

*eAppendix 1: Stata code for pregnancy weight gain-fetal growth sibling comparison analyses

*

* TABLE 3 - MODEL RESULTS

*

*Between women, sibling cohort only- simple model

quietly regress bweight c.bmi_w14##c.zscore sex _SplineGA* if sibling_cohort==1, cluster(mother_id) robust
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

*Between women, sibling cohort only- adjusted

quietly regress bweight c.bmi_w14##c.zscore sex _SplineGA* age i.smoke cohabitation i.parity height htn_prepreg
diabetes_prepreg past_gdm past_preeclampsia baby_dob if sibling_cohort==1, cluster(mother_id) robust
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

*Within cohabitationily, sibling cohort only- simple model

quietly xtreg bweight c.bmi_w14##c.zscore sex _SplineGA* if sibling_cohort==1, i(mother_id) fe cformat(%6.2f)
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

*Within cohabitationily, sibling cohort only- adjusted

quietly xtreg bweight c.bmi_w14##c.zscore sex _SplineGA* age i.smoke cohabitation i.parity htn_prepreg
diabetes_prepreg past_gdm past_preeclampsia baby_dob if sibling_cohort==1, i(mother_id) fe cformat(%6.2f)
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

* APPENDIX TABLE - MODEL RESULTS

*

*Between women, all cohort - simple model

quietly regress bweight c.bmi_w14##c.zscore sex _SplineGA* , cluster(mother_id) robust
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

*Between women, all cohort - adjusted model

quietly regress bweight c.bmi_w14##c.zscore sex _SplineGA* age i.smoke cohabitation i.parity height htn_prepreg
diabetes_prepreg past_gdm past_preeclampsia baby_dob, cluster(mother_id) robust
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

*Between women, sibling cohort only - simple model

quietly regress bweight c.bmi_w14##c.zscore sex _SplineGA* if sibling_cohort==1, cluster(mother_id) robust
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

*Between women, sibling cohort only - adjusted model

quietly regress bweight c.bmi_w14##c.zscore sex _SplineGA* age i.smoke cohabitation i.parity height htn_prepreg
diabetes_prepreg past_gdm past_preeclampsia baby_dob if sibling_cohort==1, cluster(mother_id) robust
margins, dydx(zscore) at(bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

*

*SGA analyses

egen zscore_cluster=mean(zscore), by(mother_id)
gen zscore_c=zscore-zscore_cluster

*

* TABLE 3 - SGA MODEL RESULTS

*

*Between women, sibling cohort only

```

*Crude model
logistic sga_10 c.bmi_w14##c.zscore if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*Adjusted model
logistic sga_10 c.bmi_w14##c.zscore age i.smoke cohabitation i.parity height htn_prepreg diabetes_prepreg past_gdm
past_preeclampsia baby_dob if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*Within woman analysis, sibling cohort only
*Crude model
xtlogit sga_10 c.bmi_w14##c.zscore zscore_cluster if sibling_cohort==1, i(mother_id) or cformat(%6.2f)
*
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*Adjusted model
xtlogit sga_10 c.bmi_w14##c.zscore zscore_cluster age i.smoke cohabitation i.parity height htn_prepreg
diabetes_prepreg past_gdm past_preeclampsia baby_dob if sibling_cohort==1, i(mother_id) or cformat(%6.2f)
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*****
* APPENDIX TABLE - SGA MODEL RESULTS
*
```

*MODELS WITH INTERACTION TERM BETWEEN WEIGHT GAIN AND BMI

*Between women, entire cohort

quietly logistic sga_10 c.bmi_w14##c.zscore , cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

**Between women, entire cohort adjusted

quietly logistic sga_10 c.bmi_w14##c.zscore age i.smoke cohabitation i.parity height htn_prepreg diabetes_prepreg
past_gdm past_preeclampsia baby_dob, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

*

*Between women, sibling cohort

quietly logistic sga_10 c.bmi_w14##c.zscore if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

*

*Between women, sibling cohort adjusted

quietly logistic sga_10 c.bmi_w14##c.zscore age i.smoke cohabitation i.parity height htn_prepreg diabetes_prepreg
past_gdm past_preeclampsia baby_dob if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

*

* TABLE 3 - LGA MODEL RESULTS

*

```

*Between women, sibling cohort only
*Crude model
quietly logistic lga_90 c.bmi_w14##c.zscore if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*Adjusted model
quietly logistic lga_90 c.bmi_w14##c.zscore age i.smoke cohabitation i.parity height htn_prepreg diabetes_prepreg
past_gdm past_preeclampsia baby_dob if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*Within woman analysis, sibling cohort only
*Crude model
xtlogit lga_90 c.bmi_w14##c.zscore zscore_cluster if sibling_cohort==1, i(mother_id) or cformat(%6.2f)
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*Adjusted model
xtlogit lga_90 c.bmi_w14##c.zscore zscore_cluster age i.smoke cohabitation i.parity height htn_prepreg
diabetes_prepreg past_gdm past_preeclampsia baby_dob if sibling_cohort==1, i(mother_id) or cformat(%6.2f)
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post
* BMI= 18.5
nlcom _b[2._at]/ _b[1._at]
* BMI= 25
nlcom _b[4._at]/ _b[3._at]
*BMI = 30
nlcom _b[6._at]/ _b[5._at]
* BMI=35
nlcom _b[8._at]/ _b[7._at]
*
*****
* APPENDIX TABLE - LGA MODEL RESULTS
*
```

*MODELS WITH INTERACTION TERM BETWEEN WEIGHT GAIN AND BMI

*Between women, entire cohort

quietly logistic lga_90 c.bmi_w14##c.zscore , cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

**Between women, entire cohort adjusted

quietly logistic lga_90 c.bmi_w14##c.zscore age i.smoke cohabitation i.parity height htn_prepreg diabetes_prepreg
past_gdm past_preeclampsia baby_dob, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

*

*Between women, sibling cohort

quietly logistic lga_90 c.bmi_w14##c.zscore if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

*

*Between women, sibling cohort adjusted

quietly logistic lga_90 c.bmi_w14##c.zscore age i.smoke cohabitation i.parity height htn_prepreg diabetes_prepreg
past_gdm past_preeclampsia baby_dob if sibling_cohort==1, cluster(mother_id) robust
margins, at(zscore=(0 1) bmi_w14=(18.5 25 30 35)) cformat(%6.2f) post

* BMI= 18.5

nlcom _b[2._at]/ _b[1._at]

* BMI= 25

nlcom _b[4._at]/ _b[3._at]

*BMI = 30

nlcom _b[6._at]/ _b[5._at]

* BMI=35

nlcom _b[8._at]/ _b[7._at]

*

eAppendix 2. Estimated effect of pregnancy weight gain z-score on fetal size at different pre-pregnancy BMI values among 44,457 siblings

Outcome	BMI value	Between pregnancies		Within siblings	
		Simple model β (95% CI)	Adjusted model β^* (95% CI)	Simple model β (95% CI)	Adjusted model β^* (95% CI)
Birthweight	18.5	93.97 (86.51-101.43)	95.2 (88.0-102.4)	58.7 (48.7-68.7)	83.4 (73.9-93.0)
	25	94.85 (90.1-99.59)	97.0 (92.4-101.6)	66.3 (59.5-73.1)	88.6 (82.1-95.12)
	30	95.52 (86.96-104.08)	98.4 (90.2-106.7)	72.2 (61.7-82.7)	92.7 (82.6-102.7)
	35	96.20 (82.40-109.99)	99.9 (86.6-113.2)	78.1 (61.7-94.5)	96.7 (81.2-112.3)
SGA birth	18.5	0.69 (0.65-0.73)	0.70 (0.65-0.74)	0.91 (0.84-0.97)	0.78 (0.72-0.84)
	25	0.71 (0.68-0.74)	0.70 (0.67-0.73)	0.95 (0.89-1.0)	0.80 (0.75-0.86)
	30	0.73 (0.67-0.79)	0.70 (0.65-0.76)	0.98 (0.9-1.06)	0.82 (0.75-0.90)
	35	0.75 (0.65-0.85)	0.71 (0.61-0.80)	1.02 (0.9-1.14)	0.85 (0.74-0.95)
LGA birth	18.5	1.72 (1.62-1.82)	1.76 (1.66-1.87)	1.28 (1.18-1.39)	1.58 (1.45-1.71)
	25	1.61 (1.55-1.66)	1.63 (1.58-1.69)	1.23 (1.17-1.3)	1.47 (1.39-1.55)
	30	1.52 (1.45-1.58)	1.53 (1.46-1.60)	1.20 (1.13-1.27)	1.39 (1.31-1.47)
	35	1.42 (1.33-1.51)	1.43 (1.34-1.52)	1.16 (1.08-1.24)	1.32 (1.23-1.41)

eAppendix 3. Comparison of the estimated effect of pregnancy weight gain z-score on fetal size at different pre-pregnancy BMI values in the full cohort (n=126,309) versus the sibling cohort (n=44,457).

Outcome	BMI value	Births in Stockholm-Gotland. 2008-2014 (n=126,309)		Sibling cohort (44,457 infants to 21,680 mothers)	
		Simple model β (95% CI)	Adjusted model β^* (95% CI)	Simple model β (95% CI)	Adjusted model β^* (95% CI)
Birthweight	18.5	94.8 (90.7-98.9)	95.8 (91.8-99.7)	93.97 (86.51-101.43)	95.16 (87.97-102.35)
	25	93.2 (90.6-95.8)	96.5 (93.9-99.0)	94.85 (90.1-99.59)	97.01 (92.38-101.64)
	30	92.0 (87.2-96.8)	97.0 (92.4-101.6)	95.52 (86.96-104.08)	98.43 (90.15-106.72)
	35	90.8 (83.0-98.4)	97.6 (90.1-105.0)	96.20 (82.40-109.99)	99.86 (86.55-113.17)
SGA birth		Simple model Risk Ratio (95% CI)	Adjusted model Risk Ratio* (95% CI)	Simple model Risk Ratio (95% CI)	Adjusted model Risk Ratio* (95% CI)
	18.5	0.69 (0.67-0.71)	0.70 (0.67-0.72)	0.69 (0.65-0.73)	0.70 (0.65-0.74)
	25	0.74 (0.72-0.75)	0.73 (0.71-0.74)	0.71 (0.68-0.74)	0.70 (0.67-0.73)
	30	0.78 (0.74-0.81)	0.75 (0.72-0.79)	0.73 (0.67-0.79)	0.70 (0.65-0.76)
	35	0.82 (0.76-0.88)	0.78 (0.73-0.84)	0.75 (0.65-0.85)	0.71 (0.61-0.80)
LGA birth					
	18.5	1.70 (1.65-1.76)	1.76 (1.70-1.82)	1.72 (1.62-1.82)	1.76 (1.66-1.87)
	25	1.57 (1.54-1.6)	1.62 (1.58-1.65)	1.61 (1.55-1.66)	1.63 (1.58-1.69)
	30	1.47 (1.43-1.51)	1.51 (1.47-1.55)	1.52 (1.45-1.58)	1.53 (1.46-1.60)
	35	1.37 (1.32-1.42)	1.41 (1.36-1.46)	1.42 (1.33-1.51)	1.43 (1.34-1.52)