

Population attributable risk of smoking during pregnancy on obesity in offspring

Canada is undergoing an obesity epidemic and this complex problem creates challenges for reducing the public health burden. One emerging risk factor for the development of obesity in offspring is maternal smoking during pregnancy.¹ A recent meta-analysis found an increased relative risk of obesity in the offspring of 1.47 (95% CI: 1.26–1.73) where the mother had smoked during pregnancy.¹ However, to our knowledge, the population attributable risk (PAR) of smoking on obesity in the exposed child has not been calculated. Thus, to provide an estimate of the overall health impact of efforts to reduce smoking during pregnancy, we calculated the PAR for the United States, England and Canada.

Data from the major national health surveys or surveillance in each country were used to estimate smoking during pregnancy (US²: smoking during the last three months of pregnancy, 12.3%; England³: maternal smoking at the time of delivery, 11.5%; Canada⁴: pregnant women aged 15–55 who smoked daily or occasionally during their previous pregnancy, 14.3%). We used Levin's formula ($P_e (RR_e - 1) / [1 + P_e (RR_e - 1)]$) to calculate PAR for each country.

The calculated PAR was 5.5% in the US, 5.1% in England and 6.3% in Canada. These estimates suggest that smoking during pregnancy is an avoidable risk factor responsible for a substantial proportion of the childhood obesity epidemic. For instance, this effect size implies that the health care costs associated with obesity in offspring as a result of their mothers' smoking during pregnancy are over \$9 billion a year in the US alone.⁵

These values are likely to underestimate the full burden of smoking during pregnancy on obesity in the offspring. The effect of smoking during pregnancy on obesity may occur during the first trimester, before many women are aware of the pregnancy, resulting in higher non-disclosure rates. This calculation also does not include the effect that smoking during pregnancy may have on other related metabolic outcomes in the offspring, such as diabetes.

All three countries (US, UK, and Canada) have seen a decline over the past decade in the prevalence of smoking during pregnancy. Unfortunately, many subjurisdictions and population groups, particularly among marginalized communities, continue to have smoking during pregnancy rates in excess of 25% – a level that suggests a PAR of obesity of 10.5%. This suggests that addressing smoking during pregnancy will have an immediate and long-lasting impact on the worldwide obesity epidemic and that increased efforts to promote smoking cessation should be included in strategies to combat obesity.

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doi: 10.17269/CJPH.107.5686

REFERENCES

1. Weng SF, Redsell SA, Swift JA, Yang M, Glazebrook CP. Systematic review and meta-analyses of risk factors for childhood overweight identifiable during infancy. *Arch Dis Child* 2012;97(12):1019–26. PMID: 23109090. doi: 10.1136/archdischild-2012-302263.
2. Tong VT, Dietz PM, Morrow B, D'Angelo DV, Farr SL, Rockhill KM, et al. Trends in smoking before, during, and after pregnancy – Pregnancy Risk Assessment Monitoring System, United States, 40 sites, 2000–2010. *MMWR Surveill Summ* 2013;62(6):1.
3. Statistics on Women's Smoking Status at Time of Delivery: England, Quarter 1, April 2014 to June 2014. London, UK: Health and Social Care Information Centre, 2014. Available at: <http://www.hscic.gov.uk/catalogue/PUB14834/stat-wome-smok-time-deli-eng-q1-14-15-rep.pdf> (Accessed November 5, 2014).
4. Lange S, Probst C, Quere M, Rehm J, Popova S. Alcohol use, smoking and their co-occurrence during pregnancy among Canadian women, 2003 to 2011/12. *Addict Behav* 2015;50:102–9. PMID: 26117214. doi: 10.1016/j.addbeh.2015.06.018.
5. Cawley J, Meyerhoefer C. The medical care costs of obesity: An instrumental variables approach. *J Health Econ* 2012;31:219–30. PMID: 22094013. doi: 10.1016/j.jhealeco.2011.10.003.