**Supplementary material**

**Supplemental Table 1: Items used for creating the wealth index**

|  |  |
| --- | --- |
| Communication  | Radio+, ++, +++Television+, ++, +++Telephone +, +++Mobile telephone++, +++Watch+++ |
| Transport  | Bicycle +, ++, +++Motorcycle +, ++, +++Car/truck+, ++, +++Boat/ Canoe+, ++, +++Boat with a motor++, +++Donkey+Animal drawn cart++, +++ |
| Health and Hygiene | Piped drinking water in residence+, ++, +++Piped drinking water into yard++, +++Piped drinking water from public tap +, ++, +++Piped drinking water outside of residence+Open well drinking water in yard/plot+, ++Open well drinking water outside yard+, +++Protected well drinking water in yard+, ++, +++Unprotected well drinking water++, +++Protected well drinking water outside yard+, +++Borehole well drinking water in yard+, +++Borehole well drinking water outside yard+, ++, +++Drinking water from spring+, +++Uses river, canal, or surface water for drinking+, +++ Uses rain for drinking water+, ++, +++Uses tanker truck for drinking water+, ++, +++Uses bottled water for drinking+, ++, +++Drinking water from gravity flow scheme+Own flushing toilet+, ++, +++Shared flushing toilet+, ++, +++ Has traditional pit latrine+, Covered pit latrine with no slab++, +++Covered pit latrine with slab++, +++Has private pit latrine++Shares pit latrine++Uncovered pit latrine with slab+++Composting toilet/ecosan+++Ecosan toilet+++ Has VIP latrine+, ++, +++ Uses shared VIP latrine++, +++Uses bush or field as latrine+, ++, +++ Other type of latrine+, +++ |
| Household essentials  | Has electricity+, ++, +++Lantern+Cupboard+, ++, +++Table++, +++Chairs++, +++Sofa set++, +++Bed++, +++Clock++, +++ Has refrigerator+, ++, +++Has video recorder Has cassette player++, +++Has dirt, earth, dung principal floor surface+, ++, +++ Has parquet principal floors+, ++, +++Has vinyl or asphalt tile principal floors+Has ceramic tile principal floors+, +++Has cement principal floor+, ++, +++Has brick floor+++Has stone floor+++Has other type of flooring+, +++Uses electricity as cooking fuel+, ++, +++ Uses gas as cooking fuel+, ++, +++ Uses biogas as cooking fuel+, +++ Uses kerosene as cooking fuel+, ++, +++Uses coal as cooking fuel+Uses charcoal as cooking fuel+, ++, +++ Uses wood/straw as cooking fuel+, ++, +++Does not cook+++Uses other type of cooking+, ++, +++Has thatch for walls+, ++, +++Walls of mud and poles+, ++, +++Walls of unburnt brick+, ++, +++Walls of unburnt brick and plaster+++Walls of burnt bricks and mud+, ++, +++Walls of burnt bricks and cement+, ++, +++Wood timber for walls+, ++, +++ Has bricks, cement blocks, concrete walls+, +++Has stone walls+, +++Has thatched roofing+, +++Has wood/planks roofing+++ Has corrugated iron roofing+, ++, +++Has asbestos roofing+++ Has tile roof +++Has tin roof +++Has cement roof++Has nat roof ++Has finished roof ++ Uses electricity for lighting+ Uses biogas for lighting+ Uses kerosene for lighting+ Uses charcoal for lighting+ Uses dung for lighting+  |
| Household members  | Number of household members per sleeping room++, +++ |
| Household farming assets | If household works own family agriculture land++ Cattle own++ Cows, bulls own++Horses, donkeys, mules own++ Goats own++ Sheep own++ Chickens own++  |

+ Included in 2001 survey

++ Included in 2006 survey

+++ Included in 2011 survey

**Supplemental Table 2: Analysis of sub-regions in the overall multivariable model for moderate-severe stunting (primary analysis) for the 2006 and 2011 surveys**

|  |  |
| --- | --- |
| Variable: regions | Moderate-severe stunting, N=4,433, OR (95% CI) |
| Eastern (ref.)Central 1 Central 2KampalaEast CentralNorth West NileWesternSouthwest | 1.001.15 (0.79, 1.66)1.24 (0.88, 1.76)1.69 (1.14, 2.50)\*\*\*1.42 (1.06, 1.90)\*\*1.25 (0.94, 1.66)1.26 (0.93, 1.73)1.65 (1.22 2.23)\*\*\*2.23 (1.63, 3.06)\*\*\* |

ref., reference category.

\*P ≤ 0.05, \*\*P ≤ 0.01, \*\*\*P ≤ 0.001

Model is adjusted for survey year indicator, household, maternal, and child-related variables.

**Supplemental Table 3: Analysis of discrete years of education in the overall multivariable model for moderate-severe stunting**

|  |  |
| --- | --- |
| Variable: continuous years of education  | moderate-severe stunting, N=**14,747**, OR (95% CI) |
| 0 (ref.)123456789101112 | 1.001.01 (0.82, 1.26)1.00 (0.85, 1.18)0.96 (0.82, 1,12)0.90 (0.77, 1.05)0.91 (0.78, 1.06)0.84 (0.72, 0.97)\*0.63 (0.54, 0.74)\*\*\*0.71 (0.54, 0.94)\*0.88 (0.66, 1.16)0.73 (0.53, 1.01)0.63 (0.46, 0.86)\*\*0.43 (0.30, 0.61)\*\*\* |

ref., reference category.

\*P ≤ 0.05, \*\*P ≤ 0.01, \*\*\*P ≤ 0.001

Model is adjusted for survey year indicator, household, maternal, child-related variables.

**Supplemental Table 4: Overall WHO standard-based multivariable models for moderate-severe stunting (primary analysis), severe stunting, weight z-score, and CDC standard- based moderate-severe stunting**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Moderate-Severe Stunting, N=14,747** | **Severe Stunting N=14,747** | **Continuous Z-Score N=14,747** | **Moderate-Severe Stunting Using CDC Standard, N=14,747** |
|  | OR (95% CI) | OR (95% CI) | β (Standard Error) | OR (95% CI) |
| Intercept | - | - | 0.1218 (0.07) |  |
| **Household characteristics** |  |
| Region Central Northern Western Eastern (ref.) | 1.25 (1.11, 1.42)\*\*\*1.02 (0.89, 1.16)1.74 (1.55, 1.96)\*\*\*1.00 | 1.26 (1.07, 1.48)\*\*1.16 (0.98, 1.37)1.80 (1.56, 2.08)\*\*\*1.00 | -0.19 (0.04)\*\*\*-0.07 (0.04)-0.41 (0.04)\*\*\* 0.00  | 1.29 (1.13, 1.46)\*\*\*1.06 (0.92, 1.21)\*1.77 (1.57, 1.99)\*\*\*1.00  |
| Residence Rural  Urban (ref.) | 1.20 (1.03, 1.40)\*1.00 | 1.26 (1.02, 1.56)\*1.00 | -0.19 (0.05)\*\*\*0.00 | 1.22 (1.04, 1.43)\*1.00 |
| Wealth Index Poorest  Poorer  Middle Richer  Richest (ref.) | 1.73 (1.45, 2.06)\*\*\*1.50 (1.26, 1.78)\*\*\*1.61 (1.36, 1.90)\*\*\*1.37 (1.16, 1.61)\*\*\*1.00 | 1.84 (1.45, 2.34)\*\*\*1.70 (1.35, 2.15)\*\*\*1.71 (1.36, 2.14)\*\*\*1.46 (1.16, 1.83)\*\*1.00 | -0.37 (0.05)\*\*\*-0.30 (0.05)\*\*\*-0.34 (0.05)\*\*\*-0.20 (0.05)\*\*\*0.00 | 1.67 (1.40, 2.01)\*\*\*1.54 (1.29, 1.84)\*\*\*1.67 (1.41, 1.98)\*\*\*1.39 (1.18, 1.65)\*\*\*1.00 |
| Source of drinking water Non-improved Improved (ref.) | 1.09 (1.00, 1.18)1.00 | 1.03 (0.92, 1.14)1.00 | -0.01 (0.03)0.00 | 1.06 (0.97, 1.16)1.00 |
| **Maternal characteristics** |  |
| Age  15-19 20-30 31-49 (ref.)  | 1.57 (1.31, 1.87)\*\*\*1.18 (1.08, 1.29)\*\*\*1.00 | 1.44 (1.15, 1.81)\*\*1.11 (0.99, 1.24)1.00 | -0.27 (0.06)\*\*\*-0.10 (0.03)\*\*\*0.00 | 1.52 (1.27, 1.83)\*\*\*1.19 (1.08, 1.31)\*\*\*1.00 |
| BMI  Pregnant/postpartum Thin Over/Obese Normal (ref.)  | 1.04 (0.94, 1.16)1.08 (0.92, 1.27)0.70 (0.61, 0.79)\*\*\*1.00 | 1.04 (0.91, 1.19)1.15 (0.94, 1.41)0.70 (0.58, 0.84)\*\*\*1.00 | -0.01 (0.03)-0.10 (0.06)0.25 (0.04)\*\*\*0.00 | 1.04 (0.93, 1.15)1.11 (0.94, 1.31)0.71 (0.62, 0.81)\*\*\*1.00 |
| Highest educational level None  Primary Secondary+ (ref.) | 1.34 (1.14, 1.59)\*\*\*1.20 (1.04, 1.38)\*1.00 | 1.37 (1.08, 1.73)\*\*1.25 (1.00, 1.55)\*1.00 | -0.11 (0.05)\*-0.10 (0.04)\*0.00 | 1.52 (1.28, 1.81)\*\*\*1.32 (1.13, 1.54)\*\*\*1.00 |
| Work Status Unemployed Self-employed Employed (ref.) | 1.06 (0.92, 1.23)1.18 (1.04, 1.34)\*1.00 | 1.21 (0.99, 1.47)1.26 (1.06, 1.51)\*\*1.00 | -0.08 (0.05)-0.14 (0.04)\*\*\*0.00 | 1.01 (0.88, 1.17)1.07 (0.94, 1.23)1.00 |
| **Child-related characteristics** |  |
| Sex  Male Female (ref.) | 1.42 (1.31, 1.54)\*\*\*1.00 | 1.47 (1.32, 1.64)\*\*\*1.00 | -0.22 (0.03)\*\*\*0.00 | 1.26 (1.15, 1.37)\*\*\*1.00 |
| Current age in months 13-23 24-35 36-59 0-12 (ref.) | 3.22 (2.85, 3.65)\*\*\*4.61 (4.05, 5.25)\*\*\*3.75 (3.32, 4.23)\*\*\*1.00 | 3.64 (3.04, 4.37)\*\*\*5.38 (4.47, 6.49)\*\*\*4.05 (3.38, 4.86)\*\*\*1.00 | -0.92 (0.04)\*\*\*-1.20 (0.04)\*\*\*-1.10 (0.04)\*\*\*0.00 | 4.11 (3.61, 4/69)\*\*\*3.76 (3.27, 4.32)\*\*\*4.40 (3.86, 5.01)\*\*\*1.00 |
| Low birth size  Yes No (ref.) | 1.59 (1.44, 1.77)\*\*\*1.00 | 1.56 (1.37, 1.77)\*\*\*1.00 | -0.35 (0.03)\*\*\*0.00 | 1.56 (1.40, 1.73)\*\*\*1.00 |
| Preceding birth interval less than 24 months Yes No (ref.) | 1.19 (1.08, 1.32)\*\*\*1.00 | 1.32 (1.16, 1.49)\*\*\*1.00 | -0.12 (0.03)\*\*\*0.00 | 1.23 (1.11, 1.37)\*\*\*1.00 |
| Had fever in last two weeks  Yes No (ref.) | 1.08 (0.99, 1.18)1.00 | 1.01 (0.90, 1.13)1.00 | -0.07 (0.03)\*0.00 | 1.06 (0.97, 1.16)1.00 |
| Had diarrhea in last two weeks Yes  No (ref.) | 1.17 (1.11, 1.23)\*\*\*1.00 | 1.16 (1.09, 1.24)\*\*\*1.00 | -0.21 (0.03)\*\*\*0.00 | 1.19, (1.12, 1.25)\*\*\*1.00 |
| Survey Year 2001 2006 2011 1995 (ref.) | 0.89 (0.81, 0.99)\*0.64 (0.57, 0.73)\*\*\*0.58 (0.51, 0.67)\*\*\*1.00 | 0.96 (0.84, 1.09)0.64 (0.54, 0.76)\*\*\*0.67 (0.56, 0.81)\*\*\*1.00 | 0.05 (0.03)0.34 (0.04)\*\*\*0.39 (0.04)\*\*\* | 0.94 (0.85, 1.04)0.66 (0.58, 0.75)\*\*\*0.61 (0.53, 0.70)\*\*\*1.00 |

ref., reference category.

\*P ≤ 0.05, \*\*P ≤ 0.01, \*\*\*P ≤ 0.001



**Supplemental Fig. 1: IRB termination letter, not human subject research**



**Supplemental Fig. 2: Sub-regions of Uganda**(41)

Sub-regions were combined into four regions as shown below:

Northern = West Nile, Mid Northern, and North East

Eastern = East Central and Mid Eastern

Central = Central 1, Central 2, and Kampala

Western = Mid Western and South Western