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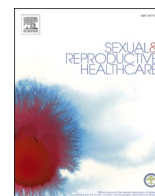
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## Short communication

## Decline in home births associated with faster increase in trend of postpartum haemorrhage and manual removal of the placenta

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## ABSTRACT

In this study we explored the relationship between home birth rates and increasing rates of postpartum haemorrhage (PPH) and manual removal of the placenta (MROP). Data were used from the Dutch national perinatal registry (2000–2014) of women in midwife-led care. Adjusting for place of birth flattened the increasing trends of PPH and MROP. By adjusting for place of birth, the rising trend of MROP among multiparous women disappeared. This suggests that if home birth rates had not declined, PPH and MROP rates might not have increased as much. This study supports policies of enabling women to choose home births.

## Introduction

Rates of postpartum haemorrhage (PPH) exceeding 1000 mL and manual removal of the placenta (MROP) are rising in high-income countries [1]. Our previous study on this subject revealed increasing rates of PPH and MROP among both low- and high-risk women in the Netherlands between 2000 and 2014 [2]. We also observed rising rates of induction and augmentation of labour, pain medication, and caesarean sections (CS). Despite the identified associations between induction of labour with oxytocin, augmentation of labour, epidural analgesia, and PPH/MROP, adjustment for these interventions did not eliminate the upward trends in PPH and MROP. Although the increasing trend in MROP plateaued, it remained statistically significant.

After the publication of our previous paper, a new research question arose about the role of home birth in the increase of PPH/MROP. Existing literature indicates a decreasing trend in home births in the Netherlands [3]. As home births are known to be associated with lower rates of PPH [4], we questioned whether an association exists between the decline in home births and the increasing rates of PPH and MROP

among nulliparous and multiparous women giving birth in midwife-led care.

## Methods

Methods employed in this study closely align with those used in our previous paper on trends of PPH and MROP [2]. Data were used from the Dutch national perinatal registry 'Perined'. In the current study we focused on births in midwife-led care, as home births only occur in this setting. Generally, only low-risk women give birth in midwife-led care. They can choose to give birth at home or in the hospital with their community midwife. Women requiring referral before birth were excluded from our analyses. Women with severe blood loss or a retained placenta are referred to obstetrician-led care after birth where a MROP is performed if required. These women were included. We included all births of single, term children born in midwife-led care between 2000 and 2014, which were registered in Perined. Exclusions comprised cases with missing information on parity or gestational age.

PPH was defined as blood loss of  $\geq 1000$  mL within the first 24 h

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**Table 1**

Unadjusted and adjusted ORs of trend in PPH between 2000 and 2014 in midwife-led care at the time of birth.

Year	Postpartum haemorrhage						Total n	Manual removal of the placenta				
	Total n	Total n	%	OR (95 % CI)	aOR* (95 % CI)	aOR# (95 % CI)		Total n	%	OR (95 % CI)	aOR* (95 % CI)	aOR# (95 % CI)
Nulliparous women												
2000	21,953	717	3.3	1.00	1.00	1.00	22,042	287	1.3	1.00	1.00	1.00
2014	12,918	693	5.4	1.68 (1.51–1.87)	1.70 (1.53–1.89)	1.48 (1.33–1.65)	12,963	280	2.2	1.67 (1.42–1.98)	1.72 (1.45–2.03)	1.52 (1.29–1.80)
Multiparous women												
2000	40,814	833	2.0	1.00	1.00	1.00	40,757	357	0.9	1.00	1.00	1.00
2014	31,080	1,101	3.5	1.76 (1.61–1.93)	1.78 (1.63–1.96)	1.44 (1.31–1.58)	31,267	371	1.2	1.36 (1.17–1.57)	1.39 (1.20–1.62)	1.06 (0.91–1.23)

Non-significant trends are indicated in bold type, as these indicate no significant difference in trend between 2000 and 2014.

\* adjusted for maternal age, ethnic background, socio-economic status, birthweight, gestational age, and obstetric anal sphincter injury.

# adjusted for the factors mentioned above, and for place of birth.

after birth, estimated and/or measured by the attending maternity care professional(s).

We described numbers and percentages of PPH and MROP for the years 2000 and 2014. Subsequently, we applied univariable and multivariable logistic regression analyses to calculate the association between the year of birth and the outcome. Odds ratios (OR) with 95 % confidence intervals (CI) were described. Adjustments were made to examine whether baseline characteristics or place of birth were associated with the trend in the primary outcomes. First, we adjusted the odds ratio (aOR) of this trend for baseline characteristics (i.e., maternal age, ethnic background, socio-economic status, birthweight, gestational age, and obstetric anal sphincter injury). Subsequently, we added an adjustment for place of birth. The aOR after adjusting indicates how the trend might have been if the adjusting factor would not have changed. All analyses were stratified for nulliparous and multiparous women.

We used STATA version 14 (StataCorp, Texas, USA) for the analyses.

For a detailed description of the data analyses, variables, and confounders, we refer to our previous paper [2].

## Results

A total of 813,395 women gave birth in midwife-led care between 2000 and 2014. The total number of included women in 2000 was 62,767 for the outcome PPH and 62,779 for the outcome MROP, and the number in 2014 was 43,998 for PPH and 44,230 for MROP. In women in midwife-led care, the overall rate of home births decreased from 73 % in 2000 to 51 % in 2014. Among nulliparous women, the decline was from 70 % to 45 %, while among multiparous women, it decreased from 74 % to 53 %.

PPH rates in midwife-led care increased from 3.3 % to 5.4 % among nulliparous women and from 2.0 % to 3.5 % among multiparous women (Table 1). After adjusting for place of birth (of which the trend declined), the aOR of the PPH rate in 2014 lowered from 1.70 (95 % CI 1.53–1.89) to 1.48 (95 % CI 1.33–1.65) for nulliparous women and from 1.78 (95 % CI 1.63–1.96) to 1.44 (95 % CI 1.31–1.58) for multiparous women. Concerning MROP, rates in midwife-led care increased from 1.3 % to 2.2 % among nulliparous women and from 0.9 % to 1.2 % among multiparous women. After adjusting for place of birth, the aOR of the rate in 2014 lowered from 1.72 (95 % CI 1.45–2.03) to 1.52 (95 % CI 1.29–1.80) for nulliparous women and from 1.39 (95 % CI 1.20–1.62) to 1.06 (95 % CI 0.91–1.23) for multiparous women.

## Discussion and conclusion

This present study reveals that adjustment for the decline in home

births leads to a flattening of trends in both PPH and MROP. Notably, the rising trend in MROP among multiparous women disappeared after adjusting for place of birth. This suggests that if home birth rates had not declined, MROP rates in midwife-led care might not have increased. Furthermore, rates of PPH and, among nulliparous women, rates of MROP would have seen less of an increase.

These findings align with studies showing lower rates of PPH and childbirth interventions in home births compared to hospital births among low-risk women [4]. Although many studies have shown beneficial results for women giving birth at home, giving birth at home is not legal or safely possible in many countries [5] and has declined in the Netherlands [3]. This study adds to the body of evidence about the safety and improved maternal outcomes of home births among low-risk women and supports the choice for a maternity care system and policy which enables women to choose for home birth.

## CRedit authorship contribution statement

**Anna E. Seijmonsbergen-Schermers:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Lilian L. Peters:** Writing – review & editing. **Suze Jans:** Writing – review & editing. **Corine J. Verhoeven:** Writing – review & editing. **Ank de Jonge:** Writing – review & editing, Supervision, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Ethical approval

The VU University Medical Center confirmed that ethical approval was not required for this study according to the Dutch legislation (reference 2019.597; <https://www.ccmo.nl/onderzoekers/wet-en-geving-voor-medisch-wetenschappelijk-onderzoek/uw-onderzoek-w-mo-plichtig-of-niet>).

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There was no external funding for this study. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

### Data sharing statement

The data that support the findings of this study are available from Perined (contact via [info@perined.nl](mailto:info@perined.nl)) for researchers who meet the criteria for access to confidential data, and if Perined gives permission. Restrictions apply to the availability of these data, which were used under license for this study.

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