Birth length is the strongest predictor of linear growth status and stunting in the first 2 years of life after a preconception maternal nutrition intervention: the children of the Women First trial (Krebs, et al)

Online Supplementary Material

Supplemental Table 1. All sites unadjusted growth outcomes from birth to 24 months by treatment arm among the longitudinal analysis subset [1]

Variable [2]	Arm 1 (N=755)	Arm 2 (N=808)	Arm 3 (N=774)	Unadjusted Pairwise Arm Comparisons and 95% CI [3]		
				Arm 1 vs. 3	Arm 2 vs. 3	Arm 1 vs. 2
Continuous Variables	**Mean (n, SD)**	**Mean (n, SD)**	**Mean (n, SD)**	**Mean Difference (95% CI)**	**Mean Difference (95% CI)**	**Mean Difference (95% CI)**
Length, cm						
Birth (<7 days)	47.65 (755, 2.18)	47.63 (808, 2.03)	47.32 (774, 2.09)	0.34 (0.12, 0.55)	0.31 (0.11, 0.51)	0.03 (-0.18, 0.24)
6 months	63.85 (747, 2.58)	63.62 (801, 2.69)	63.41 (769, 2.65)	0.44 (0.18, 0.71)	0.21 (-0.05, 0.47)	0.23 (-0.03, 0.50)
12 months	70.20 (730, 3.05)	69.98 (797, 3.09)	69.92 (752, 2.94)	0.27 (-0.03, 0.58)	0.06 (-0.24, 0.36)	0.22 (-0.09, 0.52)
18 months	75.18 (724, 3.37)	74.83 (789, 3.41)	74.86 (746, 3.42)	0.32 (-0.03, 0.67)	-0.03 (-0.37, 0.31)	0.35 (0.01, 0.69)
24 months	79.18 (712, 3.70)	78.96 (772, 3.74)	78.92 (735, 3.60)	0.26 (-0.12, 0.64)	0.04 (-0.33, 0.41)	0.22 (-0.16, 0.60)
Length-for-age Z-score (LAZ)						
Birth (<7 days)	-1.00 (755, 1.15)	-1.01 (808, 1.07)	-1.19 (774, 1.10)	0.19 (0.07, 0.30)	0.17 (0.07, 0.28)	0.01 (-0.10, 0.12)
6 months	-1.24 (747, 1.12)	-1.33 (801, 1.18)	-1.45 (769, 1.16)	0.21 (0.10, 0.33)	0.12 (0.00, 0.23)	0.10 (-0.02, 0.21)
12 months	-1.90 (730, 1.19)	-1.97 (797, 1.21)	-2.02 (752, 1.16)	0.12 (0.00, 0.24)	0.05 (-0.07, 0.17)	0.07 (-0.05, 0.19)
18 months	-2.25 (724, 1.17)	-2.36 (789, 1.19)	-2.37 (746, 1.20)	0.13 (0.01, 0.25)	0.02 (-0.10, 0.14)	0.11 (-0.01, 0.23)
24 months	-2.40 (712, 1.15)	-2.46 (772, 1.17)	-2.49 (735, 1.13)	0.09 (-0.03, 0.21)	0.03 (-0.09, 0.15)	0.06 (-0.06, 0.18)
Weight, gm						
Birth (<7 days)	2812 (755, 433)	2812 (808, 412)	2763 (774, 414)	48.9 (6.3, 91.4)	48.7 (8.0, 90.0)	0.1 (-41.8, 42.1)
6 months	6743 (749, 1048)	6725 (804, 1031)	6684 (770, 1018)	59.3 (-44.7, 163.3)	40.6 (-60.8, 142.0)	18.7 (-84.8, 122.2)
12 months	7878 (729, 1143)	7843 (798, 1119)	7866 (750, 1110)	12.1 (-102.8, 127.0)	-22.3 (-133.5, 88.9)	34.4 (-79.3, 148.0)
18 months	8819. (724, 1198)	8719 (788, 1185)	8753 (745, 1186)	66.5 (-55.5, 188.6)	-33.4 (-152.2, 85.4)	99.9 (-20.4, 220.2)
24 months	9696 (712, 1300)	9602 (773, 1278)	9632 (735, 1249)	65.0 (-66.5, 196.4)	-29.0 (-156.8, 98.7)	94.0 (-37.3, 225.3)

Variable [2]	Arm 1 (N=755)	Arm 2 (N=808)	Arm 3 (N=774)	Unadjusted Pairwise Arm Comparisons and 95% CI [3]		
				Arm 1 vs. 3	Arm 2 vs. 3	Arm 1 vs. 2
Continuous Variables	**Mean (n, SD)**	**Mean (n, SD)**	**Mean (n, SD)**	**Mean Difference (95% CI)**	**Mean Difference (95% CI)**	**Mean Difference (95% CI)**
Length, cm						
Weight-for-age Z-score (WAZ)						
Birth (<7 days)	-1.10 (755, 1.02)	-1.10 (808, 0.97)	-1.22 (774, 0.98)	0.11 (0.01, 0.22)	0.12 (0.02, 0.22)	-0.01 (-0.11, 0.09)
6 months	-1.11 (749, 1.31)	-1.12 (804, 1.30)	-1.19 (770, 1.27)	0.08 (-0.05, 0.21)	0.07 (-0.06, 0.20)	0.01 (-0.12, 0.14)
12 months	-1.53 (729, 1.23)	-1.55 (798, 1.21)	-1.55 (750, 1.20)	0.02 (-0.10, 0.14)	-0.00 (-0.12, 0.12)	0.02 (-0.10, 0.15)
18 months	-1.65 (724, 1.17)	-1.73 (788, 1.16)	-1.73 (745, 1.14)	0.08 (-0.04, 0.20)	-0.01 (-0.12, 0.11)	0.09 (-0.03, 0.20)
24 months	-1.76 (712, 1.12)	-1.83 (773, 1.12)	-1.82 (735, 1.09)	0.06 (-0.06, 0.17)	-0.01 (-0.12, 0.10)	0.07 (-0.04, 0.19)
Weight-for-length Z-score (WLZ)						
Birth (<7 days)	-0.47 (675, 1.06)	-0.44 (729, 1.05)	-0.42 (675, 0.99)	-0.05 (-0.16, 0.06)	-0.03 (-0.13, 0.08)	-0.03 (-0.14, 0.08)
6 months	-0.34 (745, 1.27)	-0.29 (801, 1.25)	-0.25 (767, 1.20)	-0.09 (-0.21, 0.03)	-0.03 (-0.15, 0.09)	-0.06 (-0.18, 0.07)
12 months	-0.74 (728, 1.16)	-0.72 (797, 1.15)	-0.68 (749, 1.15)	-0.06 (-0.18, 0.05)	-0.05 (-0.16, 0.07)	-0.02 (-0.13, 0.10)
18 months	-0.77 (722, 1.11)	-0.81 (788, 1.12)	-0.79 (744, 1.09)	0.03 (-0.09, 0.14)	-0.02 (-0.13, 0.09)	0.04 (-0.07, 0.16)
24 months	-0.70 (712, 1.08)	-0.74 (772, 1.07)	-0.71 (735, 1.06)	0.01 (-0.10, 0.12)	-0.03 (-0.14, 0.08)	0.04 (-0.07, 0.15)
Head Circumference, cm						
Birth (<7 days)	33.3 (751, 1.5)	33.3 (805, 1.4)	33.2 (772, 1.5)	0.03 (-0.11, 0.18)	0.05 (-0.09, 0.19)	-0.01 (-0.15, 0.13)
6 months	41.5 (743, 1.6)	41.5 (802, 1.5)	41.5 (767, 1.5)	-0.02 (-0.18, 0.14)	-0.05 (-0.20, 0.10)	0.02 (-0.13, 0.18)
12 months	44.0 (727, 1.6)	43.9 (795, 1.5)	44.0 (747, 1.5)	-0.04 (-0.20, 0.12)	-0.07 (-0.22, 0.08)	0.03 (-0.12, 0.19)
18 months	45.2 (722, 1.6)	45.2 (785, 1.5)	45.2 (742, 1.5)	-0.04 (-0.19, 0.12)	-0.07 (-0.22, 0.07)	0.04 (-0.12, 0.19)
24 months	46.1 (711, 1.6)	46.0 (769, 1.4)	46.1 (733, 1.5)	-0.02 (-0.18, 0.13)	-0.05 (-0.19, 0.10)	0.03 (-0.13, 0.18)
Head Circumference-for-age Z-score (HCAZ)						
Birth (<7 days)	-0.76 (751, 1.16)	-0.74 (805, 1.09)	-0.79 (772, 1.16)	0.03 (-0.08, 0.15)	0.05 (-0.06, 0.16)	-0.02 (-0.13, 0.10)
6 months	-0.96 (743, 1.20)	-0.97 (802, 1.12)	-0.95 (767, 1.14)	-0.01 (-0.13, 0.11)	-0.02 (-0.13, 0.09)	0.01 (-0.11, 0.12)
12 months	-1.16 (727, 1.10)	-1.17 (795, 1.06)	-1.14 (747, 1.06)	-0.03 (-0.14, 0.08)	-0.03 (-0.14, 0.07)	0.01 (-0.10, 0.12)

Variable [2]	Arm 1 (N=755)	Arm 2 (N=808)	Arm 3 (N=774)	Unadjusted Pairwise Arm Comparisons and 95% CI [3]		
				Arm 1 vs. 3	Arm 2 vs. 3	Arm 1 vs. 2
Continuous Variables	**Mean (n, SD)**	**Mean (n, SD)**	**Mean (n, SD)**	**Mean Difference (95% CI)**	**Mean Difference (95% CI)**	**Mean Difference (95% CI)**
Length, cm						
18 months	-1.19 (722, 1.08)	-1.20 (785, 1.02)	-1.17 (742, 1.01)	-0.02 (-0.12, 0.09)	-0.03 (-0.13, 0.07)	0.01 (-0.09, 0.12)
24 months	-1.21 (711, 1.05)	-1.21 (769, 0.99)	-1.20 (733, 0.98)	-0.01 (-0.11, 0.10)	-0.01 (-0.11, 0.09)	0.01 (-0.10, 0.11)
Dichotomous Variables	**n/N (%)**	**n/N (%)**	**n/N (%)**	**Relative Risk (95% CI)**	**Relative Risk (95% CI)**	**Relative Risk (95% CI)**
LAZ <-2						
Birth (<7 days)	123/755 (16.3)	121/808 (15.0)	168/774 (21.7)	0.75 (0.61, 0.93)	0.69 (0.56, 0.85)	1.09 (0.86, 1.37)
6 months	171/747 (22.9)	203/801 (25.3)	234/769 (30.4)	0.75 (0.63, 0.89)	0.83 (0.71, 0.98)	0.90 (0.76, 1.08)
12 months	329/730 (45.1)	383/797 (48.1)	369/752 (49.1)	0.92 (0.82, 1.02)	0.98 (0.88, 1.09)	0.94 (0.84, 1.04)
18 months	419/724 (57.9)	476/789 (60.3)	463/746 (62.1)	0.93 (0.86, 1.01)	0.97 (0.90, 1.05)	0.96 (0.88, 1.04)
24 months	447/712 (62.8)	500/772 (64.8)	487/735 (66.3)	0.95 (0.88, 1.02)	0.98 (0.91, 1.05)	0.97 (0.90, 1.05)
WAZ <-2						
Birth (<7 days)	127/755 (16.8)	131/808 (16.2)	147/774 (19.0)	0.89 (0.71, 1.10)	0.85 (0.69, 1.06)	1.04 (0.83, 1.30)
6 months	165/749 (22.0)	169/804 (21.0)	183/770 (23.8)	0.93 (0.77, 1.12)	0.88 (0.74, 1.06)	1.05 (0.87, 1.27)
12 months	234/729 (32.1)	257/798 (32.2)	251/750 (33.5)	0.96 (0.83, 1.11)	0.96 (0.83, 1.11)	1.00 (0.86, 1.15)
18 months	255/724 (35.2)	311/788 (39.5)	300/745 (40.3)	0.87 (0.77, 1.00)	0.98 (0.87, 1.11)	0.89 (0.78, 1.02)
24 months	280/712 (39.3)	323/773 (41.8)	310/735 (42.2)	0.93 (0.82, 1.06)	0.99 (0.88, 1.12)	0.94 (0.83, 1.06)
WLZ <-2						
Birth (<7 days)	50/675 (7.4)	51/729 (7.0)	36/675 (5.3)	1.39 (0.92, 2.10)	1.31 (0.87, 1.98)	1.06 (0.73, 1.54)
6 months	64/745 (8.6)	74/801 (9.2)	58/767 (7.6)	1.14 (0.81, 1.60)	1.22 (0.88, 1.70)	0.93 (0.68, 1.28)
12 months	101/728 (13.9)	103/797 (12.9)	91/749 (12.1)	1.14 (0.88, 1.49)	1.06 (0.82, 1.38)	1.07 (0.83, 1.39)

18 months	97/722 (13.4)	101/788 (12.8)	93/744 (12.5)	1.07 (0.82, 1.40)	1.03 (0.79, 1.33)	1.05 (0.81, 1.36)
24 months	73/712 (10.3)	90/772 (11.7)	74/735 (10.1)	1.02 (0.75, 1.38)	1.16 (0.87, 1.55)	0.88 (0.66, 1.18)

[1] After excluding extreme invalid measurements as determined by expert manual review and accounting for biologically implausible Z-scores based on WHO standards [b], the 24-month longitudinal analysis subset included all live born infants with birth length measurements measured by 7 days (168 hours) of age on portable infantometers/pediatric stadiometers, and consented to the offspring follow-up study.

[2] Extreme invalid measurements as determined by expert manual review were excluded from the longitudinal analysis. All length-for-age, weight-for-age, weight-for-length, and head-circumference-for-age Z-scores (LAZ, WAZ, WLZ, and HCAZ, respectively) were calculated using the expanded tables of the Child Growth Standards published by the WHO that provide Z-scores by sex and age in days at time of measurement. Weight-for-length Z-scores (WLZ) were calculated using the expanded tables of the Child Growth Standards published by the WHO that provide Z-scores by sex and tabulated lengths from 45.0 cm to 110.0 cm. All WHO standards are based on term infants. LAZ, WAZ, WLZ, and HCAZ were within the biologically plausible range according to WHO standards ($-6 \leq LAZ \leq 6$, $-6 \leq WAZ \leq 6$, $-5 \leq WLZ \leq 5$, $-5 \leq HCAZ \leq 5$). If an infant was found to have a biologically implausible LAZ or WAZ according to WHO standards at a visit, all growth outcomes at the visit were set to missing. If an infant was found to have a biologically implausible WLZ or HCAZ according to WHO standards at a visit, only the corresponding measurement and Z-score at the visit were set to missing. WLZ could not be obtained for infants with a length of less than 45.0 cm at any visit due to limitations in the WHO standards and were set to missing for that visit (1).

[3] Unadjusted pairwise mean differences and 95% confidence limits (CI) were obtained from t-test assuming equal variance across arms.

Arm 1 maternal participants received the study supplement starting at least 3 months prior to conception and continued through delivery; Arm 2 started the study supplement at the end of the first trimester and continued through delivery; Arm 3 (Control) did not receive study supplement. Number of infants considered for combined site analyses was 755, 808, and 774 in Arms 1, 2, and 3, respectively.

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Online Supplementary Material

Supplemental Table 2. Effect sizes and relative risks for 0-24 month continuous and categorical anthropometric outcomes, respectively, for the longitudinal analysis [1]

Variable	Arm 1 vs. Arm 3		Arm 2 vs. Arm 3		Arm 1 vs. Arm 2	
Continuous Variables [2]	**Effect Size (95% CI)**	***P* value**	**Effect Size (95% CI)**	***P* value**	**Effect Size (95% CI)**	***P* value**
Length, cm [3]						
Democratic Republic of Congo	0.84 (0.41, 1.27)	0.0001	0.29 (-0.12, 0.69)	0.162	0.55 (0.15, 0.96)	0.0075
Guatemala	-0.06 (-0.44, 0.32)	0.756	0.11 (-0.28, 0.49)	0.591	-0.17 (-0.57, 0.23)	0.416
India	0.31 (-0.12, 0.74)	0.164	0.22 (-0.21, 0.65)	0.318	0.09 (-0.36, 0.53)	0.706
Pakistan	0.30 (-0.17, 0.78)	0.214	0.12 (-0.34, 0.58)	0.607	0.18 (-0.26, 0.62)	0.423
Length-for-age Z-score (LAZ) [4]						
Democratic Republic of Congo	0.36 (0.18, 0.54)	<0.0001	0.14 (-0.03, 0.31)	0.098	0.22 (0.05, 0.39)	0.0101
Guatemala	-0.03 (-0.19, 0.13)	0.702	0.06 (-0.09, 0.22)	0.444	-0.09 (-0.25, 0.07)	0.272
India	0.13 (-0.04, 0.31)	0.141	0.10 (-0.07, 0.28)	0.247	0.03 (-0.15, 0.21)	0.759
Pakistan	0.17 (-0.02, 0.37)	0.084	0.08 (-0.11, 0.26)	0.427	0.10 (-0.09, 0.28)	0.301
Weight (gm)	78.3 (8.4, 148.1)	0.0281	15.4 (-51.9, 82.8)	0.653	62.8 (-5.7, 131.4)	0.072
Weight-for-age Z-score (WAZ)	0.12 (0.03, 0.20)	0.0077	0.05 (-0.03, 0.13)	0.254	0.07 (-0.01, 0.15)	0.107
Weight-for-length. kg/m	0.09 (0.01, 0.17)	0.0337	0.02 (-0.06, 0.09)	0.693	0.07 (-0.01, 0.15)	0.074
Weight-for-length Z-score (WLZ)	0.00 (-0.07, 0.08)	0.920	-0.04 (-0.11, 0.03)	0.294	0.04 (-0.03, 0.12)	0.263
Dichotomous Variables	**Relative Risk (95% CI)**	**p value**	**Relative Risk (95% CI)**	**p value**	**Relative Risk (95% CI)**	**p value**
LAZ <-2 [5]	0.94 (0.88, 1.01)	0.081	0.98 (0.92, 1.04)	0.515	0.96 (0.90, 1.03)	0.245
WAZ <-2 [6]	0.90 (0.81, 0.99)	0.0338	0.96 (0.88, 1.06)	0.441	0.93 (0.84, 1.03)	0.172
WLZ <-2 [7]	1.02 (0.86, 1.21)	0.822	1.08 (0.92, 1.28)	0.348	0.94 (0.80, 1.11)	0.476

[1] After excluding extreme invalid measurements as determined by expert manual review [8], the longitudinal analysis subset includes all live born infants with birth length measurements measured by 7 days (168 hours) of age on portable length boards, and had consented to participate in the follow-up study.

[2] Using longitudinal generalized linear models with generalized estimating equations (GEE), assuming a normal distribution and the identity link, and Auto-regressive order 1 covariance structure. Adjusted for site, cluster nested within site, visit, maternal education, stunting, parity, socioeconomic status (SES), and infant sex.

[3] In the longitudinal analysis of length, the interaction between intervention and site was significant at α=0.10 (*P* value=0.0972), and thus site specific estimates are presented.

[4] In the longitudinal analysis of length-for-age Z-scores (LAZ), the interaction between intervention and site was significant at α=0.10 (*P* value=0.0620), and thus site specific estimates are presented.

[5] Using longitudinal generalized linear models with GEE, assuming a binary distribution and the log link, and Auto-regressive order 1 covariance structure. Adjusted for site, visit, maternal education, parity, SES, and infant sex.

[6] Using longitudinal generalized linear models with GEE, assuming a binary distribution and the log link, and Auto-regressive order 1 covariance structure. Adjusted for site, cluster nested within site, visit, maternal education, parity, SES, and infant sex.

[7] Using longitudinal generalized linear models with GEE, assuming a binary distribution and the log link, and Auto-regressive order 1 covariance structure. Adjusted for site, visit, maternal education, stunting, parity, SES, and infant sex.

[8] All Z-scores were calculated using the expanded tables of the Child Growth Standards published by the WHO that provide Z-scores by sex and age in days at time of measurement. Weight-for-length Z-scores (WLZ) were calculated using the expanded tables of the Child Growth Standards published by the WHO that provide Z-scores by sex and tabulated lengths from 45.0 cm to 110.0 cm. All WHO standards are based on term infants. LAZ, WAZ, and WLZ were within the biologically plausible range according to WHO standards ($-6 \leq LAZ \leq 6$, $-6 \leq WAZ \leq 6$, $-5 \leq WLZ \leq 5$). If an infant was found to have a biologically implausible LAZ or WAZ according to WHO standards at a visit, all growth outcomes at the visit were set to missing. If an infant was found to have a biologically implausible WLZ according to WHO standards at a visit, only the corresponding measurement and Z-score at the visit were set to missing. WLZ could not be obtained for infants with a length of less than 45.0 cm at any visit due to limitations in the WHO standards and were set to missing for that visit (1).

Arm 1 maternal participants received the study supplement starting at least 3 months prior to conception and continued through delivery; Arm 2 started the study supplement at the end of the first trimester and continued through delivery; Arm 3 (Control) did not receive study supplement. The number of infants considered for the combined site analyses according to treatment arm were 755, 808, and 774 for Arms 1, 2, and 3, respectively.

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Online Supplementary Material

Supplemental Table 3. Adjusted linear growth outcomes comparisons from birth to 24 months by treatment arm and visit time point [1, 2]

Visit	Arm Difference	Democratic Republic of Congo Length[3]		Democratic Republic of Congo Length-for-age Z-score (LAZ)[4]		All Sites LAZ <-2[5]	
		Adj. Mean Diff. (95% CI)	*P* value	Adj. Mean Diff. (95% CI)	*P* value	Adj. Relative Risk (95% CI)	*P* value
<7 days	Arm 1 vs.2	0.32 (-0.09, 0.73)	0.129	0.18 (-0.03, 0.39)	0.087	1.08 (0.86, 1.35)	0.526
	Arm 1 vs.3	0.69 (0.25, 1.13)	0.0022	0.37 (0.14, 0.60)	0.0014	0.75 (0.61, 0.92)	0.0057
	Arm 2 vs.3	0.37 (-0.02, 0.76)	0.062	0.19 (-0.02, 0.39)	0.072	0.69 (0.56, 0.85)	0.0006
1 month	Arm 1 vs.2	0.28 (-0.15, 0.71)	0.198	0.15 (-0.06, 0.36)	0.172	1.15 (0.94, 1.40)	0.181
	Arm 1 vs.3	0.90 (0.43, 1.37)	0.0002	0.49 (0.26, 0.73)	<0.0001	0.87 (0.72, 1.04)	0.127
	Arm 2 vs.3	0.62 (0.21, 1.03)	0.0032	0.35 (0.14, 0.55)	0.0009	0.76 (0.63, 0.91)	0.0038
3 months	Arm 1 vs.2	0.72 (0.29, 1.14)	0.001	0.27 (0.07, 0.48)	0.0097	0.94 (0.77, 1.15)	0.540
	Arm 1 vs.3	1.22 (0.78, 1.67)	<0.0001	0.56 (0.35, 0.77)	<0.0001	0.77 (0.63, 0.93)	0.0074
	Arm 2 vs.3	0.51 (0.08, 0.94)	0.0197	0.29 (0.09, 0.50)	0.0053	0.82 (0.68, 0.99)	0.0343
6 months	Arm 1 vs.2	0.41 (-0.01, 0.83)	0.057	0.16 (-0.03, 0.35)	0.097	0.91 (0.77, 1.08)	0.282
	Arm 1 vs.3	0.99 (0.54, 1.45)	<0.0001	0.45 (0.24, 0.65)	<0.0001	0.76 (0.64, 0.89)	0.0008
	Arm 2 vs.3	0.59 (0.15, 1.03)	0.0087	0.28 (0.08, 0.48)	0.0056	0.83 (0.71, 0.97)	0.0182
12 months	Arm 1 vs.2	0.46 (-0.05, 0.97)	0.075	0.16 (-0.04, 0.37)	0.124	0.93 (0.85, 1.03)	0.179
	Arm 1 vs.3	0.88 (0.35, 1.40)	0.0012	0.36 (0.15, 0.57)	0.0009	0.92 (0.83, 1.01)	0.081
	Arm 2 vs.3	0.41 (-0.10, 0.92)	0.113	0.20 (-0.01, 0.40)	0.061	0.98 (0.89, 1.08)	0.673
18 months	Arm 1 vs.2	0.87 (0.25, 1.49)	0.0059	0.30 (0.08, 0.52)	0.0085	0.95 (0.88, 1.02)	0.167
	Arm 1 vs.3	1.04 (0.39, 1.69)	0.0017	0.38 (0.15, 0.61)	0.0012	0.94 (0.87, 1.01)	0.101
	Arm 2 vs.3	0.17 (-0.46, 0.79)	0.610	0.08 (-0.14, 0.31)	0.467	0.99 (0.92, 1.06)	0.767
24 months	Arm 1 vs.2	0.81 (0.13, 1.50)	0.0205	0.27 (0.05, 0.49)	0.0172	0.96 (0.89, 1.02)	0.181

Arm 1 vs.3	0.76 (0.07, 1.45)	0.0298	0.23 (0.01, 0.46)	0.037	0.95 (0.89, 1.02)	0.186
Arm 2 vs.3	-0.05 (-0.72, 0.62)	0.885	-0.03 (-0.25, 0.18)	0.760	1.00 (0.94, 1.06)	0.980

[1] After excluding extreme invalid measurements as determined by expert manual review and accounting for biologically implausible Z-scores based on WHO standards [b], the 24-month longitudinal analysis subset includes all live born infants with birth length measurements measured by 7 days (168 hours) of age on portable length boards, and consented to the offspring follow-up study.

[2] All Z-scores were calculated using the expanded tables of the Child Growth Standards published by the WHO that provide Z-scores by sex and age in days at time of measurement. Weight-for-length Z-scores (WLZ) were calculated using the expanded tables of the Child Growth Standards published by the WHO that provide Z-scores by sex and tabulated lengths from 45.0 cm to 110.0 cm. All WHO standards are based on term infants. LAZ, WAZ, and WLZ were within the biologically plausible range according to WHO standards ($-6 \leq LAZ \leq 6$, $-6 \leq WAZ \leq 6$, $-5 \leq WLZ \leq 5$). If an infant was found to have a biologically implausible LAZ or WAZ according to WHO standards at a visit, all growth outcomes at the visit were set to missing. If an infant was found to have a biologically implausible WLZ according to WHO standards at a visit, only the corresponding measurement and Z-score at the visit was set to missing (1).

[3] Using longitudinal generalized linear models with generalized estimating equations (GEE), assuming a normal distribution and the identity link, and Auto-regressive order 1 covariance structure. Adjusted for country, cluster, visit, maternal education, stunting, parity, social-economic status (SES), infant sex, and arm by visit time interaction arm by visit time interaction *P* value was 0.011.

[4] Using longitudinal generalized linear models with GEE, assuming a normal distribution and the identity link, and Auto-regressive order 1 covariance structure. Adjusted for country, cluster nested within country, visit, maternal education, stunting, parity, SES, infant sex, and arm by visit time interaction. Arm by visit time interaction *P* value was 0.005.

[5] Using longitudinal generalized linear models with GEE, assuming a binary distribution and the log link, and Auto-regressive order 1 covariance structure. Adjusted for country, visit, maternal education, parity, SES, infant sex, and arm by visit time interaction. Arm by visit time interaction *P* value was 0.014.

Arm 1 maternal participants received the study supplement starting at least 3 months prior to conception and continued through delivery; Arm 2 started the study supplement at the end of the first trimester and continued through delivery; Arm 3 (Control) did not receive study supplement.

Birth length is the strongest predictor of linear growth status and stunting in the first 2 years of life after a preconception maternal nutrition intervention: the children of the Women First trial (Krebs, et al)

Online Supplementary Material

Supplemental Table 4. Spearman correlations for subjects included in the model for predictors of linear growth status at 24 months (WHO, n=2221)

	SES	Maternal Educ	Maternal Stunting	Parity	Sex	Maternal BMI Cat	Maternal Ht Cat	Maternal Age Cat	Paternal Ht Cat	Paternal BMI Cat	Birth LAZ<-1	Birth LAZ<-2	Birth WAZ<-2	Birth WLZ<-2	LBW	Birth Stunting Group
SES	1.000	0.362	-0.196	0.018	-0.030	0.202	-0.157	-0.004	-0.056	0.214	-0.079	-0.028	0.021	0.034	-0.009	-0.078
Maternal Education	0.362	1.000	-0.098	-0.023	0.000	0.127	-0.049	-0.098	-0.006	0.159	-0.041	-0.037	-0.015	-0.061	-0.025	-0.045
Maternal Stunting	-0.196	-0.098	1.000	-0.104	-0.001	-0.285	0.922	-0.021	0.252	-0.148	-0.120	-0.021	0.003	0.068	0.020	-0.114
Parity	0.018	-0.023	-0.104	1.000	-0.007	0.121	-0.108	0.361	-0.072	0.053	-0.088	-0.029	-0.183	-0.107	-0.187	-0.087
Sex	-0.030	0.000	-0.001	-0.007	1.000	-0.033	0.002	-0.001	0.003	0.018	-0.046	-0.069	-0.022	-0.008	0.034	-0.056
Maternal BMI Cat	0.202	0.127	-0.285	0.121	-0.033	1.000	-0.259	0.077	-0.196	0.281	-0.020	0.000	-0.094	-0.093	-0.125	-0.018
Maternal Ht Cat	-0.157	-0.049	0.922	-0.108	0.002	-0.259	1.000	-0.020	0.224	-0.118	-0.141	-0.037	-0.001	0.049	0.011	-0.137
Maternal Age Cat	-0.004	-0.098	-0.021	0.361	-0.001	0.077	-0.020	1.000	-0.034	0.086	-0.021	-0.006	-0.069	-0.025	-0.070	-0.020
Paternal Ht Cat	-0.056	-0.006	0.252	-0.072	0.003	-0.196	0.224	-0.034	1.000	-0.157	-0.083	-0.036	0.011	0.041	0.029	-0.083
Paternal BMI Cat	0.214	0.159	-0.148	0.053	0.018	0.281	-0.118	0.086	-0.157	1.000	-0.047	-0.018	-0.076	-0.059	-0.082	-0.046
Birth LAZ <-1	-0.079	-0.041	-0.120	-0.088	-0.046	-0.020	-0.141	-0.021	-0.083	-0.047	1.000	0.323	0.331	-0.016	0.359	0.980
Birth LAZ <-2	-0.028	-0.037	-0.021	-0.029	-0.069	0.000	-0.037	-0.006	-0.036	-0.018	0.323	1.000	0.316	0.049	0.313	0.503
Birth WAZ <-2	0.021	-0.015	0.003	-0.183	-0.022	-0.094	-0.001	-0.069	0.011	-0.076	0.331	0.316	1.000	0.397	0.796	0.369
Birth WLZ <-2	0.034	-0.061	0.068	-0.107	-0.008	-0.093	0.049	-0.025	0.041	-0.059	-0.016	0.049	0.397	1.000	0.397	-0.004
LBW	-0.009	-0.025	0.020	-0.187	0.034	-0.125	0.011	-0.070	0.029	-0.082	0.359	0.313	0.796	0.397	1.000	0.393
Birth Stunting Group	-0.078	-0.045	-0.114	-0.087	-0.056	-0.018	-0.137	-0.020	-0.083	-0.046	0.980	0.503	0.369	-0.004	0.393	1.000

BMI, body mass index; Cat, category; Educ, education; Ht, height; LAZ, length-for-age Z-score; Mat, maternal; SES, socio-economic status; SGA, small-for-gestational-age; WAZ, weight-for-length Z-score; WLZ, weight-for-length Z-score.

Birth length is the strongest predictor of linear growth status and stunting in the first 2 years of life after a preconception maternal nutrition intervention: the children of the Women First trial (Krebs, et al)

Online Supplementary Material

Supplemental Table 5. Spearman Correlations for subjects included in in the model for predictors of linear growth status at 24 months (Intergrowth-21st, n= 1329)

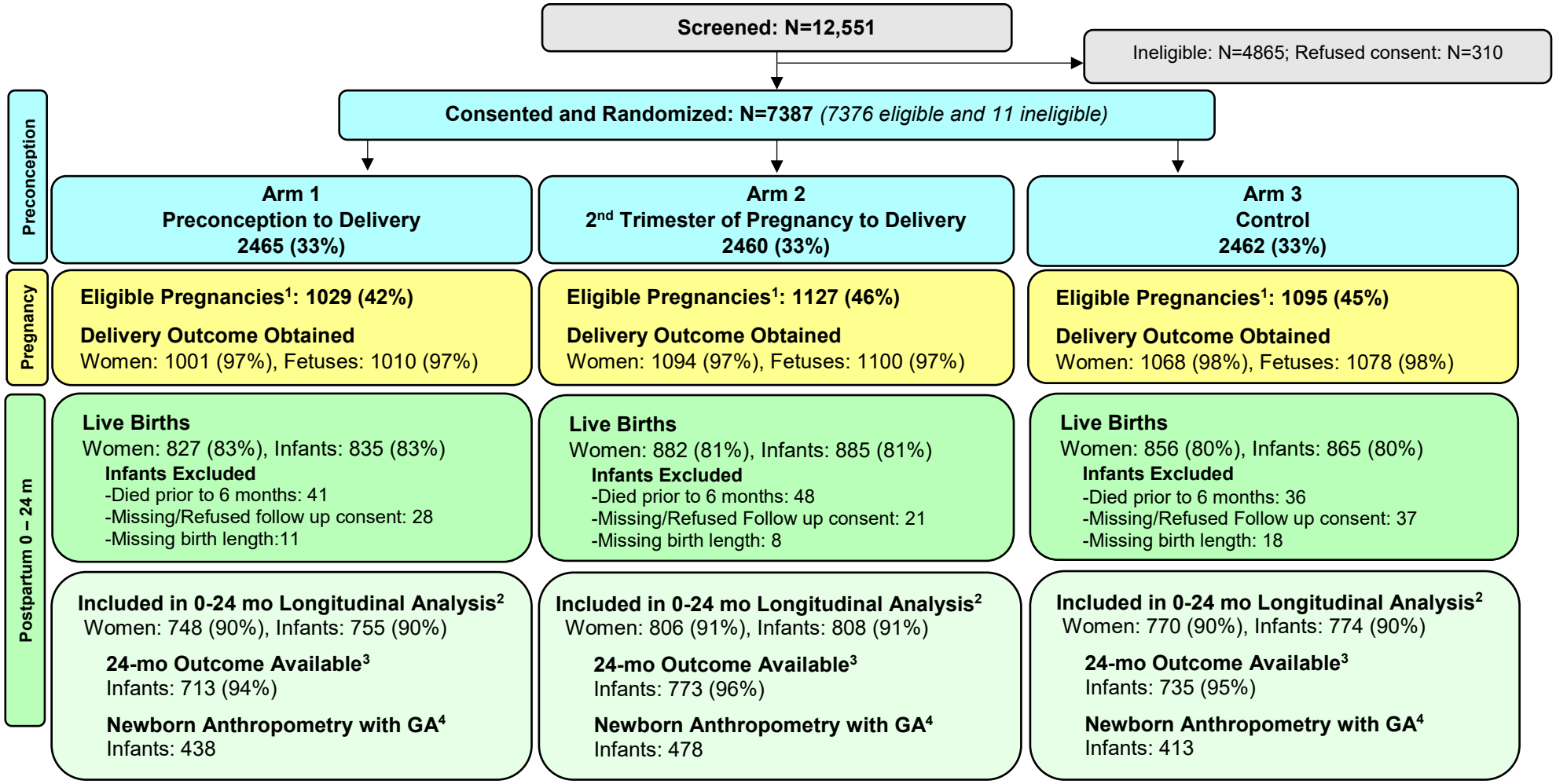
	SES	Maternal Education	Maternal Stunting	Parity	Sex	Maternal BMI Cat	Maternal Ht Cat	Maternal Age Cat	Paternal Ht Cat	Paternal BMI Cat	Birth LAZ<-2	Birth LAZ<-1	SGA	Preterm	Birth Stunting Group
SES	1.000	0.378	-0.089	0.052	-0.038	0.169	-0.057	-0.024	-0.022	0.172	-0.068	-0.004	0.015	-0.095	-0.019
Maternal Education	0.378	1.000	-0.051	0.002	0.001	0.118	-0.017	-0.074	0.015	0.171	-0.055	-0.020	-0.082	-0.142	-0.030
Maternal Stunting	-0.089	-0.051	1.000	-0.110	-0.004	-0.272	0.936	-0.025	0.251	-0.095	-0.104	-0.167	0.031	0.067	-0.170
Parity	0.052	0.002	-0.110	1.000	-0.006	0.151	-0.105	0.381	-0.083	0.077	-0.110	-0.077	0.130	-0.115	-0.094
Sex	-0.038	0.001	-0.004	-0.006	1.000	-0.042	-0.015	0.002	-0.031	-0.003	0.058	0.056	-0.041	-0.084	0.063
Maternal BMI Cat	0.169	0.118	-0.272	0.151	-0.042	1.000	-0.246	0.103	-0.180	0.282	-0.102	-0.062	0.182	-0.053	-0.079
Maternal Ht Cat	-0.057	-0.017	0.936	-0.105	-0.015	-0.246	1.000	-0.020	0.230	-0.062	-0.106	-0.164	0.035	0.048	-0.168
Maternal Age Cat	-0.024	-0.074	-0.025	0.381	0.002	0.103	-0.020	1.000	-0.039	0.111	-0.091	-0.026	0.070	-0.018	-0.044
Paternal Ht Cat	-0.022	0.015	0.251	-0.083	-0.031	-0.180	0.230	-0.039	1.000	-0.131	-0.069	-0.110	0.046	0.004	-0.112
Paternal BMI Cat	0.172	0.171	-0.095	0.077	-0.003	0.282	-0.062	0.111	-0.131	1.000	-0.076	-0.085	0.121	-0.006	-0.092
Birth LAZ <-2	-0.068	-0.055	-0.104	-0.110	0.058	-0.102	-0.106	-0.091	-0.069	-0.076	1.000	0.451	-0.405	0.027	0.634
Birth LAZ <-1	-0.004	-0.020	-0.167	-0.077	0.056	-0.062	-0.164	-0.026	-0.110	-0.085	0.451	1.000	-0.508	-0.011	0.976
SGA	0.015	-0.082	0.031	0.130	-0.041	0.182	0.035	0.070	0.046	0.121	-0.405	-0.508	1.000	0.078	-0.539
Preterm	-0.095	-0.142	0.067	-0.115	-0.084	-0.053	0.048	-0.018	0.004	-0.006	0.027	-0.011	0.078	1.000	-0.003
Birth Stunting Group	-0.019	-0.030	-0.170	-0.094	0.063	-0.079	-0.168	-0.044	-0.112	-0.092	0.634	0.976	-0.539	-0.003	1.000

BMI, body mass index; Cat, category; Educ, education; LAZ, length-for-age Z-score; Mat, maternal; SES, socio-economic status; SGA, small-for-gestational age; WAZ, weight-for-length Z-score; WLZ, weight-for-length Z-score.

Birth length is the strongest predictor of linear growth status and stunting in the first 2 years of life after a preconception maternal nutrition intervention: the children of the Women First trial (Krebs, et al)

Online Supplementary Material

Supplemental Figure 1. Consort diagram: All sites screening, consent, randomization, and longitudinal analysis subset by treatment arm



[1] Excludes women who became pregnant less than 3 months into the study. The women who had eligible pregnancies may have had delivery data obtained or they may have exited the study prior to delivery.

[2] After excluding extreme invalid measurements as determined by expert manual review and accounting for biologically implausible Z-scores based on WHO standards (1), the 24-month longitudinal analysis subset includes all live born infants with birth length measurements measured by 7 days (168 hours) of age on portable length boards, and consented to the offspring follow-up study.

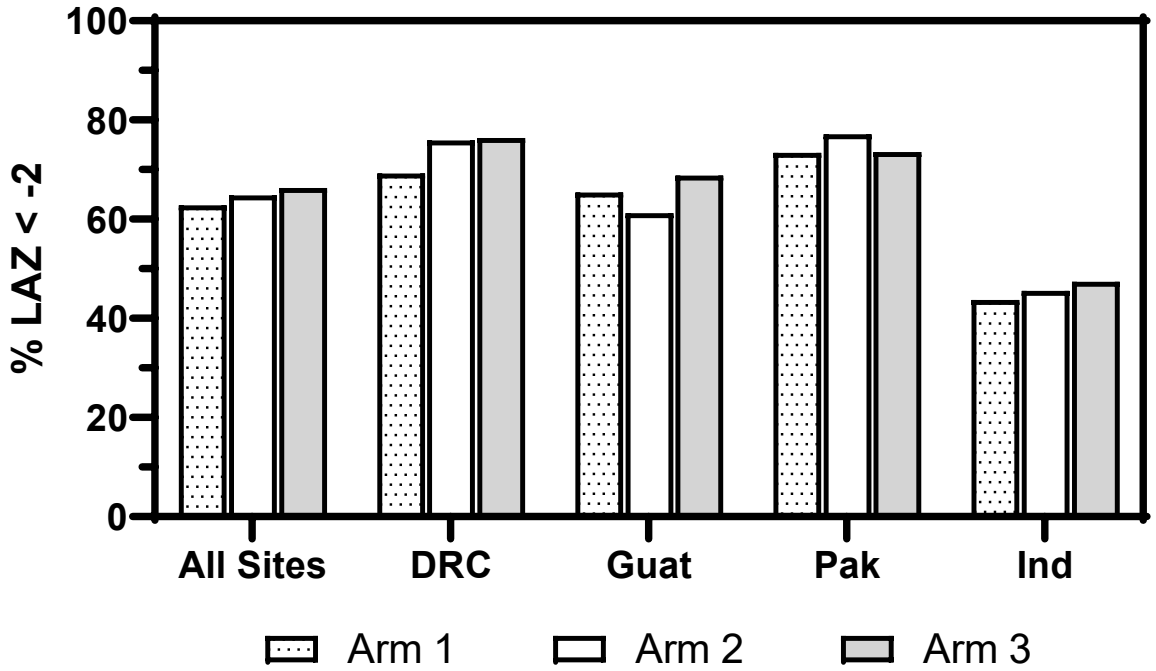
[3] At least one of the following anthropometric outcomes must have been available after excluding extreme invalid measurements as determined by expert manual review and accounting for biologically implausible Z-scores based on WHO standards:(1) length, weight, head-circumference, weight-for-length measurements.

[4] Gestational age (GA) at birth is defined as the GA determined by ultrasound based on the ultrasound plus time until birth if the ultrasound was done between 6 weeks + 0 days to 13 weeks + 6 days, and the GA at birth is between 24 weeks + 0 days and 42 weeks + 6 days. If the ultrasound was not conducted during the GA interval previously mentioned, then the GA at birth is missing. Please note, ultrasounds were not performed in the Democratic Republic of Congo.

Birth length is the strongest predictor of linear growth status and stunting in the first 2 years of life after a preconception maternal nutrition intervention: the children of the Women First trial (Krebs, et al)

Online Supplementary

Supplemental Figure 2. Proportion of 24-month-old participants with length-for-age Z-score (LAZ) <-2 by research site and arm



Data for all sites are available in Supplemental Table 1. Rates of stunting at 24 months by unadjusted LAZ did not differ by arm.

Arm 1 maternal participants received the study supplement starting at least 3 months prior to conception and continued through delivery; Arm 2 started the study supplement at the end of the first trimester and continued through delivery; Arm 3 (Control) did not receive study supplement. The number of infants considered for the combined site analysis according to treatment arm were 713, 773, and 735 for Arms 1, 2, and 3, respectively.

DRC, Democratic Republic of Congo; Guat, Guatemala; Pak, Pakistan; Ind, India

1. World Health Organization. The WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-height and body mass index-for-age. Methods and development. Geneva: WHO, 2006.