Postpartum Haemorrhage 1

Postpartum haemorrhage: epidemiology, consequences, and missed opportunities

Arri Coomarasamy, Kulandaipalayam N Sindhu, Ioannis Gallos, Nishanthi Periyathambi, Malcolm J Price, Idnan Yunas, Zahida Qureshi, Francis G Muriithi, Caitlin R Williams, Sue Fawcus, Anne George, Fernando Althabe, Patricia Titulaer, Ashraf Aswat, Jenny A Cresswell, Sabaratnam Arulkumaran, Nick Scott, Adam J Devall, Olufemi T Oladapo

Excessive bleeding after childbirth, known as postpartum haemorrhage (PPH), can turn an uncomplicated birth into a catastrophe. Each year, PPH occurs in an estimated 27 million women worldwide—17 million after vaginal birth and 10 million during or after caesarean birth. An estimated 43 000 women die from PPH annually, translating to a death every 12 min. The pooled prevalence of PPH at vaginal birth is 12·6% (95% CI 10·1–15·2) and at caesarean birth 30·9% (95% credible interval 24·9–37·6), based on the conventional definition of PPH. Common causes of PPH are uterine atony, genital tract trauma, retained placenta, abnormal placentation, and coagulopathy. Risk factors include caesarean birth, multiple pregnancy, anaemia, high maternal BMI, previous PPH, female genital mutilation, sepsis, pre-eclampsia, macrosomia, and inadequate antenatal care. In addition to being the leading cause of maternal mortality worldwide, the consequences of PPH include serious morbidities such as severe anaemia, hysterectomy, organ failure, and long-term psychological trauma. The global economic burden of PPH is estimated at US$10·4 billion (95% credible interval $9·8–13·2 billion) annually, consisting of $3·6 billion ($3·2–6·2 billion) for health systems and $6·8 billion ($6·2–7·5 billion) for societies. Based on a rigorous review of the evidence, WHO has recently redefined PPH as objectively measured blood loss of at least 300 mL plus an abnormal haemodynamic sign, or objectively measured blood loss of at least 500 mL, whichever occurs first. This new definition prioritises early PPH diagnosis and treatment to avert life-threatening maternal outcomes. Comprehensive efforts to address missed opportunities in the prevention, diagnosis, and treatment of PPH are needed to improve outcomes. These efforts include addressing the unmet need for contraception, mitigating modifiable risks such as anaemia, avoiding caesarean sections that are not medically indicated, using effective single uterotonic prophylaxis for all births and combination prophylaxis for women at high risk of PPH, ensuring accurate and objective measurement of blood loss for early PPH diagnosis, and promptly implementing treatment with an evidence-based bundle. The PPH Roadmap (2023–30) provides a global framework for action.

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This is the first in a **Series** of three papers about postpartum haemorrhage. All papers in the Series are available at thelancet.com/series-do/postpartum-haemorrhage

Nuffield Department of Women's & Reproductive Health, University of Oxford, Oxford, UK (Prof A Coomarasamy MD, K N Sindhu PhD, N Periyathambi PhD, I Yunas MBBChir, A Aswat BSc, Prof A J Devall PhD); **UNDP/UNFPA/UNICEF/WHO/World Bank Special Programme of Research, Development and Research Training in Human Reproduction, Department of Sexual, Reproductive, Maternal, Child, Adolescent Health and Ageing, World Health Organization, Geneva, Switzerland** (Dr I Gallos MD, C R Williams PhD, F Althabe MD, J A Cresswell PhD, O T Oladapo MD); **School of Health Sciences & Psychology, Canadian University Dubai, Dubai, United Arab Emirates** (M J Price PhD); **Department of Obstetrics and Gynaecology, University of Nairobi, Nairobi, Kenya** (Prof Z Qureshi MMed); **Centre for Perinatal Research, School of Medicine, University of Nottingham, Nottingham, UK** (F Muriithi PhD); **Department of Obstetrics and Gynaecology, University of Cape Town, Cape Town, South Africa** (Prof S Fawcus MBBCh); **Christian Medical College, Vellore, India** (Prof A George MD); **International Confederation of Midwives, The Hague, Netherlands** (P Titulaer BSc); **City St George's University of London, London, UK**

Introduction

Some blood loss is expected after childbirth, but for some women the bleeding becomes excessive. Excessive bleeding after birth, called postpartum haemorrhage (PPH), can abruptly turn an uncomplicated birth into a life-threatening emergency. If PPH is not recognised and treated early, a woman can deteriorate very quickly and die from exsanguination. Each maternal death extinguishes the life and aspirations of a woman, denying her the fundamental right to survive childbirth and thrive. PPH-related maternal deaths can also leave behind newborn orphans, for whom the prospects of survival are poor. A 25-year longitudinal study in Ethiopia found that infants whose mothers died within 42 days of their birth were 57 times more likely to die within the first month of life when compared with those whose mothers survived.[1] Similarly, a survival analysis in rural Tanzania found children orphaned by early maternal deaths had only a 50% chance of reaching their first birthday, compared with more than a 90% chance in peers with living mothers.[2]

A particular tragedy of PPH deaths is that most are assessed to be preventable. Confidential enquiries into maternal deaths from multiple countries consistently show that poor access to care and substandard quality of care underlie most of these deaths.[3–5] Sound knowledge about the causes, risk factors, prevention, diagnosis, treatment, and consequences of PPH are prerequisites to improve outcomes. This three-part *Lancet* Series on PPH presents evidence and recommendations to improve the standard of care to reduce PPH morbidity and mortality. We call for urgent action on specific clinical and policy priorities and highlight important research gaps. In this first paper of the Series, we examine the epidemiology of PPH, including its definition, prevalence, causes, risk factors, consequences, and costs, and consider the missed opportunities to reduce its burden (panel 1, figure 1). The second and third papers of the Series focus on prevention and management of PPH, respectively.[16,17]

Definitions and terminology

The definitions and terminology[18] for PPH vary widely across guidelines, health systems, and research. These definitions often differ by both the variables used to constitute the definition (eg, blood loss alone, or blood loss plus vital signs) and the thresholds used for defining abnormal parameters (eg, 500 mL, 750 mL, or 1000 mL for blood loss).[18,19] Such variations have hampered progress in improving PPH outcomes.

(S Arulkumaran PhD); **Women's, Children's, and Adolescents' Health Program, Burnet Institute, Melbourne, VIC, Australia** (N Scott PhD)

Correspondence to: Prof Adam J Devall, Nuffield Department of Women's & Reproductive Health, University of Oxford, Oxford OX2 6NW, UK
adam.devall@wrh.ox.ac.uk

Panel 1: Search strategy and consensus-building consultations

We published systematic reviews of postpartum haemorrhage (PPH) prevalence[6] (last search: Aug 11, 2025), and causes and risk factors[7] (last search: Nov 30, 2024) in the lead-up to this Series. For our systematic review on the consequences of PPH, we conducted a comprehensive literature search on MEDLINE, Web of Science, Embase, Google Scholar, Cochrane Library, and ClinicalTrials.gov, using relevant free text search terms and Medical Subject Headings (last search: July 13, 2025). We also reviewed the latest international guidelines on the diagnosis, prevention, and treatment of PPH, and updated several systematic reviews on diagnosis, prevention, and treatment of PPH.[6–12]

An international consensus meeting on PPH was held in March, 2023, with a group of 27 key stakeholders from Argentina, Brazil, Kenya, Malawi, Nigeria, Norway, Pakistan, South Africa, Sri Lanka, Tanzania, the UK, and the USA. The conference was funded by the Gates Foundation, with no involvement or sponsorship from commercial organisations. Key questions and evidence on policies and recommendations for PPH diagnosis, prevention, treatment, and organisation of care were presented for discussion, and the scope of work for this Series was defined.

In March, 2023, WHO convened 136 stakeholders at the Global Summit on Postpartum Haemorrhage to identify persistent challenges in reducing the global burden of PPH and chart a course of action. Stakeholders included researchers, policy makers, guideline developers, programme implementers, women's advocates, funders, UN agencies, industry representatives, and innovators from more than 50 countries.[13] Key challenges identified included guideline variations, difficulties in implementing evidence-based recommendations in the field, insufficient clarity on research priorities, and fragmented advocacy efforts resulting in diluted messages and slower-than-desired progress. The PPH Roadmap (2023–30) was developed to outline steps for addressing these challenges.[14] As a key step in advancing the Roadmap, WHO, in collaboration with the International Federation of Gynecology and Obstetrics and the International Confederation of Midwives, developed the *Consolidated Guidelines for the Prevention, Diagnosis and Treatment of Postpartum Haemorrhage*.[15] This comprehensive set of guidelines provides an up-to-date repository of clinical practice guidance.

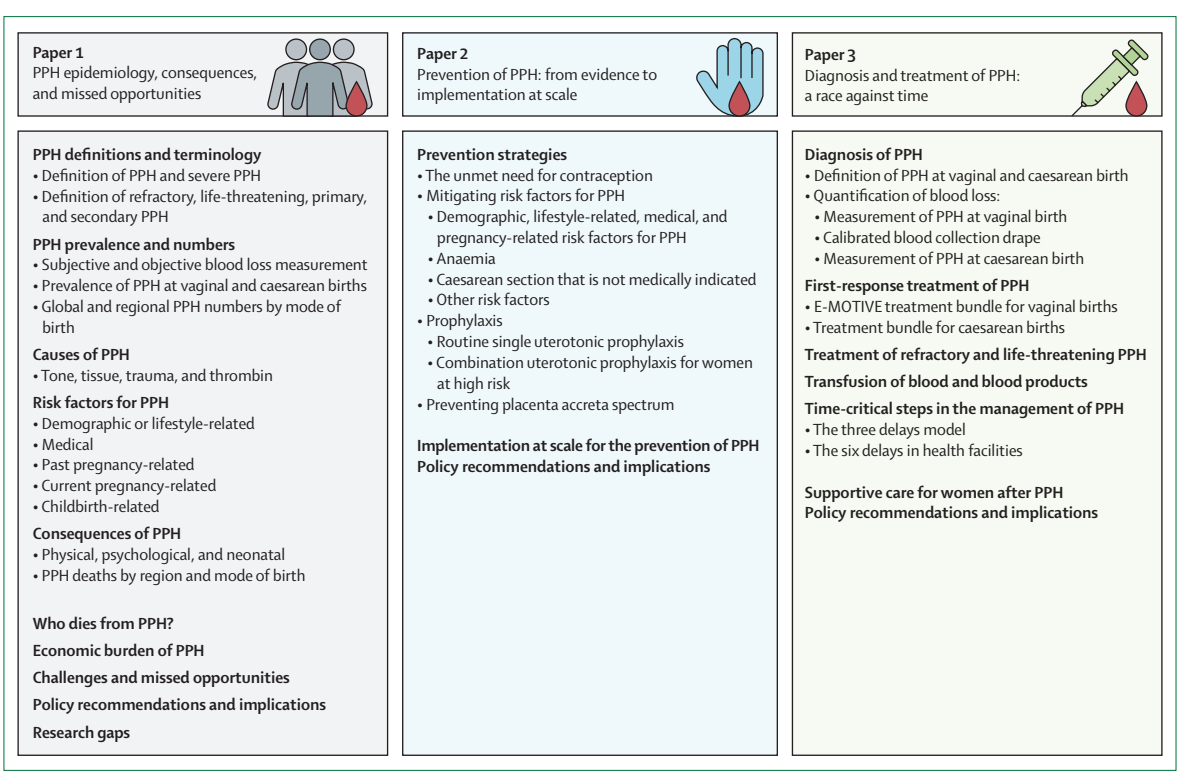


Figure 1: **Outline of the 2026 *Lancet* Series on postpartum haemorrhage**
PPH=postpartum haemorrhage.

WHO responded to this challenge by reappraising the definition of PPH through an evidence-based framework that included the systematic exploration of prognostic implications,[15,20] therapeutic effects,[9] and cost-effectiveness of using various clinical markers[21] or definitions for identifying women at risk of death or severe morbidity from PPH. The clinical markers explored included measured blood loss, pulse, systolic and diastolic blood pressure, and shock index, individually and in combination, by use of an individual participant data meta-analysis (IPDMA) of 12 datasets from 23 countries, comprising 312 151 women.[20] The analysis found that diagnostic criteria that included measured blood loss of 300 mL or more, in combination with any abnormal vital sign (eg, pulse >100 beats per min, systolic blood pressure <100 mm Hg, diastolic blood pressure <60 mm Hg, or shock index >1·0), or at least 500 mL blood loss even in the absence of an abnormal vital sign, had a prognostic sensitivity of 87–88% and prognostic specificity of 67–76% for predicting maternal death or severe morbidity.[20]

A Cochrane network meta-analysis evaluating the effectiveness of various combinations of diagnostic and treatment strategies for PPH found a diagnostic strategy that prompted treatment based on a three-option trigger (ie, clinical concern, blood loss ≥300 mL to <500 mL plus abnormal vital signs, or blood loss ≥500 mL), compared with a two-option trigger (clinical concern or blood loss ≥500 mL), resulted in reduced rates of PPH (≥500 mL; risk ratio [RR] 0·65, 95% CI 0·49–0·86; high certainty) and severe PPH (≥1000 mL; RR 0·38, 0·27–0·55; high certainty), and reduced need for additional uterotonics (RR 0·34, 0·20–0·55; high certainty).[9] There was also a reduced need for blood transfusion (RR 0·78, 0·38–1·59; moderate certainty) and of maternal death (RR 0·72, 0·00–2·9×10⁷; low certainty) with the three-option trigger strategy when compared with the two-option trigger; however, these findings were not significant.[9]

An international panel of experts, convened by WHO, considered the evidence on prognostic accuracy and on the importance of outcomes to women and health workers, resource implications and cost-effectiveness, acceptability, feasibility, and impact on equity of an expanded diagnostic criteria for PPH, and formulated a new recommendation for PPH diagnosis. The WHO–International Federation of Gynecology and Obstetrics–International Confederation of Midwives *Consolidated Guidelines for the Prevention, Diagnosis and Treatment of Postpartum Haemorrhage*,[15] therefore, recommends the diagnosis of PPH and initiation of first-response treatment (see the third paper in this Series), with the following criteria: objectively measured blood loss of at least 300 mL with any abnormal haemodynamic sign (pulse >100 beats per min, systolic blood pressure <100 mm Hg, diastolic blood pressure <60 mm Hg, or a shock index >1), or objectively measured blood loss of at least 500 mL, whichever occurs first within 24 h after childbirth, and with particular vigilance in the first 2 h.[15] The PPH definition based on these criteria prioritises prognostic sensitivity (ie, capturing women with predicted poor outcomes) and optimises early diagnosis and first-response treatment of PPH. Definitions of PPH terms used in this Series are presented in panel 2 and reflect commonly used classifications based on severity of bleeding, timing of onset of bleeding, and response to treatment or need for escalation of care. The prognostic data underpinning these terms should be reviewed and further refinement of the severity spectrum might be necessary to ensure the terms have a clear link to prognostic outcomes and treatment decisions.

***Panel 2:* Postpartum haemorrhage terminology**

By severity of bleeding

- PPH: objectively measured blood loss of at least 300 mL with any abnormal haemodynamic sign, or objectively measured blood loss of at least 500 mL, whichever happens first.
- Severe PPH: objectively measured blood loss of at least 1000 mL.
- Life-threatening PPH: bleeding that has compromised a woman's condition through haemodynamic shock, collapse, or acute organ failure, necessitating immediate life-saving interventions from health-care professionals. Life-threatening PPH is likely to occur when objectively measured blood loss is at least 1500 mL but can also occur at lower volumes of blood loss; for example, in a woman with severe anaemia.

By response to treatment

- Refractory PPH: PPH that has not responded to the first-line treatment bundle.

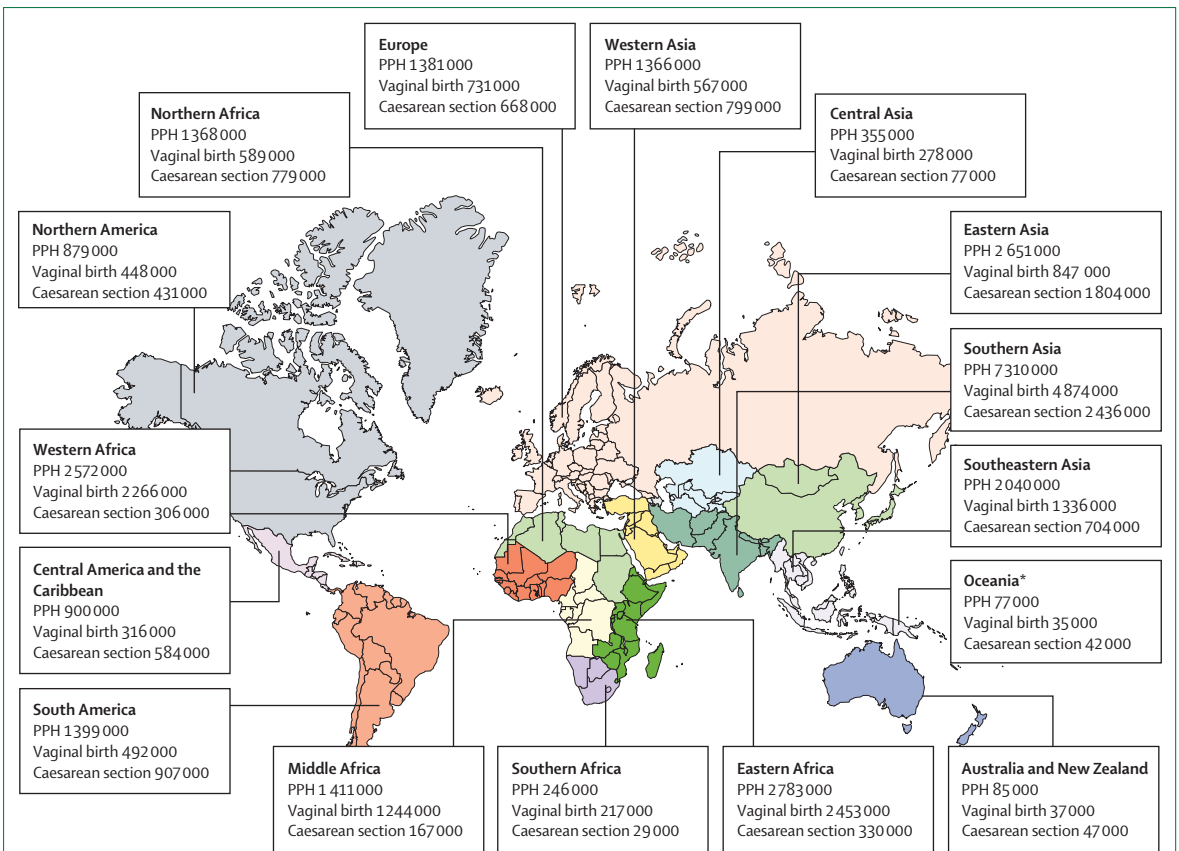
By timing of onset

- Primary PPH: PPH that occurs within the first 24 h of childbirth.
- Secondary PPH: PPH that occurs after the first 24 h of childbirth.

PPH=postpartum haemorrhage.

Postpartum haemorrhage prevalence and numbers

Studies investigating the prevalence of PPH have shown highly variable results.[6] A key reason for the variation relates to the methods used for assessing blood loss. Subjective visual assessment of blood loss is currently the most common practice to diagnose PPH, but it misses 52% of women with PPH (pooled sensitivity 48%, 95% CI 44–53; four studies comprising 196 305 participants; moderate certainty).[8] On the other hand, objective blood loss measurement with blood collection devices, such as a calibrated blood collection



SDG regions	Total cases of PPH	Cases of PPH from vaginal births	Cases of PPH from caesarean section	Global fraction
Australia and New Zealand	85 000	37 000	47 000	0·3%
Central Asia and southern Asia	7 665 000	5 152 000	2 513 000	28·6%
Eastern Asia and southeastern Asia	4 691 000	2 183 000	2 508 000	17·5%
Latin America and the Caribbean	2 299 000	808 000	1 491 000	8·6%
Northern America and Europe	2 260 000	1 161 000	1 099 000	8·4%
Oceania*	77 000	35 000	42 000	0·3%
Sub-Saharan Africa	7 012 000	6 180 000	832 000	26·1%
Western Asia and northern Africa	2 734 000	1 156 000	1 578 000	10·2%
Total	**26 822 000**	**16 712 000**	**10 110 000**	**100%**

Figure 2: **Estimated annual postpartum haemorrhage (≥500 mL) numbers by SDG regions and subregions, and mode of birth**
Estimates from modelled data for 2023 (total PPH cases in the figure vary slightly from the modelled estimates due to rounding of numbers for representation in the map). Data derived from Bayesian hierarchical modelling (appendix pp 3–50). Global fraction represents the proportion of the global total in a specific region or subregion. PPH=postpartum haemorrhage. SDG=Sustainable Development Goal. *Oceania excludes Australia and New Zealand.

See Online for appendix

drape, is far more accurate, missing only 7% of women with PPH (pooled sensitivity 93%, 92–94; two studies comprising 53 762 participants; high certainty).[8]

We conducted a systematic review and meta-analysis to synthesise the prevalence of PPH (defined as blood loss ≥500 mL) and severe PPH (≥1000 mL), stratified by the method of blood loss assessment and the mode of birth.[6] The synthesis included 81 studies, with a total of 42 709 185 women from 40 countries. The pooled prevalence of objectively diagnosed PPH (≥500 mL) at vaginal birth was 12·6% (10·1–15·2). This prevalence was more than three-fold higher than that for subjectively diagnosed PPH at vaginal birth (3·9%, 3·0–4·9). The pooled prevalence of objectively diagnosed severe PPH (≥1000 mL) at vaginal birth was 3·3% (2·6–4·1), whereas the pooled prevalence of subjectively diagnosed severe PPH at vaginal birth was lower at 2·3% (1·3–3·6).

Data on the prevalence of objectively diagnosed PPH (≥500 mL) at caesarean birth were scarce, but modelled estimates suggest a prevalence of 30·9% (95% credible interval 24·9–37·6; appendix p 20). The pooled prevalence of subjectively diagnosed PPH (≥500 mL) at caesarean birth was 8·2% (95% CI 3·7–14·3). The pooled prevalence of objectively diagnosed severe PPH (≥1000 mL) at caesarean birth was 8·5% (5·8–11·6), which is more than two-fold higher than that for subjectively diagnosed

severe PPH at caesarean birth (3·7%, 2·7–4·9). We found the prevalence of PPH and severe PPH was substantially higher with objective blood loss assessment methods for diagnosis, suggesting underestimation of blood loss and missed diagnosis of PPH with subjective assessment methods.

We used Bayesian hierarchical models to estimate global and regional numbers of PPH (appendix pp 3–50). The models used country-specific birth counts, country or region-specific caesarean birth rates, and global rates of objectively diagnosed PPH at vaginal and caesarean births. An estimated 27 million women have a PPH (≥500 mL) globally every year, with 17 million (63%) at vaginal birth and 10 million (37%) at caesarean birth. The annual total of women who have PPH in each Sustainable Development Goal (SDG) region and subregion is shown in figure 2. More than 80% of the estimated global burden of PPH is in Asia and Africa.

Postpartum haemorrhage causes and risk factors

The causes and risk factors for PPH are debated in both non-expert and scientific communities. A systematic review of qualitative literature found that in many communities, bleeding after childbirth is considered "normal" and could even be viewed as necessary to expel "impurities" and "cleanse the woman's body".[22] Misconceptions about the causes of PPH persist, with some communities believing that PPH is caused by supernatural powers or evil spirits that are punishing the woman for past mistakes.[22] There are also uncertainties within the scientific community about the causes and risk factors for PPH.

A systematic review of 327 studies (consisting of 847 413 451 women) was conducted to understand the various causes of and risk factors for PPH.[7] The pooled rates of the five most common known causes of PPH were uterine atony (70·6% [95% CI 63·9–77·3]; n=834 707 women, 14 studies), genital tract trauma (16·9% [9·3–24·6]; n=18 449 women, six studies), retained placenta (16·4% [12·3–20·5]; n=235 021 women, nine studies), abnormal placentation (3·9% [0·1–7·6]; n=29 638 women, two studies), and coagulopathy (2·7% [0·8–4·5]; n=236 261 women, nine studies). Uterine atony can be associated with a distended uterus (eg, through multiple pregnancy, macrosomia, or polyhydramnios), intrauterine infection, or prolonged labour.[23] Genital tract trauma includes lacerations to the perineum, vagina, or cervix at vaginal birth, as well as uterine or cervical tears at caesarean section. Uterine rupture is a particularly serious genital tract trauma that can be linked to obstructed labour and previous uterine surgery (eg, caesarean section or myomectomy). Abnormal placentation includes placenta praevia and placenta accreta spectrum. Coagulopathy can result from pre-existing medical conditions (eg, haemophilia A, idiopathic thrombocytopenic purpura, or von Willebrand's disease) or conditions acquired in pregnancy (eg, pre-eclampsia, disseminated intravascular coagulation, or anticoagulation treatment).[23] An uncommon but serious cause of PPH is uterine inversion, which is associated with fundal placentation, uterine atony, and forceful umbilical cord traction.[23]

	Risk factor	OR (95% CI)
Sociodemographic		
Weak association (OR >1–1·5)	Black *vs* white ethnicity	1·44 (1·03–2·01)
Weak association (OR >1–1·5)	Asian *vs* white ethnicity	1·15 (1·04–1·27)
Medical		
Strong association (OR >2)	Anaemia	2·36 (1·29–4·32)
Strong association (OR >2)	Female genital mutilation	2·14 (1·43–3·20)
Strong association (OR >2)	Sepsis	2·31 (1·55–3·46)
Moderate association (OR >1·5–2)	BMI 30–34·9 *vs* 18·5–24·9 kg/m²	1·51 (1·32–1·72)
Moderate association (OR >1·5–2)	Liver disease	1·64 (1·12–2·42)
Moderate association (OR >1·5–2)	COVID-19	1·85 (1·56–2·18)
Weak association (OR >1–1·5)	BMI 25–29·9 *vs* 18·5–24·9 kg/m²	1·21 (1·13–1·30)
Weak association (OR >1–1·5)	Uterine fibroids	1·20 (1·06–1·35)
Weak association (OR >1–1·5)	Antidepressant use	1·47 (1·28–1·70)
Weak association (OR >1–1·5)	Asthma	1·24 (1·13–1·36)
Weak association (OR >1–1·5)	Epilepsy[24]	1·21 (1·17–1·25)
Past pregnancy-related		
Strong association (OR >2)	Previous PPH	3·17 (2·42–4·16)
Strong association (OR >2)	Grand multiparity *vs* nulliparity	2·62 (1·24–5·52)
Moderate association (OR >1·5–2)	Family history of PPH[25]	1·63 (1·24–2·14)
Weak association (OR >1–1·5)	Grand multiparity *vs* multiparity	1·48 (1·14–1·91)
Current pregnancy-related		
Strong association (OR >2)	Multiple pregnancy	2·62 (2·14–3·21)
Strong association (OR >2)	Placenta praevia	3·10 (1·61–5·97)
Strong association (OR >2)	No antenatal care *vs* antenatal care	2·78 (1·78–4·36)
Strong association (OR >2)	Resolved placenta praevia	3·35 (2·43–4·62)
Strong association (OR >2)	Stillbirth	5·39 (3·32–8·75)
Strong association (OR >2)	Assisted conception *vs* natural conception	2·40 (2·08–2·76)
Moderate association (OR >1·5–2)	Pre-eclampsia	1·54 (1·48–1·60)
Moderate association (OR >1·5–2)	Gestational diabetes	1·88 (1·16–3·03)
Moderate association (OR >1·5–2)	Polyhydramnios	1·73 (1·32–2·28)
Labour and childbirth		
Strong association (OR >2)	Caesarean birth	5·18 (3·42–7·85)
Strong association (OR >2)	General anaesthesia[26]	2·90 (1·90–4·50)
Strong association (OR >2)	Magnesium infusion[27]	2·02 (1·15–3·56)
Strong association (OR >2)	Prolonged second stage of labour[28]	3·40 (2·40–4·70)
Strong association (OR >2)	Shoulder dystocia	2·06 (1·67–2·54)
Strong association (OR >2)	Birthweight 4500–5000 g *vs* <4000 g	2·08 (1·70–2·54)
Moderate association (OR >1·5–2)	Birthweight 4000–<4500 g *vs* <4000 g	1·67 (1·54–1·80)
Moderate association (OR >1·5–2)	Episiotomy[27]	1·81 (1·56–2·11)
Weak association (OR >1–1·5)	PROM *vs* no PROM	1·39 (1·28–1·51)
Weak association (OR >1–1·5)	Induction of labour	1·37 (1·22–1·54)
Weak association (OR >1–1·5)	Augmentation of labour	1·28 (0·85–1·94)
Weak association (OR >1–1·5)	Instrumental birth	1·44 (1·03–2·00)

Information sourced from Yunas et al,[7] or from other referenced sources. Adjusted pooled ORs are reported, where available; otherwise, pooled crude ORs are reported. Nulliparity=no previous births. Multiparity=one or more previous births. Grand multiparity=five or more previous births. PPH=postpartum haemorrhage. PROM=premature rupture of membranes. OR=odds ratio.

Table 1: **Risk factors for postpartum haemorrhage, grouped by category**

	Percentage risk of the complication or consequence (95% CI)	Risk of the consequence in women with PPH *vs* no PPH (95% CI)
Immediate physical consequences		
Acute renal complications*	1·0 (0·5–1·7)	..
Acute respiratory complications†	2·2 (0·7–4·7)	..
Blood transfusion	12·3 (9·9–15·0)	..
Cardiac complications‡	1·7 (0·4–3·8)	aHR 1·02 (0·97–1·07);[29] aHR 1·96 (1·51–2·53)[30]
Coagulopathy	3·4 (1·4–6·3)	..
Hepatic failure	0·3 (0·2–0·4)	..
Hysterectomy	2·1 (1·3–3·1)	..
ICU admission	3·3 (1·0–6·7)	..
Maternal death	1·6 (0·8–2·6)	cOR 5·6 (3·75–8·37)[31]
Near-miss§	18·0 (6·6–33·3)	..
Pulmonary embolism	0·3 (0·1–0·6)	..
Prolonged hospitalisation¶	13·1 (0·0–51·0)	..
Seizure	0·4 (0·3–0·6)	..
Shock	2·9 (0·3–7·5)	..
Cerebral complications‖	0·5 (0·0–2·0)	..
Delayed physical consequences		
Postnatal anaemia	46·3 (30·8–62·1)	..
Postnatal sepsis	0·6 (0·1–1·6)	..
Psychological consequences		
Anxiety	28·5 (0·0–88·3)	aHR 0·99 (0·90–1·09)[32]
Postnatal depression	15·5 (8·5–24·2)	aHR 1·08 (0·99–1·17);[33] aOR 1·68 (1·16–2·42);[34] aOR 1·68 (1·16–2·42)[35]
Post-traumatic stress disorder	10·7 (3·1–21·7)	aHR 1·17 (0·73–1·89)[32]
Consequences on the newborn		
Inability to exclusively breastfeed	27·8 (19·3–37·2)	aOR 0·88 (0·86–0·90)**
Need for NICU admission	16·1 (11·9–20·8)	..

Information from a systematic review conducted by the Series authors (appendix pp 67–83), or from other identified sources. aHR=adjusted hazard ratio. cOR=crude odds ratio. ICU=intensive care unit. NICU=neonatal intensive care unit. PPH=postpartum haemorrhage. *Four of the eight studies specified the complication as renal failure. †Three of the seven studies specified the complication as respiratory failure. ‡Four of the ten studies specified the complication as heart failure, and two studies as cardiac arrest. §A woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy. ¶Includes one study from a low-income country, where it was estimated that ≥1 additional day in hospital was expected in 51·9% of women with PPH; and two studies from high-income countries, where it was estimated that ≥4 additional days in hospital were expected in 2·4% of women with PPH. ‖Two of the three studies specifically reported this as stroke. **Women with PPH were less likely to be exclusively breastfeeding their babies compared with those without PPH.

Table 2: **Consequences of postpartum haemorrhage**

We organised risk factors for PPH into socio-demographic, medical, past pregnancy-related, current pregnancy-related, and childbirth-related categories (table 1). Based on the pooled odds ratios (ORs), the risk factors were classified as having weak (OR >1–1·5), moderate (OR >1·5–2), or strong (OR >2) association with PPH. Potentially modifiable strong or moderate risk factors include obesity, anaemia, inadequate antenatal care, and unnecessary caesarean sections. Risk factors for which expert clinical care can mitigate the risk of PPH include gestational diabetes, female genital mutilation, placenta praevia, multiple pregnancy, stillbirth, and various medical conditions associated with PPH (eg, hypertensive disorders and liver disease). General anaesthesia has a strong association with PPH;[26] therefore, regional anaesthesia is generally preferable.

Consequences of postpartum haemorrhage

The consequences of PPH can extend well beyond the immediate episode of bleeding, affecting the woman, her newborn, her family, and the wider society. Consequences can be physical, psychological, or social (appendix pp 67–83). Physical consequences include haemodynamic shock, organ dysfunction, laparotomy, hysterectomy, and death (table 2). Psychological consequences include increased anxiety, postnatal depression, and post-traumatic stress disorder. Consequences for the newborn include compromised bonding and breastfeeding; however, if a mother dies from PPH, the effects on the baby and any siblings are even greater. Domestic and societal consequences include diminished care for children[36] and loss of productivity.[37] Approaches to mitigate these consequences are provided in the third paper in this Series.

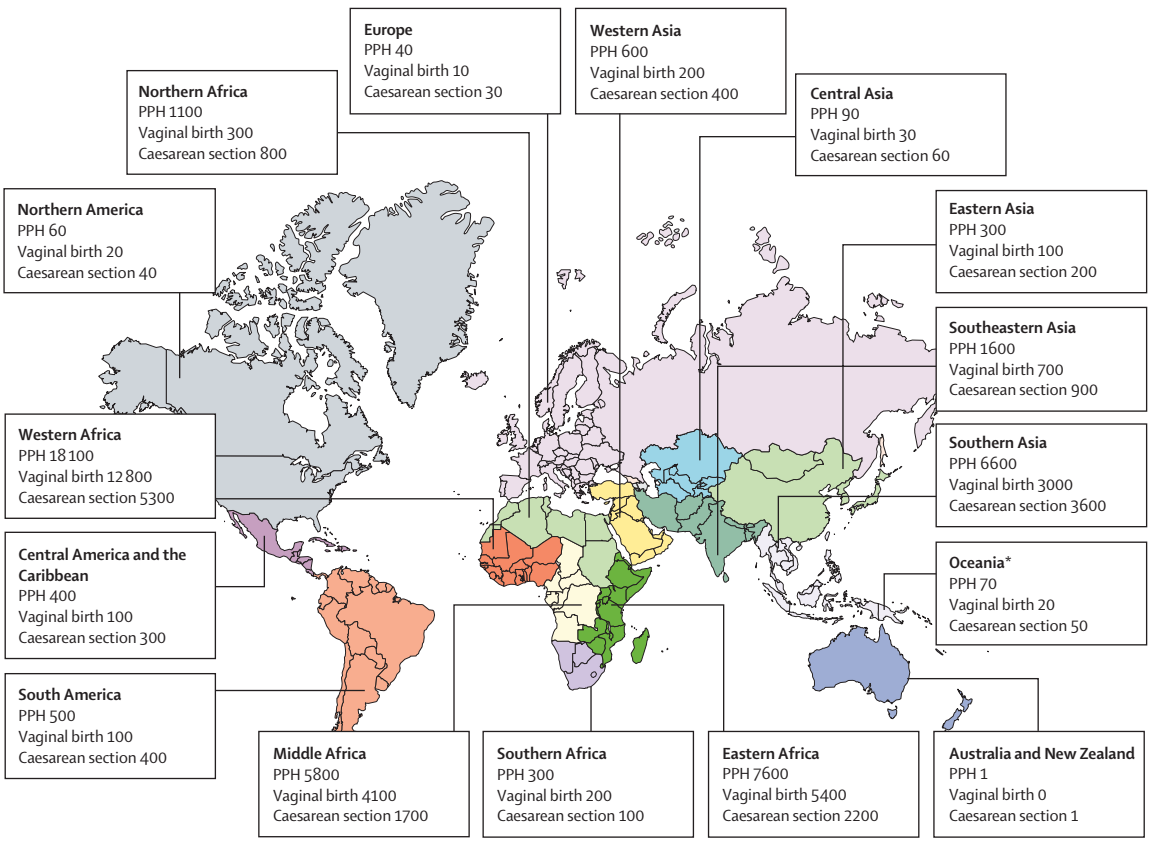
Anaemia, one of the common complications of PPH, can cause tiredness, cognitive impairment, depression, and increased susceptibility of infection, as well as problems in future pregnancy, such as PPH, low birthweight, preterm birth, pre-eclampsia, stillbirth, and neonatal death.[38,39]

Pregnancy-related acute kidney injury can be a serious consequence of obstetric haemorrhage, pre-eclampsia, or sepsis.[40] The majority of women with the condition will need haemodialysis and intensive care unit management, and 10–47% might not have renal recovery after the injury.[40]

An estimated 43 000 women die from PPH each year, with 27 000 (63%) deaths occurring at vaginal birth and 16 000 (37%) at caesarean birth (figure 3; appendix p 38). These statistics translate to one PPH death every 12 min, with an estimated 79% of PPH deaths occurring within the first 24 h after childbirth.[41] Two SDG regions contribute an estimated 90% of total PPH deaths: sub-Saharan Africa (74%) and central and southern Asia (16%; figure 3). Two continents, Africa and Asia, contribute an estimated 98% of total PPH deaths. The women who are at particularly high risk of dying from PPH are identified in panel 3.

Economic cost of postpartum haemorrhage

PPH has substantial economic implications for health systems and society. For health systems, women



SDG regions	Total deaths from PPH	Deaths from PPH after vaginal births	Deaths from PPH after caesarean section	Global fraction
Australia and New Zealand	1	0	1	0·0%
Central Asia and southern Asia	6700	3030	3660	15·5%
Eastern Asia and southeastern Asia	1900	800	1100	4·4%
Latin America and the Caribbean	900	200	700	2·1%
Northern America and Europe	100	30	70	0·2%
Oceania*	70	20	50	0·2%
Sub-Saharan Africa	31 800	22 500	9300	73·7%
Western Asia and northern Africa	1700	500	1200	3·9%
Total	**43 161**	**27 080**	**16 081**	**100%**

Figure 3: **Estimated annual postpartum haemorrhage deaths by Sustainable Development Goal regions and mode of birth**
Estimates from modelled data for 2023 (total PPH deaths in the figure vary slightly from the modelled estimates due to rounding of numbers for representation in the map). Data derived from Bayesian hierarchical modelling (appendix pp 3–50). Global fraction represents the proportion of the global total in a specific region or subregion. PPH=postpartum haemorrhage. SDG=Sustainable Development Goal. *Oceania excludes Australia and New Zealand.

experiencing PPH can require medical procedures that have resource implications; for society, morbidity and mortality attributed to PPH are associated with high economic costs, including potentially catastrophic levels of spending required by patients and their families.

We estimated the annual global economic burden of PPH for health systems using an ingredients-based approach, based on the different medical procedures required for PPH management, their frequency of occurrence, and associated unit costs (eg, additional oxytocin, tranexamic acid, blood transfusion, uterine tamponade, hysterectomy, transfer to higher level facilities, or admission to intensive care units). Unit costs were estimated separately for lower-middle and middle-income countries, and high-income countries. Costs were estimated for 1 year (2023) in US$ (appendix pp 51–67).

We used the value of a statistical life-year approach to assess the burden of PPH on society by estimating the annual global economic burden of PPH-attributable disability-adjusted life-years (DALYs). The analysis estimated the total years of life lost due to a single year (2023) of PPH mortality, based on country-specific, female health-adjusted life expectancy at mean age of pregnancy. For non-fatal PPH, disutility weights for either PPH ≥1000 mL or PPH <1000 mL were assigned

Panel 3: Who dies from postpartum haemorrhage?

Maternal death reviews, of which the most comprehensive are confidential enquiries into maternal deaths, provide detailed information on maternal deaths, including causes, contributory factors, context, and the quality of care received.[42] Several countries periodically publish their maternal death review reports, often identifying elements of substandard care and providing recommendations for improvements.[43] A systematic evidence synthesis of maternal death review reports from countries where maternal death rates are high showed several common themes on causes, contributory factors, quality of care provided, and outcomes of PPH.[44,45] Women who are most likely to die from PPH are those who have home births; those with anaemia or pre-existing medical problems; those who have a caesarean birth, particularly an emergency caesarean at full cervical dilation; and those delivering in health-care settings with staffing challenges.[7,46–48] Delayed identification of PPH and delayed initiation of treatment were particular problems for women who died from PPH. Substandard care was reported in 50–75% of women who died from PPH.[45,49] Lessons from South Africa, which has robust triennial Confidential Enquiries into Maternal Deaths, show that 86% of obstetric haemorrhage deaths are possibly or probably avoidable.[50] Patient-related avoidable factors, mostly delays in seeking care, were present for 35% of women who died. Avoidable health service factors were observed in 70% of deaths, including inadequate blood supplies for transfusion (8·5%), delays in inter-institutional transport (11·4%), delays in initiating clinical care due to overburdened services (12·2%), staff shortages (13·4%), and shortages of staff with appropriate skill (18·5%). Important problems were identified with initial assessment and recognition of PPH at community health-care centres and district hospitals. Many women were discharged from labour wards to postnatal wards with abnormal vital signs and unrecognised PPH. At all levels of care, substandard care was the most frequent problem.

Key recommendations from maternal death reviews target women, communities, health-care providers, and policy makers.[43,44] Recommendations targeting women and communities include promotion of facility births assisted by skilled birth attendants; those targeting health-care providers include improving timely decision making in managing obstetric complications, such as PPH; and those targeting policy makers include greater interventions at the health-system level to ensure adequate numbers of competent staff, quality-assured essential medicines, effective clinical governance and risk management systems, and sustained funding.[44,51] These recommendations are further explored in the second and third papers in this Series.

for a period of 6 weeks. DALYs were valued at the average gross domestic product per capita and were weighted across countries according to their PPH-attributable DALY burden, with 3% per annum discounting applied to future years of life lost.

In 2023, the global economic burden of PPH was estimated to be $3·6 billion (95% credible interval $3·2–6·2 billion) to health systems and $6·8 billion ($6·2–7·5 billion) to society, totalling $10·4 billion ($9·8–13·2 billion).

Challenges and missed opportunities

The PPH prevalence in low-income, middle-income, and high-income countries is similar,[6] but the case-fatality rate from PPH in low-income countries is disproportionately high (appendix p 74). Furthermore, the likelihood of death from PPH can be more than 200-fold higher in low-income countries compared with high-income countries (appendix p 74). This vast health disparity, although unacceptable, does show reduction in PPH deaths is possible. In this Series, we identify missed opportunities that, if addressed, could create global impact (figure 4). These missed opportunities exist throughout a woman's life course and are rooted in broader underlying determinants of health, such as the social, economic, political, legal, environmental, and structural factors that affect health-seeking behaviour; access to and quality of care; and, thereby, maternal health outcomes.[48] Insufficient autonomy or funds can hinder a woman from seeking contraception or antenatal care, or from giving birth in a health-care facility. Long distance and travel time to a health-care facility can worsen the outcomes for a woman bleeding after homebirth. Perverse financial incentives for health-care providers or hospitals—rather than genuine clinical need—can increase the rate of caesarean births.

The missed opportunities presented in this Series can be grouped into those relating to menstrual health, sexual and reproductive health, pre-pregnancy, pregnancy, labour and childbirth, and intrahospital postpartum and post-discharge periods (figure 4). Anaemia increases the risk of PPH[7] and PPH deaths.[52] Malnutrition, heavy menstrual bleeding, malaria, and parasitic infections in endemic zones are substantial causes of anaemia; addressing these during adolescence and pre-pregnancy, pregnancy, and postpartum periods is discussed in the second paper in this Series. Women who avoid unintended pregnancies by accessing contraception can circumvent pregnancy complications such as PPH, and addressing the unmet need for contraception is therefore an important strategy to reduce PPH deaths (again discussed in the second paper in this Series). Robust PPH risk assessment and risk mitigation in the pre-pregnancy, pregnancy, labour and childbirth, and postpartum periods are addressed in the second and third papers in this Series. Regular

antenatal care and access to obstetric ultrasound, quality-assured essential medicines, adequate equipment and infrastructure, and well trained and supported staff, are fundamental to improving outcomes.[51] For example, the absence of an ultrasound service could mean missing the diagnosis of multiple pregnancies or placenta praevia, and thus a missed opportunity to improve PPH outcomes for women with these conditions.

Caesarean section can be a life-saving intervention; however, many are done with no medical indication (ie, too much, too soon), or done too late or not at all (too little, too late). This problem is addressed in the third paper in this Series. Many countries in sub-Saharan Africa and south Asia have inadequate provisions for assisted vaginal birth; this insufficiency represents a missed opportunity to reduce the need for caesarean section (and its associated high risk of PPH), as well as future risk of placenta accreta spectrum.

The immediate postpartum period, particularly the first 2 h after childbirth, presents a critical period to improve PPH outcomes. The key opportunities in this period include provision of routine uterotonic prophylaxis for all births; accurate and early diagnosis of PPH by use of objective blood loss assessment devices; early and prompt first-response treatment, such as the use of treatment bundles; and rapid escalation for refractory and life-threatening PPH management. Further detail on these approaches is given in the second and third papers in this Series.[16,17] Finally, the postpartum and post-discharge periods offer important opportunities to correct anaemia, provide contraception, and advise on an appropriate interpregnancy interval that is essential for the health of the woman, and her current and future offspring.[53]

An important lens through which to consider the missed opportunities for reducing adverse outcomes of PPH is the three delays model.[54] The first delay—in deciding to seek care—can be addressed through strategies such as effective antenatal care, birth preparedness, and community awareness raising. The second delay—in reaching a health facility—can be mitigated through the provision of transportation for women in remote settings, maternity waiting homes (ie, residential facilities located near a hospital), effective referral pathways, and improvements in public transport infrastructure. The third delay—in receiving effective care once at a health facility—is discussed in detail in the third paper in this Series.[17]

Discussion

PPH affects a woman every 1·2 s and kills a mother every 12 min.

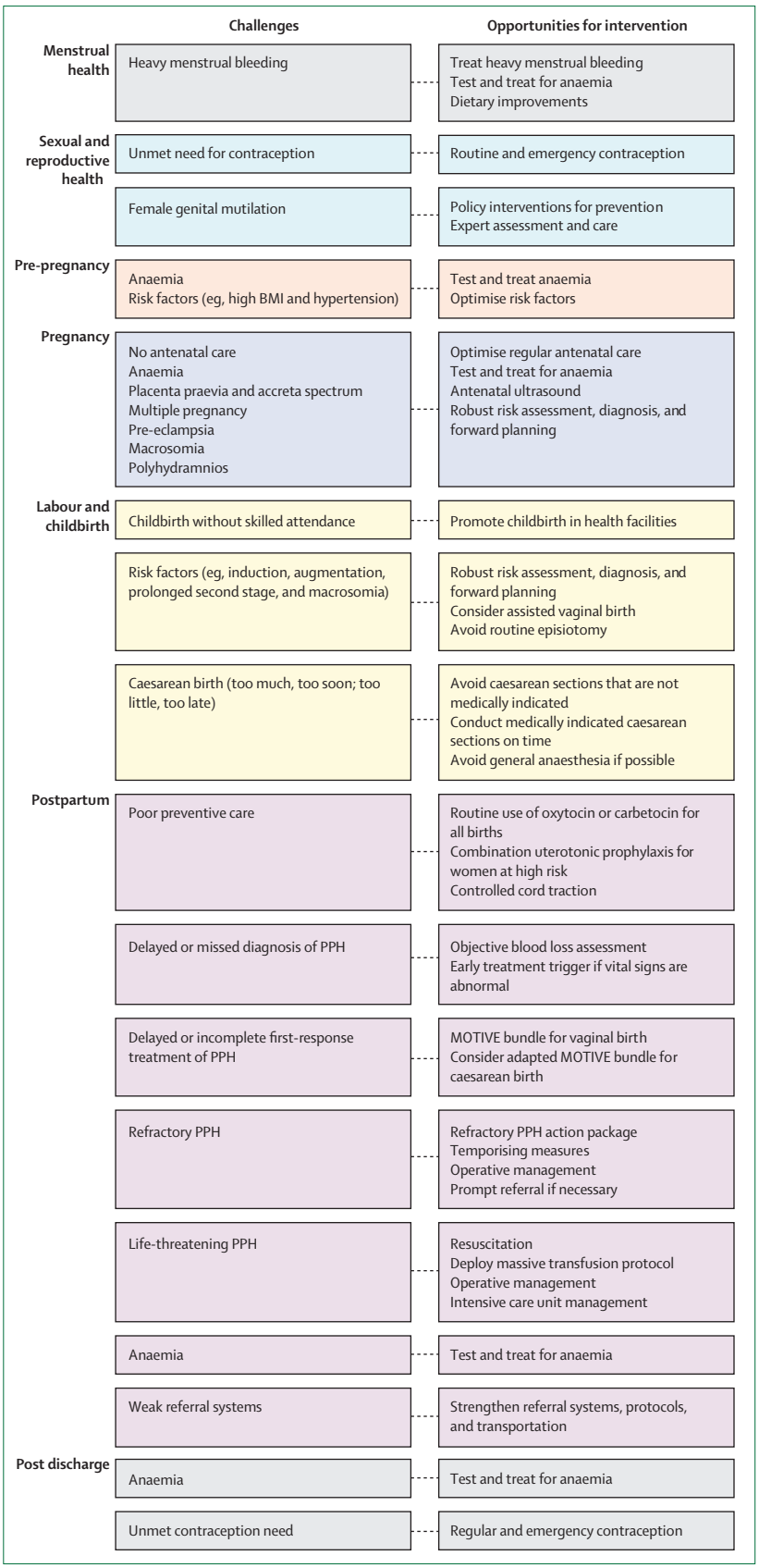


Figure 4: **Challenges and opportunities to reduce postpartum haemorrhage morbidity and mortality**
PPH=postpartum haemorrhage.

Although the risk of having a PPH does not vary much between low-income, middle-income, and high-income countries, the risk of death from PPH (ie, the case-fatality rate) varies dramatically by resource level. The PPH case-fatality rate can be more than 200-fold higher in low-income countries compared with high-income countries. PPH outcomes are strong markers of health inequity, not just between regions, but also between and within countries. The reasons for this inequity can be related to the long-standing neglect of women's wellbeing and under-resourced health services (eg, scarcity of quality essential drugs and equipment; inadequate staffing, training, and support; absence of blood and blood products; and inequitable access to advanced surgery and intensive care facilities).[51] Poor PPH outcomes also reflect multilevel intersectional gender and sociodemographic inequalities. Compared with men, women are more likely to live in poverty, have restricted autonomy in health-related decision making,[55] and face chronic nutritional disadvantage, contributing directly to adverse PPH outcomes through, for example, iron-deficient anaemia.[56] Moreover, chronic underinvestment[57,58] in maternal health is indicative of broader neglect of women in global health, reflecting long-standing disregard for women's rights.[59]

Two central approaches to mitigate the risk of PPH deaths in women are addressing key risk factors (particularly anaemia and caesarean sections that are not medically indicated) and improving the timely diagnosis and management of PPH before complications (eg, haemodynamic shock or clotting derangement) occur. WHO's updated definition of PPH provides effective recommendations for early diagnosis and intervention. Accurate measurement of blood loss by use of objective methods, such as a calibrated blood collection drape, and regular assessment of haemodynamic signs in the immediate postpartum period are essential to apply the updated WHO definition in practice.

Knowledge about the causes of PPH (ie, atony, retained tissue, abnormal placentation, trauma, clotting abnormalities, and multiple causes acting concurrently) can help guide management. These causes of PPH are shared by both vaginal and caesarean births, but the likelihood of each of the causes being present in a woman varies by the mode of birth and other clinical and contextual factors. For example, a caesarean section for prolonged labour and impacted fetal head can result in both atonic PPH and PPH from tear of the uterine incision angles upon delivery of the impacted fetal head. A woman arriving at a health facility with obstructed labour can have PPH related to uterine rupture. Furthermore, if treatment with uterotonics does not resolve PPH caused by atony, other causes, such as concealed trauma (eg, cervical tear), retained tissue, and clotting abnormalities should be suspected. Finally, placenta accreta spectrum as a cause of PPH should be considered in any woman who has had a previous caesarean section. We have systematically reviewed the risk factors for PPH and address these in detail in the second paper in this Series.[16]

An important limitation in several existing studies is that PPH diagnosis was often based on subjective visual estimation of blood loss and the use of traditional blood loss thresholds. In individual studies exploring risk factor associations, as the blood loss assessment method and the definition of PPH used were consistent between the exposed (ie, women with anaemia) and the unexposed (women without anaemia) groups, the elicited associations are expected to be valid. However, for studies reporting the prevalence and consequences of PPH, the method of diagnosis (ie, subjective *vs* objective) and the PPH definition used would have affected the reported rates. Furthermore, rates of consequences are also highly sensitive to case-mix, definitions of outcomes, the time horizon over which outcomes were ascertained, and study design.

The physical, psychological, and economic consequences of PPH are substantial. Psychological consequences have been neglected in clinical practice and research but could have long-term impact. The short-term direct economic burden of PPH is a staggering $3·6 billion per year globally. A conservative estimate for societal cost comes to $6·8 billion, giving a total annual global cost of $10.4 billion (appendix pp 51–66). A limitation in the health economic evaluation is the absence of patient-level cost data. Our estimates do not include direct out-of-pocket or indirect costs borne by women and their families, reflecting the scarce data available. These costs can be substantial, and their exclusion means the true economic burden of PPH is likely to be underestimated. Omitting patient-borne costs risks biasing economic evaluations towards services that shift costs on to patients. More robust and standardised data on patient costs across settings are needed. Furthermore, the long-term costs of PPH are unknown but could add substantially to the total annual cost. Despite these uncertainties, the annual investment in research and PPH programmes remains a small fraction of the total economic cost of PPH. The Roadmap for PPH has identified research, programmatic, and advocacy priorities; however, urgent investment is needed to achieve these goals.[14]

A health-system perspective that considers workforces, supply chains, infrastructure, continuous quality improvement, financing, and governance is essential for improving PPH care and outcomes. Maintaining an effective workforce, by empowering midwives to diagnose and treat PPH, task-sharing between multidisciplinary teams, providing on-site interprofessional training and drills, and ensuring adequate staffing and availability of specialists (eg, anaesthetists and haematologists), is essential to provide high-quality care. Standardisation of care—for example, with the MOTIVE bundle[60] or massive transfusion protocols—will ensure consistently effective

care. Supply chain issues, such as cold-chain maintenance for oxytocin, provision of essential drugs and supplies (eg, blood collection drapes), and an effective blood bank service, should be carefully monitored and remedied to avoid stock shortages. Infrastructure issues that need attention include emergency transport, including interfacility transfers; an obstetric ultrasound service; and the availability of a well functioning operating theatre for emergencies. Continuous quality improvement and effective governance require accountability systems, regular audits, near-miss reviews, targeted problem solving, and effective health-care management and leadership.

Opportunities to improve pregnancy and PPH outcomes exist throughout a woman's life course. Identifying the specific missed opportunities in relation to a woman's menstrual health, sexual health, and pre-pregnancy, pregnancy, labour and childbirth, and postpartum periods is essential in addressing the overall burden of PPH globally. The adoption of a standardised PPH definition, an objective method for blood loss measurement, and a treatment bundle, as well as management escalation for women with prolonged bleeding and rectifying missed opportunities to prevent PPH, remain central in reducing the burden of PPH globally.

Contributors

AC and OTO drafted the structure of the Series paper and wrote the first draft. NP and MJP were the main contributors to the Postpartum haemorrhage prevalence and numbers section and were responsible for the data modelling analysis. IY was the main contributor to the Postpartum haemorrhage causes and risk factors section. KNS was the main contributor to the Consequences of postpartum haemorrhage section. AA was responsible for the production of figures 2 and 3. KNS and AJD were responsible for the production of figures 1 and 4. All coauthors revised the manuscript at least once, contributed to the literature review, and provided important intellectual input. Authors listed on individual papers within the Series contributed only to those specific papers and not to others. All authors had the opportunity to review each completed paper and agree to the inclusion of the paper they coauthored in this Series.

Declaration of interests

IDG and OTO were members of the WHO Steering Group that oversaw the development of the WHO–International Federation of Gynecology and Obstetrics–International Confederation of Midwives *Consolidated Guidelines for the Prevention, Diagnosis and Treatment of Postpartum Haemorrhage*. All other authors declare no competing interests.

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