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Associations between household air pollution and early child development among 36 to 59 months old children in Bangladesh

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Supplementary Figure

Figure S1: Regional variation in early childhood developmental delays

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Supplementary Tables

Table S1: Association between SFU and global ECDI stratified by sex of the children

Predictors	**Overall (Model I)**	**Boy (Model II)**	**Girl (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs (*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.66 (1.46, 1.89) ***	1.52 (1.30, 1.79) ***	1.93 (1.57, 2.38) ***
[a]Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.47 (1.25, 1.73) ***	1.37 (1.13, 1.65) **	1.64 (1.31, 2.07) ***
Sex of child	(Ref=Boy)	(Ref=Boy)	(Ref=Girl)
	0.76 (0.70, 0.83) ***	0.64 (0.50, 0.82) ***	1.55 (1.21, 1.98) ***
Child age (in years)	0.65 (0.60, 0.72) ***	0.66 (0.60, 0.72) ***	0.66 (0.60, 0.72) ***
Ever attended ECE Program (Ref=No)			
Yes	0.66 (0.58, 0.76) ***	0.66 (0.58, 0.76) ***	0.66 (0.58, 0.76) ***
Iodine Intake (Ref=No)			
Yes	0.96 (0.87, 1.06)	0.96 (0.87, 1.06)	0.96 (0.87, 1.06)
Stunting (Ref=No)			
Yes	1.09 (1.00, 1.20)	1.09 (1.00, 1.20)	1.09 (1.00, 1.20)
Maternal Age	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.96 (0.84, 1.10)	0.96 (0.84, 1.10)	0.96 (0.84, 1.10)
Secondary	0.79 (0.69, 0.91) **	0.79 (0.69, 0.91) **	0.79 (0.69, 0.91) **
Higher Secondary+	0.68 (0.56, 0.82) ***	0.68 (0.56, 0.82) ***	0.68 (0.56, 0.82) ***
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.06 (0.93, 1.20)	1.06 (0.93, 1.20)	1.06 (0.93, 1.20)
Middle	1.00 (0.88, 1.14)	1.00 (0.88, 1.14)	1.00 (0.88, 1.15)
Richer	0.95 (0.82, 1.09)	0.95 (0.82, 1.09)	0.95 (0.82, 1.09)
Richest	0.82 (0.69, 0.98) *	0.82 (0.69, 0.98) *	0.82 (0.69, 0.98) *
Cooking Place (Ref=Main Room)			
Separate	0.90 (0.81, 1.00) *	0.90 (0.81, 1.00) *	0.90 (0.81, 1.00) *
Outdoor	0.90 (0.80, 1.01)	0.90 (0.81, 1.01)	0.90 (0.80, 1.01)
Urbanicity (Ref=Rural)			
Urban	1.10 (0.97, 1.25)	1.11 (0.98, 1.25)	1.11 (0.98, 1.25)
Season (Ref=Winter)			
Summer	0.96 (0.88, 1.05)	0.96 (0.89, 1.05)	0.96 (0.89, 1.05)
SFU*Sex	-	**Ref=SFU*Girl**	**Ref= SFU*Boy**
		0.83 (0.64, 1.08)	1.20 (0.93, 1.56)

[a]Prevalence ratios (PRs) were adjusted for child age, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, season, and urbanicity. * p<0.05, ** p<0.01, *** p<0.001.

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Table S2: Association between SFU and global ECDI stratified by urbanicity

Predictors	**Overall (Model I)**	**Rural (Model II)**	**Urban (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs(*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.66 (1.46, 1.89) ***	1.64 (1.63, 1.64)***	1.79 (1.78, 1.79) ***
[a]Adjusted PRs(*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.47 (1.25, 1.73) ***	1.40 (1.13, 1.74) **	1.54 (1.24, 1.91) ***
Sex of child	(Ref=Boy)	(Ref=Girl)	(Ref=Girls)
	0.76 (0.70, 0.83) ***	1.32 (1.21, 1.43) ***	1.32 (1.21, 1.43) ***
Child age (in years)	0.65 (0.60, 0.72) ***	0.65 (0.60, 0.72) ***	0.66 (0.60, 0.72) ***
Ever attended ECE Program (Ref=No)			
Yes	0.66 (0.58, 0.76) ***	0.66 (0.58, 0.76) ***	0.66 (0.58, 0.76) ***
Iodine Intake (Ref=No)			
Yes	0.96 (0.87, 1.06)	0.96 (0.87, 1.06)	0.96 (0.87, 1.06)
Stunting (Ref=No)			
Yes	1.09 (1.00, 1.20)	1.09 (1.00, 1.20) *	1.10 (1.00, 1.20) *
Maternal Age	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.96 (0.84, 1.10)	0.96 (0.84, 1.10)	0.96 (0.84, 1.10)
Secondary	0.79 (0.69, 0.91) **	0.79 (0.69, 0.91) **	0.79 (0.69, 0.91) **
Higher Secondary+	0.68 (0.56, 0.82) ***	0.68 (0.56, 0.82) ***	0.68 (0.56, 0.82) ***
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.06 (0.93, 1.20)	1.06 (0.93, 1.20)	1.06 (0.93, 1.20)
Middle	1.00 (0.88, 1.14)	1.00 (0.88, 1.14)	1.00 (0.88, 1.14)
Richer	0.95 (0.82, 1.09)	0.94 (0.82, 1.09)	0.94 (0.82, 1.09)
Richest	0.82 (0.69, 0.98) *	0.82 (0.69, 0.98) *	0.82 (0.69, 0.98) *
Cooking Place (Ref=Main Room)			
Separate	0.90 (0.81, 1.00) *	0.90 (0.81, 1.00) *	0.90 (0.81, 1.00) *
Outdoor	0.90 (0.80, 1.01)	0.90 (0.80, 1.01)	0.90 (0.81, 1.01)
Urbanicity (Ref=Rural)			
Urban	1.10 (0.97, 1.25)	1.03 (0.80, 1.32)	0.97 (0.76-1.25)
Season (Ref=Winter)			
Summer	0.96 (0.88, 1.05)	0.96 (0.88, 1.05)	0.96 (0.89, 1.05)
SFU*Urbanicity	-	**Ref=SFU*Urban**	**Ref= SFU*Rural**
		0.91 (0.68, 1.21)	1.10 (0.83, 1.46)

[a]Prevalence ratios (PRs) were adjusted for child age and sex, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, and season. * p<0.05, ** p<0.01, *** p<0.001.

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Table S3: Association between SFU and learning-cognition stratified by sex of the children

Predictors	**Overall (Model I)**	**Boy (Model II)**	**Girl (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs (*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.98 (1.50, 2.60)***	1.87 (1.35, 2.58) ***	2.18 (1.45, 3.28) ***
Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.90 (1.39, 2.60) ***	1.86 (1.28, 2.70) **	2.05 (1.34, 3.11) **
Sex of child	(Ref=Boy)	(Ref=Boy)	(Ref=Girl)
	0.92 (0.79, 1.06)	0.85 (0.54, 1.34)	1.17 (0.74, 1.85)
Child age (in years)	0.72 (0.61, 0.84) ***	0.72 (0.61, 0.84) ***	0.71 (0.61, 0.83) ***
Ever attended ECE Program (Ref=No)			
Yes	0.61 (0.48, 0.79) ***	0.62 (0.48, 0.79) ***	0.64 (0.50, 0.82) ***
Iodine Intake (Ref=No)			
Yes	1.17 (0.98, 1.41)	1.17 (0.97, 1.40)	1.18 (0.98, 1.41)
Stunting (Ref=No)			
Yes	1.10 (0.94, 1.29)	1.13 (0.96, 1.33)	1.11 (0.95, 1.30)
Maternal Age	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.85 (0.67, 1.06)	0.84 (0.67, 1.06)	0.84 (0.67, 1.05)
Secondary	0.66 (0.52, 0.84) **	0.67 (0.53, 0.84) **	0.65 (0.52, 0.83) ***
Higher Secondary+	0.70 (0.50, 0.97) *	0.71 (0.51, 0.98) *	0.70 (0.50, 0.97) **
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.05 (0.84, 1.32)	1.01 (0.81, 1.26)	1.04 (0.83, 1.30)
Middle	0.97 (0.76, 1.23)	0.92 (0.73, 1.17)	0.95 (0.75, 1.21)
Richer	0.79 (0.60, 1.03)	0.75 (0.57, 0.98) *	0.78 (0.60, 1.01)
Richest	0.81 (0.59, 1.10)	0.78 (0.57, 1.06)	0.81 (0.59, 1.10)
Cooking Place (Ref= Main Room)			
Separate	0.82 (0.68, 1.00) *	0.81 (0.67, 0.98) *	0.83 (0.68, 1.00)
Outdoor	0.82 (0.67, 1.01)	0.81 (0.66, 0.99) *	0.82 (0.67, 1.00)
Urbanicity (Ref=Rural)			
Urban	1.12 (0.87, 1.43)	1.11 (0.87, 1.42)	1.13 (0.88, 1.44)
Season (Ref= Winter)			
Summer	0.86 (0.73, 1.03)	0.87 (0.73, 1.04)	0.87 (0.73, 1.03)
SFU*Sex	-	**Ref= SFU*Girl**	**Ref=SFU*Boy**
		0.93 (0.57, 1.51)	1.08 (0.66, 1.75)

[a]Prevalence ratios (PRs) were adjusted for age of children, child age, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, season, and urbanicity. * p<0.05, ** p<0.01, *** p<0.001.

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Table S4: Association between SFU and learning-cognition stratified by urbanicity

Predictors	**Overall (Model I)**	**Rural (Model II)**	**Urban (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs (*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.98 (1.50, 2.60)***	1.89 (1.26, 2.82)**	2.32 (1.52, 3.52)***
[a]Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.90 (1.39, 2.60) ***	1.77 (1.16, 2.70) **	2.17 (1.43, 3.28) ***
Sex of child	(Ref=Boy)	(Ref=Girl)	(Ref=Girl)
	0.92 (0.79, 1.06)	1.08 (0.93, 1.25)	1.09 (0.94, 1.26)
Child age (in years)	0.72 (0.61, 0.84) ***	0.71 (0.61, 0.83) ***	0.73 (0.62, 0.85) ***
Ever attended ECE Program (Ref=No)			
Yes	0.61 (0.48, 0.79) ***	0.63 (0.49, 0.81) ***	0.61 (0.48, 0.79) ***
Iodine Intake (Ref=No)			
Yes	1.17 (0.98, 1.41)	1.17 (0.98, 1.40)	1.17 (0.98, 1.40)
Stunting (Ref=No)			
Yes	1.10 (0.94, 1.29)	1.10 (0.94, 1.29)	1.10 (0.93, 1.29)
Maternal Age	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.85 (0.67, 1.06)	0.83 (0.66, 1.04)	0.83 (0.66, 1.05)
Secondary	0.66 (0.52, 0.84) **	0.64 (0.51, 0.82) ***	0.65 (0.52, 0.83) ***
Higher Secondary+	0.70 (0.50, 0.97) *	0.69 (0.50, 0.96) *	0.70 (0.50, 0.97) *
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.05 (0.84, 1.32)	1.04 (0.83, 1.31)	1.02 (0.81, 1.27)
Middle	0.97 (0.76, 1.23)	0.95 (0.75, 1.21)	0.93 (0.74, 1.19)
Richer	0.79 (0.60, 1.03)	0.78 (0.60, 1.02)	0.75 (0.58, 0.98) *
Richest	0.81 (0.59, 1.10)	0.81 (0.60, 1.11)	0.79 (0.58, 1.08)
Cooking Place (Ref= Main Room)			
Separate	0.82 (0.68, 1.00) *	0.83 (0.68, 1.00)	0.81 (0.67, 0.99) *
Outdoor	0.82 (0.67, 1.01)	0.82 (0.67, 1.01)	0.81 (0.66, 0.99) *
Urbanicity (Ref=Rural)			
Urban	1.12 (0.87, 1.43)	0.97 (0.59,1.60)	1.05 (0.63, 1.73)
Season (Ref= Winter)			
Summer	0.86 (0.73, 1.03)	0.87 (0.73, 1.03)	0.86 (0.73, 1.02)
SFU*Urbanicity	-	**Ref=SFU*Urban**	**Ref= SFU*Rural**
		0.81 (0.46, 1.41)	1.21 (0.69, 2.11)

[a]Prevalence ratios (PRs) were adjusted for child age and sex, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, and season. * p<0.05, ** p<0.01, *** p<0.001.

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Table S5: Association between SFU and socio-emotional stratified by sex of the children

Predictors	**Overall (Model I)**	**Boy (Model II)**	**Girl (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs (*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.22 (1.09, 1.37) **	1.22 (1.06,1.41) **	1.23 (1.03,1.46) **
[a]Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.17 (1.01, 1.36) *	1.18 (0.99, 1.40)	1.16 (0.96, 1.42)
Sex of child	(Ref=Boy)	(Ref=Boy)	(Ref=Girl)
	0.75 (0.69, 0.82) ***	0.76 (0.62, 0.93) *	1.31 (1.07, 1.61) **
Child age (in years)	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) ***	0.86 (0.79, 0.94) **
Ever attended ECE Program (Ref=No)			
Yes	1.05 (0.94, 1.17)	1.05 (0.94, 1.17)	1.05 (0.94, 1.17)
Iodine Intake (Ref=No)			
Yes	1.00 (0.91, 1.10)	1.00 (0.91, 1.10)	1.00 (0.91, 1.10)
Stunting (Ref=No)			
Yes	1.03 (0.94, 1.13)	1.03 (0.94, 1.13)	1.03 (0.94, 1.13)
Maternal Age	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.97 (0.84, 1.12)	0.97 (0.85, 1.12)	0.97 (0.85, 1.12)
Secondary	0.94 (0.82, 1.08)	0.95 (0.82, 1.09)	0.95 (0.82, 1.09)
Higher Secondary+	0.91 (0.76, 1.08)	0.91 (0.76, 1.09)	0.91 (0.76, 1.09)
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.07 (0.94, 1.23)	1.08 (0.94, 1.23)	1.08 (0.94, 1.23)
Middle	1.14 (1.00, 1.31) *	1.14 (1.00, 1.31)	1.14 (1.00, 1.31)
Richer	1.07 (0.93, 1.24)	1.07 (0.93, 1.23)	1.07 (0.93, 1.23)
Richest	0.94 (0.79, 1.11)	0.93 (0.79, 1.10)	0.93 (0.79, 1.11)
Cooking Place (Ref= Main Room)			
Separate	1.01 (0.91, 1.12)	1.01 (0.91, 1.12)	1.01 (0.91, 1.12)
Outdoor	0.96 (0.85, 1.07)	0.96 (0.85, 1.07)	0.96 (0.86, 1.07)
Urbanicity (Ref=Rural)			
Urban	1.05 (0.93, 1.19)	1.05 (0.93, 1.19)	1.05 (0.93, 1.19)
Season (Ref= Winter)			
Summer	0.97 (0.89, 1.06)	0.97 (0.89, 1.06)	0.97 (0.89, 1.06)
SFU*Sex	-	**Ref=SFU*Girl**	**Ref= SFU*Boy**
		1.01 (0.81, 1.27)	0.99 (0.79, 1.23)

[a]Prevalence ratios (PRs) were adjusted for child age, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, season, and urbanicity. * p<0.05, ** p<0.01, *** p<0.001.

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Table S6: Association between SFU and socio-emotional stratified by urbanicity

Predictors	**Overall (Model I)**	**Rural (Model II)**	**Urban (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs(*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.22 (1.09, 1.37) **	1.33 (1.11,1.60)**	1.16 (0.97, 1.39)
[a]Adjusted PRs(*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.17 (1.01, 1.36) *	1.12 (0.93, 1.35)	1.24 (1.23, 1.24) ***
Sex of child	(Ref=Boy)	(Ref=Girl)	(Ref=Girl)
	0.75 (0.69, 0.82) ***	1.33 (1.23, 1.44) ***	1.33 (1.33, 1.33) ***
Child age (in years)	0.86 (0.79, 0.94) **	0.86 (0.79, 0.94) ***	0.86 (0.86, 0.86) ***
Ever attended ECE Program (Ref=No)			
Yes	1.05 (0.94, 1.17)	1.05 (0.94, 1.18)	1.05 (1.05, 1.05) ***
Iodine Intake (Ref=No)			
Yes	1.00 (0.91, 1.10)	1.00 (0.91, 1.10)	1.00 (1.00, 1.00)
Stunting (Ref=No)			
Yes	1.03 (0.94, 1.13)	1.03 (0.94, 1.13)	1.03 (1.03, 1.03) ***
Maternal Age	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	1.00 (1.00, 1.00)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.97 (0.84, 1.12)	0.97 (0.85, 1.12)	0.97 (0.97, 0.97) ***
Secondary	0.94 (0.82, 1.08)	0.95 (0.85, 1.09)	0.94 (0.94, 0.95) ***
Higher Secondary+	0.91 (0.76, 1.08)	0.91 (0.76, 1.09)	0.91 (0.91, 0.91) ***
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.07 (0.94, 1.23)	1.07 (0.94, 1.23)	1.08 (1.08, 1.08) ***
Middle	1.14 (1.00, 1.31) *	1.14 (1.00, 1.31)	1.15 (1.15, 1.15) ***
Richer	1.07 (0.93, 1.24)	1.07 (0.92, 1.23)	1.07 (1.07, 1.07) ***
Richest	0.94 (0.79, 1.11)	0.94 (0.79, 1.11)	0.94 (0.94, 0.94) ***
Cooking Place (Ref=Main Room)			
Separate	1.01 (0.91, 1.12)	1.01 (0.91, 1.12)	1.01 (1.01, 1.01) ***
Outdoor	0.96 (0.85, 1.07)	0.96 (0.86, 1.07)	0.95 (0.95, 0.95) ***
Urbanicity (Ref=Rural)			
Urban	1.05 (0.93, 1.19)	0.98 (0.79, 1.22)	1.02 (1.01, 1.02) ***
Season (Ref=Winter)			
Summer	0.97 (0.89, 1.06)	0.98 (0.90, 1.06)	0.97 (0.97, 0.98) ***
SFU*Urbanicity	-	**Ref=SFU*Urban**	**Ref= SFU*Rural**
		0.91 (0.91, 0.91) ***	1.11 (0.86, 1.44)

[a]Prevalence ratios (PRs) were adjusted for child age and sex, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, and season. * p<0.05, ** p<0.01, *** p<0.001.

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Table S7: Association between SFU and literacy-numeracy stratified by sex of the children

Predictors	**Overall (Model I)**	**Boy (Model II)**	**Girl (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs (*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.23 (1.15, 1.31)***	1.23 (1.12, 1.34) ***	1.23 (1.12, 1.36) ***
[a]Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.04 (0.95, 1.13)	1.04 (0.93, 1.16) ***	1.03 (0.92, 1.16)
Sex of child	(Ref=Boy)	(Ref=Boy)	(Ref=Girl)
	0.96 (0.92, 1.01)	0.97 (0.86, 1.09)	1.03 (0.91, 1.17)
Child age (in years)	0.77 (0.73, 0.81) ***	0.77 (0.73, 0.81) ***	0.77 (0.73, 0.81) ***
Ever attended ECE Program (Ref=No)			
Yes	0.61 (0.56, 0.66) ***	0.61 (0.56, 0.66) ***	0.61 (0.56, 0.66) ***
Iodine Intake (Ref=No)			
Yes	0.95 (0.90, 1.01)	0.95 (0.90, 1.01)	0.95 (0.90, 1.01)
Stunting (Ref=No)			
Yes	1.08 (1.03, 1.14) **	1.08 (1.03, 1.14) *	1.08 (1.03, 1.14) **
Maternal Age	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)
Secondary	0.88 (0.81, 0.95) **	0.87 (0.81, 0.95) **	0.87 (0.81, 0.95) **
Higher Secondary+	0.75 (0.67, 0.83) ***	0.75 (0.67, 0.83) ***	0.75 (0.67, 0.83) ***
Household Wealth Quintiles (Ref=Poorest)			
Poorer	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)
Middle	0.94 (0.87, 1.02)	0.94 (0.87, 1.02)	0.94 (0.87, 1.02)
Richer	0.90 (0.83, 0.98) *	0.90 (0.83, 0.98) *	0.90 (0.83, 0.98) *
Richest	0.84 (0.76, 0.93) **	0.84 (0.76, 0.93) **	0.84 (0.76, 0.93) **
Cooking Place (Ref= Main Room)			
Separate	1.00 (0.94, 1.06)	1.00 (0.94, 1.06)	1.00 (0.94, 1.06)
Outdoor	0.99 (0.92, 1.06)	0.99 (0.92, 1.06)	0.99 (0.92, 1.06)
Urbanicity (Ref=Rural)			
Urban	1.03 (0.96, 1.11)	1.03 (0.96, 1.11)	1.03 (0.96, 1.11)
Season (Ref= Winter)			
Summer	1.02(0.97, 1.07)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)
SFU*Sex	-	**Ref=SFU*Girl**	**Ref= SFU*Boy**
		1.01 (0.88, 1.15)	0.99 (0.87, 1.13)

[a]Prevalence ratios (PRs) were adjusted for child age, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, season, and urbanicity. * p<0.05, ** p<0.01, *** p<0.001.

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Table S8: Association between SFU and literacy-numeracy stratified by urbanicity

Predictors	**Overall (Model I)**	**Rural (Model II)**	**Urban (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs (*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.23 (1.15, 1.31)***	1.22 (1.09, 1.36)***	1.23 (1.10, 1.36)***
[a]Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.04 (0.95, 1.13)	1.04 (0.93, 1.17)	1.03 (0.91, 1.16)
Sex of child	(Ref=Boy)	(Ref=Girl)	(Ref=Girl)
	0.96 (0.92, 1.01)	1.04 (0.99, 1.09)	1.04 (0.99, 1.09)
Child age (in years)	0.77 (0.73, 0.81) ***	0.77 (0.73, 0.81) ***	0.77 (0.73, 0.81) ***
Ever attended ECE Program (Ref=No)			
Yes	0.61 (0.56, 0.66) ***	0.61 (0.56, 0.66) ***	0.61 (0.56, 0.66) ***
Iodine Intake (Ref=No)			
Yes	0.95 (0.90, 1.01)	0.95 (0.90, 1.01)	0.95 (0.90, 1.01)
Stunting (Ref=No)			
Yes	1.08 (1.03, 1.14) **	1.08 (1.03, 1.14) **	1.08 (1.03, 1.14) **
Maternal Age	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)
Secondary	0.88 (0.81, 0.95) **	0.88 (0.81, 0.95) **	0.88 (0.81, 0.95) **
Higher Secondary+	0.75 (0.67, 0.83) ***	0.75 (0.67, 0.83) ***	0.75 (0.67, 0.83) ***
Household Wealth Quintiles (Ref=Poorest)			
Poorer	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)	0.97 (0.90, 1.05)
Middle	0.94 (0.87, 1.02)	0.94 (0.87, 1.02)	0.94 (0.87, 1.02)
Richer	0.90 (0.83, 0.98) *	0.90 (0.83, 0.98) *	0.90 (0.83, 0.98) *
Richest	0.84 (0.76, 0.93) **	0.84 (0.76, 0.93) **	0.84 (0.76, 0.93) **
Cooking Place (Ref= Main Room)			
Separate	1.00 (0.94, 1.06)	1.00 (0.94, 1.06)	1.00 (0.94, 1.06)
Outdoor	0.99 (0.92, 1.06)	0.99 (0.92, 1.06)	0.99 (0.92, 1.06)
Urbanicity (Ref=Rural)			
Urban	1.03 (0.96, 1.11)	1.04 (0.91, 1.18)	0.96 (0.85-1.10)
Season (Ref= Winter)			
Summer	1.02(0.97, 1.07)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)
SFU*Urbanicity	-	**Ref=SFU*Urban**	**Ref= SFU*Rural**
		1.01 (0.87, 1.18)	0.99 (0.85, 1.15)

[a]Prevalence ratios (PRs) were adjusted for child age, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, and season. * p<0.05, ** p<0.01, *** p<0.001.

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Table S9: Association between SFU and physical development stratified by sex of the children

Predictors	**Overall (Model I)**	**Boy (Model II)**	**Girl (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs(*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.58 (0.48, 5.20)	1.10 (0.26, 4.55)	3.07 (0.31, 30.84)
[a]Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	0.71 (0.32, 1.60)	0.34 (0.13, 0.88) *	2.23 (0.65, 7.66)
Sex of child	(Ref=Boy)	(Ref=Boy)	(Ref=Girl)
	0.69 (0.45, 1.05)	0.39 (0.13, 1.19)	2.41 (0.69, 8.39)
Child age (in years)	0.53 (0.34, 0.84) **	0.77 (0.50, 1.19)	0.62 (0.40, 0.97) *
Ever attended ECE Program (Ref=No)			
Yes	1.12 (0.62, 2.02)	0.97 (0.55, 1.73)	0.92 (0.50, 1.70)
Iodine Intake (Ref=No)			
Yes	0.55 (0.34, 0.90) *	0.60 (0.37, 0.98) *	0.64 (0.40, 1.05)
Stunting (Ref=No)			
Yes	0.75 (0.46, 1.21)	0.70 (0.44, 1.14)	0.76 (0.47, 1.22)
Maternal Age	0.96 (0.93, 1.00) *	0.94 (0.91, 0.98) **	0.98 (0.94, 1.02)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.56 (0.30, 1.05)	0.59 (0.31, 1.12)	0.58 (0.31, 1.09)
Secondary	0.30 (0.15, 0.59) ***	0.38 (0.19, 0.75) **	0.39 (0.20, 0.77) **
Higher Secondary+	0.49 (0.20, 1.17)	0.78 (0.33, 1.87)	0.48 (0.19, 1.21)
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.22 (0.61, 2.43)	0.87 (0.46, 1.66)	0.95 (0.49, 1.86)
Middle	1.24 (0.61, 2.50)	0.76 (0.39, 1.47)	0.86 (0.43, 1.73)
Richer	1.14 (0.50, 2.60)	0.55 (0.24, 1.22)	0.92 (0.41, 2.05)
Richest	1.09 (0.41, 2.92)	0.44 (0.16, 1.17)	1.00 (0.38, 2.59)
Cooking Place (Ref=Main Room)			
Separate	1.08 (0.62, 1.88)	1.11 (0.64, 1.93)	0.73 (0.42, 1.26)
Outdoor	0.79 (0.43, 1.45)	0.78 (0.43, 1.43)	0.61 (0.34, 1.10)
Urbanicity (Ref=Rural)			
Urban	0.73 (0.31, 1.72)	0.47 (0.18, 1.22)	0.44 (0.16, 1.27)
Season (Ref=Winter)			
Summer	1.15 (0.64, 2.07)	1.22 (0.69, 2.16)	1.46 (0.79, 2.67)
SFU*Sex	-	**Ref=SFU*Girl**	**Ref= SFU*Boy**
		0.43 (0.11,1.60)	2.77 (0.84,9.17)

[a]Prevalence ratios (PRs) were adjusted for child age, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, season, and urbanicity. * p<0.05, ** p<0.01, *** p<0.001.)

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Table S10: Association between SFU and physical development stratified by urbanicity

Predictors	**Overall (Model I)**	**Rural (Model II)**	**Urban (Model III)**
	Prevalence Ratios (95 % CI)	**Prevalence Ratios (95 % CI)**	**Prevalence Ratios (95 % CI)**
Unadjusted PRs (*N*=9395)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	1.58 (0.48, 5.20)	1.38 (0.22, 8.41)	1.67 (0.24, 11.74)
[a]Adjusted PRs (*N*=9202)			
Solid Fuel Use (SFU)			
Exposed vs Unexposed	0.71 (0.32, 1.60)	0.75 (0.30, 1.91)	0.94 (0.28, 3.19)
Sex of child	(Ref=Boy)	(Ref=Girl)	(Ref=Girl)
	0.69 (0.45, 1.05) *	0.71 (0.47, 1.09)	0.99 (0.66, 1.48)
Child age (in years)	0.53 (0.34, 0.84) ***	0.57 (0.37, 0.89) *	1.10 (0.72, 1.66)
Ever attended ECE Program (Ref=No)			
Yes	1.12 (0.62, 2.02)	1.08 (0.60, 1.93)	0.64 (0.36, 1.16)
Iodine Intake (Ref=No)			
Yes	0.55 (0.34, 0.90) **	0.43 (0.27, 0.69) **	0.72 (0.45, 1.15)
Stunting (Ref=No)			
Yes	0.75 (0.46, 1.21)	0.64 (0.39, 1.04)	0.63 (0.39, 1.01)
Maternal Age	0.96 (0.93, 1.00) **	0.94 (0.91, 0.98) **	0.98 (0.94, 1.02)
Maternal Education Level (Ref=Pre-primary or none)			
Primary	0.56 (0.30, 1.05)	0.45 (0.24, 0.83) *	0.86 (0.46, 1.61)
Secondary	0.30 (0.15, 0.59) ***	0.23 (0.12, 0.45) ***	0.68 (0.35, 1.32)
Higher Secondary+	0.49 (0.20, 1.17)	0.51 (0.22, 1.19)	1.17 (0.49, 2.80)
Household Wealth Quintiles (Ref=Poorest)			
Poorer	1.22 (0.61, 2.43)	1.05 (0.55, 2.01)	0.63 (0.35, 1.15)
Middle	1.24 (0.61, 2.50)	0.87 (0.44, 1.74)	0.43 (0.22, 0.82) *
Richer	1.14 (0.50, 2.60)	1.00 (0.46, 2.19)	0.29 (0.13, 0.64) **
Richest	1.09 (0.41, 2.92) *	0.79 (0.30, 2.07)	0.29 (0.33, 0.75) *
Cooking Place (Ref= Main Room)			
Separate	1.08 (0.62, 1.88)	0.97 (0.57, 1.67)	0.94 (0.56, 1.59)
Outdoor	0.79 (0.43, 1.45)	0.71 (0.39, 1.29)	0.63 (0.35, 1.13)
Urbanicity (Ref=Rural)			
Urban	0.73 (0.31, 1.72)	0.66 (0.20, 2.24)	0.54 (0.14, 2.15)
Season (Ref= Winter)			
Summer	1.15 (0.64, 2.07)	1.28 (0.75, 2.20)	1.24 (0.73, 2.11)
SFU*Urbanicity	-	**Ref=SFU*Urban**	**Ref= SFU*Rural**
		1.60 (0.33,7.73)	0.91 (0.19,4.22)

[a]Prevalence ratios (PRs) were adjusted for child age, sex, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, cooking place, and season. * p<0.05, ** p<0.01, *** p<0.001.)

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Table S11: Levels of HAP Exposure and ECD Outcomes by Sex of the Children

ECD Outcomes	Levels of HAP Exposure	Sex	Unadjusted PRs *N*=9395 (95% CI)	P-value	Adjusted PRs *N*=9202 (95% CI)[a]	P-value/ P-int	P-trend
ECDI	Moderately Exposed vs. Unexposed	All	1.64 (1.44, 1.87)	<0.001	1.39, (1.18, 1.63)	<0.001	<0.001
ECDI	Highly Exposed vs. Unexposed	All	1.72 (1.48, 2.00)	<0.001	1.47, (1.24, 1.75)	<0.001	
ECDI	Moderately Exposed vs. Unexposed	Boys	1.52 (1.29, 1.79)	<0.001	1.30 (1.08, 1.57)	P-int >0.05	0.039
ECDI	Highly Exposed vs. Unexposed	Boys	1.54 (1.27, 1.86)	<0.001	1.33 (1.08, 1.65)		
ECDI	Moderately Exposed vs. Unexposed	Girls	1.88 (1.52, 2.33)	<0.001	1.54 (1.22, 1.94)	P-int >0.05	<0.001
ECDI	Highly Exposed vs. Unexposed	Girls	2.08 (1.64, 2.64)	<0.001	1.71 (1.32, 2.20)		
Learning-Cognition	Moderately Exposed vs. Unexposed	All	1.84 (1.40, 2.44)	<0.001	1.59 (1.16, 2.16)	0.004	<0.001
Learning-Cognition	Highly Exposed vs. Unexposed	All	2.41 (1.77, 3.29)	<0.001	1.97 (1.42, 2.74)	<0.001	
Learning-Cognition	Moderately Exposed vs. Unexposed	Boys	2.95 (2.94, 2.95)	<0.001	1.70 (1.16, 2.48)	P-int >0.05	0.001
Learning-Cognition	Highly Exposed vs. Unexposed	Boys	3.63 (3.63, 3.64)	<0.001	1.96 (1.31, 2.95)		
Learning-Cognition	Moderately Exposed vs. Unexposed	Girls	1.97 (1.30, 3.00)	0.001	1.67 (1.10, 2.55)	P-int >0.05	<0.001
Learning-Cognition	Highly Exposed vs. Unexposed	Girls	2.85 (1.81, 4.50)	<0.001	2.31 (1.48, 3.60)		
Socio-emotional Development	Moderately Exposed vs. Unexposed	All	1.25 (1.11, 1.40)	<0.001	1.20 (1.04, 1.39)	0.015	0.760
Socio-emotional Development	Moderately Exposed vs. Unexposed	All	1.14 (0.99, 1.31)	0.068	1.10 (0.93, 1.29)	0.259	
Socio-emotional Development	Moderately Exposed vs. Unexposed	Boys	1.24 (1.07, 1.44)	0.004	1.19 (1.00, 1.42)	P-int >0.05	0.661

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Socio-emotional Development	Highly Exposed vs. Unexposed	Boys	1.16 (0.97, 1.38)	0.115	1.11 (0.91, 1.35)		
Socio-emotional Development	Highly Exposed vs. Unexposed	Girls	1.26 (1.06, 1.50)	0.010	1.19 (0.98, 1.46)	P-int >0.05	0.967
Socio-emotional Development	Highly Exposed vs. Unexposed	Girls	1.13 (0.91, 1.40)	0.262	1.07 (0.84, 1.36)		
Literacy-Numeracy	Moderately Exposed vs. Unexposed	All	1.23 (1.15, 1.32)	<0.001	1.03 (0.95, 1.13)	0.456	0.588
Literacy-Numeracy	Highly Exposed vs. Unexposed	All	1.23 (1.13, 1.33)	<0.001	1.03 (0.94, 1.14)	0.494	
Literacy-Numeracy	Moderately Exposed vs. Unexposed	Boys	1.23 (1.12, 1.35)	<0.001	1.04 (0.93, 1.16)	P-int >0.05	0.764
Literacy-Numeracy	Highly Exposed vs. Unexposed	Boys	1.22 (1.09, 1.37)	<0.001	1.03 (0.91, 1.16)		
Literacy-Numeracy	Moderately Exposed vs. Unexposed	Girls	1.23 (1.12, 1.36)	<0.001	1.03 (0.92, 1.15)	P-int >0.05	0.605
Literacy-Numeracy	Highly Exposed vs. Unexposed	Girls	1.23 (1.10, 1.39)	<0.001	1.04 (0.91, 1.19)		
Physical Development	Moderately Exposed vs. Unexposed	All	1.58 (0.47, 5.33)	0.461	0.62 (0.19, 2.02)	0.428	0.519
Physical Development	Highly Exposed vs. Unexposed	All	1.56 (0.38, 6.49)	0.539	0.48 (0.12, 1.85)	0.284	
Physical Development	Moderately Exposed vs. Unexposed	Boys	1.18 (0.27, 5.11)	0.825	2.93 (0.24, 36.44)	P-int >0.05	0.910
Physical Development	Highly Exposed vs. Unexposed	Boys	0.83 (0.12, 5.74)	0.847	6.93 (0.49, 96.98)		
Physical Development	Moderately Exposed vs. Unexposed	Girls	2.87 (0.29, 28.72)	0.371	0.24 (0.04, 1.37)	P-int >0.05	0.776
Physical Development	Highly Exposed vs. Unexposed	Girls	3.85 (0.33, 45.07)	0.282	0.71 (0.12, 4.15)		

[a]Prevalence ratios (PRs) were adjusted for child age, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, urbanicity, and season. CI-Confidence Intervals; * p<0.05, ** p<0.01, *** p<0.001.

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Table S12: Levels of HAP Exposure and ECD Outcomes by Urbanicity

ECD Outcomes	Levels of HAP Exposure	Urbanicity	Unadjusted PRs *N*=9395 (95% CI)	P-value	Adjusted PRs *N*=9202 (95% CI) [a]	P-value/ P-int	P-trend
ECDI	Moderately Exposed vs. Unexposed	All	1.64 (1.44, 1.87)	<0.001	1.39 (1.18, 1.63)	<0.001	<0.001
ECDI	Highly Exposed vs. Unexposed	All	1.72 (1.48, 2.00)	<0.001	1.47 (1.24, 1.75)	<0.001	
ECDI	Moderately Exposed vs. Unexposed	Rural	1.60 (1.29, 1.97)	<0.001	1.32 (1.06, 1.63)	P-int >0.05	0.011
ECDI	Highly Exposed vs. Unexposed	Rural	1.68 (1.34, 2.37)	<0.001	1.41 (1.12, 1.77)		
ECDI	Moderately Exposed vs. Unexposed	Urban	1.81 (1.46, 2.25)	<0.001	1.48 (1.18, 1.86)	P-int >0.05	0.002
ECDI	Highly Exposed vs. Unexposed	Urban	1.78 (1.34, 2.37)	<0.001	1.48 (1.11, 1.99)		
Learning-Cognition	Moderately Exposed vs. Unexposed	All	1.84 (1.40, 2.44)	<0.001	1.59 (1.16, 2.16)	0.004	<0.001
Learning-Cognition	Highly Exposed vs. Unexposed	All	2.41 (1.77, 3.29)	<0.001	1.97 (1.42, 2.4)	<0.001	
Learning-Cognition	Moderately Exposed vs. Unexposed	Rural	1.78 (1.19, 2.66)	0.005	1.49 (0.98, 2.25)	P-int >0.05	0.003
Learning-Cognition	Highly Exposed vs. Unexposed	Rural	2.22 (1.46, 3.39)	<0.001	1.85 (1.20, 2.85)		
Learning-Cognition	Moderately Exposed vs. Unexposed	Urban	2.14 (1.36, 3.36)	0.001	1.82 (1.17, 2.84)	P-int >0.05	0.001
Learning-Cognition	Highly Exposed vs. Unexposed	Urban	2.78 (1.60, 4.83)	<0.001	2.37 (1.42, 3.94)		
Socio-emotional Development	Moderately Exposed vs. Unexposed	All	1.25 (1.11, 1.40)	<0.001	1.20 (1.04, 1.39)	0.015	0.760
Socio-emotional Development	Moderately Exposed vs. Unexposed	All	1.14 (0.99, 1.31)	0.068	1.10 (0.93, 1.29)	0.259	
Socio-emotional Development	Moderately Exposed vs. Unexposed	Rural	1.18 (0.99, 1.41)	0.0065	1.14 (0.94, 1.37)	P-int >0.05	0.757

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Socio-emotional Development	Highly Exposed vs. Unexposed	Rural	1.10 (0.90, 1.34)	0.360	1.05 (0.86, 1.29)		
Socio-emotional Development	Highly Exposed vs. Unexposed	Urban	1.40 (1.15, 1.71)	0.001	1.30 (1.05, 1.60)	P-int >0.05	0.237
Socio-emotional Development	Highly Exposed vs. Unexposed	Urban	1.16 (0.86, 1.32)	0.558	1.09 (0.81, 1.47)		
Literacy-Numeracy	Moderately Exposed vs. Unexposed	All	1.23 (1.15, 1.32)	<0.001	1.03 (0.95, 1.13)	0.456	0.588
Literacy-Numeracy	Highly Exposed vs. Unexposed	All	1.23 (1.13, 1.33)	<0.001	1.03 (0.94, 1.14)	0.494	
Literacy-Numeracy	Moderately Exposed vs. Unexposed	Rural	1.23 (1.10, 1.37)	<0.001	1.04 (0.93, 1.17)	P-int >0.05	0.772
Literacy-Numeracy	Highly Exposed vs. Unexposed	Rural	1.22 (1.08, 1.37)	0.001	1.03 (0.91, 1.17)		
Literacy-Numeracy	Moderately Exposed vs. Unexposed	Urban	1.20 (1.06, 1.36)	0.003	1.01 (0.89, 1.26)	P-int >0.05	0.565
Literacy-Numeracy	Highly Exposed vs. Unexposed	Urban	1.25 (1.06, 1.47)	0.007	1.06 (0.89, 1.26)		
Physical Development	Moderately Exposed vs. Unexposed	All	1.58 (0.47, 5.33)	0.461	0.62 (0.19, 2.02)	0.428	0.519
Physical Development	Highly Exposed vs. Unexposed	All	1.56 (0.38, 6.49)	0.539	0.48 (0.12, 1.85)	0.284	
Physical Development	Moderately Exposed vs. Unexposed	Rural	1.39 (0.22, 8.64)	0.722	1.23 (0.44, 3.44)	P-int >0.05	0.855
Physical Development	Highly Exposed vs. Unexposed	Rural	1.32 (0.18, 9.74)	0.788	0.97 (0.31, 3.01)		
Physical Development	Moderately Exposed vs. Unexposed	Urban	1.51(0.17, 13.38)	0.713	0.58 (0.14, 2.42)	P-int >0.05	0.493
Physical Development	Highly Exposed vs. Unexposed	Urban	2.05(0.15, 12.14)	0.847	0.70 (0.11, 4.27)		

[a]Prevalence ratios (PRs) were adjusted for child age, sex, ECE, iodine intake, stunting, maternal age, maternal education, household wealth index, and season.
CI-Confidence Intervals; * p<0.05, ** p<0.01, *** p<0.001.