

# Giving Birth to Obesity: Do Caesarean Sections Increase the Risk of Offspring Obesity in Childhood to Young Adulthood compared to Vaginal Birth Delivery?



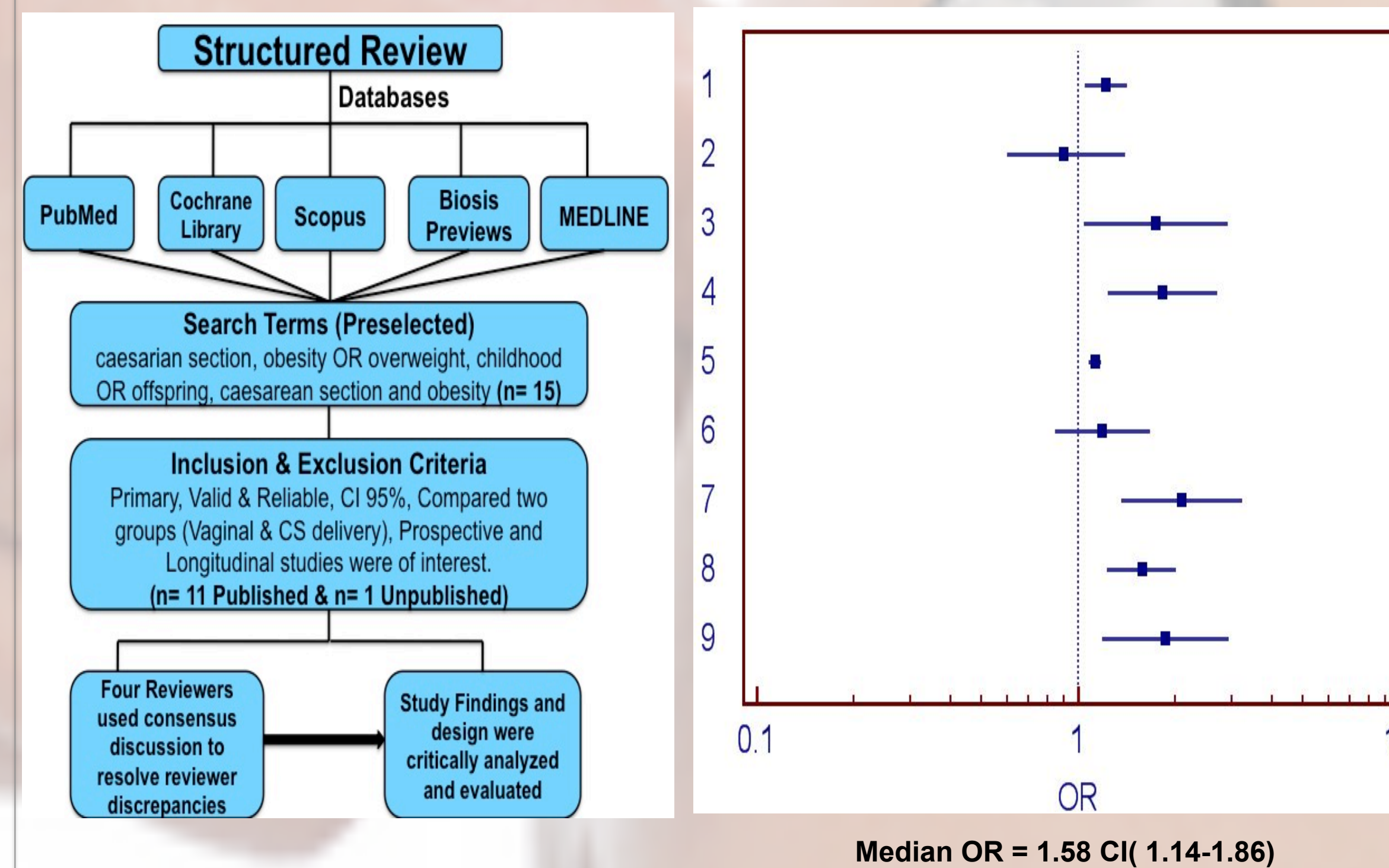
Esi Dankwa<sup>1</sup>, Jennifer Marcelo<sup>1</sup>, Zainab Nweke-Muse<sup>1</sup>, and Ariana Rodriguez<sup>1</sup>  
1. University of Ottawa, Faculty of Health Sciences



## ABSTRACT

Caesarean section (CS) rates are steadily rising and have exceeded the maximum recommended level of 15% by the OECD/WHO. The objective of this structured review was to examine the relationship between mode of delivery and the risk of offspring obesity and overweight in later life - up to 25 years old – by comparing caesarean and vaginal deliveries. A structured review was done on 11 articles extracted from 5 databases and an inclusion criteria was set. Of the 11 articles that were reviewed, there were 8 that found an association between CS delivery and obesity. In conclusion, findings suggest that there is an association between CS delivery and offspring obesity.

## METHODOLOGY



## LIMITATIONS

- Only articles published in English were reviewed
- Confounding variables were not considered
- Researcher biases were not considered
- Inconsistencies were found in selecting study designs

## FUTURE DIRECTIONS

Future research should consider possible confounders (such as maternal weight and SES), since unmeasured confounding variables can mask or yield spurious results.

The mechanism by which this association occurs is still unclear. Further studies must be performed to validate the microbiota theory and to explore the potential use of probiotics to negate the effects of CS delivery.

## DISCUSSION

From 9 of the 11 articles that specifically calculated OR, it can be inferred that 7 fall above 1, which suggests a strong likelihood of offspring obesity resulting from CS delivery.

It is clinically relevant to provide sound evidence in the association between CS and future related health risks to enable informed decision regarding CS delivery in the absence of medical indication.

The mechanism by which CS contributes to a greater risk of obesity seems to be based on changes in gut microbiota.

With CS, there is a lack of contact with the maternal vaginal flora, which results in reduced populations of Bifidobacteria and Bacteroides in the gastrointestinal tract - both of which protect against overweight by influencing gut energy harvest from the diet

Some articles failed to consider strong confounders such as maternal pre-pregnancy weight or BMI, thus association should not be deemed causal.

## CONCLUSION

According to our findings, there is a positive association between CS delivery and offspring obesity compared to vaginal delivery, however, future research is required.

## REFERENCES

1. Barros, F. C., A. Matijasevich, P. C. Hallal, B. L. Horta, A. J. Barros, A. B. Menezes, I. S. Santos, D. P. Gigante, and C. G. Victora. 2012. Caesarean section and risk of obesity in childhood, adolescence, and early adulthood: Evidence from 3 Brazilian birth cohorts. *The American Journal of Clinical Nutrition* 95 (2) (Feb): 465-70.
2. Blustein, J., T. Attna, M. Liu, A. M. Ryan, L. M. Cox, M. J. Blaser, and L. Trasande. 2013. Association of caesarean delivery with child adiposity from age 6 weeks to 15 years. *International Journal of Obesity* (2005) 37 (7) (Jul): 900-6.
3. Darmasaseelane, K., M. J. Hyde, S. Santhakumaran, C. Gale, and N. Modi. 2014. Mode of delivery and offspring body mass index, overweight and obesity in adult life: A systematic review and meta-analysis. *PLoS One* 9 (2) (Feb 26): e87896.
4. Fleming, K., C. G. Woolcott, A. C. Allen, P. J. Veugelers, and S. Kuhle. 2013. The association between caesarean section and childhood obesity revisited: A cohort study. *Archives of Disease in Childhood* 98 (7) (Jul): 526-32.
5. Goldani, M. Z., M. A. Barbieri, A. A. da Silva, M. R. Gutierrez, H. Bettiol, and H. A. Goldani. 2013. Caesarean section and increased body mass index in school children: Two cohort studies from distinct socioeconomic background areas in Brazil. *Nutrition Journal* 12 (1) (Jul 25): 104.
6. Huh, S. Y., S. L. Rifas-Shiman, C. A. Zera, J. W. Edwards, E. Oken, S. T. Weiss, and M. W. Gillman. 2012. Delivery by caesarean section and risk of obesity in preschool age children: A prospective cohort study. *Archives of Disease in Childhood* 97 (7) (Jul): 610-6.
7. Li, H., R. Ye, L. Pei, A. Ren, X. Zheng, and J. Liu. 2014. Caesarean delivery, caesarean delivery on maternal request and childhood overweight: A Chinese birth cohort study of 181 380 children. *Pediatric Obesity* 9 (1) (Feb): 10-6.
8. Li, H. T., Y. B. Zhou, and J. M. Liu. 2013. The impact of caesarean section on offspring overweight and obesity: A systematic review and meta-analysis. *International Journal of Obesity* (2005) 37 (7) (Jul): 893-9.
9. ———. 2012. Caesarean section might moderately increase offspring obesity risk. *The American Journal of Clinical Nutrition* 96 (1) (Jul): 215; author reply 216.
10. Mamun, A. A., R. Sutharsan, M. O'Callaghan, G. Williams, J. Najman, H. D. McIntyre, and L. Callaway. 2013. Caesarean delivery and the long-term risk of offspring obesity. *Obstetrics and Gynecology* 122 (6) (Dec): 1176-83.
11. Mesquita, D. N., M. A. Barbieri, H. A. Goldani, M. Z. Goldani, G. Kac, A. A. Silva, and H. Bettiol. 2013. Caesarean section is associated with increased peripheral and central adiposity in young adulthood: Cohort study. *PLoS One* 8 (6) (Jun 27): e66827.
12. Wang, L., A. Alaman, J. Southerland, K. Wang, J. Anderson, and M. Stevens. 2013. Caesarean section and the risk of overweight in grade 6 children. *European Journal of Pediatrics* 172 (10) (Oct): 1341-7.

## ACKNOWLEDGEMENTS

The reviewers would like to thank Professor Raywat Deonandan and the Canadian Society for Epidemiology and Biostatistics (CSEB)

## BACKGROUND AND OBJECTIVE

•Caesarean section (CS) rates have exceeded the maximum recommended level of 15%.<sup>3</sup>

•Predictions suggest that in the upper and middle income countries, CS may surpass vaginal births as the primary mode of delivery.<sup>2,8</sup>

•Research has shown that CS may pose a risk for offspring obesity and overweight, which can increase susceptibility to other chronic diseases such as Type 2 diabetes, sleep apnea, hypertension, and psychosocial problems.<sup>1,7</sup>

**OBJECTIVE:** To perform a structured review of the literature to examine the relationship between mode of delivery and the risk of offspring obesity in later life – up to 25 years old – by comparing caesarean and vaginal deliveries.

## RESULTS

•11 articles were reviewed; 9 found an association between CS delivery and obesity and overweight, while 2 articles found no association between the variables, and 1 remained inconclusive.