

How socioeconomic status moderates the stunting-age relationship in low-income and middle-income countries

supplementary appendix

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Table S1: List of indicators and coding

Nutrition-specific	Coding
Early initiation of breastfeeding	<i>Binary indicator equal to 1 if child was breastfed either immediately or no later than 1 hour after birth. Set to missing for all children with unknown timing of breastfeeding.</i>
Vitamin A supplements	<i>Binary indicator equal to 1 if vitamin A supplementation was reported by mother and/or is indicated on vaccination card (with or without date). Set to missing if unknown.</i>
Iron supplements	<i>Binary indicator equal to 1 if child took iron supplements within seven days before interview. Set to missing if unknown.</i>
Drugs against intestinal parasites	<i>Binary indicator equal to 1 if child received drugs against intestinal parasites within six months before interview. Set to missing if unknown.</i>
Bacillus Calmette–Guérin (BCG) vaccination and first DPT vaccination	<i>Binary indicator equal to 1 if both BCG and first DPT vaccination were reported by mother and/or are indicated on vaccination card (with or without date). Set to missing if one of them or both are unknown.</i>
Safe stool disposal	<i>Binary indicator equal to 1 if stool of last born child is disposed in one of the following ways: child uses toilet or latrine; stool is put/rinsed into toilet or latrine; stool is buried. Category “other” set to missing.</i>
Non-solid fuel	<i>Binary indicator equal to 1 if household uses non-solid fuels (i.e. electricity; LPG; gas or kerosene).</i>
Nutrition-sensitive	Coding
High-quality water source	<i>Binary indicator equal to 1 if drinking water is piped into dwelling or yard/plot. Category “other” set to missing.</i>
Adequate sanitation	<i>Binary indicator equal to 1 if water is flushed to sewer system. Category “other” set to missing. In Peru, category definitions differed. After consulting final report, every household with access to toilet in- or outside dwelling was considered to have adequate sanitation.</i>
Delivery in health facility	<i>Binary indicator equal to 1 if child was delivered in a health facility (as opposed to at home). Category “other” set to missing.</i>
Maternal education	<i>Maternal education in six categories: “no education”; “incomplete primary”; “complete primary”; “incomplete secondary”; “complete secondary”; “higher”.</i>

Table S2: Survey details

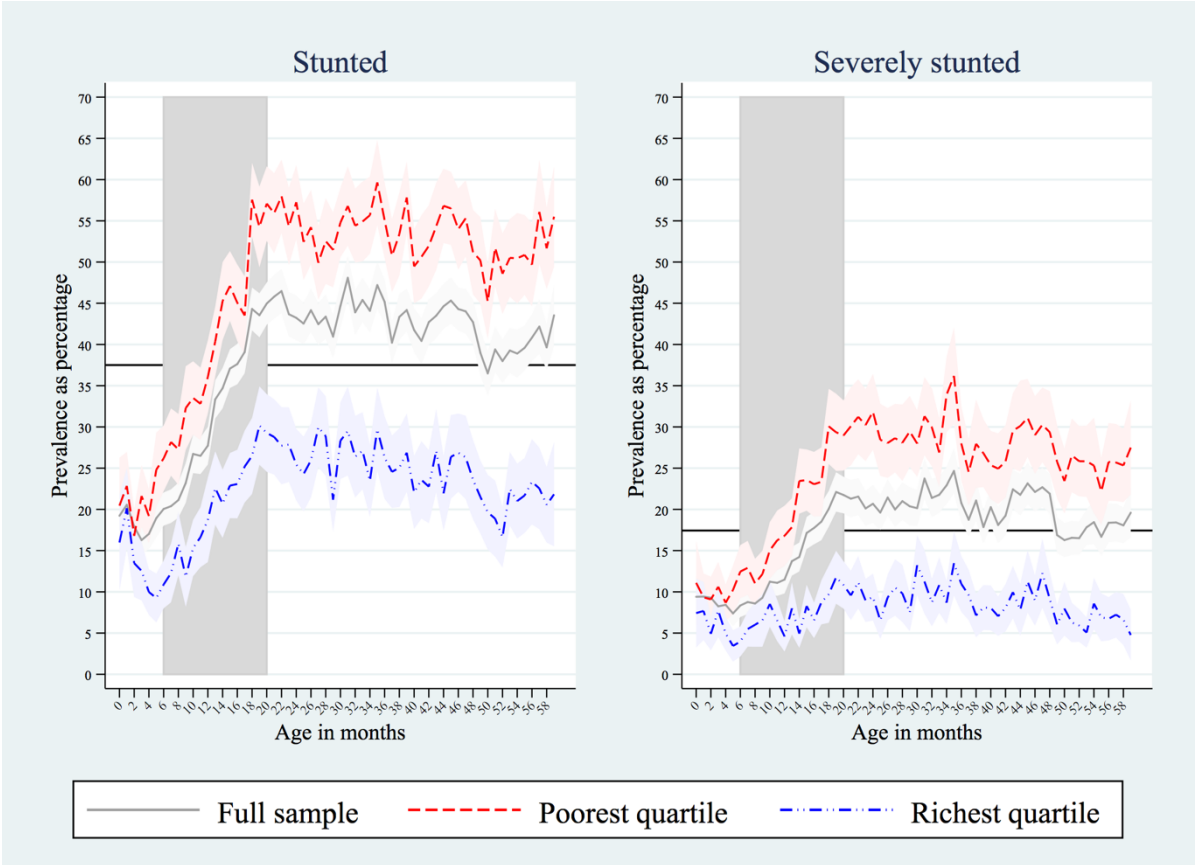
Country	DHS code	Observations	Start of survey	Number of assets available
Albania	ALBR50	1424	2008	10
Angola	AOBR71	6270	2015	11
Armenia	AMBR61	1329	2010	10
Azerbaijan	AZBR52	1895	2006	10
Bangladesh	BDBR72	6427	2014	11
Benin	BJBR61	10041	2011	11
Bolivia	BOBR51	7430	2008	11
Brazil	BRBR31	4051	1996	8
Burkina Faso	BFBR62	6548	2010	11
Burundi	BUBR61	3386	2010	10
Cambodia	KHBR73	4282	2014	11
Cameroon	CMBR61	4821	2011	11
Central African Republic*	CFBR31	2334	1994	10
Chad	TDBR71	9950	2014	10
Colombia	COBR61	15885	2009	10
Comoros	KMBR61	2470	2012	11
Congo	CGBR51	3742	2005	11
Congo Democratic Republic	CDBR61	7902	2013	11
Cote d'Ivoire	CIBR62	3160	2011	10
Dominican Republic	DRBR61	3072	2013	9
Egypt	EGBR61	13757	2014	9
Ethiopia	ETBR70	8631	2008	11
Gabon	GABR60	3300	2012	11
Gambia	GMBR60	3105	2013	11
Ghana	GHBR72	2643	2014	11
Guatemala	GUBR71	11496	2014	11
Guinea	GNBR62	3117	2012	11
Guyana	GYBR51	1558	2009	11
Haiti	HTBR61	3951	2012	9
Honduras	HNBR62	9583	2011	10
India	IABR52	39771	2005	11
Jordan	JOBR6C	6055	2012	9
Kazakhstan	KKBR42	560	1999	5
Kenya	KEBR70	17997	2014	10
Kyrgyz Republic	KYBR61	3841	2012	11
Lesotho	LSBR71	1252	2014	11
Liberia	LBRR6A	3132	2013	10
Madagascar	MDBR51	5121	2008	10
Malawi	MWBR7H	5071	2015	11
Maldives	MVBR52	2342	2009	10
Mali	MLBR6H	4400	2012	11
Moldova	MBBR53	1276	2005	9
Morocco	MABR43	5400	2003	8
Mozambique	MZBR62	9363	2011	10
Myanmar	MMBR71	4074	2015	11
Namibia	NMBR61	1766	2013	10
Nicaragua	NPBR60	2226	2011	10
Niger	NCBR41	5836	2001	11
Nigeria	NIBR61	4819	2012	10
Nepal	NGBR6A	24603	2013	11
Pakistan	PKBR61	3048	2012	11
Paraguay	PYBR21	3617	1990	9
Peru	PEBR61	8751	2012	9
Rwanda	RWBR70	3509	2014	11
Sao Tome and Principe	STBR50	1567	2008	9
Senegal	SNBR7H	6048	2015	11
Sierra Leone	SLBR61	4186	2013	11
Sri Lanka*	LKBR02	2012	1987	7
Swaziland	SZBR51	1997	2006	11
Tajikistan	TJBR61	4471	2012	11
Tanzania	TZBR7A	8516	2015	11
Thailand*	THBR01	1854	1987	7
Timor-Leste	TLBR61	7672	2009	11
Togo	TGBR61	3124	2013	11
Trinidad and Tobago*	TTBR01	842	1987	7
Tunisia*	TNBR02	2039	1988	6
Turkey	TRBR4A	3909	2003	7
Uganda	UGBR60	2044	2011	10
Uzbekistan*	UZBR31	1024	1996	9
Yemen	YEBR61	13524	2013	11
Zambia	ZMBR61	11219	2013	11
Zimbabwe	ZWBR71	4743	2015	11

DHS codes are unique identifiers of DHS surveys downloadable from <https://dhsprogram.com>. Countries marked with an asterisk only included children up to the age of three years in anthropometric measurement module.

Table S3: Prevalence of stunting and severe stunting as percentage by age and SES

Age in months	Stunting prevalence in percent (95%-CI in brackets)			Severe stunting prevalence in percent (95%-CI in brackets)		
	Full sample	Poorest quartile	Richest quartile	Full sample	Poorest quartile	Richest quartile
0	17.8 [16.4;19.3]	18.8 [16.3;21.4]	16.5 [13.4;19.6]	8.5 [7.5;9.6]	8.5 [6.7;10.4]	7.4 [5.2;9.7]
1	17.5 [16.6;18.5]	18.8 [17.1;20.5]	17.5 [15.4;19.5]	7.4 [6.8;8.1]	7.6 [6.4;8.7]	6.1 [4.8;7.3]
2	17.6 [16.7;18.5]	19.3 [17.7;21.0]	12.9 [11.2;14.6]	8.2 [7.5;8.8]	8.8 [7.6;10.0]	6.0 [4.8;7.2]
3	16.1 [15.2;16.9]	19.7 [18.1;21.3]	12.9 [11.2;14.5]	7.5 [6.9;8.1]	8.9 [7.7;10.0]	6.7 [5.4;7.9]
4	16.5 [15.6;17.4]	19.0 [17.4;20.6]	12.2 [10.5;13.8]	7.8 [7.2;8.4]	8.8 [7.7;10.0]	5.6 [4.4;6.7]
5	17.2 [16.3;18.0]	20.0 [18.3;21.6]	12.7 [11.0;14.3]	7.0 [6.4;7.5]	8.0 [6.9;9.1]	5.2 [4.1;6.3]
6	17.4 [16.5;18.2]	22.0 [20.3;23.7]	12.1 [10.5;13.6]	7.2 [6.7;7.8]	9.8 [8.6;11.0]	5.0 [3.9;6.0]
7	18.2 [17.3;19.1]	21.9 [20.2;23.6]	12.1 [10.5;13.6]	7.8 [7.1;8.4]	9.8 [8.5;11.0]	5.6 [4.5;6.7]
8	19.4 [18.5;20.3]	24.7 [22.9;26.6]	14.4 [12.7;16.0]	8.2 [7.5;8.8]	10.8 [9.5;12.2]	6.5 [5.4;7.7]
9	20.3 [19.4;21.2]	26.1 [24.3;27.9]	12.7 [11.0;14.3]	8.4 [7.8;9.1]	11.8 [10.4;13.1]	5.3 [4.2;6.4]
10	23.1 [22.1;24.1]	28.3 [26.4;30.3]	16.0 [14.2;17.8]	9.4 [8.7;10.1]	12.0 [10.7;13.4]	7.1 [5.8;8.4]
11	24.5 [23.5;25.6]	31.3 [29.3;33.4]	15.8 [14.0;17.6]	10.2 [9.5;10.9]	13.6 [12.1;15.1]	6.6 [5.4;7.9]
12	25.1 [24.1;26.1]	31.0 [29.1;32.9]	18.7 [16.7;20.6]	10.0 [9.3;10.7]	12.6 [11.2;13.9]	6.9 [5.5;8.2]
13	28.0 [27.0;29.1]	32.7 [30.8;34.7]	20.5 [18.5;22.5]	11.4 [10.6;12.1]	13.5 [12.1;14.9]	7.7 [6.4;9.0]
14	29.7 [28.6;30.7]	37.1 [35.2;39.0]	19.6 [17.7;21.6]	11.7 [11.0;12.4]	16.9 [15.4;18.3]	6.5 [5.3;7.6]
15	32.6 [31.5;33.7]	39.1 [37.2;41.1]	22.3 [20.2;24.3]	14.2 [13.4;15.0]	18.5 [16.9;20.1]	7.8 [6.5;9.1]
16	33.7 [32.6;34.8]	40.8 [38.7;42.8]	23.9 [21.8;26.0]	14.5 [13.7;15.3]	19.1 [17.5;20.7]	8.4 [7.0;9.8]
17	35.6 [34.5;36.8]	41.5 [39.4;43.5]	25.0 [22.8;27.2]	15.4 [14.6;16.3]	19.6 [18.0;21.3]	9.6 [8.1;11.0]
18	36.9 [35.7;38.0]	46.0 [43.9;48.1]	25.0 [22.9;27.1]	16.3 [15.5;17.2]	22.5 [20.8;24.3]	9.1 [7.7;10.5]
19	37.5 [36.3;38.6]	46.3 [44.1;48.5]	26.9 [24.6;29.1]	17.5 [16.6;18.4]	23.3 [21.5;25.2]	11.3 [9.7;12.9]
20	40.7 [39.5;41.8]	50.3 [48.2;52.4]	29.2 [26.8;31.5]	18.7 [17.7;19.6]	25.0 [23.1;26.9]	11.8 [10.1;13.4]
21	40.4 [39.2;41.6]	47.6 [45.3;49.8]	28.1 [25.8;30.4]	18.2 [17.3;19.2]	23.4 [21.6;25.3]	10.7 [9.1;12.3]
22	41.4 [40.2;42.6]	49.8 [47.6;52.0]	28.2 [25.9;30.5]	18.8 [17.8;19.8]	25.7 [23.8;27.7]	11.6 [9.9;13.2]
23	40.4 [39.2;41.6]	49.8 [47.6;52.0]	27.0 [24.8;29.3]	17.9 [17.0;18.9]	23.6 [21.7;25.5]	9.9 [8.4;11.4]
24	38.9 [37.7;40.0]	48.3 [46.2;50.4]	27.9 [25.6;30.2]	17.5 [16.6;18.4]	24.2 [22.4;26.0]	11.1 [9.5;12.7]
25	38.5 [37.4;39.6]	46.9 [44.9;49.0]	24.6 [22.6;26.7]	16.8 [15.9;17.7]	21.6 [19.9;23.3]	8.8 [7.4;10.1]
26	39.1 [37.9;40.2]	47.5 [45.4;49.7]	26.0 [23.8;28.1]	17.6 [16.7;18.5]	23.1 [21.3;24.9]	9.7 [8.2;11.1]
27	40.0 [38.8;41.1]	47.1 [45.0;49.2]	28.4 [26.1;30.6]	18.1 [17.2;19.0]	24.3 [22.5;26.1]	11.2 [9.6;12.8]
28	40.2 [39.1;41.4]	49.4 [47.3;51.6]	27.7 [25.5;29.9]	18.2 [17.3;19.1]	23.9 [22.1;25.7]	9.8 [8.4;11.2]
29	39.2 [38.0;40.3]	48.3 [46.2;50.4]	25.9 [23.6;28.1]	18.1 [17.2;19.0]	24.7 [22.8;26.5]	10.5 [8.9;12.0]
30	40.0 [38.8;41.2]	48.2 [46.1;50.4]	28.1 [25.9;30.4]	17.7 [16.8;18.6]	23.7 [21.9;25.5]	10.6 [9.0;12.1]
31	40.8 [39.6;42.0]	48.0 [45.8;50.1]	26.7 [24.4;28.9]	19.2 [18.3;20.2]	23.9 [22.1;25.8]	10.9 [9.3;12.5]
32	39.5 [38.3;40.7]	48.7 [46.5;50.9]	24.6 [22.4;26.8]	18.4 [17.4;19.3]	24.7 [22.8;26.6]	9.2 [7.7;10.6]
33	41.0 [39.7;42.2]	51.0 [48.7;53.2]	25.4 [23.2;27.6]	19.5 [18.5;20.5]	26.3 [24.4;28.3]	11.0 [9.4;12.6]
34	40.5 [39.3;41.7]	48.7 [46.5;51.0]	26.1 [23.8;28.3]	19.2 [18.2;20.2]	25.7 [23.7;27.7]	10.1 [8.5;11.6]
35	40.1 [38.9;41.3]	50.9 [48.6;53.1]	25.2 [23.0;27.4]	18.9 [18.0;19.9]	26.4 [24.3;28.4]	10.2 [8.7;11.8]
36	38.3 [37.1;39.5]	47.6 [45.4;49.8]	24.9 [22.7;27.1]	16.6 [15.7;17.5]	23.7 [21.8;25.5]	9.1 [7.6;10.6]
37	38.0 [36.9;39.1]	46.2 [44.1;48.2]	24.2 [22.1;26.3]	15.9 [15.0;16.7]	20.9 [19.2;22.6]	7.8 [6.5;9.1]
38	37.6 [36.4;38.8]	45.0 [42.9;47.2]	23.3 [21.0;25.5]	16.1 [15.2;17.0]	21.4 [19.6;23.1]	6.9 [5.6;8.2]
39	39.1 [38.0;40.3]	48.7 [46.7;50.8]	25.2 [23.0;27.4]	16.4 [15.5;17.2]	22.7 [21.0;24.5]	9.0 [7.5;10.4]
40	38.3 [37.1;39.5]	45.9 [43.7;48.0]	25.9 [23.6;28.1]	16.8 [15.8;17.7]	21.0 [19.2;22.7]	10.4 [8.8;11.9]
41	37.6 [36.5;38.8]	47.0 [44.8;49.2]	23.9 [21.7;26.1]	16.4 [15.5;17.3]	22.2 [20.4;24.1]	8.6 [7.2;10.1]
42	38.1 [37.0;39.3]	46.4 [44.2;48.5]	24.8 [22.6;27.0]	16.2 [15.3;17.1]	22.2 [20.4;24.0]	8.4 [6.9;9.8]
43	39.4 [38.2;40.6]	48.0 [45.9;50.2]	26.1 [23.8;28.4]	17.5 [16.6;18.5]	23.1 [21.3;24.9]	9.3 [7.8;10.8]
44	38.9 [37.6;40.1]	48.1 [45.9;50.4]	23.3 [21.0;25.5]	17.9 [17.0;18.9]	24.3 [22.4;26.3]	8.0 [6.6;9.5]
45	39.1 [37.9;40.3]	46.6 [44.4;48.9]	24.6 [22.3;26.9]	18.1 [17.1;19.1]	23.3 [21.4;25.2]	9.3 [7.8;10.9]
46	37.8 [36.6;39.0]	47.0 [44.7;49.3]	24.7 [22.4;27.0]	16.9 [15.9;17.8]	22.5 [20.6;24.4]	8.9 [7.4;10.4]
47	37.6 [36.4;38.8]	45.8 [43.5;48.1]	24.1 [21.9;26.4]	16.6 [15.7;17.5]	21.6 [19.7;23.5]	9.9 [8.3;11.5]
48	35.0 [33.8;36.2]	44.0 [41.8;46.2]	21.2 [19.1;23.3]	15.4 [14.5;16.3]	21.0 [19.2;22.9]	7.9 [6.5;9.2]
49	32.7 [31.5;33.8]	40.7 [38.6;42.8]	19.5 [17.5;21.6]	13.2 [12.3;14.0]	18.0 [16.4;19.7]	6.8 [5.5;8.1]
50	33.4 [32.3;34.6]	41.7 [39.5;43.8]	20.8 [18.7;22.8]	14.1 [13.3;15.0]	18.9 [17.2;20.6]	7.4 [6.1;8.8]
51	35.2 [34.0;36.4]	44.1 [41.9;46.3]	20.1 [18.0;22.2]	14.2 [13.3;15.1]	19.6 [17.8;21.4]	6.7 [5.4;8.0]
52	33.2 [32.1;34.4]	42.1 [39.9;44.3]	20.8 [18.6;23.0]	14.3 [13.4;15.1]	19.9 [18.1;21.7]	8.5 [7.0;9.9]
53	33.2 [32.1;34.4]	42.4 [40.2;44.6]	20.8 [18.7;22.9]	14.1 [13.3;15.0]	19.6 [17.9;21.4]	7.4 [6.1;8.8]
54	33.6 [32.4;34.8]	43.6 [41.4;45.9]	20.2 [18.1;22.3]	13.7 [12.8;14.5]	19.2 [17.4;21.0]	7.0 [5.7;8.3]
55	34.4 [33.2;35.6]	43.5 [41.2;45.7]	21.1 [18.9;23.3]	13.9 [13.0;14.7]	19.1 [17.3;20.9]	7.5 [6.1;8.9]
56	34.6 [33.4;35.8]	42.8 [40.5;45.1]	20.3 [18.1;22.5]	14.6 [13.7;15.5]	18.8 [17.0;20.6]	8.1 [6.6;9.5]
57	34.0 [32.8;35.2]	44.3 [42.0;46.6]	19.7 [17.6;21.8]	14.3 [13.4;15.2]	19.3 [17.5;21.2]	7.0 [5.6;8.3]
58	33.6 [32.4;34.8]	41.8 [39.5;44.1]	20.2 [18.0;22.4]	14.3 [13.4;15.2]	20.0 [18.1;21.8]	6.2 [4.9;7.5]
59	35.9 [34.2;37.6]	45.7 [42.6;48.9]	20.3 [17.2;23.4]	15.0 [13.8;16.3]	20.0 [17.5;22.5]	5.4 [3.7;7.1]

Figure S1: Prevalence of stunting and severe stunting as percentage – using population weights



Light bands indicate 95%-confidence intervals. Horizontal lines show grand means across age groups and wealth quartiles. Vertical bands highlight the age range six to 20 months.

Figure S2: Deviation of stunting rates from main analysis sample (no rounded age)

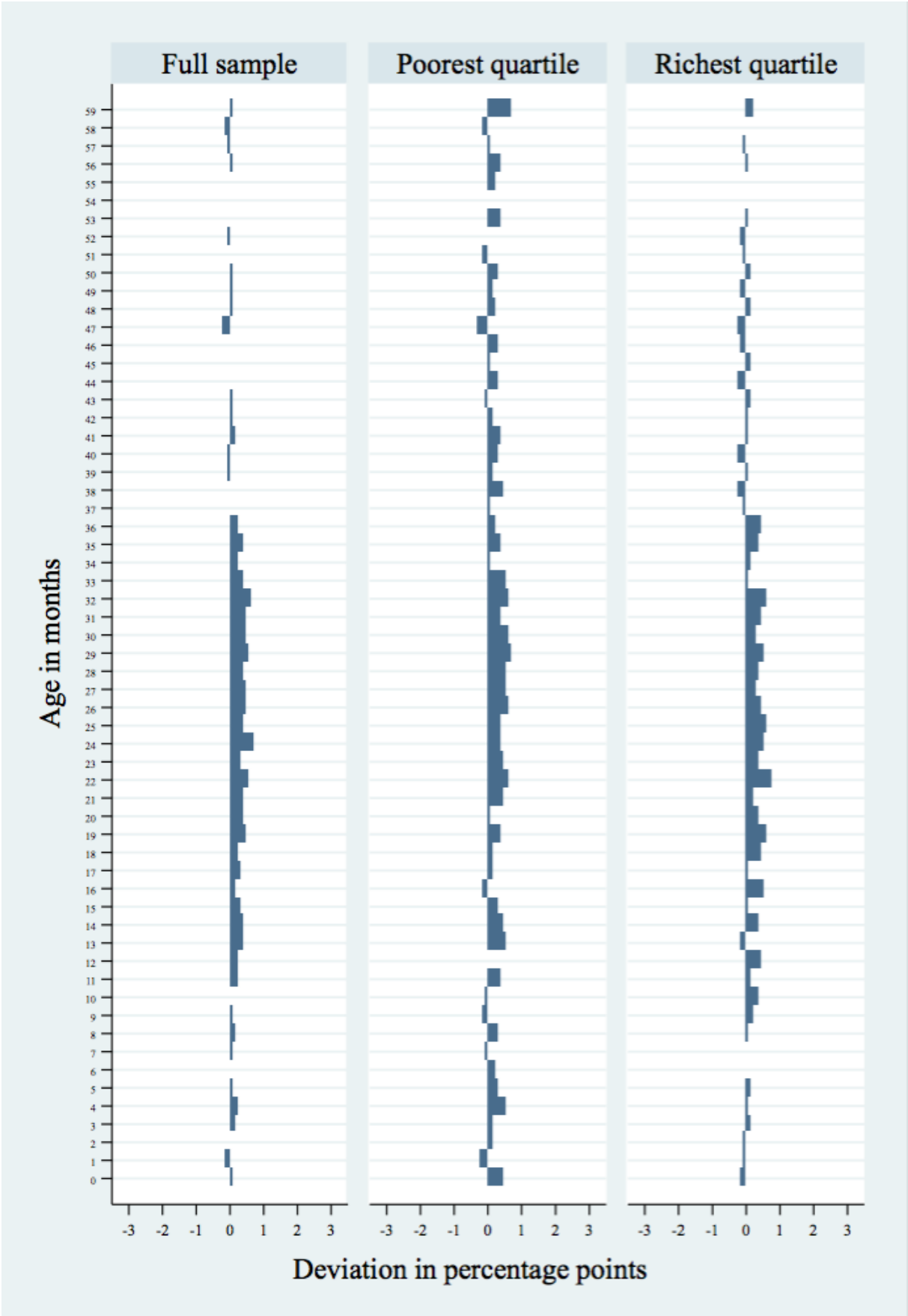


Figure S3: Deviation of stunting rates from main analysis sample (5%-cutoff for asset index)

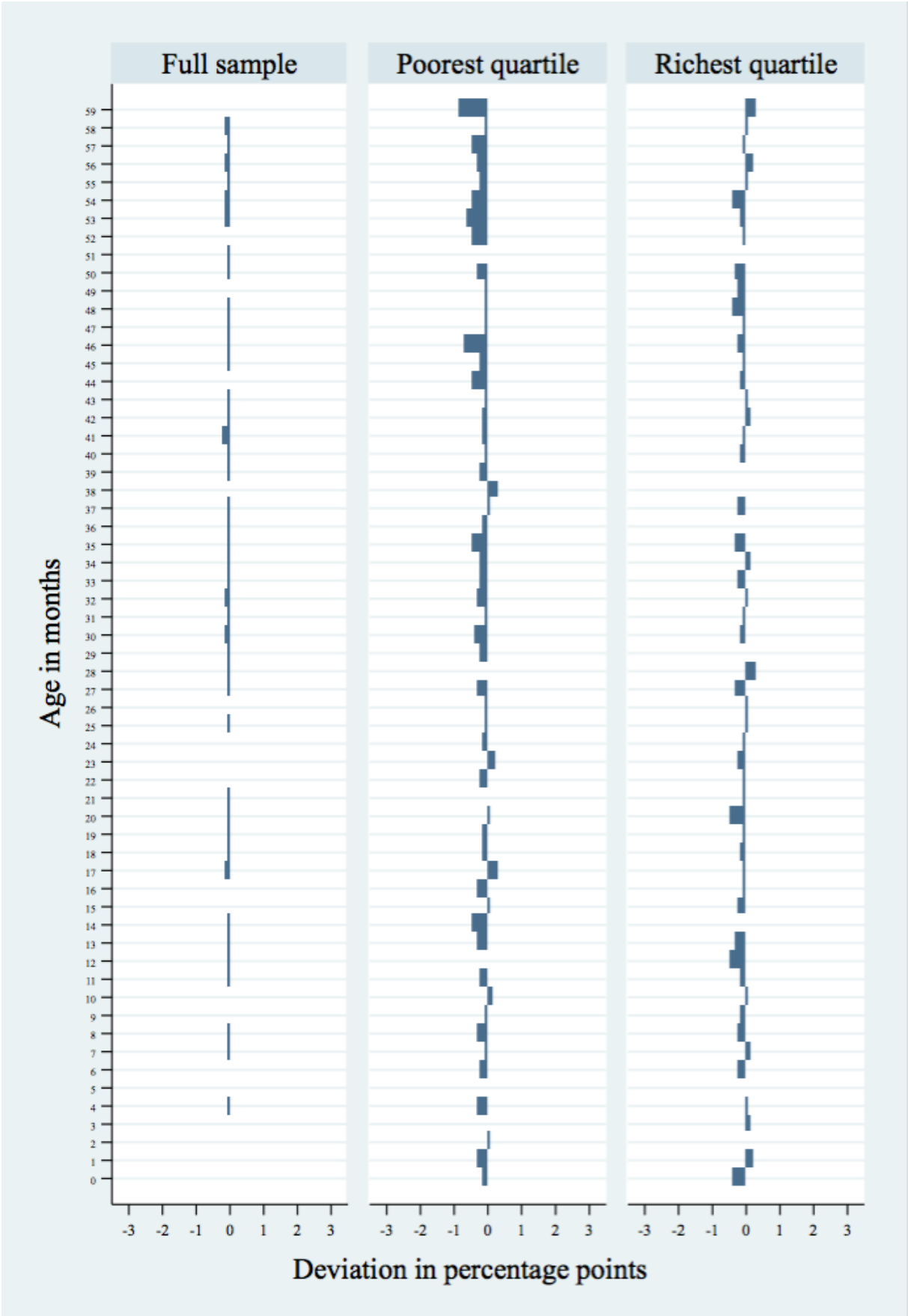
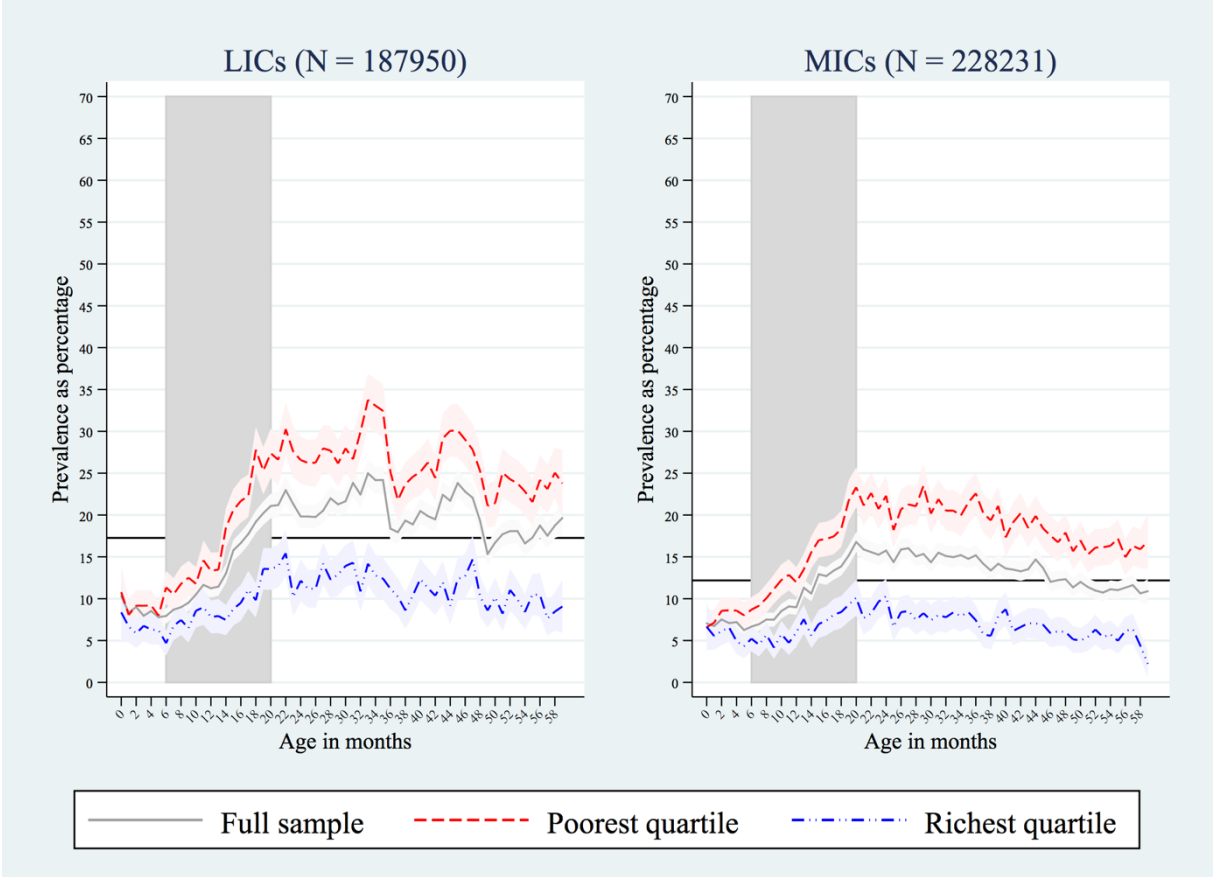
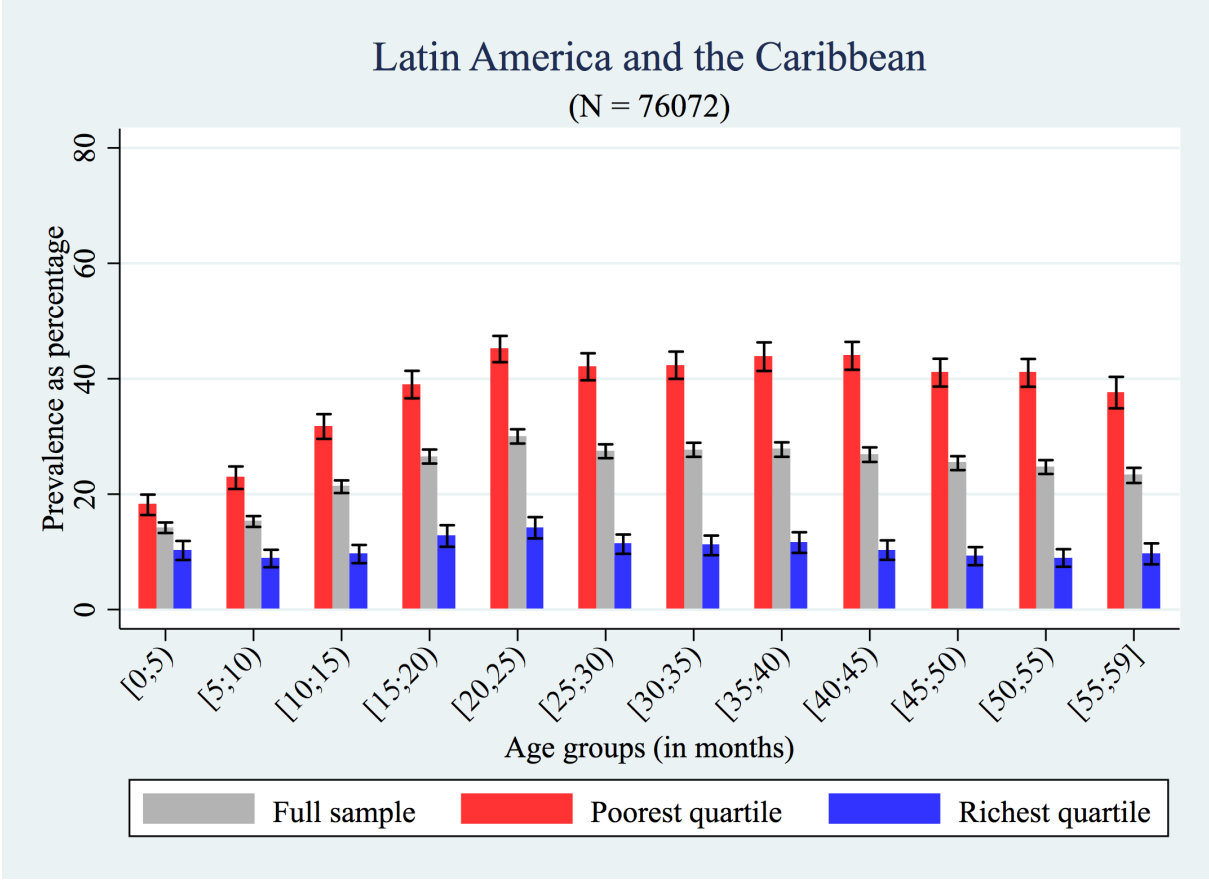


Figure S4: Prevalence of severe stunting by country income group



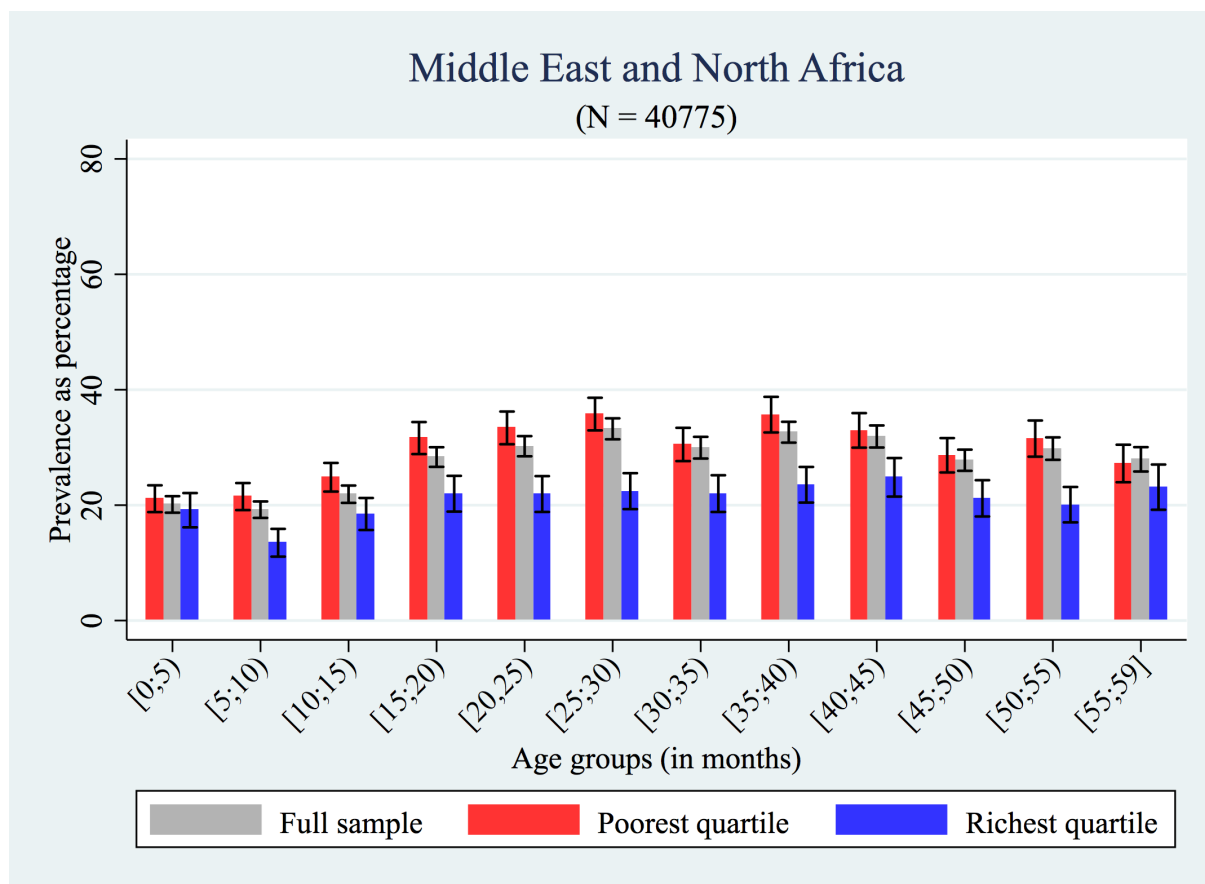
Light bands indicate 95%-confidence intervals. Horizontal lines show grand means across age groups and wealth quartiles. Vertical bands highlight the age range six to 20 months.

Figure S5: Prevalence of stunting by age group and household SES – Latin America and the Caribbean



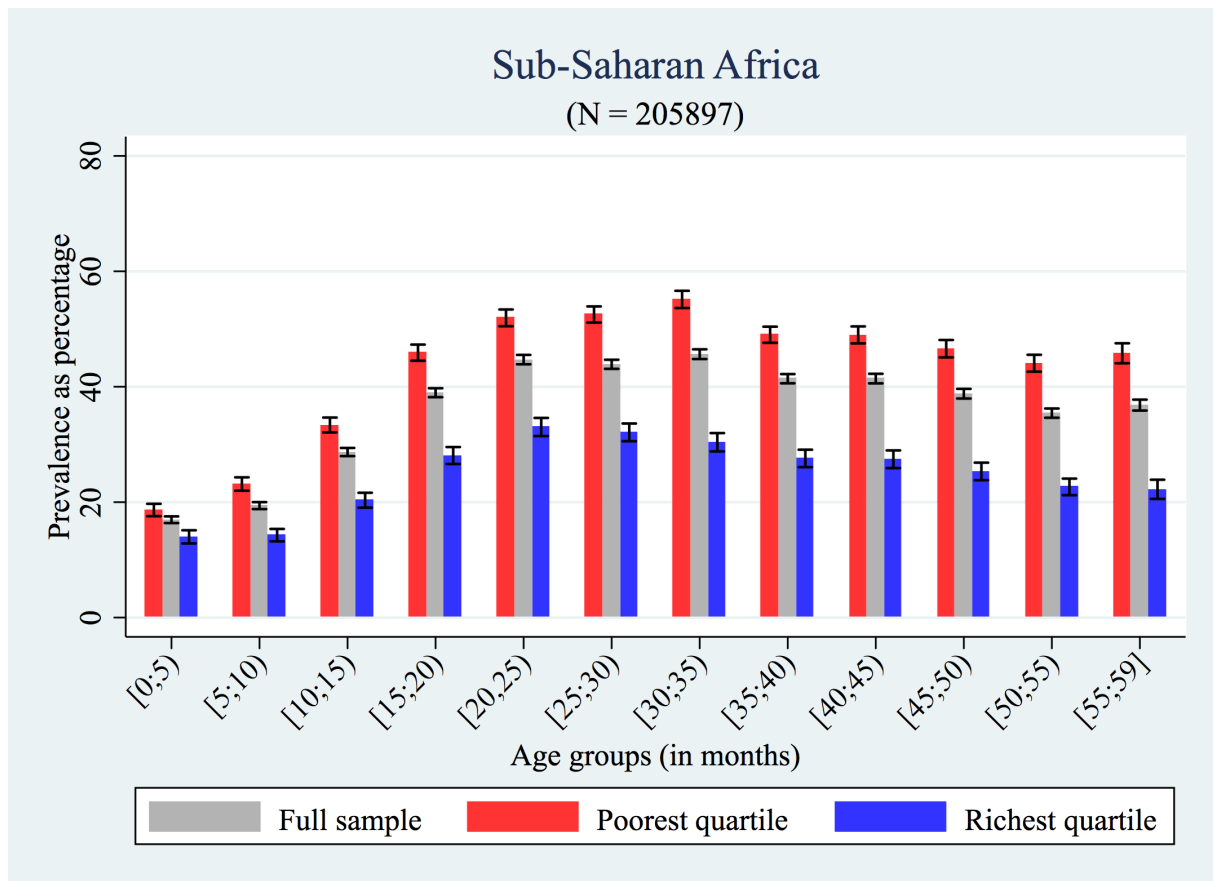
Stunting prevalence in percent. Black whiskers indicate 95% confidence intervals. Square brackets in age groups denote closed interval end-points and parentheses open interval end-points.

Figure S6: Prevalence of stunting by age group and household SES – Middle East and North Africa



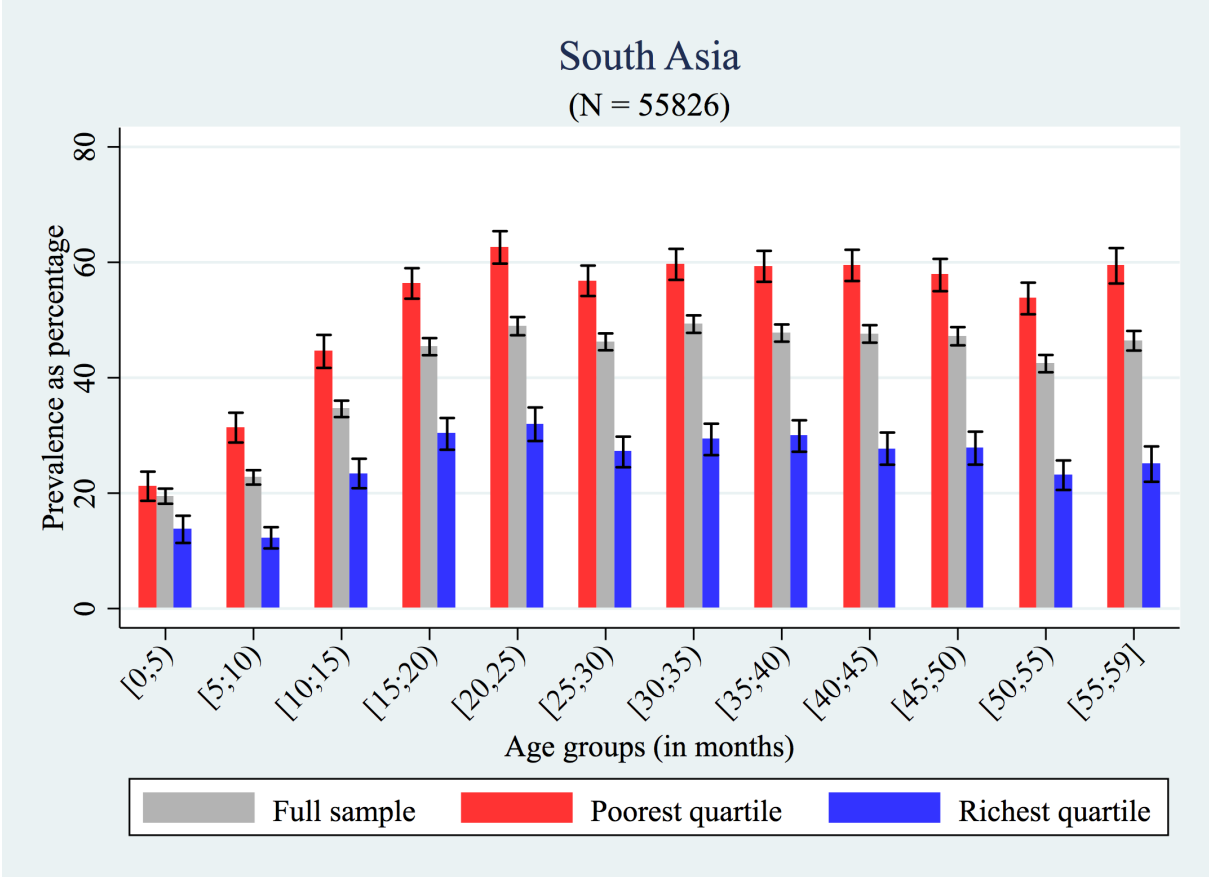
Stunting prevalence in percent. Black whiskers indicate 95% confidence intervals. Square brackets in age groups denote closed interval end-points and parentheses open interval end-points.

Figure S7: Prevalence of stunting by age group and household SES – Sub Saharan Africa



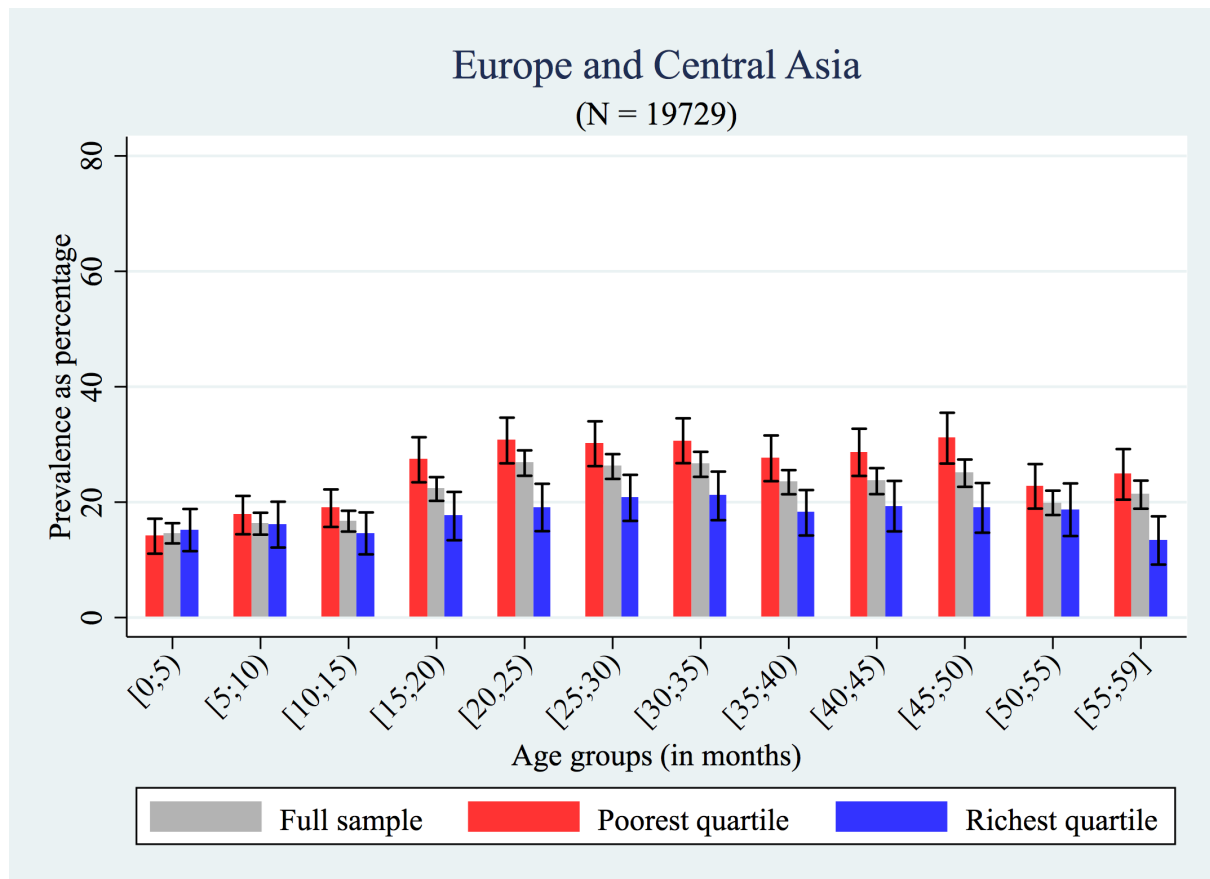
Stunting prevalence in percent. Black whiskers indicate 95% confidence intervals. Square brackets in age groups denote closed interval end-points and parentheses open interval end-points.

Figure S8: Prevalence of stunting by age group and household SES – South Asia



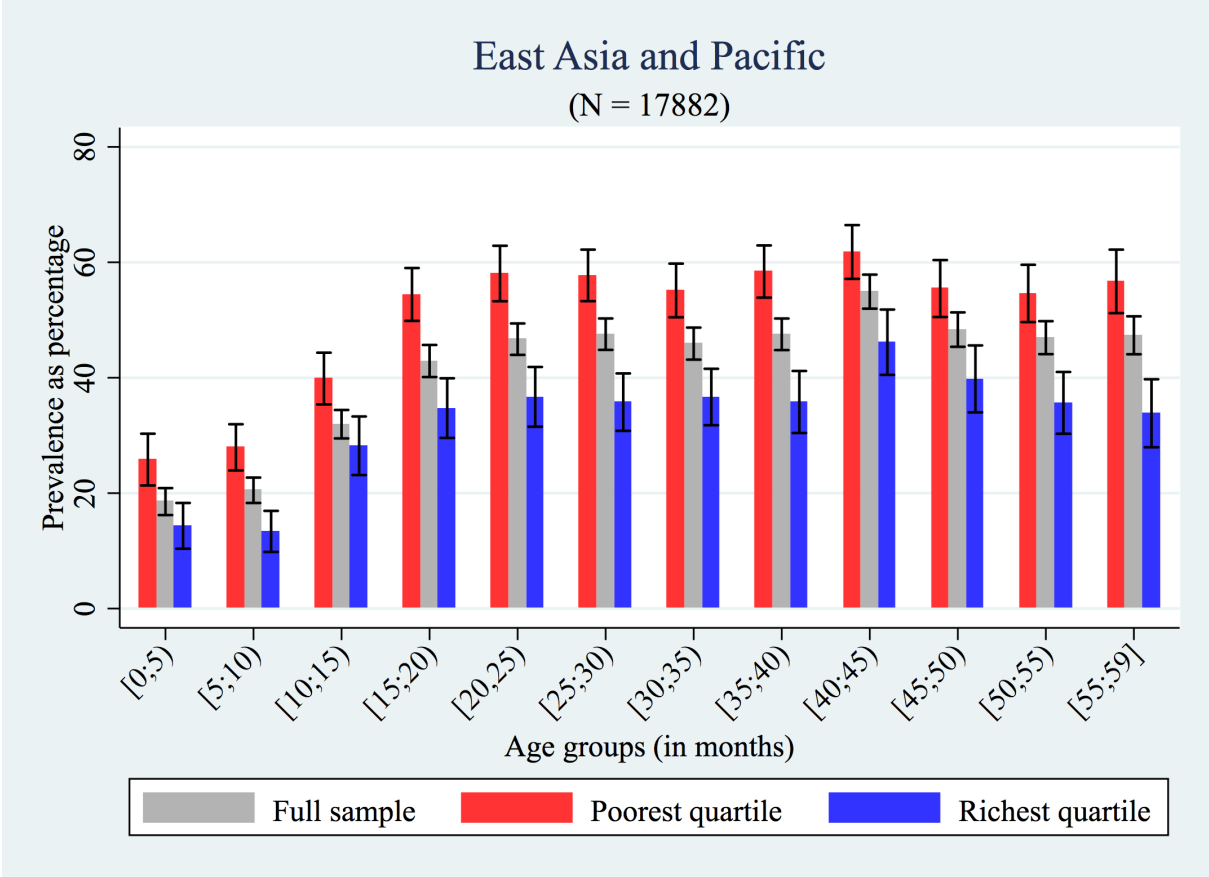
Stunting prevalence in percent. Black whiskers indicate 95% confidence intervals. Square brackets in age groups denote closed interval end-points and parentheses open interval end-points.

Figure S9: Prevalence of stunting by age group and household SES – Europe and Central Asia



Stunting prevalence in percent. Black whiskers indicate 95% confidence intervals. Square brackets in age groups denote closed interval end-points and parentheses open interval end-points.

Figure S10: Prevalence of stunting by age group and household SES – East Asia and Pacific



Stunting prevalence in percent. Black whiskers indicate 95% confidence intervals. Square brackets in age groups denote closed interval end-points and parentheses open interval end-points.

Table S4: Cross-tabulation of household SES quartiles and maternal education categories

SES quartile	Maternal education						<i>All education categories</i>
	No education	Incomplete primary education	Complete primary education	Incomplete secondary education	Complete secondary education	Higher education	
Poorest	23 881	11 812	4630	4697	1488	422	<i>46 930</i>
2 nd poorest	17 300	9419	5069	6311	1923	880	<i>40 902</i>
2 nd richest	11 750	7904	5409	9561	3809	1891	<i>40 324</i>
Richest	6102	4812	4037	11 519	6312	6585	<i>39 367</i>
<i>All SES quartiles</i>	<i>59 033</i>	<i>33 947</i>	<i>19 145</i>	<i>32 088</i>	<i>13 532</i>	<i>9778</i>	<i>167 523</i>

The table depicts the available number of observations for each cell in the regression sample. SES = socioeconomic status