

# Dataset Integrity Check for The Hyperglycemia and Adverse Pregnancy Outcome Follow-Up Study (HAPO-FUS)

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August 5, 2021

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# 1 Standard Disclaimer

The intent of this DSIC is to provide confidence that the data distributed by the NIDDK repository is a true copy of the study data. Our intent is not to assess the integrity of the statistical analyses reported by study investigators. As with all statistical analyses of complex datasets, complete replication of a set of statistical results should not be expected in secondary analysis. This occurs for a number of reasons including differences in the handling of missing data, restrictions on cases included in samples for a particular analysis, software coding used to define complex variables, etc. Experience suggests that most discrepancies can ordinarily be resolved by consultation with the study data coordinating center (DCC), however this process is labor-intensive for both DCC and Repository staff. It is thus not our policy to resolve every discrepancy that is observed in an integrity check. Specifically, we do not attempt to resolve minor or inconsequential discrepancies with published results or discrepancies that involve complex analyses, unless NIDDK Repository staff suspect that the observed discrepancy suggests that the dataset may have been corrupted in storage, transmission, or processing by repository staff. We do, however, document in footnotes to the integrity check those instances in which our secondary analyses produced results that were not fully consistent with those reported in the target publication.

## 2 Study Background

The HAPO Follow-up Study was initiated to determine whether elevated blood sugar during pregnancy, below the threshold for gestational diabetes, influences either development of type 2 diabetes mellitus in mothers or adiposity and disorders of glucose metabolism in offspring at 8-12 years of age.

The HAPO Follow-Up Study enrolled 7,000 mother-child pairs who originally participated in the HAPO Study. Mothers and children were required to complete a single study visit for measurement of height, weight, blood pressure, body fat, insulin, and blood sugar and lipid levels. The primary outcome measures assessed in relation to maternal glycemia during pregnancy were development of diabetes in mothers and obesity and altered glucose metabolism in children, as well as other metabolic abnormalities in both mothers and offspring.

## 3 Archived Datasets

All data files, as provided by the Data Coordinating Center (DCC), are located in the Data folder in the HAPO-FUS data package. For this replication, variables were taken from the following datasets: “mother\_analysis\_data.csv” and “child\_analysis\_data.csv”.

## 4 Statistical Methods

Analyses were performed to duplicate results for the data published by Lowe et al. [1] for Association of Gestational Diabetes With Maternal Disorders of Glucose Metabolism and Childhood Adiposity. To verify the integrity of the dataset, descriptive statistics were computed.

## 5 Results

For Table 1 in the publication [1], Table 1 – Participant and Nonparticipant Characteristics During the HAPO Study and the Follow-up Study, Table A below lists the variables that were used in the replication, and Table B compares the results calculated from the archived data files to the results published in Table 1. The DCC confirmed there is an error in the publication in which the values for “Prenatal alcohol

consumption” and “Prenatal smoker” are transposed in Table 1. Otherwise, the results of the replication are an exact match to the published results.

## 6 Conclusions

The NIDDK Central Repository is confident that the HAPO-FUS data files to be distributed are a true copy of the study data.

## 7 References

[1] Lowe WL, Scholtens DM, Lowe LP, Kuang A, Nodzinski M, Talbot O, Catalano PM, Linder B, Brickman WJ, Clayton P, Deerochanawong C, Hamilton J, Josefson JL, Lashley M, Lawrence JM, Lebenthal Y, Ma R, Maresh M, McCance D, Tam WH, Sacks DA, Dyer AR, Metzger BE. Association of Gestational Diabetes With Maternal Disorders of Glucose Metabolism and Childhood Adiposity. *JAMA*, 320(10), 1005-1016, September 2018. PMCID: [PMC6143108](https://pubmed.ncbi.nlm.nih.gov/30143108/) doi: [10.1001/jama.2018.11628](https://doi.org/10.1001/jama.2018.11628)

**Table A:** Variables used to replicate Table 1 – Participant and Nonparticipant Characteristics During the HAPO Study and the Follow-up Study

<b>Characteristic</b>	<b>dataset.variable</b>
Mother Gestational Diabetes Mellitus (GDM) Status	mother_analysis_data.preg_IADPSG_gdm_mom
<b>Mothers During HAPO Study</b>	
Mothers, No. (%)	mother_analysis_data
Age at oral glucose tolerance test, mean (SD), y	mother_analysis_data.preg_age_ogtt_yrs_mom
Height, mean (SD), cm	mother_analysis_data.preg_height_cm_mom
Weight, mean (SD), kg	mother_analysis_data.preg_weight_ogtt_kg_mom
Body mass index, mean (SD)	mother_analysis_data.preg_bmi_ogtt_mom
Mean arterial pressure, mean (SD), mmHg	mother_analysis_data.preg_map_ogtt_mom
Fasting plasma glucose level, mean (SD), mg/dL	mother_analysis_data.preg_gluc_fasting_mg_dl_mom
1-h plasma glucose level, mean (SD), mg/dL	mother_analysis_data.preg_gluc_1hr_mg_dl_mom
2-h plasma glucose level, mean (SD), mg/dL	mother_analysis_data.preg_gluc_2hr_mg_dl_mom
Gestational age at oral glucose tolerance test, mean (SD), wk	mother_analysis_data.preg_gest_age_ogtt_wks_mom
Race/Ethnicity, No. (%)	mother_analysis_data.hapo_ancestry_group_mom
Prenatal alcohol consumption, No. (%)	mother_analysis_data.preg_drinking_status_mom
Prenatal smoker, No. (%)	mother_analysis_data.preg_smoking_status_mom
Parity (any prior delivery $\geq$ 20 wk), No. (%)	mother_analysis_data.preg_parity_mom
Family history of diabetes, No. (%)	mother_analysis_data.preg_family_history_diabetes_mo
Family history of hypertension, No. (%)	mother_analysis_data.preg_family_history_hypertensio
<b>Mothers During HAPO Follow-up Study</b>	
Age, mean (SD), y	mother_analysis_data.age_yrs_mom
Height, mean (SD), cm	mother_analysis_data.height_cm_mom
Weight, mean (SD), kg	mother_analysis_data.weight_kg_mom
Body mass index, mean (SD)	mother_analysis_data.bmi_mom
Fasting plasma glucose level, mean (SD), mg/dL	mother_analysis_data.gluc_fasting_mg_dl_mom
2-h plasma glucose level, mean (SD), mg/dL	mother_analysis_data.gluc_2hr_mg_dl_mom
Family history of diabetes, No. (%)	mother_analysis_data.family_history_diabetes_mom
Family history of hypertension, No. (%)	mother_analysis_data.family_history_hypertension_mom
<b>Children During HAPO Follow-up Study</b>	
Children, No. (%)	child_analysis_data
Age, mean (SD), y	child_analysis_data.age_yrs_child
Height, mean (SD), cm	child_analysis_data.height_cm_child
Weight, mean (SD), kg	child_analysis_data.weight_kg_child
Male sex, No. (%)	child_analysis_data.sex_child
Tanner stage for girls, No. (%)	child_analysis_data.tanner_stage_child
Tanner stage for boys, No. (%)	child_analysis_data.tanner_stage_child

**Table B:** Comparison of values computed in integrity check to reference article Table 1 values

Variable	Manuscript: All Participants (Mom n=4697) (Child n=4832)	DSIC: All Participants (Mom n=4697) (Child n= 4832)	Diff. (n=0) (n=0)	Manuscript: Mother with Gestational Diabetes (GDM) (Mom n=672) (Child n= 683)	DSIC: Mother with GDM (Mom n=672) (Child n=683)	Diff. (n=0) (n=0)	Manuscript: Mother without GDM (Mom n=4025) (Child n=4149)	DSIC: Mother without GDM (Mom n=4025) (Child n=4149)	Diff. (n=0) (n=0)
<b>Mothers During HAPO Study</b>									
Mothers, No. (%)	4697 (100)	4697 (100)	0 (0)	672 (14.3)	672 (14.3)	0 (0)	4025 (85.7)	4025 (85.7)	0 (0)
Age at oral glucose tolerance test, mean (SD), y	30.1 (5.6)	30.1 (5.6)	0 (0)	31.9 (5.3)	31.9 (5.3)	0 (0)	29.8 (5.6)	29.8 (5.6)	0 (0)
Height, mean (SD), cm	161.7 (6.8)	161.7 (6.8)	0 (0)	161.0 (7.0)	161.0 (7.0)	0 (0)	161.8 (6.8)	161.8 (6.8)	0 (0)
Weight, mean (SD), kg	71.7 (13.7)	71.7 (13.7)	0 (0)	77.1 (15.1)	77.1 (15.1)	0 (0)	70.9 (13.3)	70.9 (13.3)	0 (0)
Body mass index, mean (SD)	27.4 (4.8)	27.4 (4.8)	0 (0)	29.7 (5.2)	29.7 (5.2)	0 (0)	27.0 (4.6)	27.0 (4.6)	0 (0)
Mean arterial pressure, mean (SD), mmHg	80.4 (7.9)	80.4 (7.9)	0 (0)	83.4 (7.7)	83.4 (7.7)	0 (0)	79.9 (7.9)	79.9 (7.9)	0 (0)
Fasting plasma glucose level, mean (SD), mg/dl	81.0 (6.6)	81.0 (6.6)	0 (0)	88.9 (7.6)	88.9 (7.6)	0 (0)	79.7 (5.4)	79.7 (5.4)	0 (0)
1-h plasma glucose level, mean (SD), mg/dl	133.3 (30.2)	133.3 (30.2)	0 (0)	173.0 (28.8)	173.0 (28.8)	0 (0)	126.7 (24.9)	126.7 (24.9)	0 (0)
2-h plasma glucose level, mean (SD), mg/dl	110.5 (23.1)	110.5 (23.1)	0 (0)	137.2 (26.7)	137.2 (26.7)	0 (0)	106.1 (19.1)	106.1 (19.1)	0 (0)
Gestational age at oral glucose tolerance test, mean (SD), wk	27.7 (1.7)	27.7 (1.7)	0 (0)	27.9 (1.7)	27.9 (1.7)	0 (0)	27.7 (1.7)	27.7 (1.7)	0 (0)
Race/ethnicity, No. (%)									
Non-Hispanic White	2213 (47.1)	2213 (47.1)	0 (0)	270 (40.2)	270 (40.2)	0 (0)	1943 (48.3)	1943 (48.3)	0 (0)
Hispanic	488 (10.4)	488 (10.4)	0 (0)	108 (16.1)	108 (16.1)	0 (0)	380 (9.4)	380 (9.4)	0 (0)
Non-Hispanic Black	735 (15.6)	735 (15.6)	0 (0)	82 (12.2)	82 (12.2)	0 (0)	653 (16.2)	653 (16.2)	0 (0)

Variable	Manuscript: All Participants (Mom n=4697) (Child n=4832)	DSIC: All Participants (Mom n=4697) (Child n= 4832)	Diff. (n=0) (n=0)	Manuscript: Mother with Gestational Diabetes (GDM) (Mom n=672) (Child n= 683)	DSIC: Mother with GDM (Mom n=672) (Child n=683)	Diff. (n=0) (n=0)	Manuscript: Mother without GDM (Mom n=4025) (Child n=4149)	DSIC: Mother without GDM (Mom n=4025) (Child n=4149)	Diff. (n=0) (n=0)
Race/ethnicity, No. (%)									
Asian	1174 (25.0)	1174 (25.0)	0 (0)	196 (29.2)	196 (29.2)	0 (0)	978 (24.3)	978 (24.3)	0 (0)
Other	87 (1.9)	87 (1.9)	0 (0)	16 (2.4)	16 (2.4)	0 (0)	71 (1.8)	71 (1.8)	0 (0)
Prenatal alcohol consumption, No. (%) <sup>1</sup>	243 (5.2)	402 (8.6)	159 (3.4)	42 (6.2)	56 (8.3)	14 (2.1)	201 (5.0)	346 (8.6)	145 (3.6)
Prenatal smoker, No. (%) <sup>1</sup>	402 (8.6)	243 (5.2)	159 (3.4)	56 (8.3)	42 (6.2)	14 (2.1)	346 (8.6)	201 (5.0)	145 (3.6)
Parity (any prior delivery ≥20 wk), No. (%)	2422 (51.6)	2422 (51.6)	0 (0)	383 (57.0)	383 (57.0)	0 (0)	2039 (50.7)	2039 (50.7)	0 (0)
Family history of diabetes, No. (%)	1057 (22.5)	1057 (22.5)	0 (0)	203 (30.2)	203 (30.2)	0 (0)	854 (21.2)	854 (21.2)	0 (0)
Family history of hypertension, No. (%)	1802 (38.4)	1802 (38.4)	0 (0)	287 (42.7)	287 (42.7)	0 (0)	1515 (37.6)	1515 (37.6)	0 (0)
<b>Mothers During HAPO Follow-up Study</b>									
Age, mean (SD), y	41.7 (5.7)	41.7 (5.7)	0 (0)	43.6 (5.4)	43.6 (5.4)	0 (0)	41.4 (5.7)	41.4 (5.7)	0 (0)
Height, mean (SD), cm	161.6 (6.5)	161.6 (6.5)	0 (0)	160.6 (6.8)	160.6 (6.8)	0 (0)	161.7 (6.5)	161.7 (6.5)	0 (0)
Weight, mean (SD), kg	70.6 (17.0)	70.6 (17.0)	0 (0)	74.7 (18.0)	74.7 (18.0)	0 (0)	69.9 (16.8)	69.9 (16.8)	0 (0)
Body mass index, mean (SD)	27.0 (6.2)	27.0 (6.2)	0 (0)	28.9 (6.5)	28.9 (6.5)	0 (0)	26.7 (6.0)	26.7 (6.0)	0 (0)
Fasting plasma glucose level, mean (SD), mg/dl	92.2 (12.6)	92.2 (12.6)	0 (0)	99.1 (22.2)	99.1 (22.2)	0 (0)	91.0 (9.8)	91.0 (9.8)	0 (0)
2-h plasma glucose level, mean (SD), mg/dl	113.5 (35.8)	113.5 (35.8)	0 (0)	134.8 (52.5)	134.8 (52.5)	0 (0)	110.1 (30.9)	110.1 (30.9)	0 (0)
Family history of diabetes, No. (%)	1981 (42.2)	1981 (42.2)	0 (0)	362 (53.9)	362 (53.9)	0 (0)	1619 (40.2)	1619 (40.2)	0 (0)

Variable	Manuscript: All Participants (Mom n=4697) (Child n=4832)	DSIC: All Participants (Mom n=4697) (Child n= 4832)	Diff. (n=0) (n=0)	Manuscript: Mother with Gestational Diabetes (GDM) (Mom n=672) (Child n= 683)	DSIC: Mother with GDM (Mom n=672) (Child n=683)	Diff. (n=0) (n=0)	Manuscript: Mother without GDM (Mom n=4025) (Child n=4149)	DSIC: Mother without GDM (Mom n=4025) (Child n=4149)	Diff. (n=0) (n=0)
Family history of hypertension, No. (%)	3175 (67.6)	3175 (67.6)	0 (0)	476 (70.8)	476 (70.8)	0 (0)	2699 (67.1)	2699 (67.1)	0 (0)
<b>Children During HAPO Follow-up Study</b>									
Children, No. (%)	4832 (100.0)	4832 (100.0)	0 (0)	683 (14.1)	683 (14.1)	0 (0)	4149 (85.9)	4149 (85.9)	0 (0)
Age, mean (SD), y	11.4 (1.2)	11.4 (1.2)	0 (0)	11.5 (1.2)	11.5 (1.2)	0 (0)	11.4 (1.2)	11.4 (1.2)	0 (0)
Height, mean (SD), cm	148.6 (10.2)	148.6 (10.2)	0 (0)	149.4 (9.8)	149.4 (9.8)	0 (0)	148.4 (10.3)	148.4 (10.3)	0 (0)
Weight, mean (SD), kg	43.2 (13.3)	43.2 (13.3)	0 (0)	45.9 (14.2)	45.9 (14.2)	0 (0)	42.8 (13.1)	42.8 (13.1)	0 (0)
Male sex, No. (%)	2465 (51.0)	2465 (51.0)	0 (0)	361 (52.9)	361 (52.9)	0 (0)	2104 (50.7)	2104 (50.7)	0 (0)
Tanner stage for girls, No. (%)									
1	381 (19.0)	381 (19.0)	0 (0)	48 (17.1)	48 (17.1)	0 (0)	333 (19.3)	333 (19.3)	0 (0)
2/3	853 (42.5)	853 (42.5)	0 (0)	123 (43.9)	123 (43.9)	0 (0)	730 (42.2)	730 (42.2)	0 (0)
4/5	774 (38.5)	774 (38.5)	0 (0)	109 (38.9)	109 (38.9)	0 (0)	665 (38.5)	665 (38.5)	0 (0)
Tanner stage for boys, No. (%)									
1	565 (36.0)	565 (36.0)	0 (0)	70 (30.7)	70 (30.7)	0 (0)	495 (36.9)	495 (36.9)	0 (0)
2/3	726 (46.2)	726 (46.2)	0 (0)	111 (48.7)	111 (48.7)	0 (0)	615 (45.8)	615 (45.8)	0 (0)
4/5	279 (17.8)	279 (17.8)	0 (0)	47 (20.6)	47 (20.6)	0 (0)	232 (17.3)	232 (17.3)	0 (0)

<sup>1</sup>The values for these two characteristics were inadvertently transposed in the publication.

# Attachment A: SAS Code

```
libname dsic "X:\NIDDK\niddk-dr_studies2\HAPO-
FUS\private_created_data\Updated IDs Datasets";

/*****
/*          Replicating Table 1          */
*****/

*****;
*          Calling Datasets          *;
*****;

data mother; set dsic.mother_analysis_data;
run;

data child; set dsic.child_analysis_data;
run;

*****;
* Replicating Table 1          *;
*****;

*****;
*Mothers During HAPO Study *;
*****;

*GDM;
proc freq data=mother;
tables preg_IADPSG_gdm_mom;
run;

*Age at OGTT overall;
proc means data=mother mean std;
var preg_age_ogtt_yrs_mom;
run;

*Age at OGTT stratified by GDM;
proc means data=mother mean std;
var preg_age_ogtt_yrs_mom;
class preg_IADPSG_gdm_mom;
run;

*height in cm overall;
proc means data=mother mean std;
var preg_height_cm_mom;
run;

*height in cm stratified by GDM;
proc means data=mother mean std;
var preg_height_cm_mom;
class preg_IADPSG_gdm_mom;
run;

*weight in kg overall;
proc means data=mother mean std;
var preg_weight_ogtt_kg_mom;
run;

*weight in kg stratified by GDM;
proc means data=mother mean std;
var preg_weight_ogtt_kg_mom;
class preg_IADPSG_gdm_mom;
```

```

run;

*BMI overall;
proc means data=mother mean std;
var preg_bmi_ogtt_mom;
run;

*BMI stratified by GDM;
proc means data=mother mean std;
var preg_bmi_ogtt_mom;
class preg_IADPSG_gdm_mom;
run;

*mean arterial pressure overall;
proc means data=mother mean std;
var preg_map_ogtt_mom;
run;

*mean arterial pressure stratified by GDM;
proc means data=mother mean std;
var preg_map_ogtt_mom;
class preg_IADPSG_gdm_mom;
run;

*fasting plasma glucose overall;
proc means data=mother mean std;
var preg_gluc_fasting_mg_dl_mom;
run;

*fasting plasma glucose stratified by GDM;
proc means data=mother mean std;
var preg_gluc_fasting_mg_dl_mom;
class preg_IADPSG_gdm_mom;
run;

*1-h glucose overall;
proc means data=mother mean std;
var preg_gluc_1hr_mg_dl_mom;
run;

*1-hr glucose stratified by GDM;
proc means data=mother mean std;
var preg_gluc_1hr_mg_dl_mom;
class preg_IADPSG_gdm_mom;
run;

*2-h glucose overall;
proc means data=mother mean std;
var preg_gluc_2hr_mg_dl_mom;
run;

*2-hr glucose stratified by GDM;
proc means data=mother mean std;
var preg_gluc_2hr_mg_dl_mom;
class preg_IADPSG_gdm_mom;
run;

*Gestational age at OGTT overall;
proc means data=mother mean std;
var preg_gest_age_ogtt_wks_mom;
run;

*Gestational age at OGTT stratified by GDM;

```

```

proc means data=mother mean std;
var preg_gest_age_ogtt_wks_mom;
class preg_IADPSG_gdm_mom;
run;

*Race/Ethnicity overall;
proc sort data=mother;
by preg_IADPSG_gdm_mom;
run;

proc freq data=mother;
tables hapo_ancestry_group_mom;
run;

*Race/Ethnicity stratified by GDM;
proc freq data=mother;
tables hapo_ancestry_group_mom;
by preg_IADPSG_gdm_mom;
run;

*prenatal alcohol consumption overall;
proc freq data=mother;
tables preg_drinking_status_mom;
run;

*prenatal alcohol consumption stratified by GDM;
proc freq data=mother;
tables preg_drinking_status_mom;
by preg_IADPSG_gdm_mom;
run;

*prenatal smoker overall;
proc freq data=mother;
tables preg_smoking_status_mom;
run;

*prenatal smoker stratified by GDM;
proc freq data=mother;
tables preg_smoking_status_mom;
by preg_IADPSG_gdm_mom;
run;

*parity overall;
proc freq data=mother;
tables preg_parity_mom;
run;

*parity stratified by GDM;
proc freq data=mother;
tables preg_parity_mom;
by preg_IADPSG_gdm_mom;
run;

*family history of diabetes overall;
proc freq data=mother;
tables preg_family_history_diabetes_mo;
run;

*family history of diabetes stratified by GDM;
proc freq data=mother;
tables preg_family_history_diabetes_mo;
by preg_IADPSG_gdm_mom;
run;

```

```

*family history of hypertension overall;
proc freq data=mother;
tables preg_family_history_hypertensio;
run;

*family history of hypertension stratified by GDM;
proc freq data=mother;
tables preg_family_history_hypertensio;
by preg_IADPSG_gdm_mom;
run;

*****;
*Mothers During HAPO Follow-up Study *;
*****;

*age overall;
proc means data=mother mean std;
var age_yrs_mom;
run;

*age stratified by GDM;
proc means data=mother mean std;
var age_yrs_mom;
class preg_IADPSG_gdm_mom;
run;

*height overall;
proc means data=mother mean std;
var height_cm_mom;
run;

*height stratified by GDM;
proc means data=mother mean std;
var height_cm_mom;
class preg_IADPSG_gdm_mom;
run;

*weight overall;
proc means data=mother mean std;
var weight_kg_mom;
run;

*weight stratified by GDM;
proc means data=mother mean std;
var weight_kg_mom;
class preg_IADPSG_gdm_mom;
run;

*bmi overall;
proc means data=mother mean std;
var bmi_mom;
run;

*bmi stratified by GDM;
proc means data=mother mean std;
var bmi_mom;
class preg_IADPSG_gdm_mom;
run;

proc contents data=mother;
run;

/*****/

```

```

*glucose values are recognized as character, need to convert to numeric;
/*****

data mother1; set mother;
gluc_fasting_mom_2 = input(gluc_fasting_mg_dl_mom, 5.);
run;

*fasting plasma glucose overall;
proc means data=mother1 mean std;
var gluc_fasting_mom_2;
run;

*fasting plasma glucose stratified by GDM;
proc means data=mother1 mean std;
var gluc_fasting_mom_2;
class preg_IADPSG_gdm_mom;
run;

data mother1; set mother;
gluc_2hr_mg_dl_mom_2 = input(gluc_2hr_mg_dl_mom, 5.);
run;

proc means data=mother1 mean std;
var gluc_2hr_mg_dl_mom_2;
run;

*fasting plasma glucose stratified by GDM;
proc means data=mother1 mean std;
var gluc_2hr_mg_dl_mom_2;
class preg_IADPSG_gdm_mom;
run;

*family history of diabetes overall;
proc freq data=mother;
tables family_history_diabetes_mom/ missing;
run;

*family history of diabetes stratified by GDM;
proc freq data=mother;
tables family_history_diabetes_mom/missing;
by preg_IADPSG_gdm_mom;
run;

*family history of hypertension overall;
proc freq data=mother;
tables family_history_hypertension_mom/ missing;
run;

*family hisoory of hypertension stratified by GDM;
proc freq data=mother;
tables family_history_hypertension_mom/missing;
by preg_IADPSG_gdm_mom;
run;

*****;
*Children During HAPO Follow-up Study *;
*****;

proc contents data=child;
run;

*children by mother GDM status;
proc freq data=child;
tables preg_IADPSG_gdm_mom;

```

```

run;

*age child overall;
proc means data=child mean std;
var age_yrs_child;
run;

*age child stratified by mother GDM;
proc means data=child mean std;
var age_yrs_child;
class preg_IADPSG_gdm_mom;
run;

*height child overall;
proc means data=child mean std;
var height_cm_child;
run;

*height child stratified by mother GDM;
proc means data=child mean std;
var height_cm_child;
class preg_IADPSG_gdm_mom;
run;

*weight child overall;
proc means data=child mean std;
var weight_kg_child;
run;

*weight child stratified by mother GDM;
proc means data=child mean std;
var weight_kg_child;
class preg_IADPSG_gdm_mom;
run;

*sex child overall;
proc freq data=child;
tables sex_child;
run;

*sex child stratified by mother GDM;
proc freq data=child;
tables sex_child*preg_IADPSG_gdm_mom;
run;

*****;
*Minor adjustments to the tanner variable to align with pub*;
*****;

data child1; set child;
if tanner_stage_child = "NA" then tanner_stage_child = "";
run;

*tanner stage girls overall;
proc freq data=child1;
tables tanner_stage_child;
where sex_child = "Female";
run;

proc sort data=child1;
by preg_IADPSG_gdm_mom;
run;

*tanner stage girls stratified by mother GDM;

```

```
proc freq data=child1;
tables tanner_stage_child;
where sex_child= "Female";
by preg_IADPSG_gdm_mom;
run;

*tanner stage boys overall;
proc freq data=child1;
tables tanner_stage_child;
where sex_child = "Male";
run;

*tanner stage boys stratified by mother GDM;
proc freq data=child1;
tables tanner_stage_child;
where sex_child= "Male";
by preg_IADPSG_gdm_mom;
run;
```