) | (2.38, 0.018) | |
| N | 673 | 660 | 674 | |
| Total (0-23) | -- | -- | -- | 0.138 |
| | | | | (1.57, 0.117) |
| N | | | | 880 |

- HAZ was associated with **diet diversity, minimum acceptable diet** and **early initiation of breastfeeding** when controlling for education, child age and gender.
- Among young children 6-11 and 6-23 months, both dietary diversity and minimum acceptable diet were significantly associated with HAZ. The effect was more concentrated in younger children (6-11 months), unlike underweight, which merits careful investigation.

## Regression models showing differences in mean hemoglobin (Hgb) by diet diversity and minimum meal frequency, controlling for education, child age and gender

*In cells: Coefficient (B) (t, p-value)*

| | Dependent variable=Hgb |
|---|---|
| Independent variable | Age: 6-23mos |
| Diet Diversity | 0.124 |
| | (1.17, 0.242) |
| Minimum meal frequency | 0.008 |
| | (0.069, 0.945) |
| Interaction diet diversity, minimum meal frequency | -- |
| Poor education (dummy) | -- |
| Age | -0.099 |
| | (-1.66, 0.097) |
| Age squared | 0.005 |
| | (2.57, 0.010) |
| Gender of child (dummy female) | -0.002 |
| | (-0.02, 0.983) |
| N | 650 |

### Hemoglobin by diet diversity and minimum meal frequency status

| | Inadequate diet diversity | Adequate diet diversity | Total |
|---|---|---|---|
| Less than minimum meal frequency | 10.2 (116) | 11.0 (18) | 10.3 (134) |
| Minimum meal frequency | 10.3 (328) | 10.4 (188) | 10.4 (516) |
| Total | 10.3 (444) | 10.5 (206) | 10.3 (650) |

*In cells: mean Hgb (n)*

- Neither diet diversity nor minimum meal frequency was associated with Hgb controlling for child age and gender.
- A significant interaction between these variables was found (p= 0.027) but is probably an artifact of the data associated with small sample size (n=18) of those with adequate diet diversity, but less than adequate minimum meal frequency.
- The similarity of the three cells with 10.2-10.4 g/dl Hgb strongly indicates that there is no association here with IYCF measures.
- However, the findings that the mean HgB is so low, and the associated very high prevalence of anemia in children, of around 70% is a concern, and for seeking solutions.

## SELECTED INDICATORS OF IYCF PRACTICES BY ECOLOGICAL ZONE AND REGION

| Ecological Zones | Diet diversity | Minimum meal frequency | Minimum acceptable diet | Early initiation of breastfeeding |
|---|---|---|---|---|
| Mountain | 28.1 (58) | 75.4 (57) | 23.5 (58) | 50.4 (73) |
| Hill | 35.5 (291) | 85.4 (289) | 33.0 (293) | 47.2 (369) |
| Terai | 23.5 (391) | 75.4 (374) | 20.0 (391) | 42.8 (526) |
| Total | 28.6 (740) | 79.4 (719) | 25.4 (742) | 45.1 (968) |
| p-value | 0.003 | 0.005 | 0.001 | 0.272 |

| Regions | Diet diversity | Minimum meal frequency | Minimum acceptable diet | Early initiation of breastfeeding |
|---|---|---|---|---|
| Eastern | 36.7 (181) | 87.1 (180) | 35.4 (181) | 47.9 (227) |
| Central | 19.8 (256) | 74.0 (242) | 16.4 (256) | 36.9 (321) |
| Western | 37.0 (129) | 86.0 (126) | 31.7 (131) | 50.3 (182) |
| Mid-western | 19.9 (106) | 71.6 (106) | 17.7 (106) | 46.7 (140) |
| Far-western | 37.7 (67) | 77.9 (65) | 33.4 (67) | 53.3 (98) |
| Total | 28.6 (740) | 79.4 (719) | 25.4 (742) | 45.1 (968) |
| p-value | <0.001 | 0.001 | <0.001 | 0.006 |

- There are significant differences in prevalence of IYCF recommended practices by ecological zone and region.
- For potential targeting of interventions to improve IYCF practices (and thus, child growth) by geographic location, priority should be given to the Terai ecological zone, where children had the least diet diversity, minimum meal frequency, minimum acceptability and early initiation of breastfeeding.
- The Central and Mid-western regions should also be considered for priority targeting for the same reasons.

## SELECTED INDICATORS OF IYCF PRACTICES BY ECOLOGICAL ZONE AND REGION

| Ethnic group/caste | Diet diversity | Minimum meal frequency | Minimum acceptable diet | Early initiation of breastfeeding |
|---|---|---|---|---|
| Brahman/Chhetri | 48.8 (204) | 81.4 (205) | 42.4 (206) | 52.4 (279) |
| Madhesi | 4.5 (87) | 63.8 (85) | 4.5 (87) | 30.6 (100) |
| Dalit | 20.1 (126) | 83.4 (119) | 18.9 (126) | 41.7 (185) |
| Newar | 35.2 (20) | 94.1 (20) | 29.3 (20) | 47.3 (28) |
| Janajati | 27.6 (249) | 82.1 (243) | 25.9 (249) | 46.8 (303) |
| Muslim | 11.5 (50) | 69.8 (45) | 6.5 (50) | 35.8 (69) |
| Other | 32.7 (4) | 49.3 (2) | 0.0 (4) | 61.4 (4) |
| Total | 28.6 (740) | 79.4 (719) | 25.4 (742) | 45.1 (968) |
| p-value | <0.001 | 0.001 | <0.001 | 0.005 |

Targeting by ethnic group/caste should be prioritized for the Madhesi group, which exhibited the poorest IYCF practices considered here, followed by the Dalit, and Muslim.

This confirms the recommendation for targeting the Terai as the majority of Madhesi people dwell there.

# CONCLUSIONS

- Optimal IYCF practices have positive effect on child growth, particularly weight-for-age.
- **Dietary diversity** are positively and significantly associated with better WAZ among children 6-23 months of age and among those ages 18-23 months. The effects are clearly concentrated in the older age group, although the coefficients in the 6-11 month group indicate some possible effect in this younger age group.
- These effects are additive, not interactive, as the interaction term is not significant (not shown).
- Adequate diverse diets are also have positive effects on HAZ, especially among ages 6-11 months. In contrast to WAZ, the effects are more concentrated among this younger age group.
- **Minimum meal frequency** is positively associated WAZ among children 6-23 months of age. Providing adequate frequency of meals to children is likely an important factor in child growth when dietary diversity is also present.

- Minimum acceptable diet has a positive impact on both WAZ and HAZ of children in the same age range as those for dietary diversity and meal frequency. The effects are larger than either diversity or meal frequency; thus suggesting importance of both.

- Mean Hgb is low and anemia prevalence high among children 6-23 months of age, particularly those in the youngest age range (6-11 months). Child diet was not associated with hemoglobin.

- This may suggest poor iron stores, likely associated with poor iron status of the mother during pregnancy and period of breastfeeding, which has important implication for maternal nutrition assessment and intervention.

- Recommended IYCF practices vary significantly by ecological zone, region and ethnicity – potential for targeting.

## Future analysis

- Further analysis work examine trends and identify the main determinants of optimal breastfeeding and complementary feeding practices to further define appropriate content of IYCF interventions, in line with the MSNP.

- Analyses will also investigate association of child growth, with intake of iron-rich foods as associated with Hgb and anemia.

# Thank You