

Accounting for the seriousness of different adverse maternal and child health outcomes

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Pregnancy weight gain guidelines

- Both high and low weight gain can increase risks of poor pregnancy outcomes

SGA birth
Stillbirth



LGA birth
Child obesity
Excess maternal weight retention
Cesarean birth
Pre-eclampsia

Pregnancy weight gain guidelines

- Both high and low weight gain can increase risks of poor pregnancy outcomes
- Goal of pregnancy weight gain guidelines is to identify the range that balance these risks

SGA birth
Stillbirth



LGA birth
Child obesity
Excess maternal weight retention
Cesarean birth
Pre-eclampsia

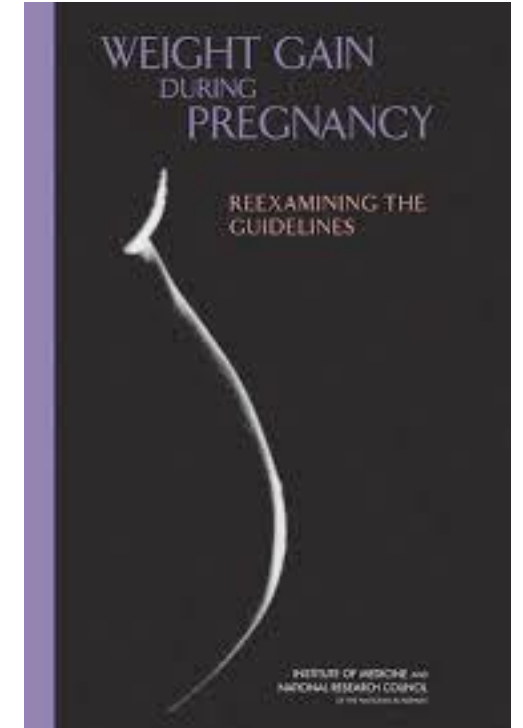
Health outcomes differ in their seriousness

- Some of the health outcomes affected by pregnancy weight gain are more serious than others
 - stillbirth $\neq$ Cesarean delivery
- Guidelines should be based on research that takes these differences in seriousness into account



2009 IOM Guidelines

- Commissioned a quantitative analysis of risk trade-offs:
 - 1) Estimated prevalence by pregnancy weight gain of:
 - infant mortality
 - maternal post-partum weight retention, and
 - childhood obesity
 - 2) Applied a type of weight (health utility value) associated with each health condition
 - 3) Identified weight gain values that maximize quality adjusted life years (QALYs)



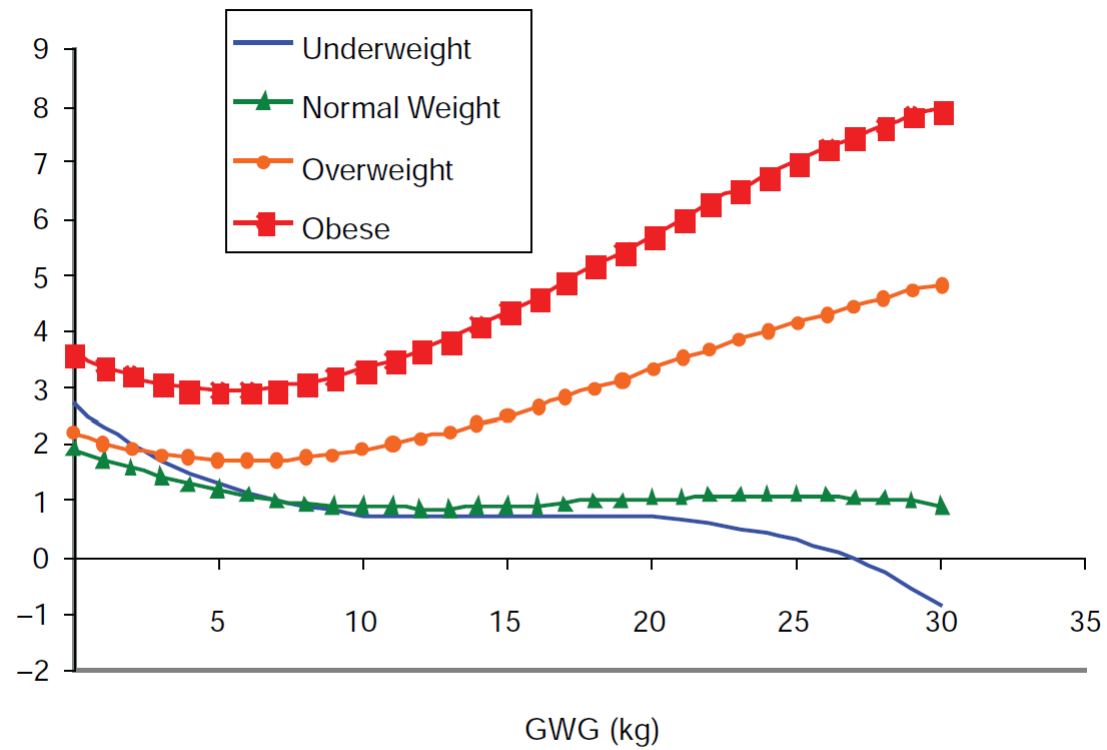
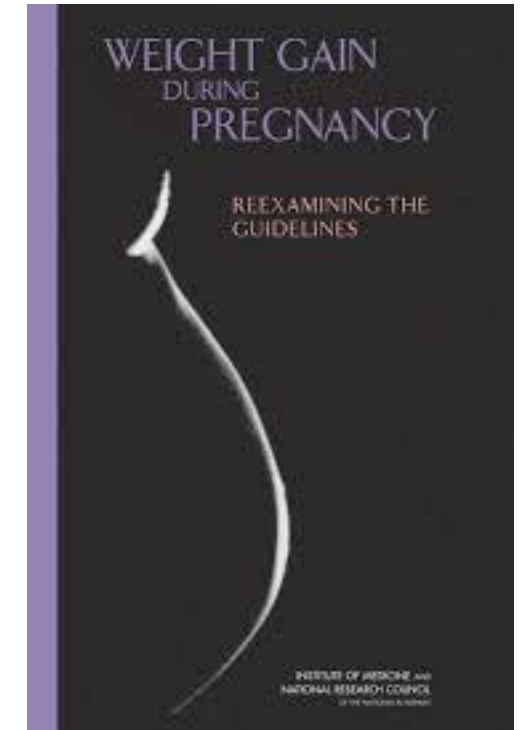


FIGURE G-57 Total expected quality-adjusted life-years (QALYs) lost (Chen et al. [2008] mortality estimates).

2009 IOM Guidelines

- Challenge: health utility values (weights) not available for many important maternal and child health outcomes

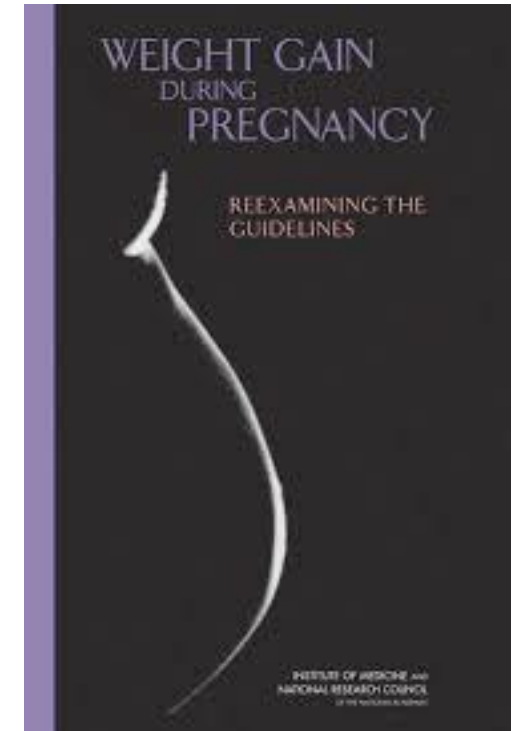
with GWG.) Other outcomes (e.g., SGA, LGA) were not quantified in part because estimating the effect of these outcomes on health (i.e., ensuing morbidity and mortality) was judged to be too difficult or speculative given available data and resources.



2009 IOM Guidelines

Recommendation for Research

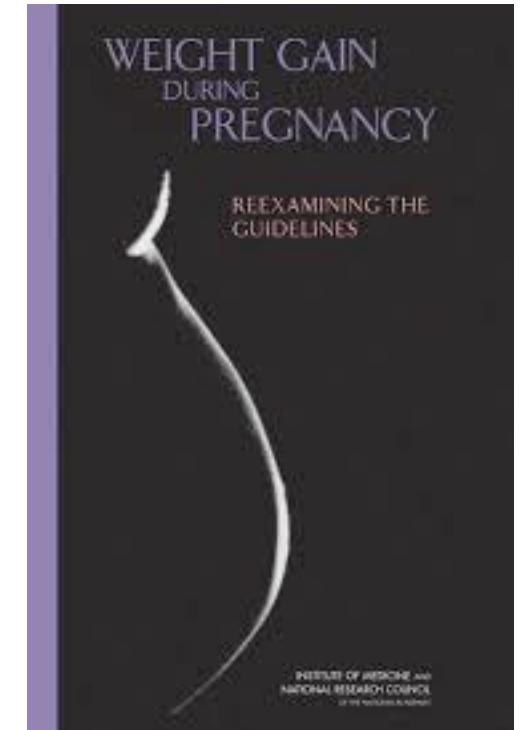
Research Recommendation 7-1: To permit the development of improved recommendations for GWG in the future, the committee recommends that the National Institutes of Health and other relevant agencies should provide support to researchers to (a) conduct studies to assess utilities (values) associated with short- and long-term health outcomes associated with GWG for both mother and child and (b) include these values in studies that employ decision analytic frameworks to estimate optimal GWG according to category of maternal prepregnancy BMI and other subgroups.



2009 IOM Guidelines

Recommendation for Research

Research Recommendation 7-1: To permit the development of improved recommendations for GWG in the future, the committee recommends that the National Institutes of Health and other relevant agencies should provide support to researchers to (a) conduct studies to assess utilities (values) associated with short- and long-term health outcomes associated with GWG for both mother and child and (b) include these values in studies that employ decision analytic frameworks to estimate optimal GWG according to category of maternal prepregnancy BMI and other subgroups.



Work needed

1. Establish the seriousness of relevant health outcomes
2. Apply the values in regression models seeking to establish optimal weight gain ranges





Rating the seriousness of maternal and child health outcomes linked with pregnancy weight gain

Lisa M. Bodnar^{1,2}  | Dmitry Khodyakov³ | Sara M. Parisi¹ | Katherine P. Himes²  |
Jessica G. Burke⁴ | Jennifer A. Hutcheon⁵ 

- Online Delphi panel using modified approach developed by RAND Corporation (ExpertLens)

Panel participants

- N=82 pregnant or recently post-partum individuals
- N=84 clinical or public health perinatal health professionals
- Use purposive sampling to obtain a group reflecting geographic and racial diversity of the United States
 - Over-inclusion of non-white participants
 - At least one participant from each state



Approach

- 11 health outcomes linked with pregnancy weight gain
- Panelists assigned ratings from 0 (not serious) to 100 (most serious)

Child outcomes



Infant death



Stillbirth



Preterm birth
SGA birth



LGA birth



Childhood
obesity

Maternal outcomes



Gestational
diabetes



Unplanned
cesarean



Maternal obesity



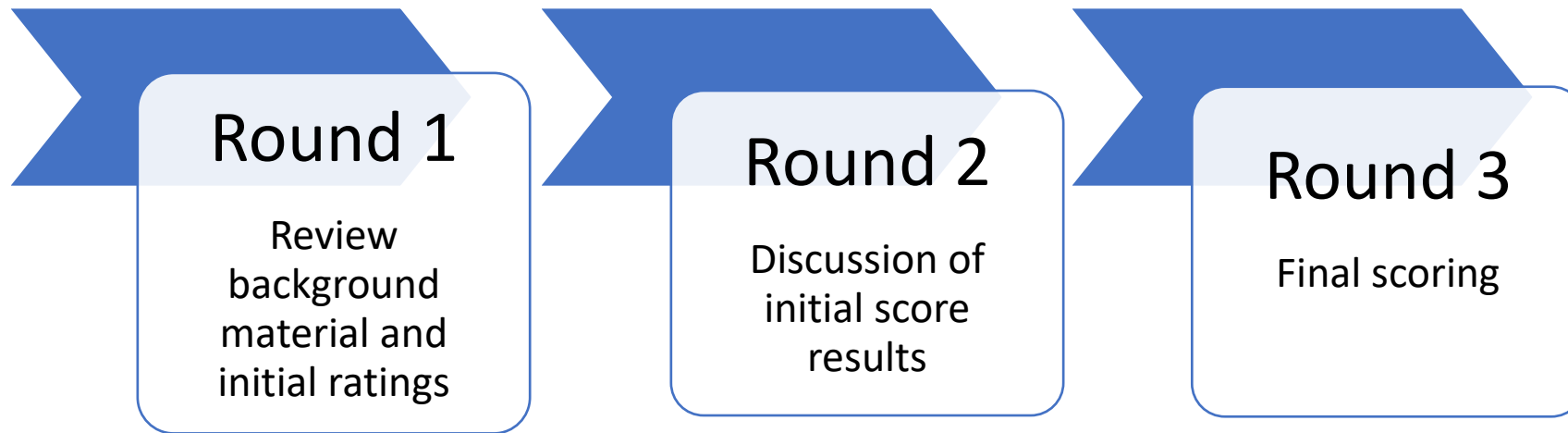
Pre-eclampsia



Maternal
metabolic
syndrome

Approach

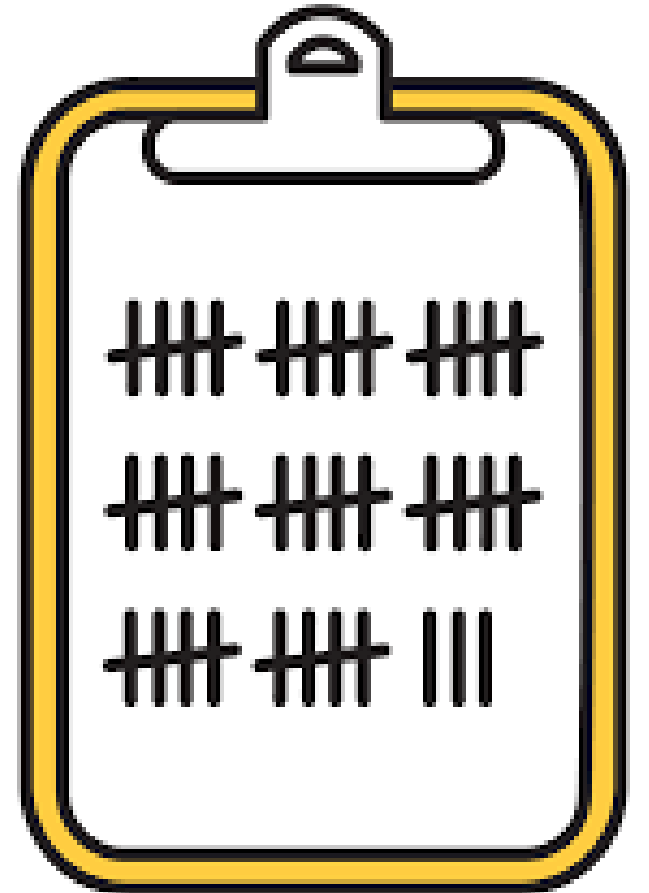
- 3 round process:

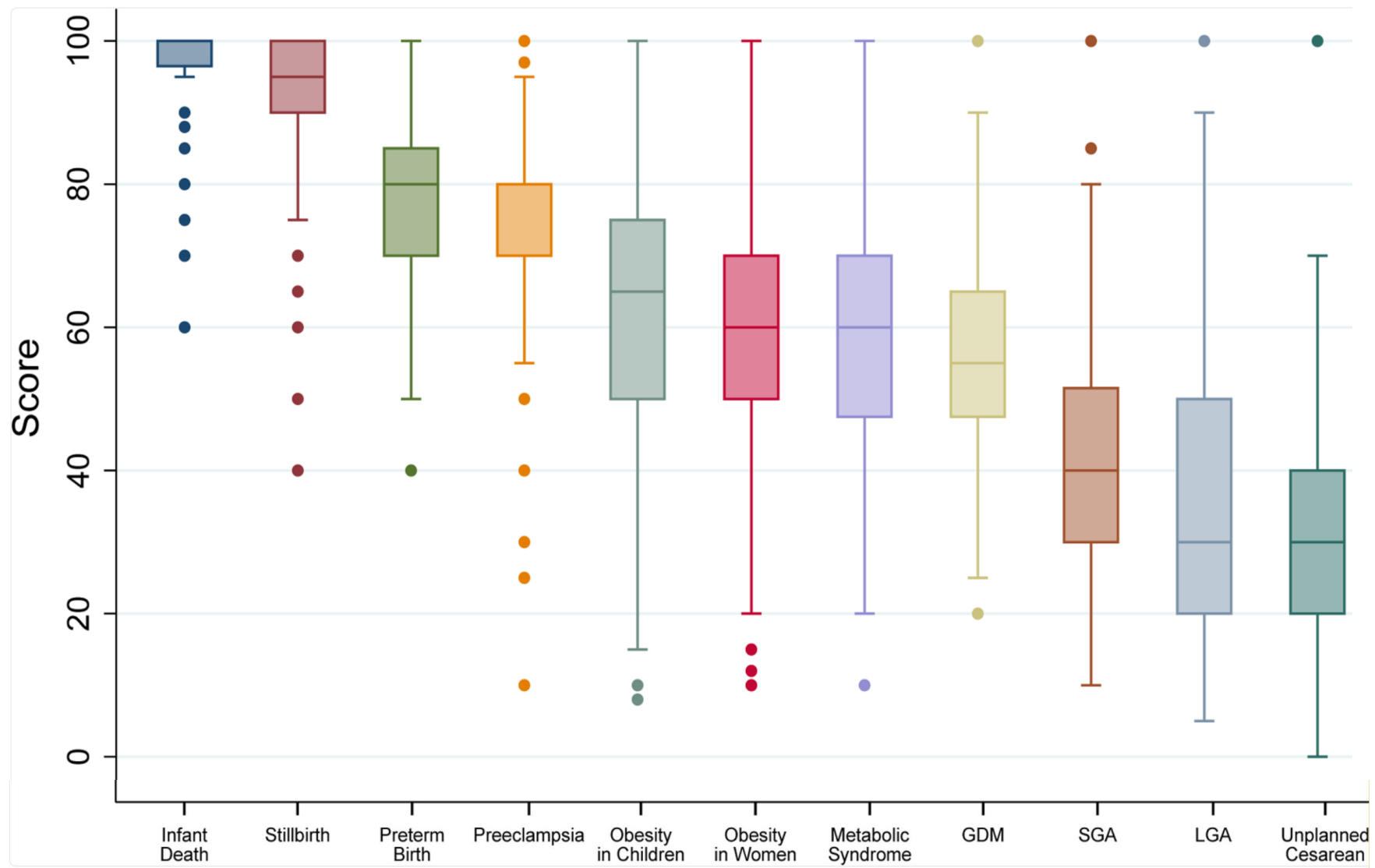


- Did not attempt to achieve consensus
 - Wanted to capture variability in perspective

Key Findings

- Infant death, stillbirth, preterm birth, and preeclampsia rated as most serious
- SGA, LGA, unplanned CS least serious
- High consensus between care providers and patients in ratings
- Variation in ratings within each outcome small compared with variation in ratings between outcome





Work needed

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Original Research Article

Do current pregnancy weight gain guidelines balance risks of adverse maternal and child health in a United States cohort?

Lisa M Bodnar^{1,2,3,*}, Kari Johansson^{4,5}, Katherine P Himes^{2,3}, Dmitry Khodyakov⁶, Barbara Abrams⁷, Sara M Parisi¹, Jennifer A Hutcheon⁸



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Original Research Article

Gestational weight gain below recommendations and adverse maternal and child health outcomes for pregnancies with overweight or obesity: a United States cohort study

Lisa M Bodnar^{1,2,3,*}, Kari Johansson^{4,5}, Katherine P Himes⁶, Dmitry Khodyakov⁷, Barbara Abrams⁸, Sara M Parisi¹, Jennifer A Hutcheon⁹



Aim

- To identify the range of pregnancy weight gain that minimizes risks of a composite outcome of 10 adverse maternal and child health outcomes, weighted for their seriousness
 - By pre-pregnancy BMI category



Approach

- Participants of nuMoM2b Heart Health study
 - n=2344 nulliparous pregnancies
 - 8 sites across US
 - Followed-up at 2-7 years post-partum



Approach

- Identified pregnancies that experienced *any* of:
- Assigned a 'seriousness score' to these pregnancies based on the values established by the Delphi panel

Child outcomes	Maternal outcomes
 Infant death	 Gestational diabetes
 Stillbirth	 Unplanned cesarean
 Preterm birth SGA birth	 Maternal obesity
 Childhood obesity	 Pre-eclampsia
	 Maternal metabolic syndrome

Approach

- E.g.

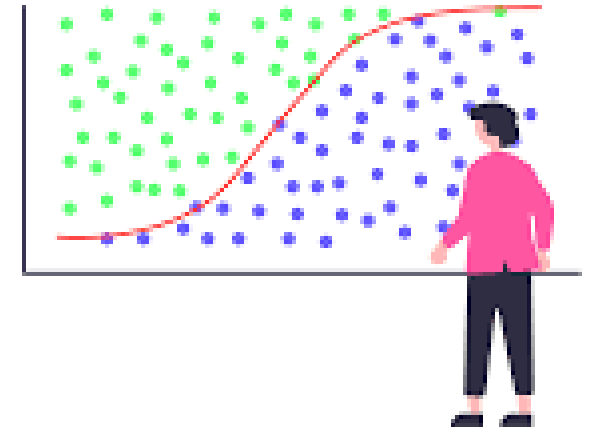
Participant ID	Pregnancy outcome(s)	Seriousness score
1	Pre-eclampsia	80
2	none	0
3	SGA birth	40

- Here, pre-eclampsia “counts” more than SGA birth



Approach

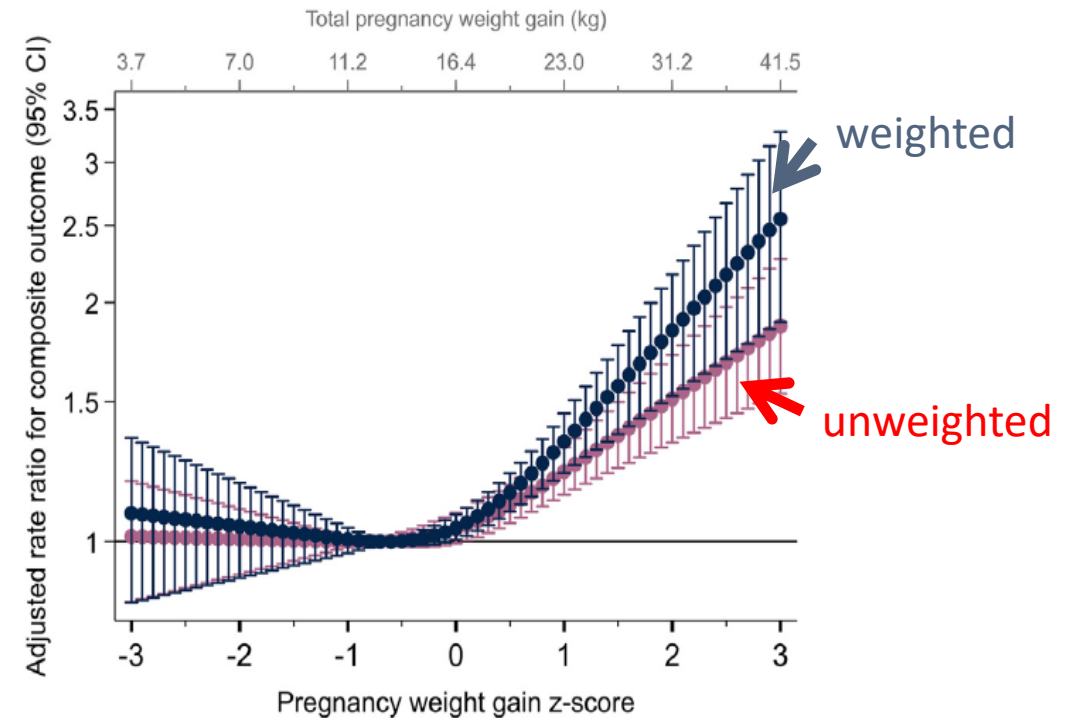
- Conducted multivariable regression linking pregnancy weight gain with risk of adverse outcomes
- Outcome= count of 'seriousness points'
- Poisson regression
 - Bootstrapped 95% CIs



Findings

1) Weighting outcomes for their seriousness matters

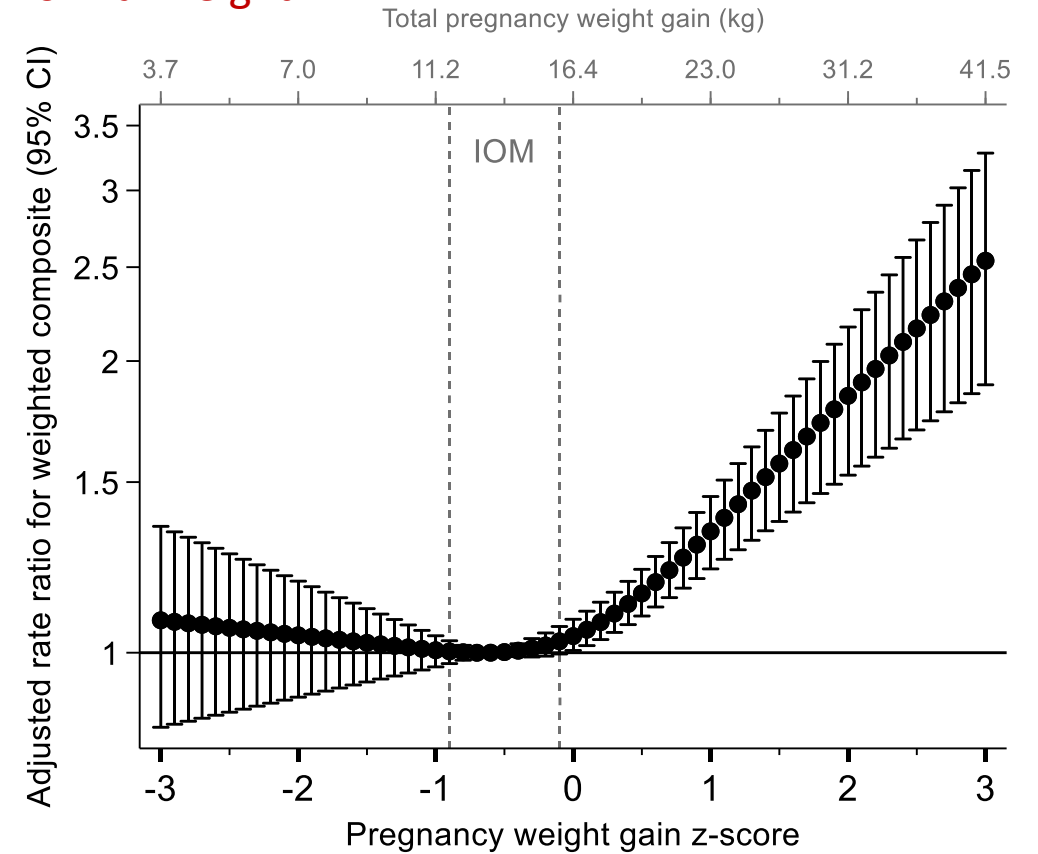
- Risks of higher weight gain became more pronounced
- Common outcomes with higher weight gain (pre-eclampsia, obesity) rated more serious than the most common outcome associated with lower weight gain (SGA)



Findings

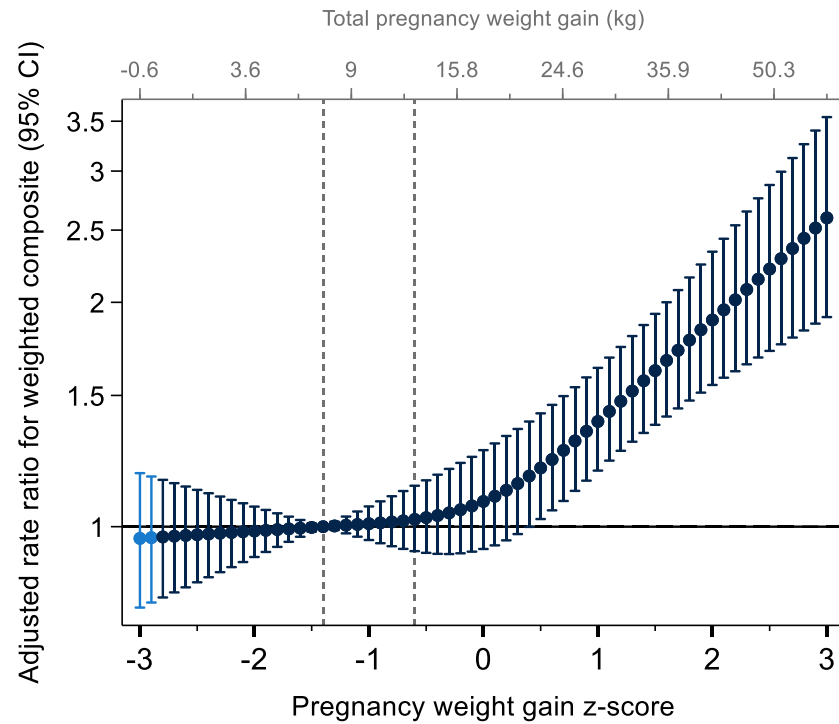
- 2) Weight gain below current recommendations was not linked with increased risks

Normal weight

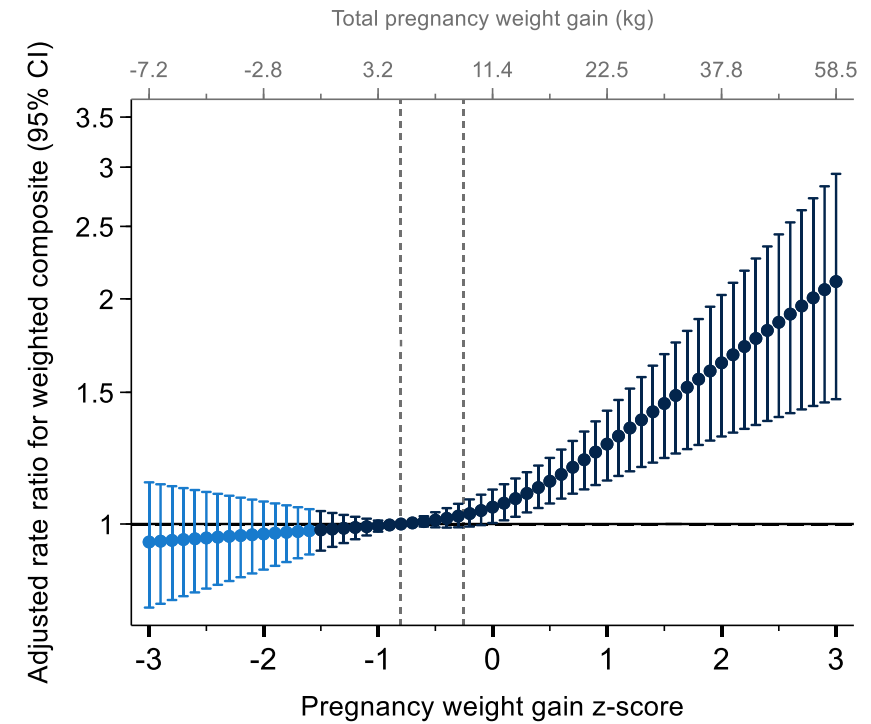


Findings

Overweight



Obesity



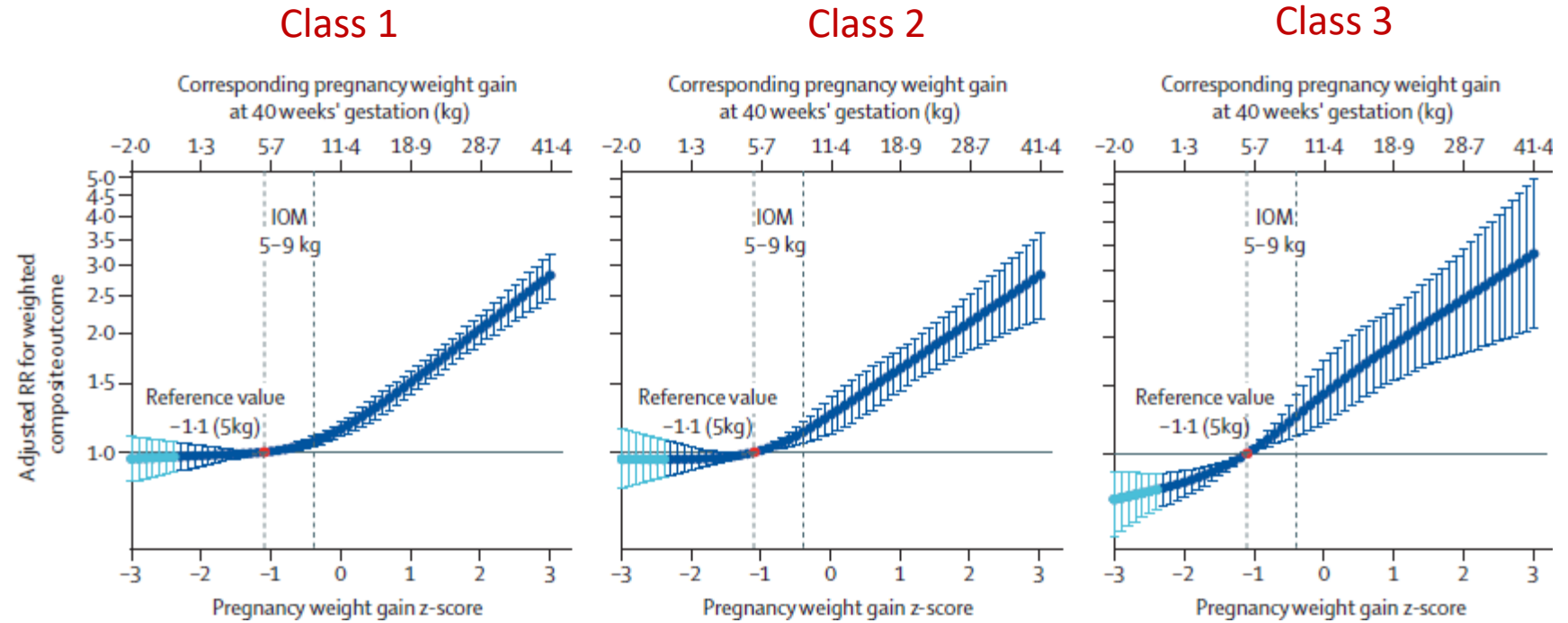
Findings

- Collaborated with Dr Kari Johansson, Karolinska Institute, to apply our methods to a population-based cohort of 15,760 pregnant individuals with obesity
- Stratified by class of obesity



Findings

- Weight gain below current recommendations not associated with increased risk



Summary

- New research has been done to fill knowledge gaps identified by the 2009 IOM Committee
- Our research has:
 - Established how pregnant individuals and maternal-child health experts rate the seriousness of 11 outcomes
 - Used ratings in analyses to define optimal pregnancy weight gain ranges



Summary

- Our new evidence suggests that the lower limit of current IOM recommendations may be too high
- This is particularly important for individuals with obesity
 - lower weight gain or weight loss may be beneficial



Questions?

Jennifer Hutcheon

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Extra slides



eTable 1. Distribution of final ratings of the seriousness of maternal and child health outcomes overall and by panel

Health outcome	5 th percentile	25 th percentile	Median	75 th percentile	95 th percentile
Final scores ¹					
Infant death	85	97	100	100	100
Stillbirth	70	90	95	100	100
Preterm birth	60	70	80	85	95
Preeclampsia	50	70	80	80	90
Obesity in children	20	50	65	75	90
Obesity in women	30	48	60	70	90
Metabolic syndrome in women	30	50	60	70	85
Gestational diabetes	30	48	55	65	80
Small-for-gestational-age birth	15	30	40	52	70
Large-for-gestational-age birth	10	20	30	40	60
Unplanned cesarean delivery	10	20	30	50	70

2009 IOM Guidelines

Although the results of this quantitative risk analysis by Dr. Hammitt provided general support for the GWG guidelines that the committee developed from published and commissioned research data needed to support a more complete and persuasive analysis were unavailable. In particular, more information is needed on associations between GWG and longer term maternal outcomes, such as postpartum weight retention and later reproductive function and health, and child health outcomes such as fetal growth restriction, child neurocognitive outcomes, and obesity. Such data should include not only the frequencies of outcomes but also the utilities associated with each so that appropriate quality adjustments could be calculated.

