

# Maternal Overweight and Obesity During Pregnancy: Short and Long-term Risks for the Neonate

**September 19<sup>th</sup>, 2023**

**Lynne Ausman | Patrick Catalano**



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## WELCOME TO THE ZOOM WEBINAR

The screenshot shows a Zoom webinar interface. On the left, a large black rectangle represents the video feed. On the right, a white sidebar titled "Zoom Group Chat" is visible. At the bottom, a dark control bar contains icons for "Join Audio", "Q&A", "Chat", and a red "Leave" button. Two orange arrows point from text instructions to specific UI elements: one points to the "Join Audio" icon, and the other points to the "To: All panelists and attendees" dropdown menu in the chat box.

**If you are unable to hear, connect your speakers by selecting "Join Audio"**

**Please use the chat box to introduce yourselves and share thoughts and comments by sending a message to "All panelists and attendees"**



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## Q&A AND CHAT

The screenshot displays a Zoom meeting interface. On the left, a large orange text overlay reads: **Submit your questions for the panelists in the Q&A box**. An orange arrow points from a circled 'Q&A' icon in the bottom toolbar to a 'Q&A' window. This window contains a 'Welcome' message and a text input field labeled 'Type your question here...'. On the right, a 'Zoom Group Chat' window is shown. A blue arrow points from a circled 'All panelists' selection in the chat's recipient dropdown to a text overlay that reads: **If you're having any technical difficulties, please send a message to "All panelists" via the chat box and we will do our best to help resolve your issue**. The chat window also shows a 'Type message here...' input field.

## Jordan Nutrition Innovation Lab Webinar

### *Maternal Overweight and Obesity During Pregnancy: Short and Long-term Risks for the Neonate*

*Tuesday, September 19th, 2023  
5:00-6:00 pm Jordan Time | 10:00-11:00 am US Eastern*



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# Maternal Overweight and Obesity During Pregnancy: Short and Long-term Risks for the Neonate

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Friedman School of Nutrition Science and Policy  
Boston, MA



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## CONFLICT OF INTEREST

**I have no significant financial, general, or obligation interests to report relative to this presentation**



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Nutrition Science and Policy

## OBJECTIVES

Obesity: mothers and neonates

Gestational weight gain

Maternal obesity: fetal growth

Lifestyle interventions during pregnancy

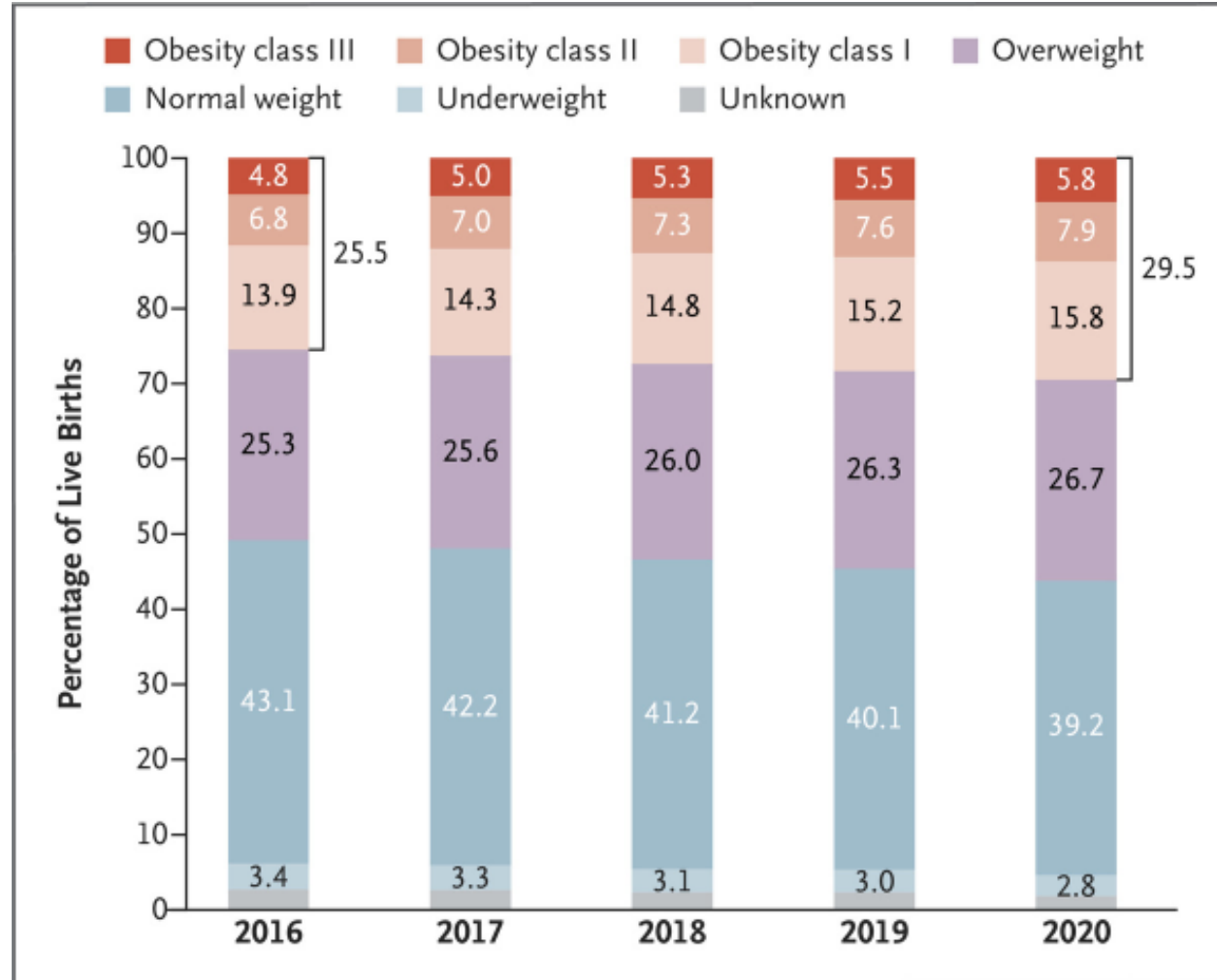
Inadequate gestational weight gain

Maternal obesity: Childhood obesity





## TRENDS IN THE DISTRIBUTION OF LIVE BIRTHS IN THE UNITED STATES ACCORDING TO MATERNAL PRE-PREGNANCY BODY-MASS INDEX (BMI), 2016 THROUGH 2020.



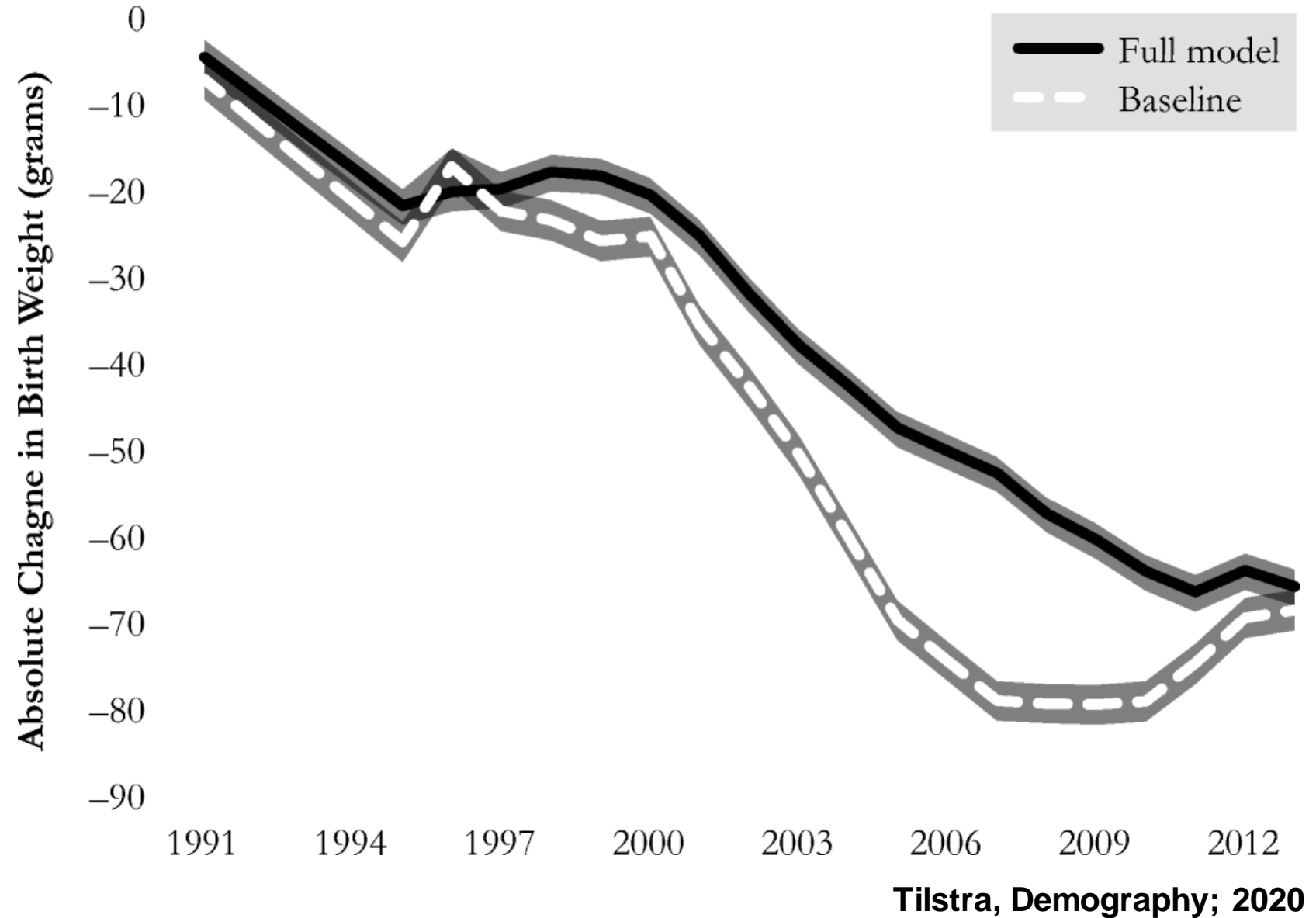




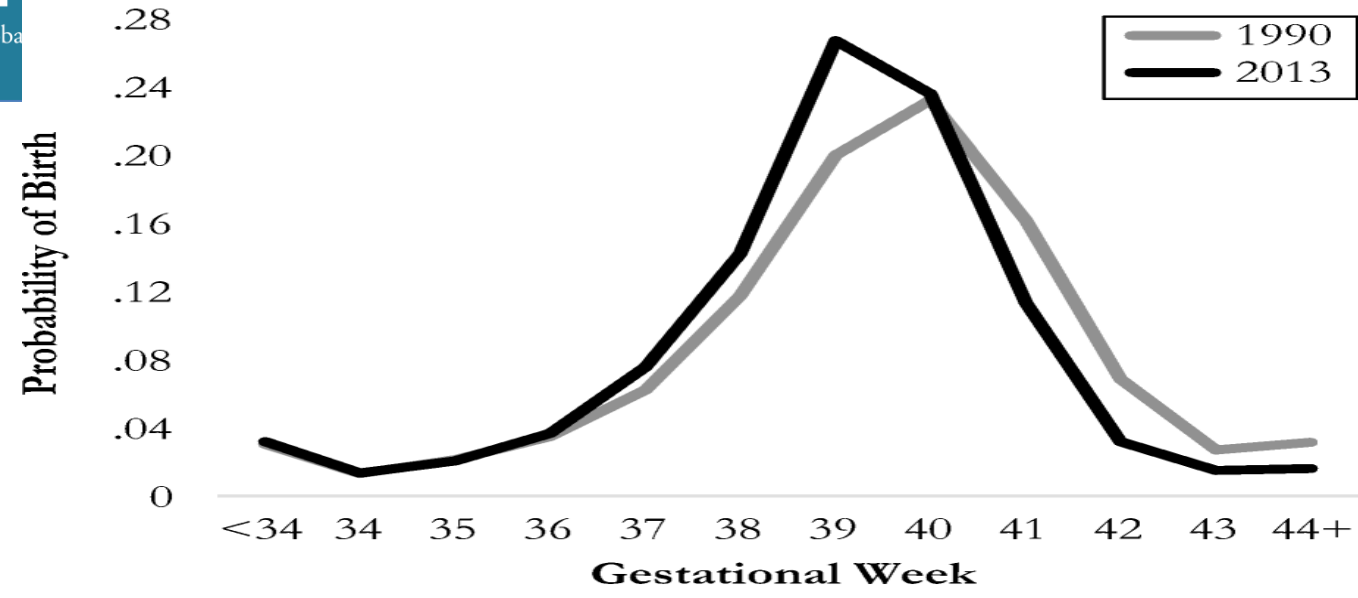
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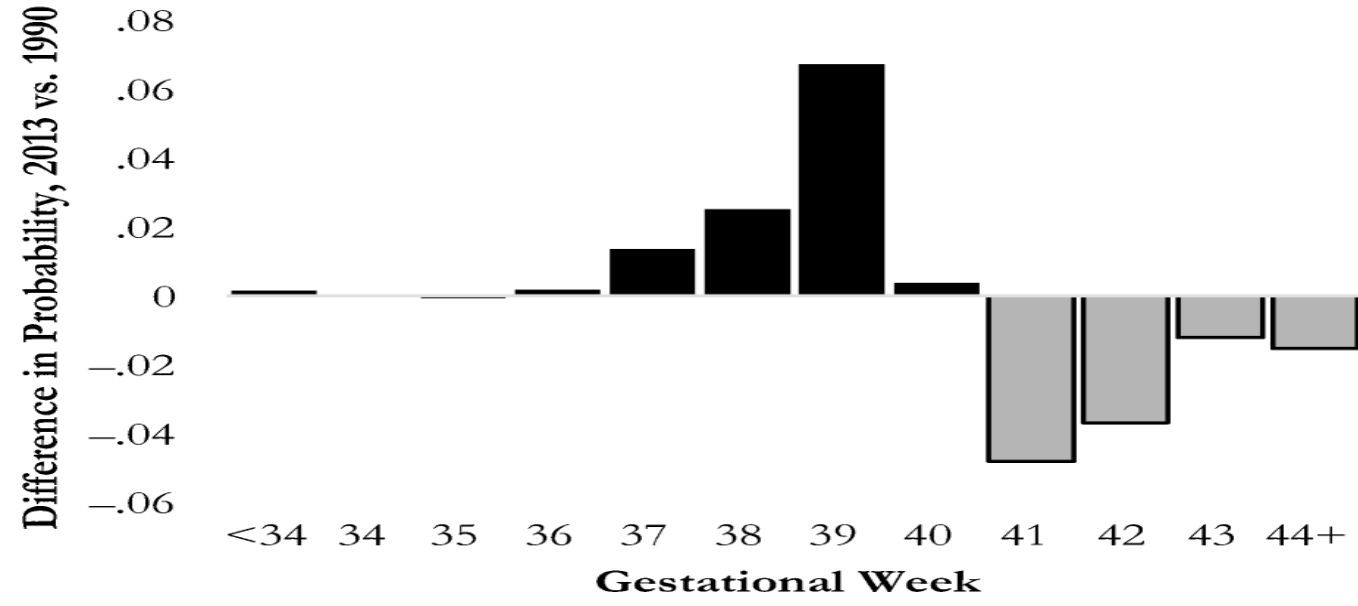
## CHANGE IN US BIRTHWEIGHT: 1990-2013



**a. Gestational age distribution of U.S. first-birth singletons, 1990 and 2013**



**b. Change in probability of birth by gestational age: 2013–1990**



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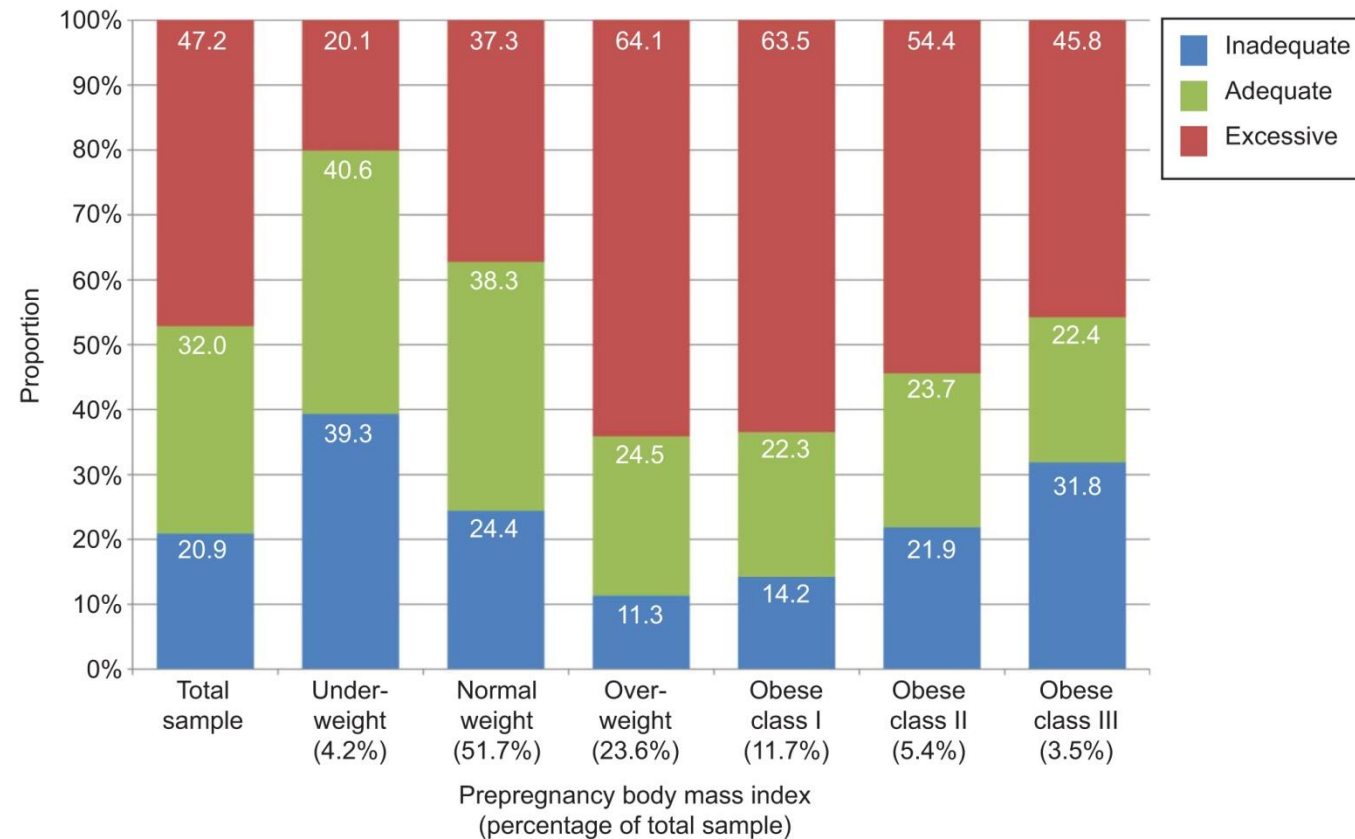
Maternal obesity: Childhood obesity

## IOM GESTATIONAL WEIGHT GAIN GUIDELINES (2009)

<b>Underweight</b>	<b>(18.5)</b>	<b>12.5 - 18 kg</b>
<b>Normal weight</b>	<b>(18.5-24.9)</b>	<b>11.5 - 16 kg</b>
<b>Overweight</b>	<b>(25.0-29.9)</b>	<b>7 – 11.5 kg</b>
<b>Obese</b>	<b>(<math>\geq 30</math>)</b>	<b>5 – 9 kg</b>



## PREVALENCE OF GWG ADEQUACY BY PRE-PREGNANCY BMI



## OBLIGATORY COMPONENTS OF WEIGHT GAIN

	Water	Protein
•Fetus	2,400	420
•Placenta	500	100
•Amniotic fluid	500	-
•Uterus	800	170
•Breast	300	80
•Maternal blood	1,300	140
•Extracellular fluid	1,500	-
<b>total:</b>	<b>7,000 - 8,000 g</b>	<b>900 - 1,000 g</b>

## VARIABLE COMPONENTS OF WEIGHT GAIN

**CHO**

**Lipids**

**Total**

---

**NIL**

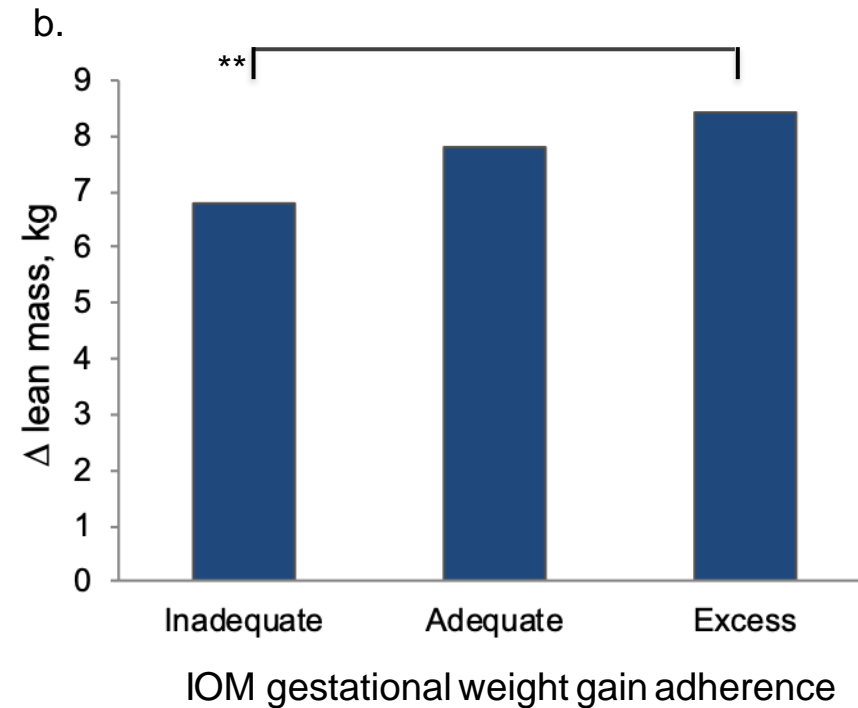
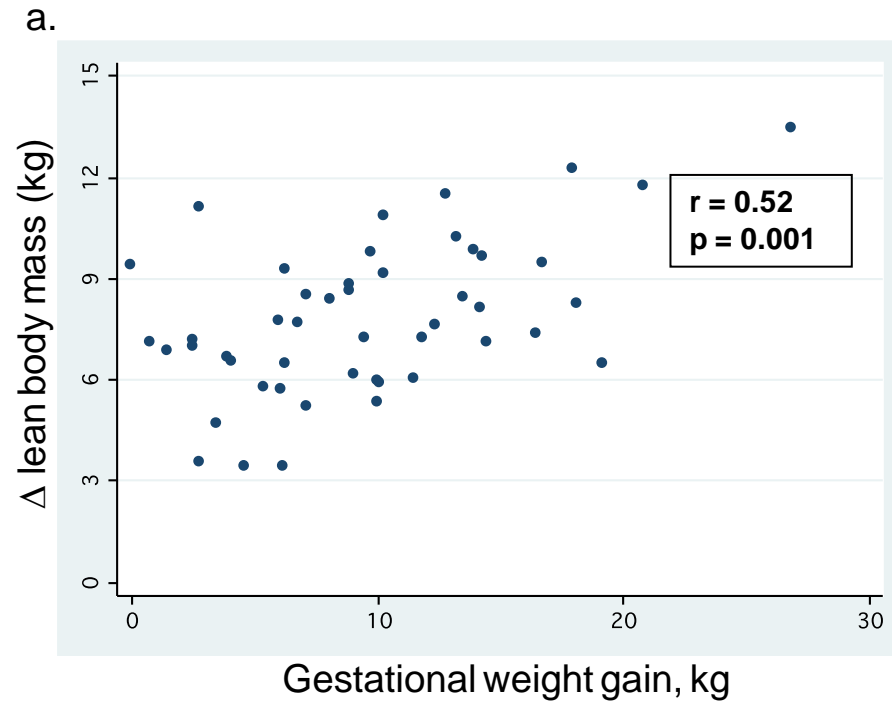
**variable 0 – 6,000 g**

**± 9,000g**



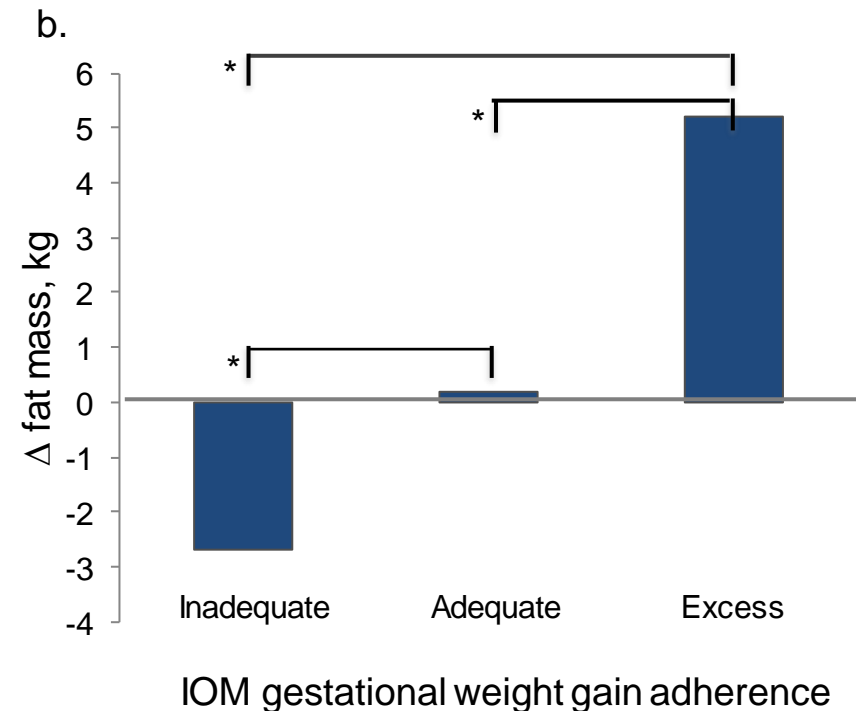
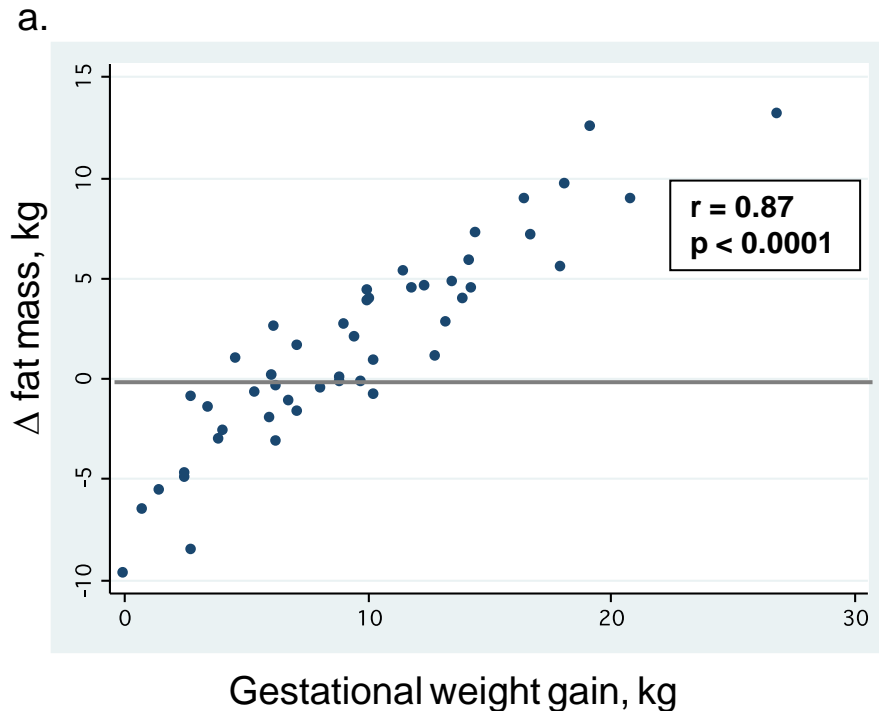


## MATERNAL LEAN MASS ACCRUAL IN OVERWEIGHT/OBESE RELATED TO GESTATIONAL WEIGHT GAIN



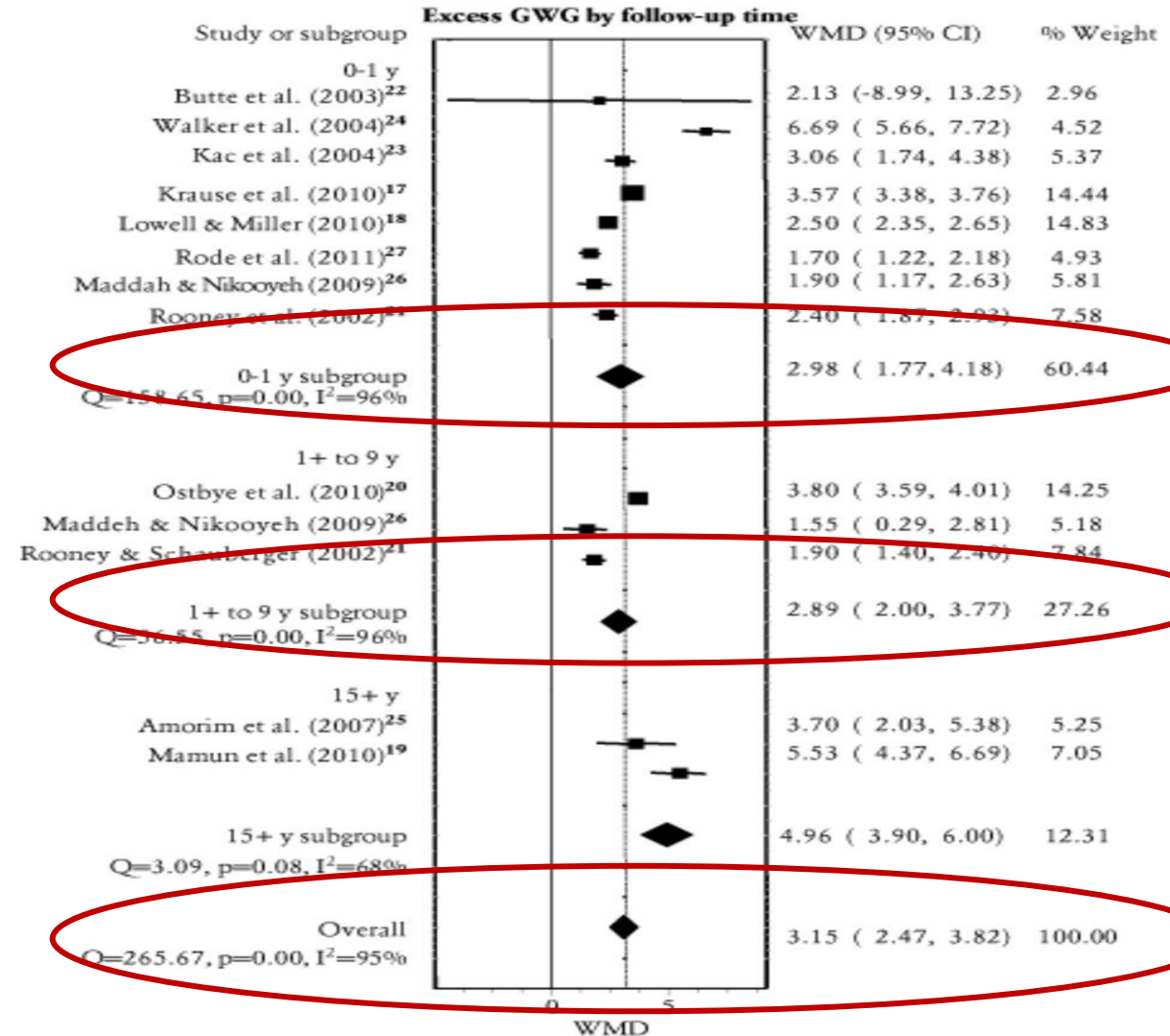


## MATERNAL FAT MASS ACCRUAL IN OVERWEIGHT/OBESE RELATED TO GESTATIONAL WEIGHT GAIN





Weighted Mean Difference between Women with **Excess GWG** and Women with Adequate GWG at: <1 year, =1 year to 9 years, and ≥15 years.



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Obesity: mothers and neonates

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## ADIPOSIITY AT BIRTH



12-18%

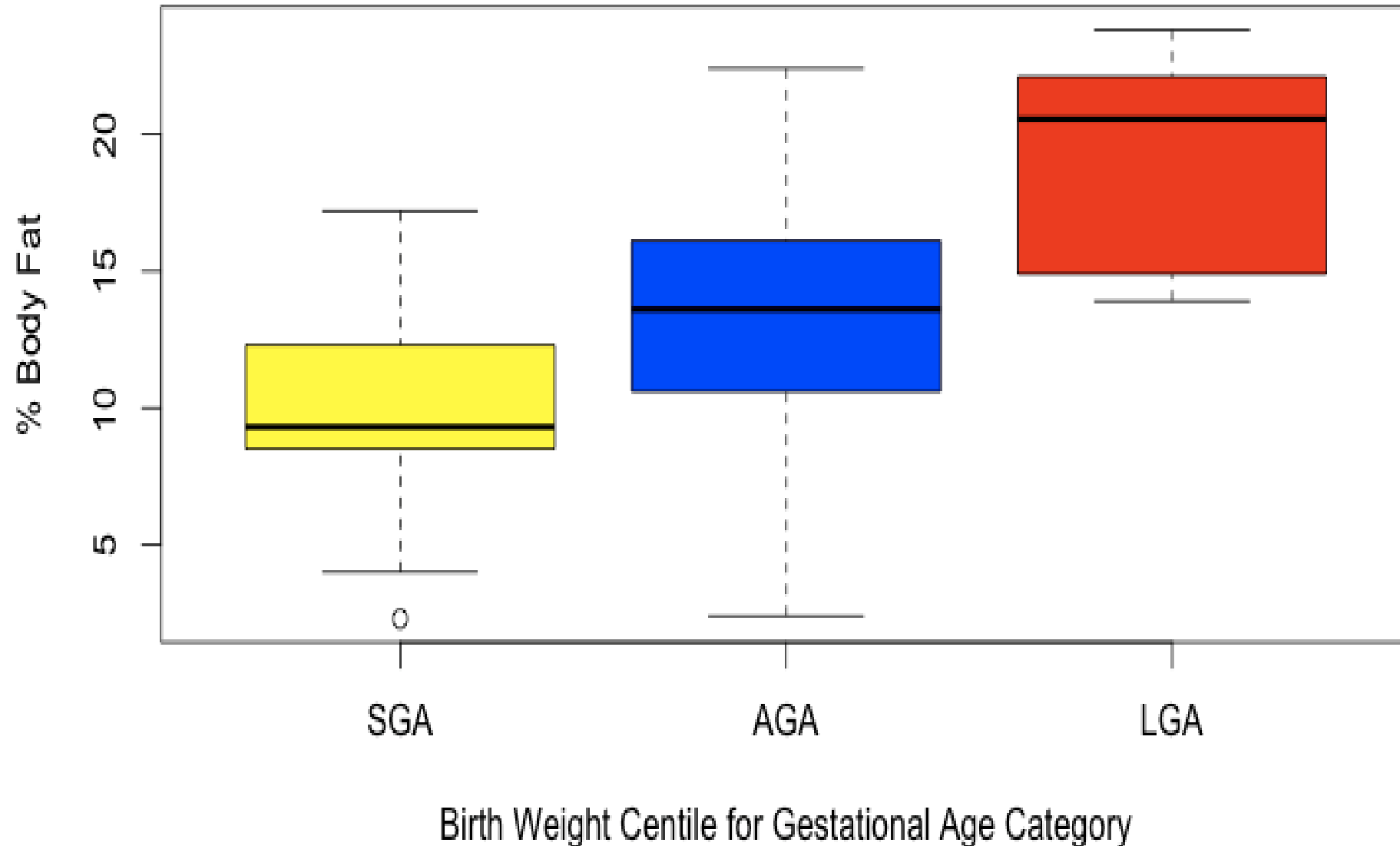


3-5%



2-3%

## Maximum, Minimum, and Interquartile Ranges of Percent Body Fat in SGA, AGA, and LGA Neonates





## BODY COMPOSITION IN NEONATES

	<u>GDM (n = 195)</u>	<u>NGT (n = 220)</u>	<i>p-value</i>
Birth Weight (g)	3398 ± 550	3337 ± 549	ns
Lean body mass (g)	2962 ± 405	2975 ± 408	ns
Fat mass (g)	436 ± 206	362 ± 198	0.0002
Body fat (%)	12.4 ± 4.6	10.4 ± 4.6	0.0001

	<u>BMI &lt; 25 (n = 144)</u>	<u>BMI &gt; 25 (n = 76)</u>	
Birth weight (g)	3284 ± 534	3436 ± 567	ns
Lean body mass (g)	2951 ± 406	3023 ± 410	ns
Fat Mass (g)	334 ± 179	416 ± 221	0.008
Body Fat (%)	9.7 ± 4.3	11.6 ± 4.7	0.006
Gest Wt. Gain (kg)	15.2 ± 5.3	13.8 ± 7.5	0.001



# FACTORS RELATING TO FETAL ADIPOSITY AT BIRTH

220 Normal Glucose Tolerance and 195 GDM

<u>Fat Mass</u>	$r^2$	Dr <sup>2</sup>	
Pre-gravid BMI	0.066	-	
EGA	0.136	0.070	
Wt. Gain	0.171	0.035	
Group (GDM)	0.187	0.016	p=0.0001

<u>% Neonatal Body Fat</u>			
Pre-gravid BMI	0.072	-	
EGA	0.116	0.044	
Wt. Gain	0.147	0.031	
Group (GDM)	0.166	0.019	p=0.0001

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## Antenatal lifestyle advice for women who are overweight or obese: LIMIT randomised trial



OPEN ACCESS

Jodie M Dodd *professor of obstetrics and gynaecology; maternal fetal medicine specialist*<sup>1,2</sup>, Deborah Turnbull *professor of psychology*<sup>3</sup>, Andrew J McPhee *director of neonatal medicine*<sup>4</sup>, Andrea R Deussen *senior clinical trials coordinator*<sup>1</sup>, Rosalie M Grivell *senior lecturer in obstetrics and gynaecology; maternal fetal medicine specialist*<sup>1,2</sup>, Lisa N Yelland *senior statistician*<sup>1</sup>, Caroline A Crowther *professor of obstetrics and gynaecology*<sup>1</sup>, Gary Wittert *professor medicine*<sup>5</sup>, Julie A Owens *head of school paediatrics and reproductive health; associate dean, research*<sup>1</sup>, Jeffrey S Robinson *professor of obstetrics and gynaecology*<sup>1</sup>, for the LIMIT Randomised Trial Group

**For women who were overweight or obese, the antenatal lifestyle advice used in this study did not reduce the risk delivering a baby weighing above the 90<sup>th</sup> centile for gestational age and sex or improve maternal pregnancy and birth outcomes.**



## Effect of a behavioural intervention in obese pregnant women (the UPBEAT study): a multicentre, randomised controlled trial

*Lucilla Poston, Ruth Bell, Helen Croker, Angela C Flynn, Keith M Godfrey, Louise Goff, Louise Hayes, Nina Khazaezadeh, Scott M Nelson, Eugene Oteng-Ntim, Dhamintra Pasupathy, Nashita Patel, Stephen C Robson, Jane Sandall, Thomas A B Sanders, Naveed Sattar, Paul T Seed, Jane Wardle, Melissa K Whitworth, Annette L Briley, on behalf of The UPBEAT Trial Consortium\**

**Interpretation:** A behavioural intervention addressing diet and physical activity in women with obesity during pregnancy is not adequate to prevent gestational diabetes, or to reduce the incidence of large-for-gestational-age infants.



## Lifestyle intervention to limit gestational weight gain: the Norwegian Fit for Delivery randomised controlled trial

LR Sagedal,<sup>a</sup> NC Øverby,<sup>b</sup> E Bere,<sup>b</sup> MK Torstveit,<sup>b</sup> H Lohne-Seiler,<sup>b</sup> M Småstuen,<sup>c</sup> ER Hillesund,<sup>b</sup> T Henriksen,<sup>d</sup> I Vistad<sup>a</sup>

**Conclusions** The Norwegian Fit for Delivery lifestyle intervention in pregnancy had no measurable effect on obstetrical or neonatal outcomes, despite a modest but significant decrease in GWG.



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BMJ 2017;358:j3119 doi: 10.1136/bmj.j3119 (Published 19 July 2017)



## RESEARCH



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click for updates

### **Effect of diet and physical activity based interventions in pregnancy on gestational weight gain and pregnancy outcomes: meta-analysis of individual participant data from randomised trials**



OPEN ACCESS

The International Weight Management in Pregnancy (i-WIP) Collaborative Group



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Nutrition Science and Policy



# EFFECT OF DIET AND PHYSICAL ACTIVITY INTERVENTIONS ON GESTATIONAL WEIGHT GAIN

Outcomes	No of studies	(No of women)	Intervention		Control		Mean difference (95% CI)		I <sup>2</sup> (%)	
	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD
<b>Overall</b>	33 (9320)	81 (17,530)	10.1 (5.4)	10.6*	10.8 (5.4)	11.5*	<b>-0.70 (-0.92 to -0.48)</b>	-1.10 (-1.46 to -0.74)	14.1	73.8
<b>Diet</b>	4 (1168)	12 (2017)	10.2 (4.4)	9.2*	11.0 (4.8)	11.7*	-0.72 (-1.48 to 0.04)	-2.84 (-4.77 to -0.91)	0.0	92.3
<b>Physical activity</b>	15 (2915)	37 (7355)	9.8 (4.4)	11.3*	10.8 (4.8)	11.9*	<b>-0.73 (-1.11 to -0.34)</b>	-0.72 (-1.04 to -0.41)	0.0	45.4
<b>Mixed</b>	15 (5369)	35 (8448)	10.2 (6.0)	10.3*	10.6 (5.9)	11.0*	-0.71 (-1.10 to -0.31)	-1.00 (-1.39 to -0.61)	34.9	54.6

\*Recalculation using DerSimonian-Laird



# EFFECT OF DIET AND PHYSICAL ACTIVITY INTERVENTIONS ON NEONATAL OUTCOMES

Outcomes	No of studies (No of women)		Intervention: event/No event		Control: event/No event		Odds ratio (95% CI)		I <sup>2</sup> (%)	
	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD
<b>Composite outcome:</b>										
Overall	18 (7981)	NA	1007/3172	NA	951/2851	NA	0.94 (0.83 to 1.08)	NA	0.0	NA
<b>Stillbirth:</b>										
Overall	2 (3719)	4 (4534)	9/1858	12/2261	11/1841	14/2247	0.81 (<0.01 to 256.69)	0.85 (0.24 to 3.02)	0.0	0.0
<b>Small for gestational age:</b>										
Overall	33 (11666)	44 (12937)	709/5324	773/6018	632/5001	685/5461	1.06 (0.94 to 1.20)	1.05 (0.94 to 1.18)	0.0	0.0
<b>Large for gestational age:</b>										
Overall	34 (12047)	45 (13348)	744/5492	820/6185	759/5052	833/5510	0.90 (0.76 to 1.07)	0.86 (0.71 to 1.04)	38.0	41.0
<b>Admission to neonatal intensive care unit:</b>										
Overall	16 (8140)	21 (9498)	302/3973	406/4543	279/3586	400/4149	1.01 (0.84 to 1.23)	0.97 (0.82 to 1.14)	0.0	0.0

# EFFECT OF DIET AND PHYSICAL ACTIVITY INTERVENTIONS ON MATERNAL OUTCOMES

Outcomes	No of studies (No of women)		Intervention: event/No event		Control: event/No event		Odds ratio (95% CI)		I <sup>2</sup> (%)	
	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD	IPD	IPD and non-IPD
<b>Composite outcome:</b>										
Overall	24 (8851)	NA	1896/2728	NA	1837/2390	NA	0.90 (0.79 to 1.03)	NA	26.7	NA
<b>Gestational Diabetes:</b>										
Overall	27 (9427)	59 (16885)	584/4333	974/7764	571/3939	1046/7101	0.89 (0.72 to 1.10)	0.76 (0.65 to 0.89)	23.8	36.8
<b>Hypertensive disorders of pregnancy:</b>										
Overall	22 (9618)	45 (14849)	432/4586	559/7130	423/4177	592/6568	0.95 (0.78 to 1.16)	0.85 (0.71 to 1.00)	24.2	21.5
<b>Pre-term birth:</b>										
Overall	32 (11676)	49 (14339)	332/5713	414/6971	345/5286	443/6511	0.94 (0.78 to 1.13)	0.92 (0.79 to 1.08)	17.3	8.7
<b>Caesarean section:</b>										
Overall	32 (11410)	66 (18041)	1525/4385	2373/6860	1506/3994	2440/6368	<b>0.91 (0.83 to 0.99)</b>	0.89 (0.83 to 0.96)	0.0	16.2

## OBJECTIVES

Obesity: mothers and neonates

Gestational weight gain

Maternal obesity: fetal growth

Lifestyle interventions during pregnancy

Inadequate gestational weight gain

Maternal obesity: Childhood obesity

# INADEQUATE WEIGHT GAIN IN OVERWEIGHT AND OBESE PREGNANT WOMEN: WHAT IS THE EFFECT ON FETAL GROWTH?

- Patrick M. Catalano, MD; Lisa Mele, ScM; Mark B. Landon, MD; Susan M. Ramin, MD; Uma M. Reddy, MD, MPH; Brian Casey, MD; Ronald J. Wapner, MD; Michael W. Varner, MD; Dwight J. Rouse, MD; John M. Thorp Jr, MD; George Saade, MD; Yoram Sorokin, MD; Alan M. Peaceman, MD; Jorge E. Tolosa, MD, MSCE; for the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network

Catalano PM, Mele L, Landon MB, et al. Inadequate weight gain in overweight and obese pregnant women: what is the effect on fetal growth? *Am J Obstet Gynecol* 2014;211:137.e1-7.



## MATERNAL CHARACTERISTICS

Catalano, AJOG; 2014

	Gestational weight gain > 5 kg (n=1053)	Gestational weight gain ≤ 5 kg (n=188)	p-value
Age (years)	28.1 ± 5.8	28.2 ± 5.7	0.67
Pre-pregnancy height (cm)	160.1 ± 7.5	159.3 ± 8.2	0.19
<b>Pre-pregnancy weight (kg)</b>	<b>78.2 ± 16.1</b>	<b>87.4 ± 21.9</b>	<b>&lt; 0.0001</b>
<b>Pre-pregnancy BMI (kg/m<sup>2</sup>)</b>	<b>30.4 ± 5.2</b>	<b>34.2 ± 7.1</b>	<b>&lt; 0.0001</b>
25.0 - < 30	627 (59.5)	59 (31.4)	
30.0 - ≤ 40	370 (35.1)	97 (51.6)	
>40	56 (5.3)	32 (17.0)	
Tobacco use + (%)	120 (11.4)	29 (15.4)	0.12
Parity (%)			0.09
1	231 (21.9)	30 (16.0)	
2	396 (37.6)	68 (36.2)	
3+	426 (40.5)	90 (47.9)	



## MATERNAL CHARACTERISTICS

Catalano, AJOG; 2014

	Gestational weight gain > 5 kg (n=1053)	Gestational weight gain ≤ 5 kg (n=188)	p-value
Race (%)			0.99
White	345 (32.8%)	62 (33.0%)	
AA/Black	220 (20.9%)	38 (20.2%)	
Hispanic	469 (44.5%)	85 (45.2%)	
Other	19 (1.8%)	3 (1.6%)	
Glucose status (%)			0.002
Normal GCT	343 (32.6%)	52 (27.7%)	
Abnormal GCT/NL OGTT	366 (34.8%)	52 (27.7%)	
GDM treated	197 (18.7%)	58 (30.9%)	
GDM untreated	147 (14.0%)	26 (13.8%)	
Weight gain/loss (kg)	14.4 ± 6.2	1.1 ± 4.4	< 0.0001

## NEONATAL CHARACTERISTICS

Catalano, AJOG; 2014

	Gestational weight gain > 5 kg (n=1053)	Gestational weight gain ≤ 5 kg (n=188)	p-value
Gestational age (weeks)	38.9 ± 1.4	38.8 ± 1.4	0.28
Gender (%)			0.32
Male	540 (51.3)	89 (47.3)	
Female	513 (48.7)	99 (52.7)	
Birth weight (g)	3466.8 ± 491.5	3258.4 ± 442.7	< 0.0001
Length (cm)	50.0 ± 2.8	49.3 ± 2.3	0.001
Head circumference (cm)	34.5 ± 1.7	34.2 ± 1.7	0.02
Lean mass (g)	2995.4 ± 346.9	2855.1 ± 321.0	< 0.0001
Fat mass (g)	471.4 ± 192.7	403.4 ± 175.3	< 0.0001
Body fat (%)	13.2 ± 4.3	12.0 ± 4.2	0.0006
LGA	139 (13.2%)	14 (7.5%)	0.03
SGA	51 (4.9%)	18 (9.6%)	0.009



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# HAPO FUS GDM Associations with Childhood BMI

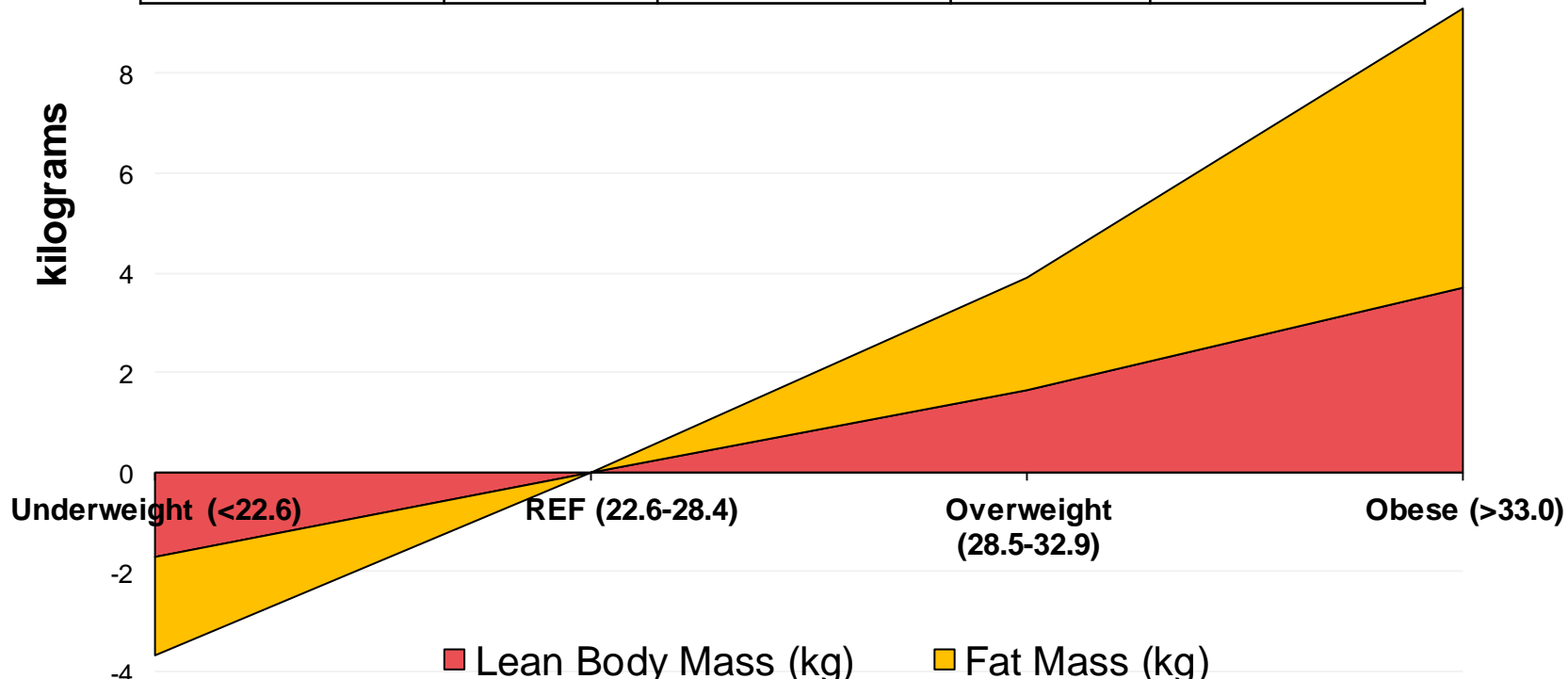
	Overweight/ Obesity	Obesity	BMI (kg/m <sup>2</sup> )
	OR 95% CI, p-value	OR 95% CI, p-value	Mean difference 95% CI, p-value
<b>Model 1</b> FC, age, sex	<b>1.51</b> 95% CI: 1.27-1.80 p<0.001	<b>1.96</b> 95% CI: 1.56-2.44 p<0.001	<b>0.88</b> 95% CI: 0.54-1.21 p<0.001
<b>Model 2</b> Child's pubertal status	<b>1.53</b> 95% CI: 1.28-1.83 p<0.001	<b>1.98</b> 95% CI: 1.58-2.49 p<0.001	<b>0.89</b> 95% CI: 0.57-1.22 p<0.001
<b>Model 3</b> Mom variables during pregnancy (excluding BMI)	<b>1.44</b> 95% CI: 1.20-1.72 p<0.001	<b>1.84</b> 95% CI: 1.46-2.33 p<0.001	<b>0.72</b> 95% CI: 0.39-1.05 p<0.001
<b>Model 4</b> Model 3 + <b>mom BMI</b> <b>during pregnancy</b>	<b>1.21</b> 95% CI: 1.00-1.46 p=0.052	<b>1.58</b> 95% CI: 1.24-2.01 p<0.001	<b>0.26</b> 95% CI: =-0.06-0.57 p=0.11

## HAPO FUS GDM Associations with Childhood Adiposity

	BOD POD % body fat > 85 <sup>th</sup> percentile  OR, 95% CI, p-value	BOD POD % body fat  Mean difference 95% CI, p-value
<b>Model 1</b> FC, age, sex	<b>1.72</b> 95% CI: 1.40-2.11 p<0.001	<b>2.31</b> 95% CI: 1.48-3.14 p<0.001
<b>Model 2</b> Child's pubertal status	<b>1.71</b> 95% CI: 1.39-2.11 p<0.001	<b>2.31</b> 95% CI: 1.50-3.12 p<0.001
<b>Model 3</b> Mom variables during pregnancy (excluding BMI)	<b>1.57</b> 95% CI: 1.27-1.95 p<0.001	<b>1.90</b> 95% CI: 1.08-2.72 p<0.001
<b>Model 4</b> Model 3 + mom BMI during pregnancy	<b>1.35</b> 95% CI: 1.08-1.68 p=0.007	<b>1.05</b> 95% CI: 0.24-1.85 p=0.011

## ASSOCIATIONS OF MATERNAL BMI CATEGORY WITH CHILD BODY COMPOSITION

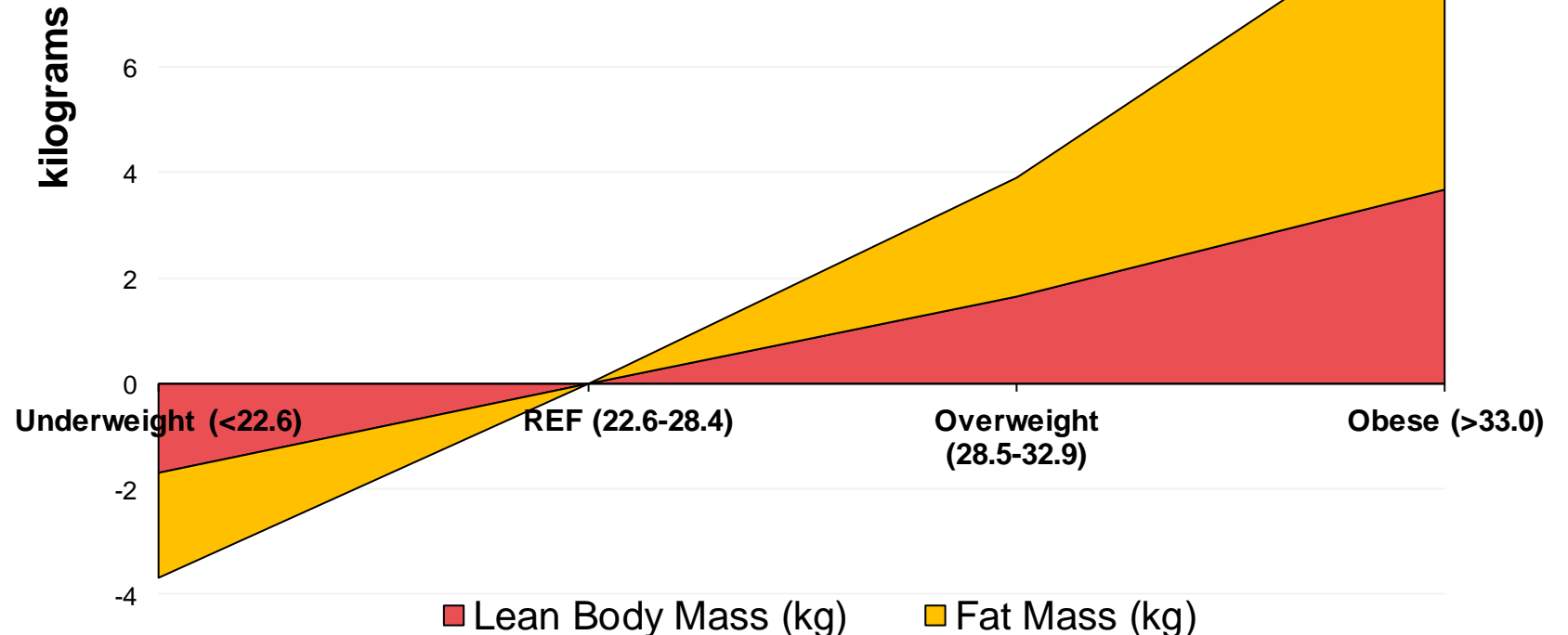
Maternal BMI (kg/m <sup>2</sup> )	Adjusted Mean Difference (95% CI)			
	Weight (kg)	Lean Body Mass (kg)	Fat Mass (kg)	Body Fat%
< 22.6 (Underweight)	-3.67 (-4.65- -2.68)	-1.67 (-2.19 - -1.16)	-1.99 (-2.64- -1.35)	-2.86 (-3.75- -1.97)
22.6-28.4 (Normal range)	Ref	Ref	Ref	Ref
28.5-32.9 (Overweight)	3.93 (3.12-4.73)	1.64 (1.22-2.06)	2.28 (1.76-2.81)	3.02 (2.30-3.75)
>33.0 (Obese)	9.31 (8.27-10.35)	3.69 (3.15-4.23)	5.62 (4.95-6.29)	6.04 (5.11-6.98)





## ASSOCIATIONS OF MATERNAL BMI CATEGORY WITH CHILD BODY COMPOSITION

Maternal BMI (kg/m <sup>2</sup> )	Adjusted Mean Difference (95% CI)			
	Weight (kg)	Lean Body Mass (kg)	Fat Mass (kg)	Body Fat%
< 22.6 (Underweight)	-3.67 (-4.65- -2.68)	-1.67 (-2.19 - -1.16)	-1.99 (-2.64- -1.35)	-2.86 (-3.75- -1.97)
22.6-28.4 (Normal range)	Ref	Ref	Ref	Ref
28.5-32.9 (Overweight)	3.93 (3.12-4.73)	1.64 (1.22-2.06)	2.28 (1.76-2.81)	3.02 (2.30-3.75)
>33.0 (Obese)	9.31 (8.27-10.35)	3.69 (3.15-4.23)	5.62 (4.95-6.29)	6.04 (5.11-6.98)

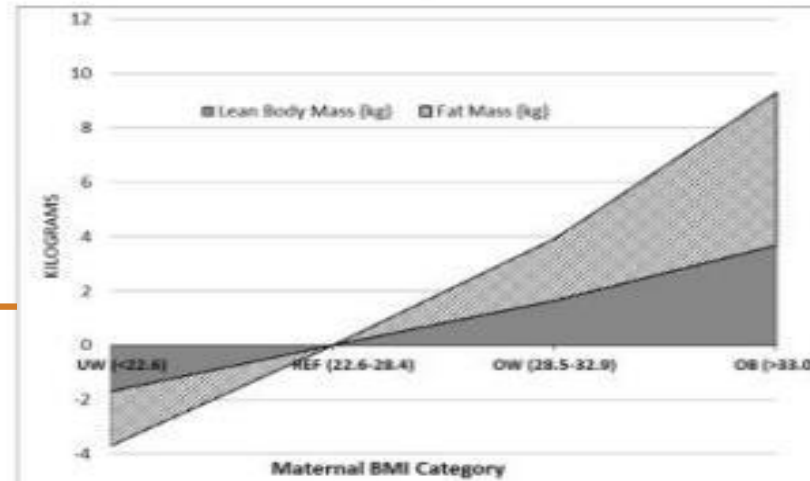




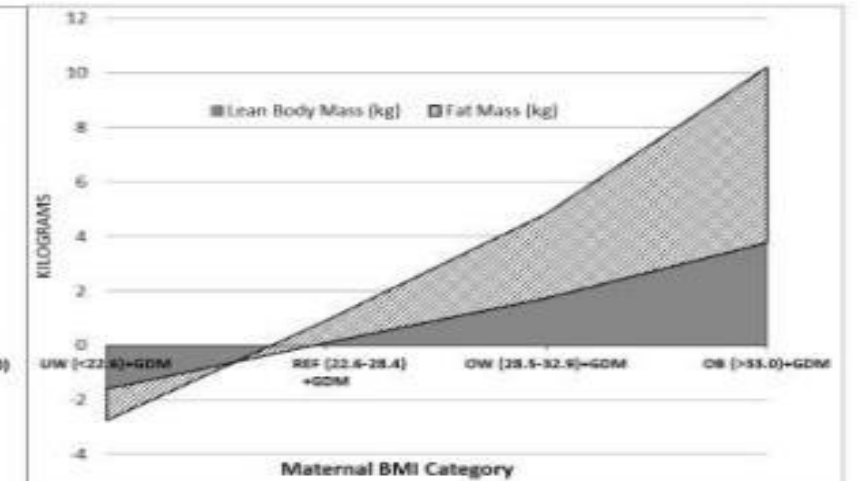
## ASSOCIATIONS BETWEEN MATERNAL BMI CATEGORY AND CHILDHOOD BODY COMPOSITION

**Fig. 2. Joint Associations of Maternal BMI Category and GDM on Childhood Body Composition**

**A. Normal Glucose Tolerance**



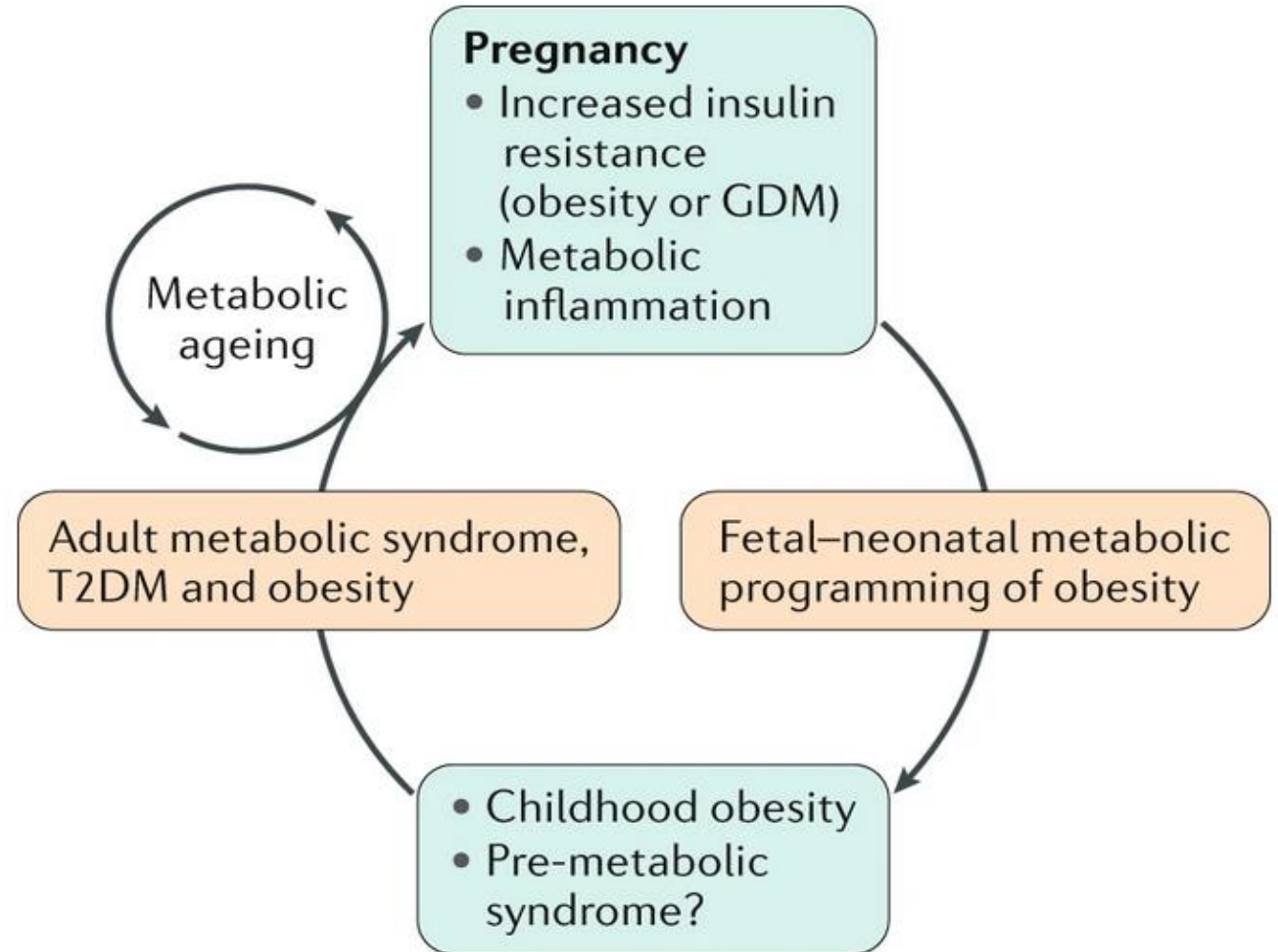
**B. Gestational Diabetes**



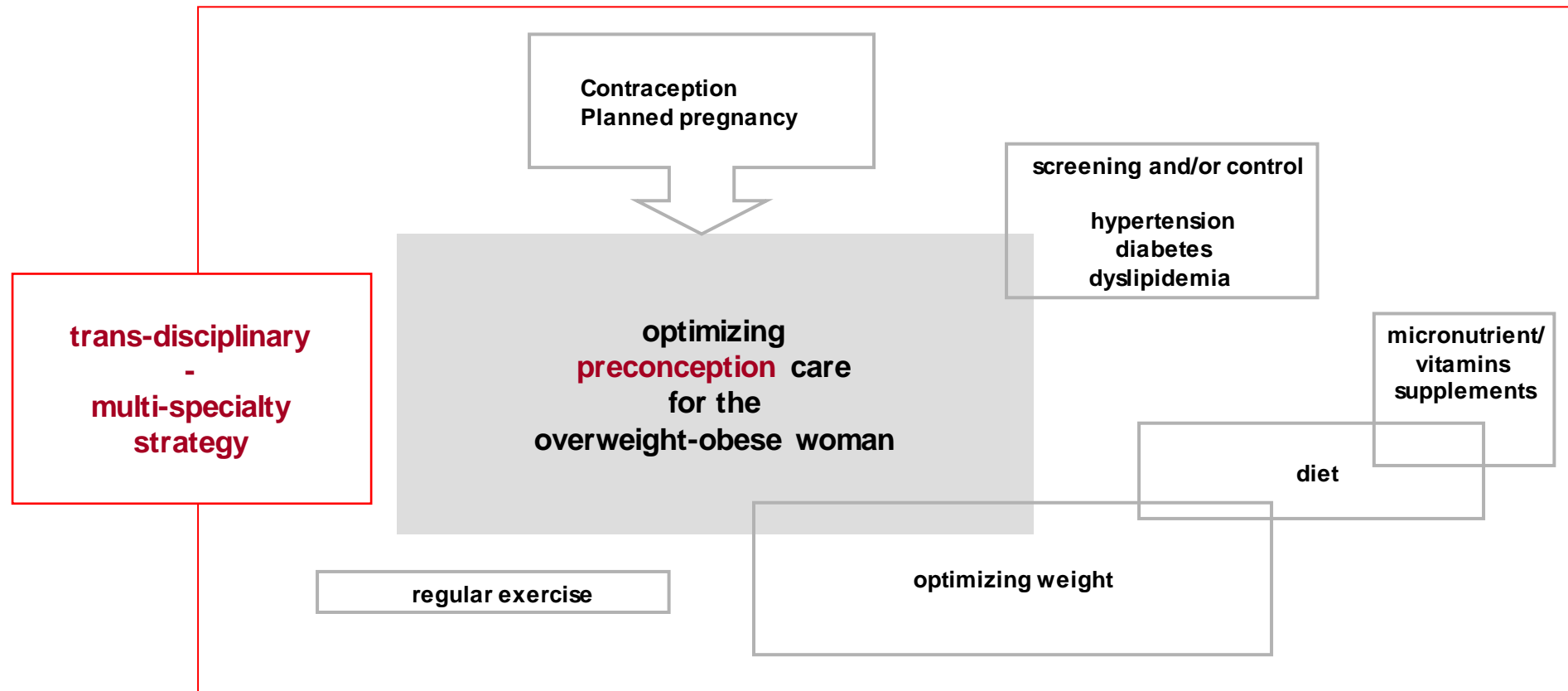
Maternal BMI (kg/m <sup>2</sup> )	Adjusted Mean Difference (95%CI) P value			
	Weight (kg)	Lean Body Mass (kg)	Fat Mass (kg)	Body Fat%
< 22.6 Underweight (UW)	-3.67 (-4.65- -2.68) <0.001	-1.67 (-2.19 - -1.16) <0.001	-1.99 (-2.64- -1.35) <0.001	-2.86 (-3.75- -1.97) <0.001
22.6-28.4 (Normal range)	Ref	Ref	Ref	Ref
28.5-32.9 Overweight (OW)	3.93 (3.12-4.73) <0.001	1.64 (1.22-2.06) <0.001	2.28 (1.76-2.81) <0.001	3.02 (2.30-3.75) <0.001
>33.0 Obese (OB)	9.31 (8.27-10.35) <0.001	3.69 (3.15-4.23) <0.001	5.62 (4.95-6.29) <0.001	6.04 (5.11-6.98) <0.001
Gestational Diabetes*	0.91 (0.003-1.82) 0.049	0.09 (-0.38-0.56) 0.71	0.82 (0.23-1.41) 0.006	1.19 (0.38-2.01) 0.004



## VICIOUS CYCLE OF OBESITY AND GDM



# CONCEPTUAL MODEL TO PREVENT CHILDHOOD OBESITY AND GDM





## CONCLUSIONS

- Overweight/obesity affects ~ 60% of reproductive age women.
- Forty-five to 65% of women with overweight/obesity gain excessive GWG.
- Overweight/Obesity in pregnancy is a risk factor for increased fetal adiposity
- Lifestyle interventions during pregnancy have modest effect on decreasing excessive gestational weight gain and minimal effects on fetal growth
- Inadequate gestational weight gain is associated with increase risk of SGA
- Maternal obesity in pregnancy is associated with higher childhood obesity.



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## Q&A



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