The trend and determinants of under-five children stunting and the role of different levels of WASH practices on childhood stunting in Nepal.

Shrestha SK[1], Sharma D[2]
[1]Save the children, Global Fund, Kathmandu, Nepal. [2]World Bank, Washington DC.

Introduction

Childhood stunting among under-five children is one of the major public health problems in Nepal. Despite, achieving remarkable progress in reducing the proportion of under-five childhood stunting over past decades, the childhood stunting is still high, with nearly 36% of under-five children stunted in 2016 [1].

The cause of growth faltering among children could be multifactorial that operates at different levels of causation [2]. Previous studies from Nepal have demonstrated that maternal literacy, duration of breast-feeding, perceived baby size at birth, frequency of ANC visits, place of delivery, maternal age and nutrition, and wealth quintile are important determinants of under-five stunting [3,-5]. However, all the studies are based on surveys collected prior to 2013. We aim to examine the factors associated with decline in under-five stunting using latest three Nepal Demographic and Health Survey (2006, 2011 & 2016) to portray the latest trend and determinants of childhood stunting in Nepal.

There is also a growing body of evidence illustrating important role of Water, Hygiene and Sanitation (WASH) practices on childhood nutrition [3,5,6] but there is a gap in current literature that has examined the combined and differential effect of various WASH practices on childhood stunting. Thus, we also aim to examine the association between different levels (combination) of household WASH practices and under-five childhood stunting in Nepal.

Objective

- To examine the trend and determinants of stunting among under-five children in Nepal.

- To examine the association between different levels of household WASH practices and childhood stunting.

Methods

Data Source:
We used nationally representative datasets from Nepal Demographic Health Survey (NDHS) 2006, 2011 and 2016.

Outcome variable:
The outcome variable was stunting among children of under-five years of age, calculated based on height-for-age z-score where children with -2 standard deviation below the median WHO reference population were categorized as "stunted", while all children with z-score greater than or equal to -2 standard deviation were classified as "adequately nourished" children.

Explanatory variables:
We included a wide range of socioeconomic indicators, child characteristics, maternal factors, WASH practices , women's health care access and access to mass media as the explanatory variables. The definition of explanatory variables are presented in table 1.

We also created the dummy variable "level of household WASH practices" using different combination of three major WASH facilities (improved sanitation, handwashing practice with soap and water, and water treatment practices) to examine the combined and differential effect of WASH practices on childhood stunting in Nepal.

Contact Author:
Som Kumar Shrestha
Email: somkr.stha@gmail.com

Table 1: Explanatory variables definition:

Determinants	Variable definition and type
Survey year	Year of survey
Ecological region	Ecological region of residence
Place of residence:	Urban or Rural residence status
Sex of HH head	Sex of the household head
Wealth quintiles	Composite measure of a household's cumulative living standard ranked from 1 to 5 based on ownership of assets
Type of fuel	Type of cooking fuel
Child's birth weight	Child weight at birth (<2500 gm=Low birth weight; >=2500 gm= Normal weight) (Dichotomous)
Child's age	Child's age in years ranged from 1 to 5
Child sex	Sex of the child
Number of living children	Number of living children in the household
Breastfeeding status	Ever breastfeed to children
Diarrhoea incidence over past 2 weeks	Child had diarrhea over last two weeks
Women age category	Women age grouped into 6 categories (15-19, 20-24, 25-29, 30-34, 35-39 40+ years)
Women's education status	Women education status
Marital Status	Current marital status
Maternal smoking status	Women smoking status (Dichotomous)
Maternal BMI	Maternal BMI Index (Normal: >=18.5 kg/m^2 & low: <18.5 kg/m^2)
Cluster sanitation coverage	Percentage of households with improved sanitation facilities in the cluster
Improved water source	Household has access to improved water source (Dichotomous)
Hand washing practice with soap and water	Availability of both soap and water in the household
Water treatment practice	Current household water treatment practice
4th ANC visits	Number of ANC visits during last pregnancy
Institutional delivery	Place of birth delivery
Watching TV	Frequency of watching TV

Data Analysis:

We used multivariate logistic regression model to examine the trend and determinants of under-five childhood stunting after controlling for potential confounding variables.

We also fit the logistic regression to evaluate the role of different levels of household WASH practices on childhood stunting.

The statistical significance is set at p-value less than 0.05. We adjust for complex study design and non-proportionate selection probability. All analysis is done using Stata SE 14.1.

Findings

A total of 9795 under-five children from three different independent surveys (NDHS 2006, 2011 & 2016) were included in the study.

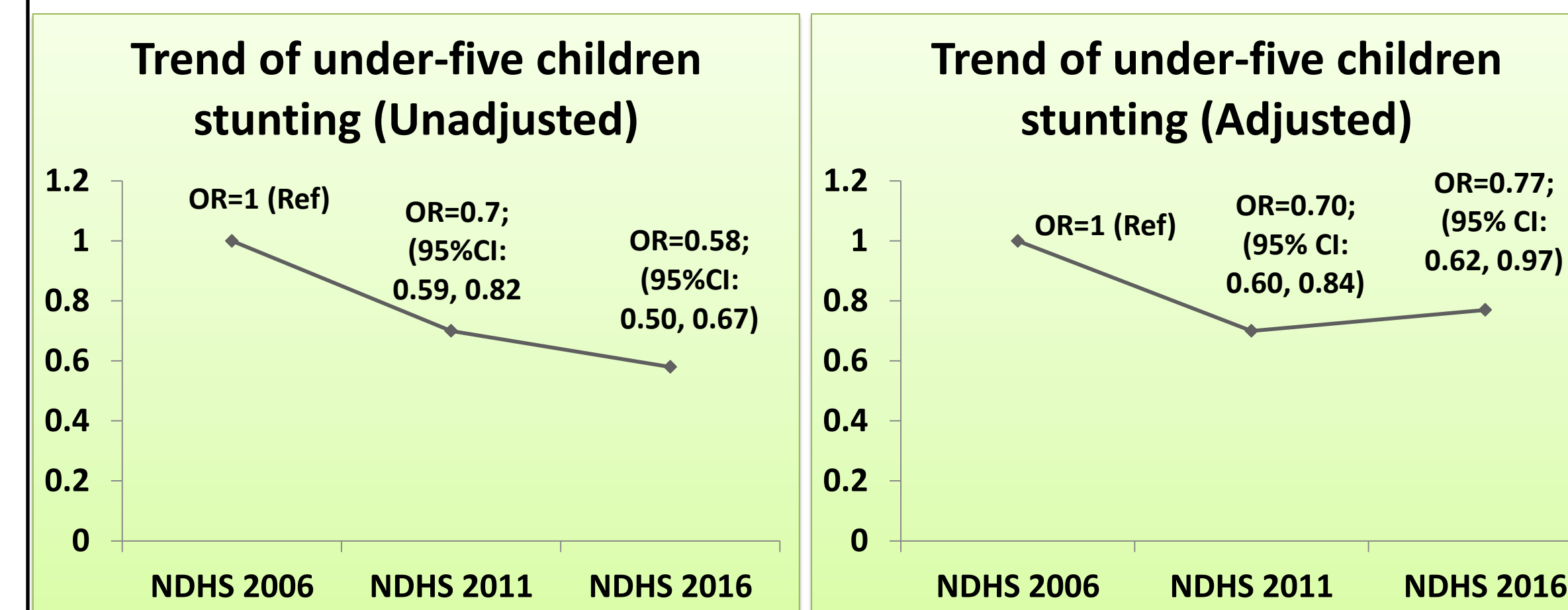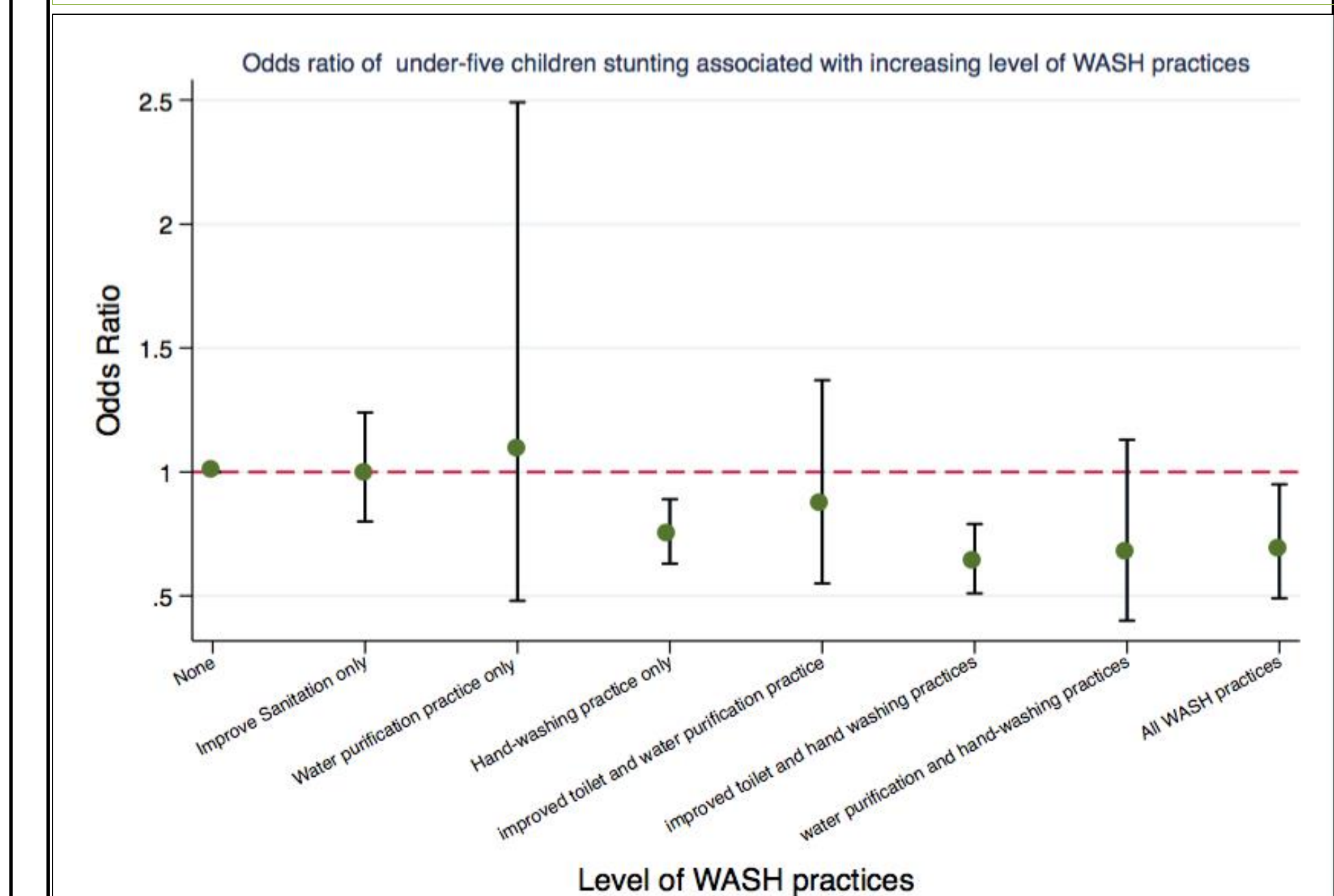**Figure 1: Trend of under-five stunting from 2006 to 2016**

Trend of under-five children stunting (Unadjusted)

Trend of under-five children stunting (Adjusted)

Table 2: Unadjusted and adjusted odds ratio of under-five children stunting (n=7580)

Independent variables	Unadjusted Odds Ratio (95% CI)	Adjusted Odd Ratio (95% CI)
Survey year		
2016	0.58 (0.50, 0.67)	0.77 (0.62, 0.97)*
2011	0.70 (0.59, 0.82)	0.70 (0.60, 0.84)***
2006 (Baseline	1	1
Ecological region		
Terai	0.55 (0.67, 0.65)	0.78 (0.61, 0.99)*
Hill	0.62 (0.53, 0.73)	0.85 (0.69, 1.04)
Mountain (Baseline)	1	1
Wealth quintiles		
Richest	0.26 (0.22, 0.32)	0.70 (0.51, 0.97)*
Richer	0.41 (0.35, 0.48)	0.72 (0.57, 0.92)**
Middle	0.55 (0.47, 0.65)	0.78 (0.64, 0.95)*
Poorer	0.69 (0.60, 0.80)	0.86 (0.71, 1.03)
Poorest (Baseline)	1	1
Child's birth weight		
Low Birth Weight (<2500 gm)	1.68 (1.58, 1.78))	2.14 (1.57, 2.90)***
Normal (>=2500 gm)	1	1
Child's age	1.39 (1.34, 1.44)	1.48 (1.40, 1.55)***
Number of living children		
3 or more children	2.52 (2.22, 2.87)	1.27 (1.02, 1.57)*
2 children	1.48 (1.31, 1.68)	1.08 (0.92, 1.28)
1 child (Baseline)	1	1
Women's education status		
SLC and above	0.26 (0.22, 0.32)	0.76 (0.59, 0.98)*
Some secondary	0.41 (0.36, 0.48)	0.83 (0.68, 1.02)
Primary	0.64 (0.57, 0.73)	0.93 (0.80, 1.09)
No education (Baseline)	1	1
Maternal smoking status		
Yes	2.39 (2.06, 2.77)	1.30 (1.07, 1.58)**
No (Baseline)	1	1
Maternal BMI		
Low	1.45 (1.28, 1.64)	1.32 (1.14, 1.51)***
Normal	1	1

Independent variables	Unadjusted Odds Ratio (95% CI)	Adjusted Odd Ratio (95% CI)
Hand washing with soap and water		
Yes	0.63 (0.56, 0.70)	0.71 (0.62, 0.81)***
No (Baseline)	1	1
Watching TV		
Once a week or more	0.46 (0.41, 0.53)	0.77 (0.63, 0.93)**
Less than once a week	0.79 (0.69, 0.90)	0.90(0.76, 1.06)
Not at all (Baseline)	1	1

Odds ratio of under-five children stunting associated with increasing level of WASH practices

Conclusion

The study found a substantial decline in under-five children stunting over past decade in Nepal. However, compared to 2011, the adjusted under-five stunting has increased slightly in 2016.

Variables such as residing in the terai region, belonging to higher wealth quintiles, higher education level of mothers, and handwashing practice with soap and water were associated with reduced risk of childhood stunting. On the other hand, women having three or more living children, low birth weight, older children, maternal smoking habit and low maternal BMI were associated with increased risk of stunting.

Overall, the risk of childhood stunting decreased with increasing level of household WASH practices, however, the statistical significance was not consistent for all levels of WASH combinations.

References

1. Ministry of Health, N., & ICF, Nepal Demographic and Health Survey 2016: Key Indicators. 2016, Ministry of Health, NewERA and ICF: Kathmandu, Nepal.
2. Black, R.E., et al., Maternal and child undernutrition and overweight in low-income and middle-income countries. The lancet, 2013. 382(9890): p. 427-451.
3. Tiwari, R., L.M. Ausman, and K.E. Agho, Determinants of stunting and severe stunting among under-fives: evidence from the 2011 Nepal Demographic and Health Survey. BMC pediatrics, 2014. 14(1): p. 239.
4. Pramod Singh, G., et al., Factors associated with underweight and stunting among children in rural Terai of eastern Nepal. Asia Pacific Journal of Public Health, 2009. 21(2): p. 144-152.
5. Cunningham K, Headey D, Singh A, Karmacharya C, Rana PP. Maternal and Child Nutrition in Nepal: Examining drivers of progress from the mid-1990s to 2010s. Global Food Security. 2017 Jun 1;13:30-7.
6. Dorsey JL, Manohar S, Neupane S, Shrestha B, Klemm RD, West Jr KP. Individual, household, and community level risk factors of stunting in children younger than 5 years: Findings from a national surveillance system in Nepal. Maternal & child nutrition. 2018 Jan;14(1):e12434.