

The carbon footprint of different modes of birth in the UK and the Netherlands: an exploratory study using life cycle assessment

Alexander Heazell¹, Nienke A. Spil¹, Kim Nieuwenhuizen², Rachel Rowe³, James Thornton⁴, Elizabeth Murphy⁵, Evelyn Verheijen⁶, and Clifford Shelton⁵

¹The University of Manchester Faculty of Biology Medicine and Health

²Leiden Universitair Medisch Centrum Oncologie Centrum Klinisch

³University of Oxford Nuffield Department of Population Health

⁴University of Nottingham

⁵Manchester University NHS Foundation Trust

⁶Saxenburgh Groep

July 18, 2023

Abstract

Objective: To compare the carbon footprint of caesarean and vaginal birth. *Design:* Life cycle assessment. *Setting:* Tertiary maternity units and home births in the UK and the Netherlands *Methods:* A life cycle assessment, including: equipment use, energy, analgesia, hospital stay, waste, sterilisation and laundry, was conducted using primary data combined with data from published sources. *Main Outcome Measures:* ‘Carbon footprint’ (in kgCO₂e) *Results:* Excluding analgesia, the carbon footprint of a caesarean birth in the UK was 31.21 kgCO₂e, compared with 12.47 kgCO₂e for vaginal birth in hospital and 7.63 kgCO₂e at home. In the Netherlands the carbon footprint of a caesarean was higher (32.96 kgCO₂e), but lower for vaginal birth in hospital and home (10.74 and 6.27 kgCO₂e respectively). Emissions associated with analgesia for vaginal birth were: 0.08 kgCO₂e (opioid analgesia), 0.75 kgCO₂e (remifentanyl), 1.2 kgCO₂e (epidural) and 237.33 kgCO₂e (nitrous oxide with oxygen). Differences in analgesia use resulted in a lower average carbon footprint for vaginal birth in the Netherlands than the UK (11.64 vs. 193.26 kgCO₂e). *Conclusion:* The carbon footprint of a caesarean is higher than for vaginal birth if analgesia is excluded, but this is very sensitive to the analgesia used; use of nitrous oxide with oxygen multiplies the carbon footprint of vaginal birth 25-fold. Alternative methods of pain relief or nitrous oxide destruction systems would lead to a substantial improvement in carbon footprint. Although clinical need and maternal choice are paramount, protocols should consider the environmental impact of different choices.

Hosted file

BJOG_Version_5.docx available at <https://authorea.com/users/489002/articles/655345-the-carbon-footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment>

Hosted file

BJOG_Figure_1.pptx available at <https://authorea.com/users/489002/articles/655345-the-carbon-footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment>

Hosted file

BJOG_Figure_2.pptx available at <https://authorea.com/users/489002/articles/655345-the-carbon-footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment>

[footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment](https://authorea.com/users/489002/articles/655345-the-carbon-footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment)

Hosted file

BJOG_Figure_3.pptx available at <https://authorea.com/users/489002/articles/655345-the-carbon-footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment>

Hosted file

BJOG_Figure_4.pptx available at <https://authorea.com/users/489002/articles/655345-the-carbon-footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment>

Hosted file

BJOG_Table_1.docx available at <https://authorea.com/users/489002/articles/655345-the-carbon-footprint-of-different-modes-of-birth-in-the-uk-and-the-netherlands-an-exploratory-study-using-life-cycle-assessment>