Evaluation Report | External

Postpartum Haemorrhage Collaborative

Breakthrough Series Collaborative

April 2022 – December 2023

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Acknowledgements

Safer Care Victoria (SCV) partnered with the Institute for Healthcare Improvement (IHI) to design and deliver the Postpartum Haemorrhage (PPH) Collaborative (the Collaborative).

We acknowledge Aboriginal and Torres Strait Islander people as the first peoples and Traditional Owners and custodians of the land and waterways on which the PPH Collaborative was conducted. We honour and pay our respects to Elders past and present.

To the 33 health services (

Appendix A. Participating Health Services that dedicated their time to improving postpartum haemorrhage in their service, your time and energy has made all the difference, thank you.

We would like to acknowledge the contributions of the project team members listed in Appendix B. Project Team

The project team was also supported by an expert faculty (Appendix C. Project Facultycomprised of clinical and lived experience experts, who contributed to the design of the Collaborative and participated in learning sessions and action period calls to support the teaching and coaching of teams.

We would like to acknowledge the consumers who shared their stories with the collaborative teams working to improve their wellbeing and reminded us why this work matters.

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Acronyms

BTS	Breakthrough Series
CCOPMM	Victorian Consultative Council on Obstetric and Paediatric Mortality and Morbidity
EBL	Estimated Blood Loss
IA	Improvement Advisor
IHI	Institute for Healthcare Improvement
PDSA	Plan-Do-Study-Act
PPH	Postpartum Haemorrhage
QBL	Quantitative Blood Loss Measurement
SCV	Safer Care Victoria

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Background

Postpartum haemorrhage (PPH), the most common form of obstetric haemorrhage, is a leading cause of preventable maternal mortality worldwide (Katz, 2020). PPH is defined as blood loss of 500ml or more during childbirth, and severe PPH, as blood loss of 1500ml or more. Primary PPH is blood loss occurring within 24 hours of birth as opposed to secondary PPH, where the loss of blood occurs after 24 hours of birth. In developed countries, there is a trend of increasing PPH that has not been completely explained by the changing risk profile of women (Health, 2021) (Kramer, 2013).

Over the past 10 years, there has been an increase in severe PPH in Victoria. In 2019, 2.4 per cent of people giving birth experienced severe PPH, a slight increase from 2.2 per cent in 2018, but a significant increase from 1.4 per cent in 2012-2013. In 2019, PPH was the most common maternity condition requiring intensive care unit (ICU) management in Victoria, contributing to 37 per cent of all reported severe acute maternal morbidity.

Evidence tells us that effective management of PPH requires the recognition of excessive bleeding post-birth, and prompt initiation of a series of increasingly invasive interventions in rapid sequence until the bleeding is stopped. Delays in diagnosis and treatment, and deviation from service protocols significantly contribute to the incidence of severe PPH (Brace, 2007).

There is increasing evidence of the psychological effects of PPH, including impacts on breastfeeding, bonding, and contact time between parents and baby. Severe PPH is associated with Post Traumatic Stress Disorder (PTSD) and increased risk of depression in birthing parents and their partners (Johansson, 2022). Evidence also indicates impacts on health professionals, including fear and distress of managing future PPH cases (Walsh, 2019).

Reducing the rate of PPH is an international healthcare priority (WHO, 2022) and developing a system wide improvement program to reduce PPH was a key recommendation from the Victorian Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM) review in 2018 and 2019 (CCOPMM, 2017).

Based on this evidence and the recommendation from CCOPMM, Safer Care Victoria (SCV) and the Institute of Healthcare Improvement (IHI) partnered with 33 health services to reduce the incidence of severe PPH's. This initiative used a breakthrough series (BTS) approach (IHI, 2003) to test, implement and scale evidenced based changes across the participating maternity services (

Appendix A. Participating Health Services Read about the breakthrough series (BTS) approach<https://www.ihi.org/resources/white-papers/breakthrough-series-ihis-collaborative-model-achieving-breakthrough>.

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Consumer Story

"A PPH is so much more than ml - I've experienced two and the impacts of each were like night and day, and I have the work of the Collaborative to thank for that.

My first birth resulted in a large PPH that was treated quickly by the team, which I'm thankful for - but no consideration was given to our emotional health, and I did not receive adequate supportive care for my blood loss. We went home alive, but without the proper tools to thrive as a new family.

For my second birth I elected to have a caesarean to avoid the risk of repeating the trauma. While I had another PPH, the whole process was smooth and calm for both myself, and my partner. We were able to be fully present and enjoy the birth and first moments with our daughter. It was so healing. Because I had appropriate support during my PPH and after, we went home and thrived."

Alana Donaldson

Consumer Faculty PPH Collaborative

We need to think differently about PPH - how can we ensure this family is sent home to really thrive after a PPH?".

By listening to lived experience experts, we learned that harm from PPH amounts to more than mls of blood loss. They shared how frightening their experiences were and spoke about the about the lasting psychological impacts, which can lead to families being less likely to have another child. This was incredibly impactful and motivated clinicians to generate change informed by lived experience.

The 'Consumer wall' at the Collaborative Showcase event exhibited 85 implemented improvements informed by lived experience whereby services took a patient-centred approach, prioritising communication, and psychological support. This was incredibly impactful and motivated clinicians to generate change informed by lived experience.

Lived Experience Representatives: Kristin Earles, Allison Roberts, Gemma Purdy, Ellie Goss standing in front of the 'Consumer wall' at the Collaborative Showcase, 2023.

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What did we want to accomplish?

The aim that was established for the PPH Collaborative was:

> By April 2023[1], we will reduce the incidence of primary PPH greater than 1500ml following vaginal birth by 50 per cent in participating health services.

At the recommendation of our Consumer Faculty, the Collaborative also aimed to reduce the harm resultant of PPH to people giving birth, their support people, and to health professionals, by standardising and improving the response to PPH across participating health services.

What approach did we take?

Health service teams were invited to participate in a 12-month project which used a Breakthrough Series (BTS) Collaborative design. This design employs a collaborative model where multiple organisations come together to learn and implement best practices within a structured framework.

The process begins with identifying a significant healthcare issue and assembling expert panels to develop evidence-based change ideas. These ideas are then tested through Plan-Do-Study-Act (PDSA) cycles in real-world settings. The impact of changes that have been tested is evaluated using a series of measures designed to help participating services decide which changes are making a difference. The measurement approach used in the PPH Collaborative is described in detail in Appendix D.

Participating organisations share their experiences, data, and results in regular collaborative sessions, fostering a culture of collective learning and rapid iteration. The PPH collaborative included three intensive 2-day face-to-face events known as learning sessions which were supplemented by monthly virtual calls known as Action Period Calls. The PPH collaborative took place between April 2022 and April 2023 (phase 1) and was attended by 33 health service teams (

[1] The collaborative was initially scheduled to conclude in April 2023 and was extended until December 2023 as some activities were impacted by the ongoing effects of the COVID-19 pandemic.

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Appendix A. Participating Health Services SCV offered additional support to 27 maternity teams who expressed an interest in continuing work in reducing PPH between August and December 2023 (phase 2).

What changes did we test?

Evidence from the literature and insights from international projects were used to shape the key focus areas and change ideas for the Victorian context. The change theory was developed after an extensive scoping period. This period included detailed literature reviews, targeted collaboration with experts by experience and clinical experts, and the formation of an expert working group to clearly define objectives and project scope. Specific and actionable evidence-based change ideas were identified in response to priority focus areas. The key focus areas tested by the collaborative centred around five key focus areas (called 'drivers):

1. **Partnering with consumers:** Delivering care that addresses the needs of consumers during pregnancy, at childbirth and following childbirth with a focus on the promotion of equity.
2. **Readiness:** Ensuring that the workforce has the capability to care for women experiencing PPH and that environmental barriers to effective treatment have been removed.
3. **Recognition:** Developing clear criteria for the prompt recognition of a potential PPH and reliable escalation processes.
4. **Response:** Clear processes for the actions to be taken when the decision to treat a PPH has occurred.
5. **Review:** Promoting a culture of continuous learning and improvement in the prevention, recognition, and treatment of PPH.

The change ideas under each of these five focus areas are outlined in Appendix E. PPH Collaborative change theory presented as a Driver DiagramAppendix E. PPH Collaborative change theory presented as a Driver Diagram

The 'Partnering with Consumers' driver was added following consultation with people who have lived experience of PPH. They highlighted that improving the care of people who suffer from PPH involves more than just reducing the volume of blood loss. PPH can affect not only the physical health of the birthing parent but also their mental health and that of their support people. Consequently, the collaborative focused not only on the blood volume of PPH but also on the harm caused by PPH, as this is what truly matters to consumers.

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Participating services began by testing Quantitative Blood Loss (QBL) as part of the PPH Recognition primary driver, which was the focus of Learning Session 1 in April 2022. This approach was chosen because transitioning to contemporaneous measurement of blood loss has been associated with an increased reported rate of PPH compared with Estimated Blood Loss (EBL) practices (Blosser, 2021). By starting with QBL, health services were better positioned to understand the incidence of PPH within their services. The other change ideas relating to response and review cannot be tested unless PPH is first accurately recognised.

What impact did we have?

Arguably the most powerful impact of the project was improved recognition of PPH (driver 3) through the implementation of quantified measurement of blood loss (QBL). QBL requires the contemporaneous weighing of blood-soaked linen and pads and subtracting from this value the weight of the products when dry. Attributing 1ml of blood to 1g of weight, the total blood loss is the value of the used products less dry weight. This important clinical and cultural transition from visual estimation of blood loss, which has long been identified as inaccurate within the scientific literature, has increased both the recognition of PPH and the transparency of Victorian PPH rates, leading to significant improvements in obstetric safety. By the end of April 2023, the percentage of birthing parents with documented QBL had increased from 30.8 per cent to 81.4 per cent (Figure 1).

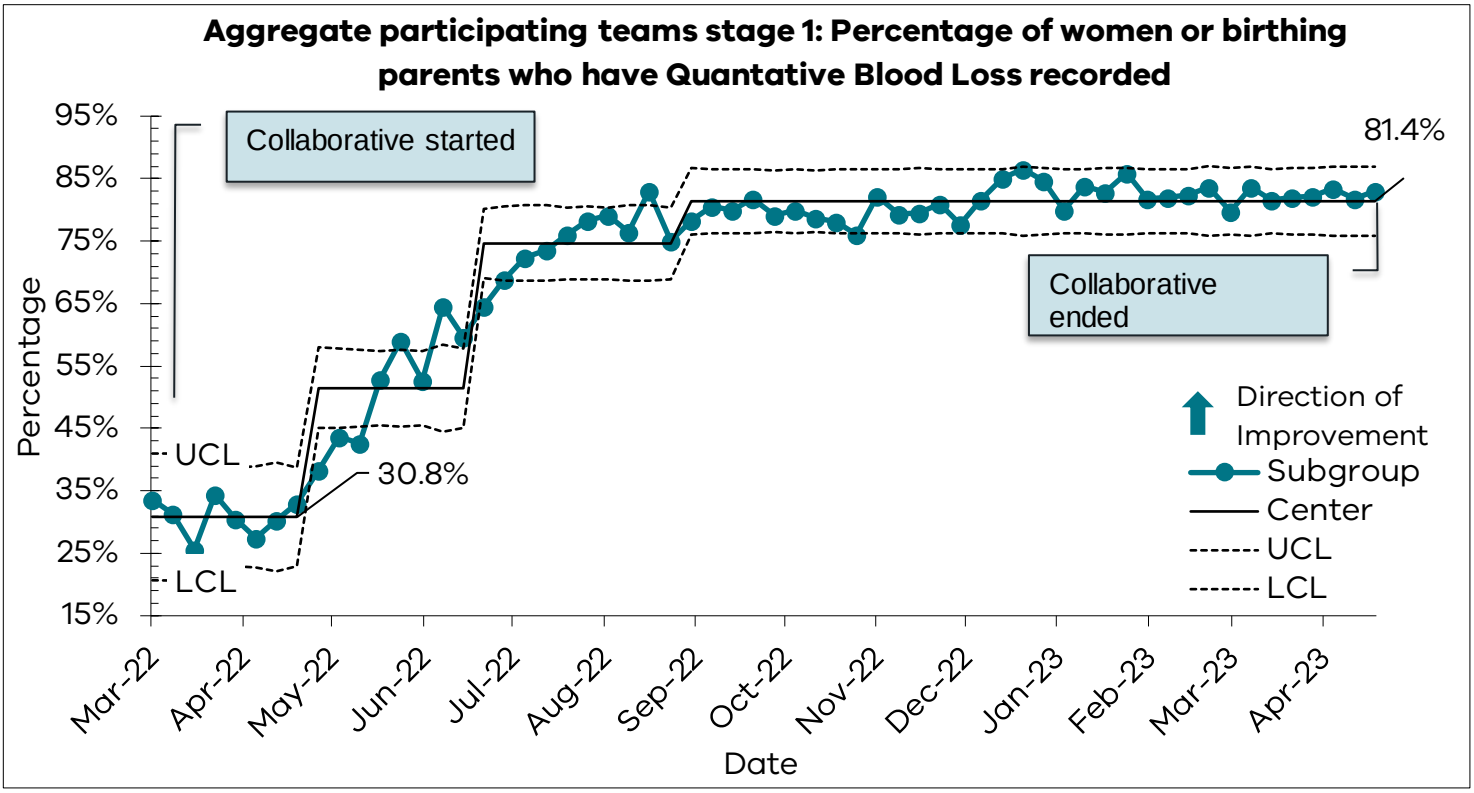

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Figure 1. Aggregate of QBL across participating sites.

This improvement in recognition of PPH likely also increased the rates of reported PPH during the collaborative and consequently the PPH Collaborative was not able to demonstrate a reduction in the incidence of severe PPH (defined as ≥ 1500ml blood loss following a vaginal birth) as was intended at the outset of the project (Figure 2).

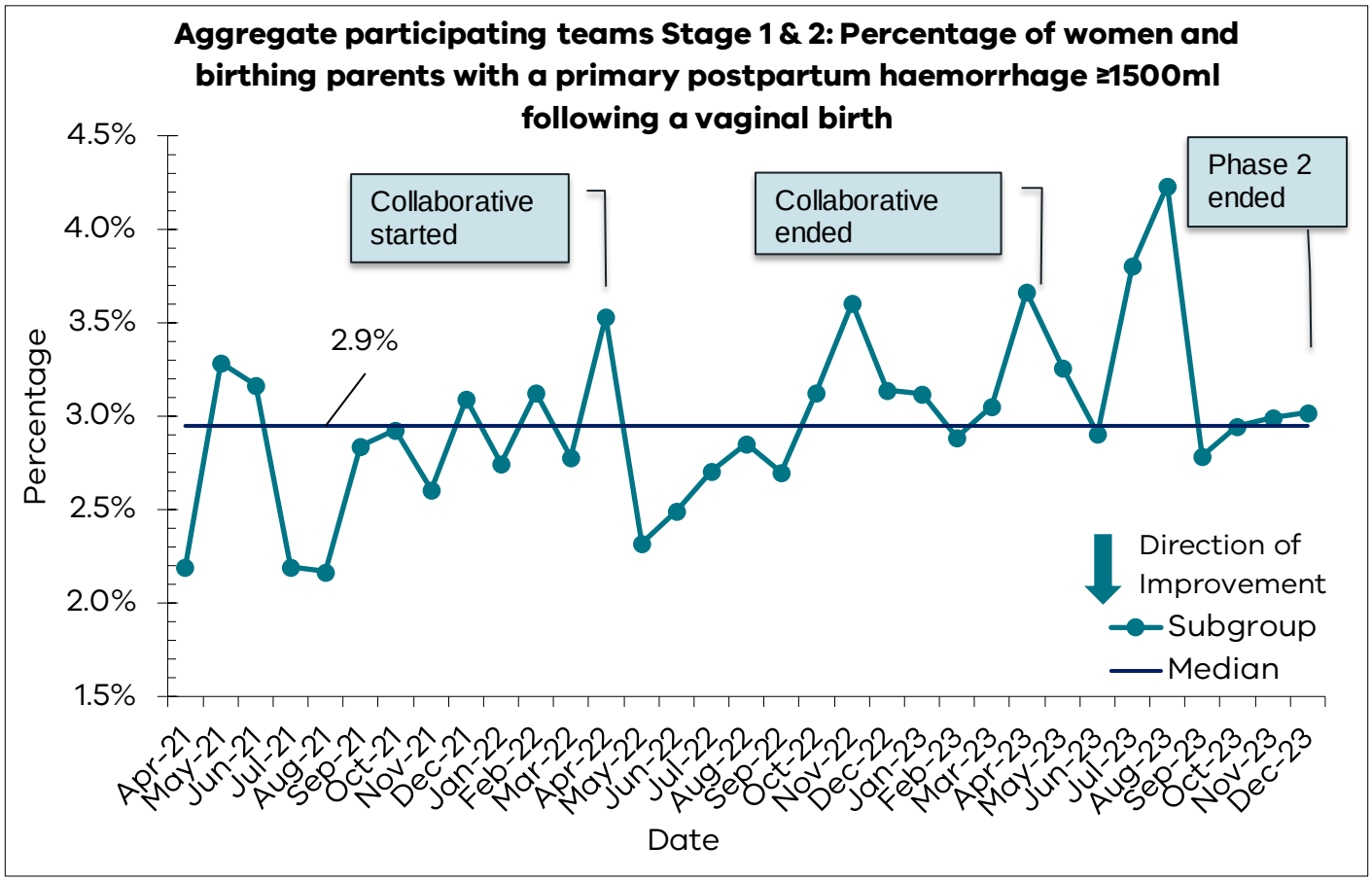

Figure 2. Aggregate data from participating services for the percentage of birthing parents with PPH ≥1500 ml.

Despite there being no change in the mean aggregate rate of PPH across all collaborative health services, analysis of data from services who achieved a reliable rate of QBL (≥85 per cent of all vaginal births) demonstrates early signals of a reduction in severe PPH rates within these services (**Error! Reference source not found.**). It is hoped that as QBL becomes more standardised across Victoria that improvements in the rates of severe PPH will be more easily detected. For this reason, it is recommended that maternity services prioritise implementation of QBL to achieve consistent performance ≥85 per cent for all vaginal births.

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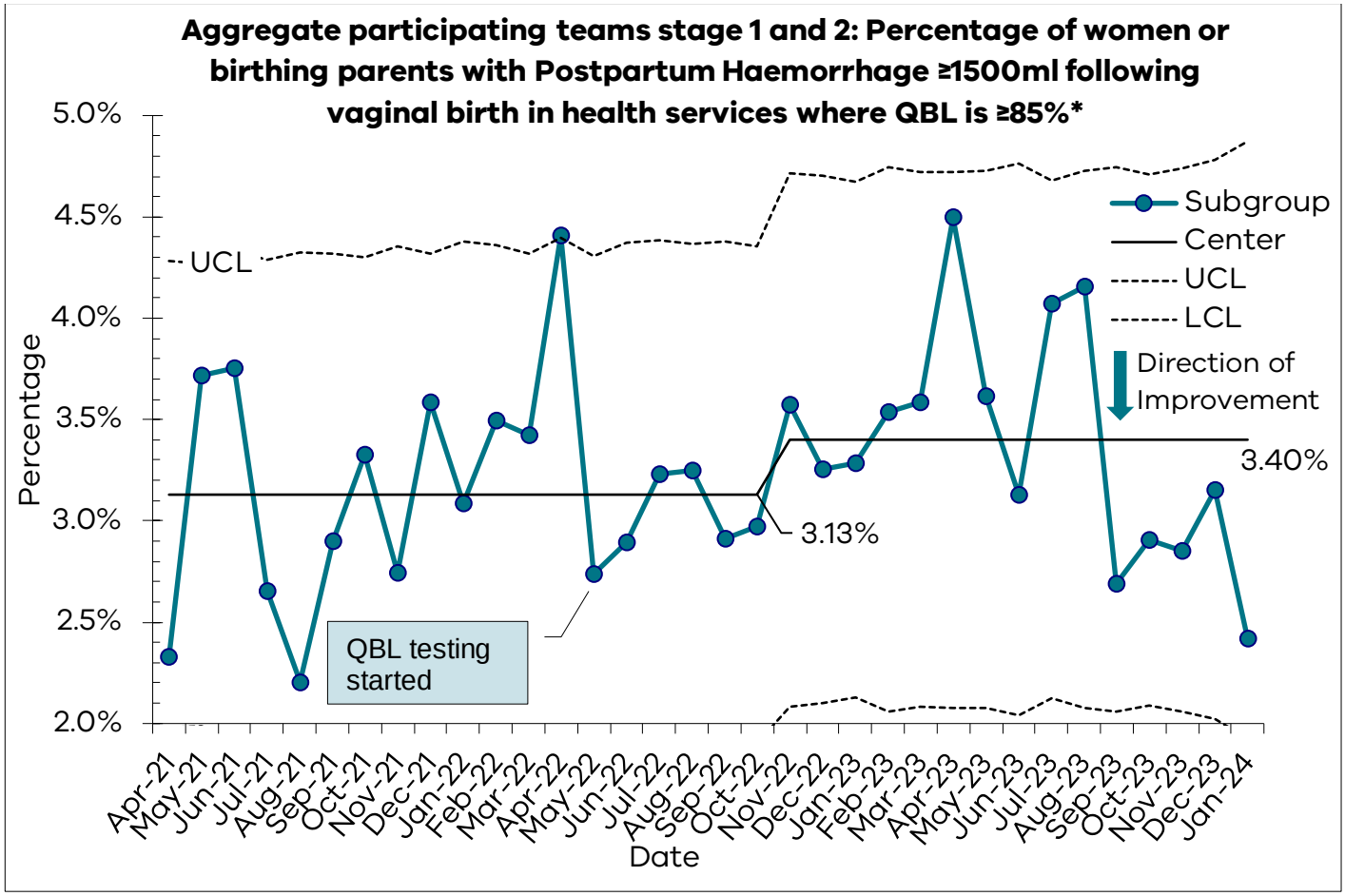

"We are grateful to CCOPMM for providing access to the data used for this chart. The conclusions, findings, opinions and views or recommendations expressed in this paper are strictly those of the author(s). They do not necessarily reflect those of CCOPMM."

Figure 3. Aggregated PPH rate ≥1500ml in services who had achieved 85 per cent QBL by December 2023

The improved recognition of PPH through use of QBL measurement was also the likely cause for increased reported rates of PPH 500ml-999ml and PPH 1000-1499ml; the timing of increases in these rates these aligned with the growing uptake in the use of QBL (see Appendix F, Figures 11 & 12).

This was an expected finding as previous research has demonstrated an increased reported PPH rate at lower volumes when Estimated Blood Loss (EBL) is replaced by QBL. This increased reporting represents birthing parents who previously would not have had documented records as having experienced a PPH and therefore may also not have received appropriate treatment.

A detailed summary of all aggregate results is provided in Appendix F. Analysis of the data allows us to quantify the number of individual birthing parents who will have benefited from these changes with the following impact for Victorian's:

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- There was a reduction in the incidence of PPH ≥1500 ml in six participating maternity services. This equated to 180 fewer women experiencing a severe PPH than would be expected over the reporting period.
- Increase in the use of QBL measurement, benefiting over 27000 women and birthing parents through improved recognition of their PPH.
- Increased awareness and reporting of PPH cases below 1500 ml leading to the identification of an additional 2300 cases than would be expected over the reporting period.

Other changes delivered through the Collaborative included an increase in the use of PPH risk assessment (

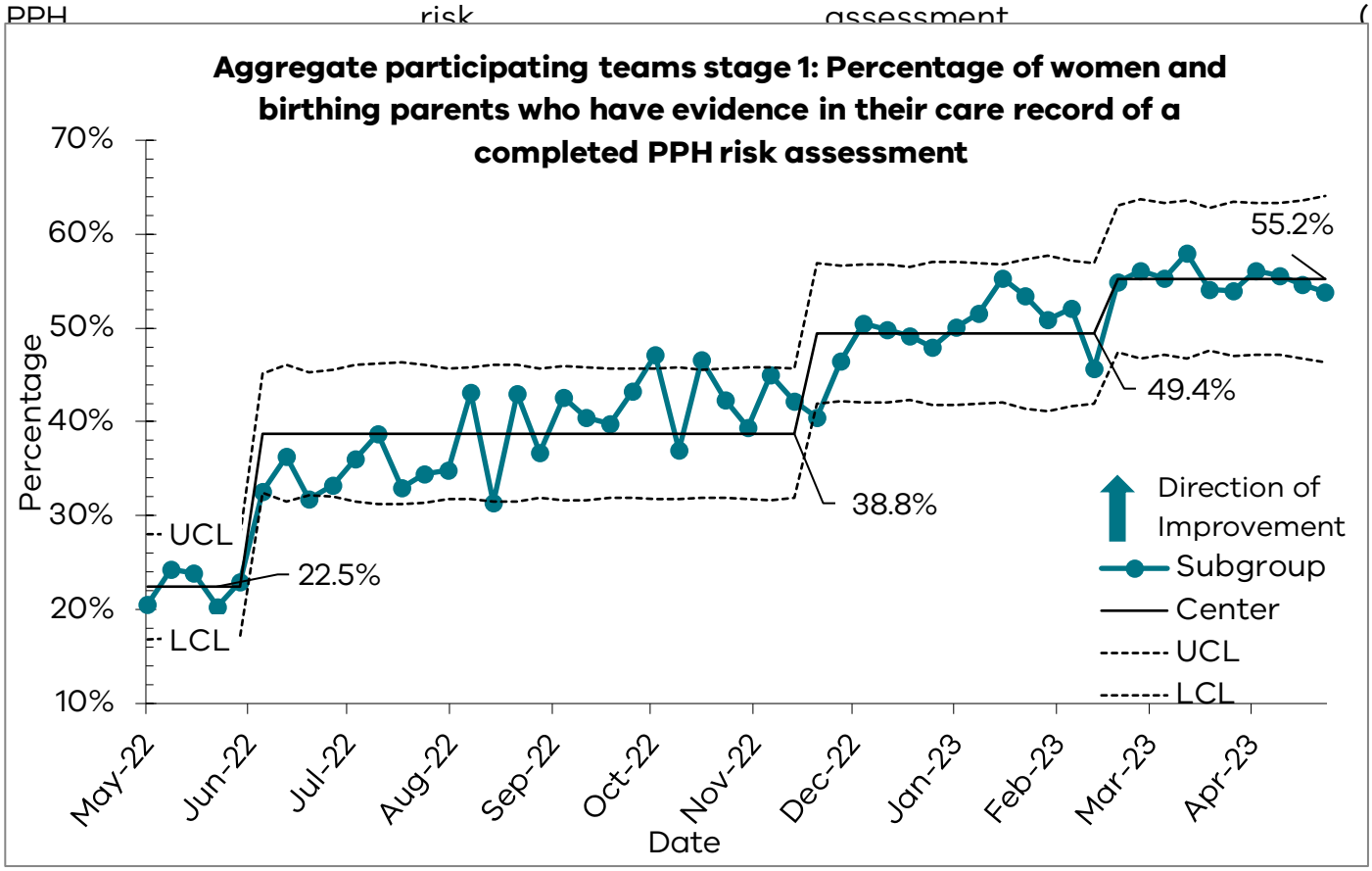

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Figure 7), documented third stage management (

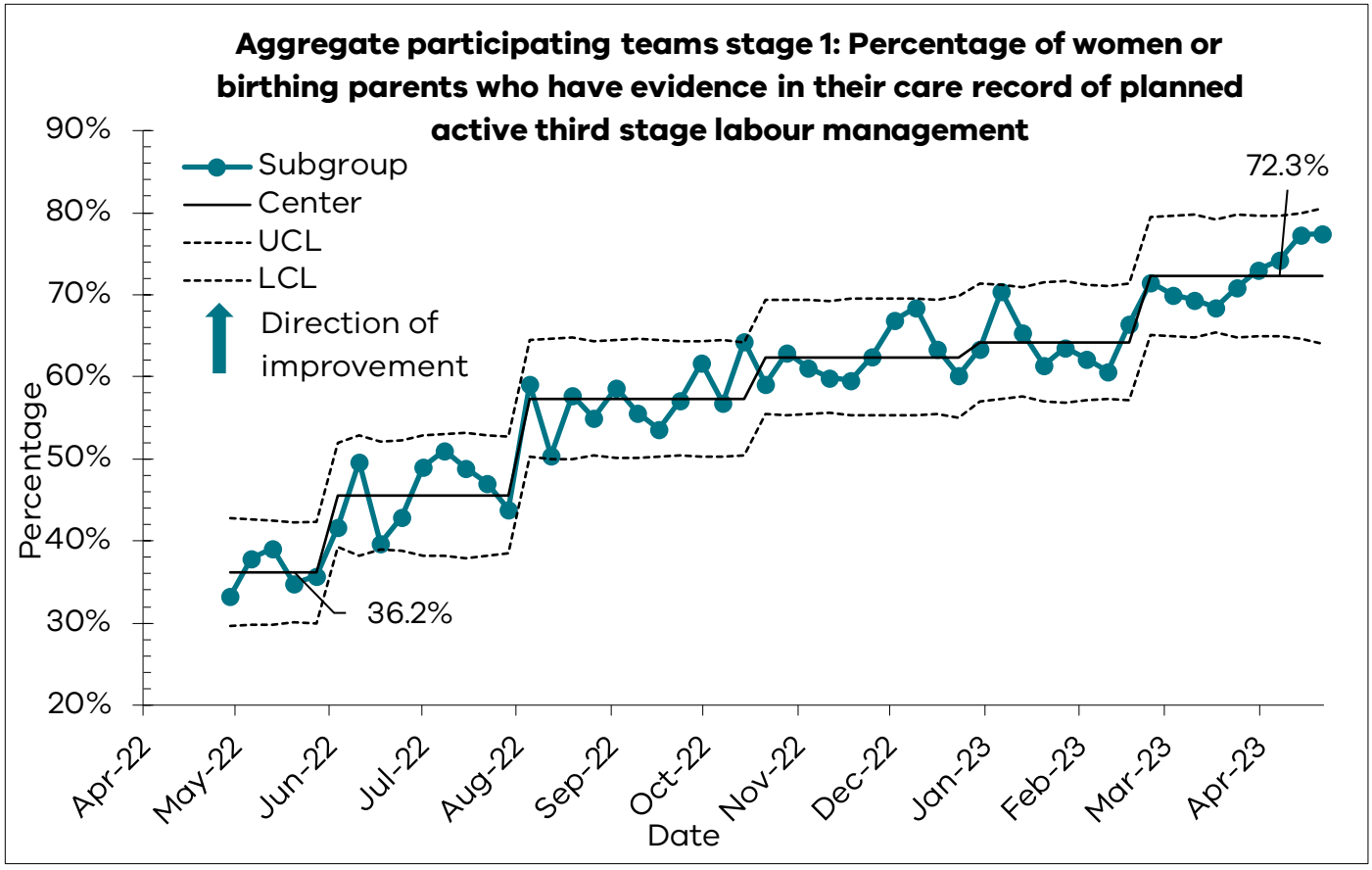

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Figure 8), and faster PPH response times in 17 health services (average time across participating services of 3.7 minutes, see

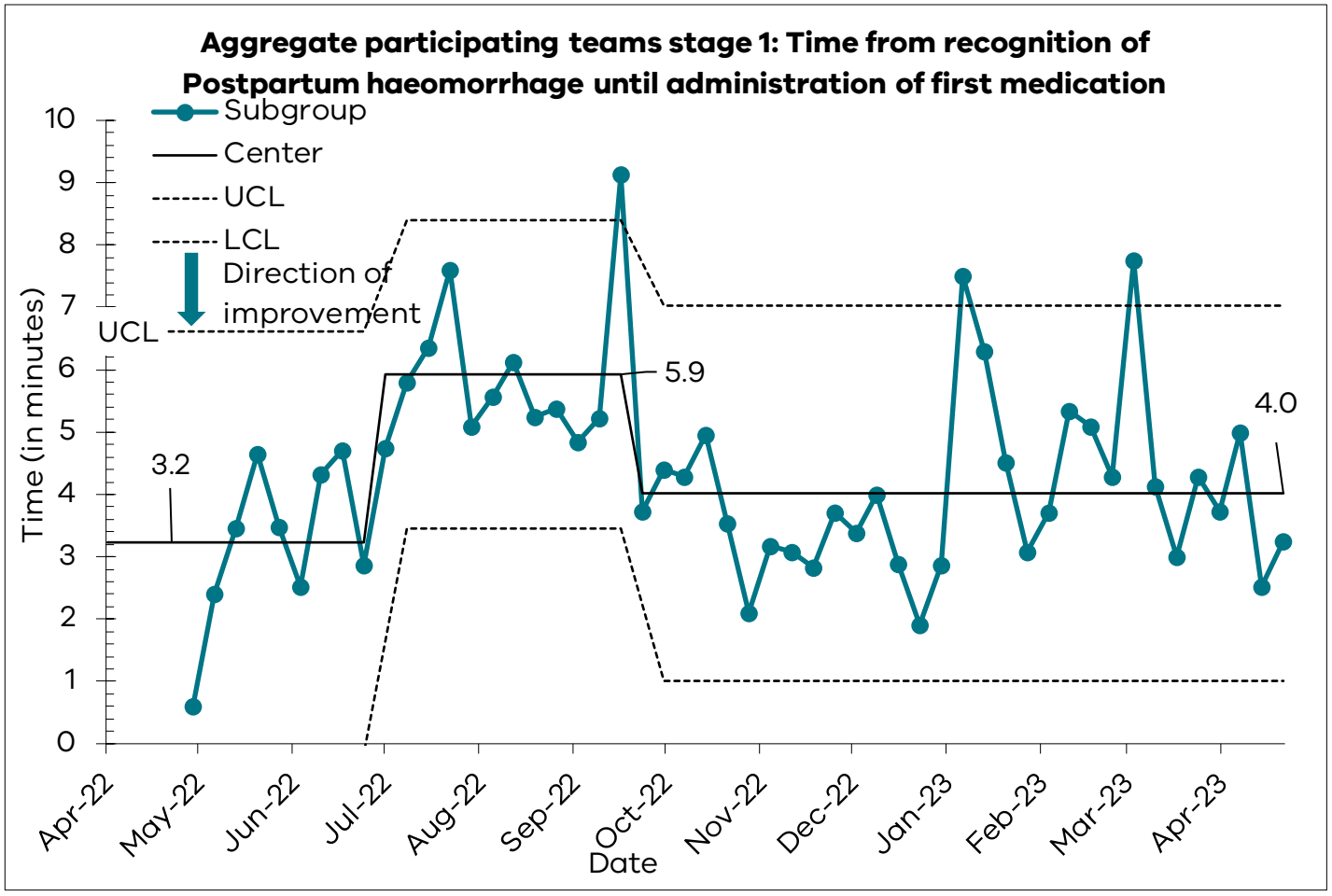

Figure 9).

A unique aspect of the Collaborative was the focus on consumer partnering to minimise the harm from birth trauma, rather than solely reducing the incidence of PPH. Qualitative analysis showed a widespread culture change in participating services to make PPH response more person-centred. Services tested improvements to debrief processes and strategies to improve communication to support women and birthing parents who experience PPH. Services also implemented strategies to extend that care to families and support people.

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What did we learn?

The most significant learning from the Collaborative was the identification of the key change ideas that lead to improved recognition and response to PPH. Qualitative Comparative Analysis (QCA)[2] of the results was undertaken to assess which changes contributed to improvement in individual health services. This analysis provided insight that wasn't able to be drawn from aggregated data.
The four key change ideas that were identified are outlined in

Figure 4. Recommended minimum care bundle for improved recognition and response to PPH.These four changes could form a minimum care bundle for maternity services that, if consistently implemented, will deliver measurable improvements in recognition and response to PPH.

1. **Standardised Quantitative Blood Loss (QBL) Measurement:** Implement QBL techniques for all women, standardising estimates in challenging cases like water births. Transitioning to QBL requires a cultural shift and several months to establish as routine. This should be the first step in evaluating PPH incidence within health services.

2. **Standardised PPH Treatment Protocol:** Variations in PPH management within the same facility cause delays. Regularly review adherence to a standard protocol and support it with processes that reduce the time from decision to treat to medication administration.

3. **Addressing Barriers to Medication Administration:** Ensure availability and proficiency in medication preparation and administration. Consider standing medication orders and ensure easy access to necessary medications and equipment.

4. **Clear Criteria and Standard Language for PPH Recognition and Escalation:** Develop standard language, such as a Code Pink procedure, to facilitate recognition and escalation. This language should be consistent across services to accommodate staff mobility.

Figure 4. Recommended minimum care bundle for improved recognition and response to PPH.

[2] QCA is an analysis technique to identify how specific conditions contribute to the desired outcome. A condition is necessary if the outcome cannot occur in the absence of the condition. Conditions are considered necessary if their consistency scores are very high (≥0.9), and relevant if the coverage score is greater than 0.5.

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Other insights and learning from the Collaborative are summarised below:

- Introduction of QBL measurement was anticipated to increase reported rates of smaller PPHs (500-999ml and 1000-1499ml). However, without standardised QBL measurement, a notable number of larger PPHs (≥1500ml) may go unnoticed, impacting the care of affected women and birthing parents.
- It is difficult to evaluate the impact of changes to reduce the rate of PPHs (≥1500ml) until QBL has been implemented to a high level of reliability. To be considered 'high reliability' QBL needs to be occurring in at least 85 per cent of vaginal births.
- Consumer concerns extend beyond mere blood loss volume during delivery. Adequate support during and after a PPH incident significantly influences the medium to long-term health outcomes of women, birthing parents, and their partners. As a minimum, services should ensure that every person who has experienced a PPH receives a clinical debrief of what has occurred and discussions on follow up care that may be required.
- The Breakthrough Series Methodology effectively provided the context and support to instigate system-wide procedural changes within Victoria's maternity sector. Engagement with collaborative activities was robust, and participant satisfaction remained high throughout.
- Effective medication management for PPH requires two integral and interconnected improvements:
    (i) adherence to evidence-based protocols to ensure appropriate medication usage, and
    (ii) elimination of administrative and logistical obstacles to facilitate prompt medication administration.

Limitations

When reviewing the results of the Collaborative there are several limitations for consideration:

1. This program was tested as a bundle of elements together. Therefore, we are unable to precisely determine which of the individual elements had the greatest impact on the results of the Collaborative.
2. The impact of the introduction of QBL was underestimated in both the time and effort that it required to achieve this clinical and cultural shift and the consequence it would demonstrate on the reported rates of PPH. Implementation of QBL identified the historical under recognition, underreporting and likely under

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treatment of PPH in Victoria. The correlation of increased recognition of PPH at the same time as testing changes to improve the clinical response to PPH may have masked improvements in the rate of PPH ≥1500ml that would otherwise have been visible.

3. There was no aggregate patient reported outcome measure to evaluate the impact on consumers and this should be considered in future work. Individual services did develop strategies to measure impact reported by consumers and used these measures to guide and demonstrate improvement.

Conclusion

The Collaborative changed the way in which PPH is identified and responded to in Victorian health services. This resulted in improvements in obstetric safety. By undertaking this project, the historical under recognition, underreporting and likely under treatment of PPH in Victoria was identified, which has significant ramifications for those who experience PPH. This work was also innovative in the manner that people with lived experience contributed to the design and delivery of the collaborative and ultimately expanded the focus of clinicians to consider the broader harms that occur following a PPH.
The Collaborative also demonstrated unprecedented sector engagement. The 33 participating teams accounted for 80 per cent of Victorian births during the Collaborative timeframe. This demonstrates that the strategic intent and priorities of CCOPMM and local maternity health services are strongly aligned.

Reducing the incidence of PPH continues to be a priority for the maternity sector and was reinforced by the Collaborative revealing the issue to be more significant than was understood from historical reporting. There is still considerable scope for improvement. SCV is dedicated to supporting sustainable improvement and spread of impactful change ideas across the sector. Assessing the true impact of the Collaborative was complicated by improved recognition of PPH via QBL implementation, occurring concurrently with the testing of other changes. This made it difficult to demonstrate the true benefits of the other elements of the change package. The change ideas included within the Collaborative are evidence based. They have demonstrated improvement in international projects involving larger data sets and a more stable outcome measure baseline.

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Next Steps

SCV has a continued commitment to improving the safety and experience of birthing parents which necessitates providing ongoing support and resources to the sector as they continue or commence this improvement work, including:

- spreading the implementation of QBL as standard best practice,
- further testing the change bundle within services where QBL is reliably embedded to build deeper understanding and confidence in the change elements that demonstrate improvement in reducing severe PPH rates, and
- scoping opportunities for evidence-based improvements in the identification and mitigation of the causative factors of PPH.

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Appendices

Appendix A. Participating Health Services

Albury Wodonga Health Service*
Bairnsdale Regional Health Service*
Ballarat Health Service*
Barwon Health*
Bass Coast Health*
Benalla Health
Bendigo Health*
Cabrini Health
Dhelkaya Health (formerly known as Castlemaine Health) *
Colac Area Health*
Eastern Health*
Echuca Regional Health
Epworth Health Care*
Goulburn Valley Health*
Grampians Health*
Kilmore District Health*
Latrobe Regional Hospital*
Maryborough District Health Services*
Mercy Public Hospitals Victoria*
Mildura Base Public Hospital
Monash Health – Monash Medical Centre, Clayton*
Monash Health – Casey Hospital*
Monash Health – Dandenong Hospital*
Northeast Health Wangaratta*
Northern Health*
Peninsula Health*
Royal Women's Hospital*
Southwest Healthcare Warrnambool
St Vincent's Private Hospital Melbourne
Swan Hill District Health*
West Gippsland Health Group*
Western Health (Bacchus Marsh) *
Western Health (Joan Kirner Women's & Children's Hospital) *

*Participated in both phase 1 and phase 2 of the collaborative

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Appendix B. Project Team

Collaborative Role	Name and Term
SCV Executive Sponsor(s)	Rebecca Reed (July 21 – Jan 23), Tracy Firth (Feb – May 2023), Janelle Devereaux (June 23 - June 2024)
IHI Executive Sponsor	Lisa McKenzie
SCV 100K Manager(s)	Kim Griffiths (2021), Laura Howell (2022), Rachael Crean (February 23 – September 2023), Lainie Cooper (October 2023 - June 2024)
IHI Project Director	Robert Forsythe
SCV Project Lead	Kaz Redmond (Nov 2021 – April 2024)
Clinical Fellow/Co Lead	Shannon Lambert (May 2023 – June 2024)
SCV Improvement Advisor(s)	Eleanor Sawyer (2021 - January 2022), Caitlyn Brennan (January 2022 - May 2022), Melissa McIlvain (June 2022 – January 2023), Brindha Garuda (Jan 23 – Mar 23), Melissa McIlvain (November 2023 - March 2024)
Principle Project Officer	Rachael Crean (December 2023 - June 2024)
Senior Project Officer	Fiona Nemeh (October 2023 - June 2024)
IHI Improvement Advisor	Linda Sorum (2021 – Jan 2023)
IHI Project Manager(s)	Kara Herbert & Jen Sloane
Clinical Lead(s)	Nicola Yuen (2021 - 2022), Tanya Farrell (2021 – July 2023), Tracy Firth (August 2023 – December 2023), Penny Sheehan (August 2023 – March 2024)
Consumer Advisor	Lydia Horvat (2022)
Consumer Faculty	Ellie Goss and Alana McDonald
Project Officer(s)	Elle Young (2021 - 2022), Joanne Nguyen (2022), Eliza Tang (October 2022 – Jan 2023), Elizabeth Doan (September & October 2023), Tess Uhi (February 2023 – June 2024)

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Appendix C. Project Faculty

The project team was supported by an expert faculty, comprised of clinical and lived experience experts who were present at Learning Sessions and action period calls to support teaching and coaching teams.

Faculty Position	Name	Professional Title and Organisation
IA Faculty	Adele Kelly	Improvement Advisor, Women's Healthcare Australasia
Consumer Faculty	Ellie Goss	Lived Experience Representative
Clinical Faculty	Nicola Yuen	Clinical Director of Obstetrics - Bendigo Health
Clinical Faculty	Warrick Pill	Consultant Obstetrician & Gynaecologist - West Gippsland Healthcare Group
Clinical Faculty	Lauren De Luca	Director of Obstetrics & Gynaecology - Western Health
Clinical Faculty	Richard Mayes	Consultant Obstetrician - Castlemaine Health
Clinical Faculty	Tanya Farrell	Director Maternity Services – Western Health
Clinical Faculty	Melanie Alcorn	Clinical Midwife Educator – Northern Health
Consumer Faculty	Alana Donaldson	Lived Experience Representative
Clinical Faculty	Sherryn Elworthy	Clinical Midwife Consultant – Grampians Health Ballarat
Clinical Faculty	Caitlin Steiner	Clinical Midwifery Consultant – Mansfield Hospital
Clinical Faculty	Carolyn Webb	Clinical Midwifery Specialist – Ramsay Health
Clinical Faculty	Eliza Petering	Resident Medical Officer - Mercy Hospital for Women
Clinical Faculty	Jaime-Lee Luckham	Clinical Midwifery Educator – Barwon Health

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Appendix D: How did we measure improvement?

Measurement strategy

Measurement is a critical part of testing and implementing changes: measures tell a team whether the changes they are making lead to improvement. "Determining if improvement has really happened and if it is lasting requires observing patterns over time." (IHI, n.d.).

Participating services in the PPH Collaborative used an established measurement strategy (Table 1) during the Collaborative to know whether the changes they were making were leading to improvement. The health service teams collected and reported data in real time using this 'Family of Measures'. The measurement strategy was developed utilising the best available evidence, in consultation with clinical subject matter experts and IHI, and was used as the basis for this summative evaluation. Read more on Measures<https://www.ihi.org/how-improve-model-improvement-establishing-measures>.

Table 1. Family of measures used in the PPH Collaborative measurement strategy.

Number	**Outcome Measures**	**Frequency**
Measure 1	Percentage of women or birthing parents with a primary postpartum haemorrhage (PPH) ≥1500 ml and a vaginal birth.	Monthly
Measure 2	Number of women or birthing parents transferred to higher-level care following PPH and a vaginal birth.	Weekly
Measure 3	Percentage of women or birthing parents receiving a blood transfusion following a PPH and a vaginal birth.	Weekly
Number	**Process Measures**	**Frequency**
Measure 4	Percentage of women or birthing parents who birth vaginally who have evidence in their care record of a completed risk assessment.	Weekly
Measure 5	Percentage of women or birthing parents who birth vaginally who have evidence in their care record of planned active third stage labour management.	Weekly
Measure 6	Percentage of women or birthing parents who birth vaginally who have evidence in their care record of the quantitative assessment of blood loss.	Weekly
Measure 7	Average length of time in minutes between initiating PPH protocol and administration of medication.	Weekly
Measure 8	Percentage of women or birthing parents who birth vaginally and have a PPH ≥1500 ml* for whom there is	Weekly

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	evidence in their pregnancy care record of a clinical debrief and provision of information on available support.	
Number	**Balancing Measures**	**Frequency**
Measure 9	Percentage of women or birthing parents with a primary PPH ≥500ml and <1000ml.	Monthly
Measure 10	Percentage of women or birthing parents with a PPH ≥1000ml and <1500ml.	Monthly

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Analysing improvement

The main tools used for measuring improvement are run charts and Shewhart (or control) charts. These charts utilise the rules of probability to detect when a change in a system has potentially occurred based on the variation of data from what would be expected in a stable system. Different types of data require the use of different control charts. In this collaborative P-Charts are utilised as the most appropriate control chart for analysing changes in categorical data. In this report, three control chart rules have been used to detect signals of system change.

These are:

- points outside the control limits of the chart (shown as Upper Control Limit [UCL] or Lower Control Limit [LCL]),
- eight consecutive points above or below the mean, or
- six consecutive increasing or decreasing points.

When these patterns in the data are observed, it means that the change in the system is unlikely to have occurred by common cause (chance or random variation).
On a control chart, the centreline describes the mean of the observed values and the upper (UCL) and lower (LCL) lines indicate the control limits. Control limits are calculated from observed values in the data of the system you are studying and indicate the expected level of variation in the system. The control chart rules have been devised to maximise the sensitivity and specificity to special cause variation (that would not be expected as part of the normal performance of the system), to reduce the likelihood of false signals of random (chance) variation.

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Appendix E. PPH Collaborative change theory presented as a Driver Diagram

AIM	PRIMARY DRIVERS (Structures, processes, norms)	SECONDARY DRIVERS (Where and when?)	CHANGE IDEAS (How?)
By April 2023, reduce primary PPH greater than 1500ml following vaginal birth by 50 per cent. ***At participating sites.**	**P1: Partnering with consumers**	**S1: During pregnancy**	› Implement a shared decision-making approach to creating a third-stage management plan. › Educating and encouraging women and birthing parents to plan for active management of third stage. › Empower partners and support people in education to support women and birthing parents in PPH management. › Establish or strengthen shared decision making with women, birthing parent, and support people around blood transfusion.
		S2: During Birth	› Shared ongoing risk assessment and decision making. › Test and implement processes to maximise bonding time between parents and baby during PPH management.
		S3: After Birth	› Review experiences of women and birthing parents and support people. › Develop, test, and implement a support program for women, birthing parents and support people following PPH that offers multiple opportunities for debriefing. › Develop, test, and implement a discharge checklist that ensures women and birthing parents receive and understand key information and where to access additional support. › Implement a process that provides information and contacts for parents and support people who may require additional support following PPH.
		S4: Promoting Equity	› Identify groups disproportionately affected by PPH through data segmentation and take action to address disparities.
	P2: Readiness	**S5: Staff capability**	› Establish team roles and responsibilities during PPH management: allocate roles on a per shift basis. › Establish or review simulation training programs: deliver the right training to the right people at the right time.

		S6: Environmental preparedness	› Implement or review a PPH kit, with a standard checking protocol. › Test and implement risk assessment process to identify PPH development antenatally, perinatally, and postnatally. › Establish a service specific PPH protocol including a clinical decision tool or checklist
	P3: Recognition	**S7: Assessment of blood loss**	› Establish a standard process for blood loss measurement by weight following every birth. › Establish a standard process for assessing blood loss where it cannot be weighed
		S8: Decision to treat PPH	› Establish a 'trigger for treatment'. › Establish a process for communicating the decision to treat PPH within the team
	P4: Response	**S9: Management of PPH**	› Build service capability for the implementation of the PPH protocol, every time for every birth. › Build service capability for standardised, timely medication management. › Build capability and culture for timely transfer of severe cases to Operating Theatres. › Review initiation and enactment of massive transfusion protocol. › Review of standardised and management of blood transfusion when clinically indicated
	P5: Review	**S10: Review and debriefing of all involved in PPH**	› Review experiences and learning from debriefing of staff and consumers involved in real-time following PPH › Strengthen or implement a multidisciplinary, systems focused review for PPH cases. › Implement a system for learning and reflection with staff following a PPH that feeds back for continual improvement. › Review and evaluate real-time use of the clinical decision tool or checklist

Appendix F. Supplementary data

The following charts provide additional aggregate data from the Collaborative. For further information about the measures, see Appendix E.

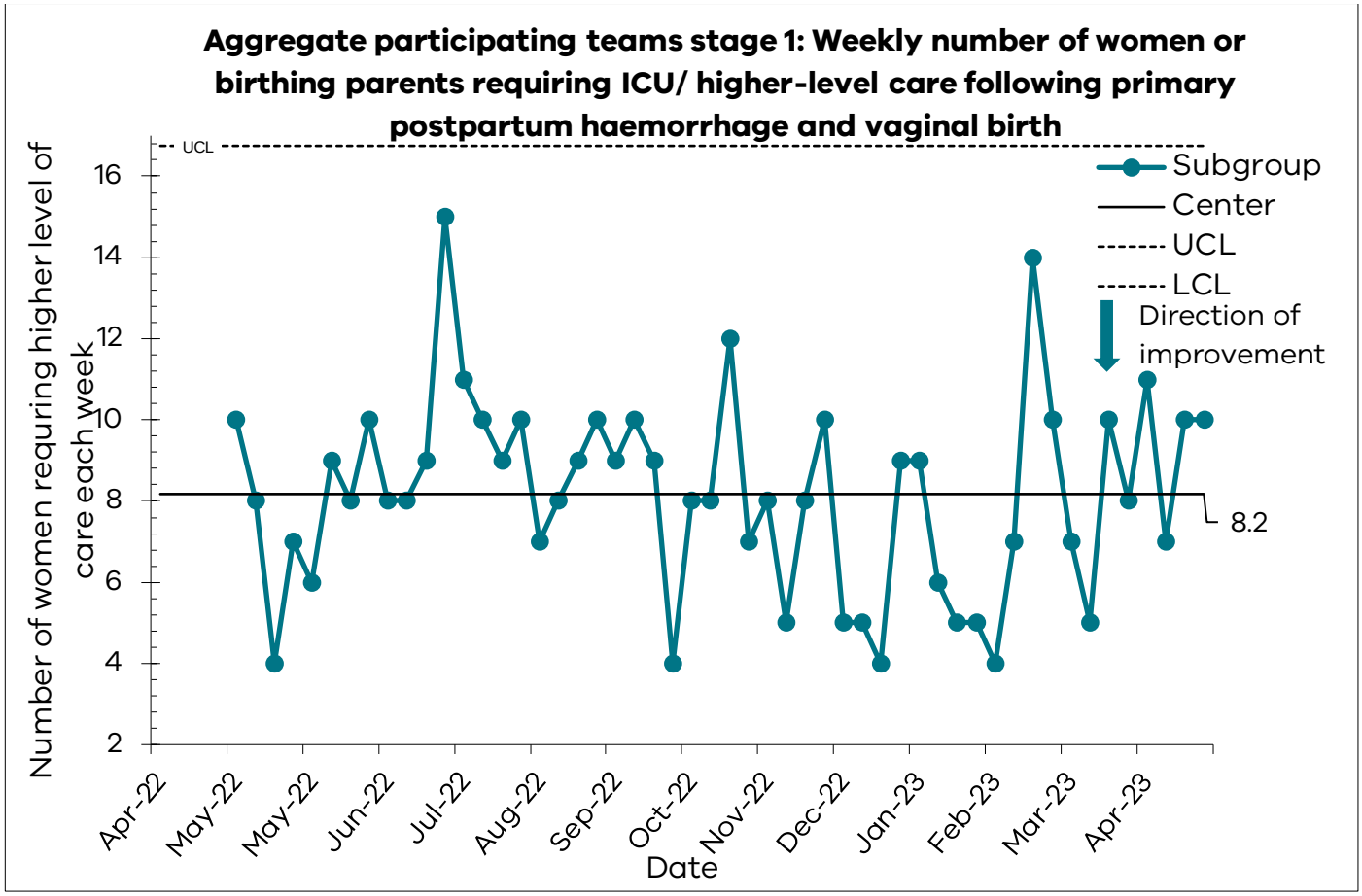

Figure 5. Weekly number of women or birthing parents requiring an ICU stay/ higher-level care following primary PPH and vaginal birth.

Insights:

- There was no change to the overall number of women or birthing parents transferred to higher care following PPH and a vaginal birth (Measure 2 – see Table 1)
- One health service had a significant reduction in the numbers of women escalated to higher levels of care. The mean number of women transferred at this site decreased from 2.5 per week to 1.2 per week. This represents a relative reduction of over 52 per cent from baseline at this health service.
- It is likely that there was significant variation in how this measure was interpreted and used throughout services. The intent was that this measure

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capture women whose clinical condition required an escalation of care; however, the reasons for utilisation of care environments in services have complexities which make recording these data challenging. The aggregated data should therefore be interpreted with caution.

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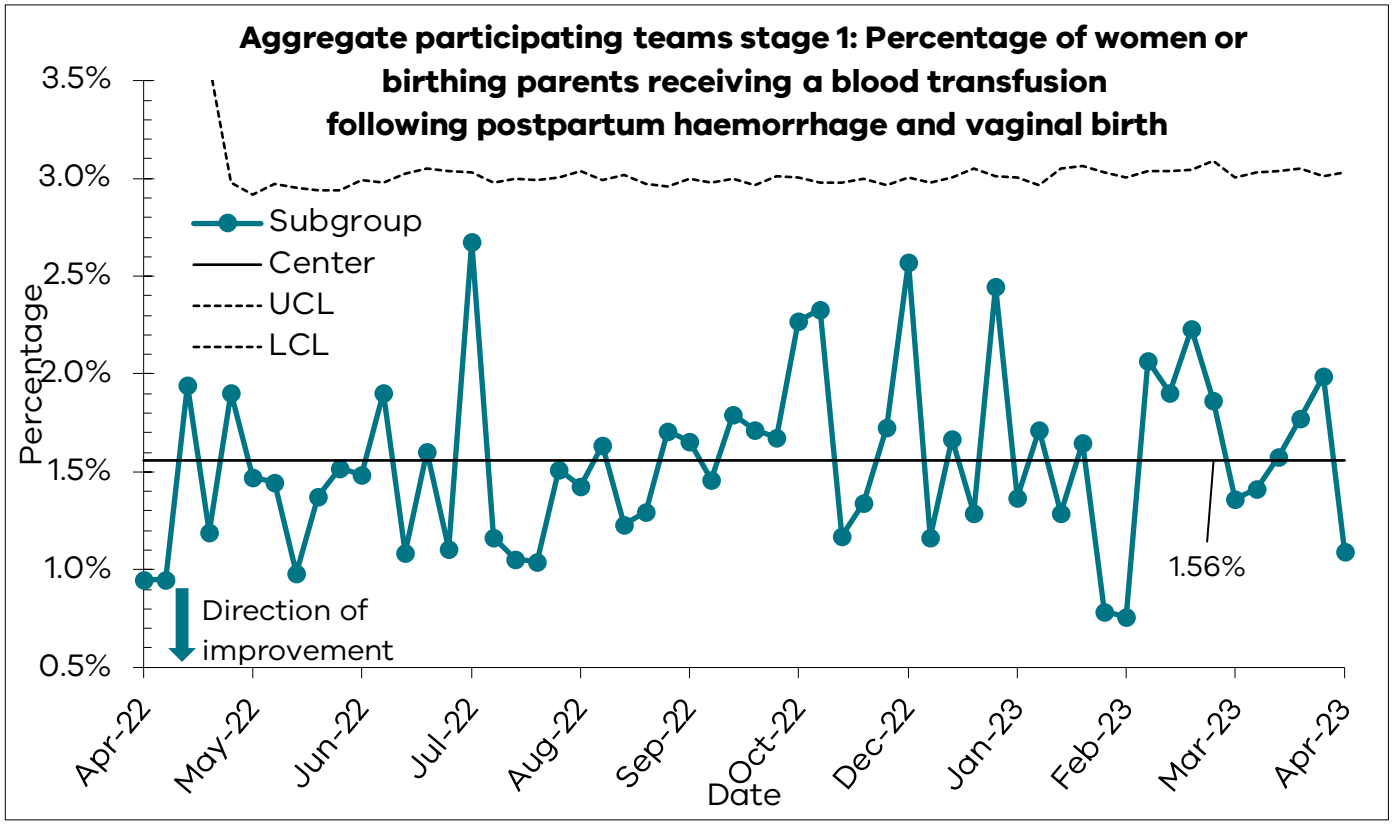

Figure 6. Aggregate percentage of women or birthing parents receiving a blood transfusion following PPH and vaginal birth.

Insights:

- There was no recorded change in the mean rate of 1.56 per cent in the aggregated percentage of women or birthing parents receiving a blood transfusion.
- Two services demonstrated a significant reduction in the use of blood transfusions.

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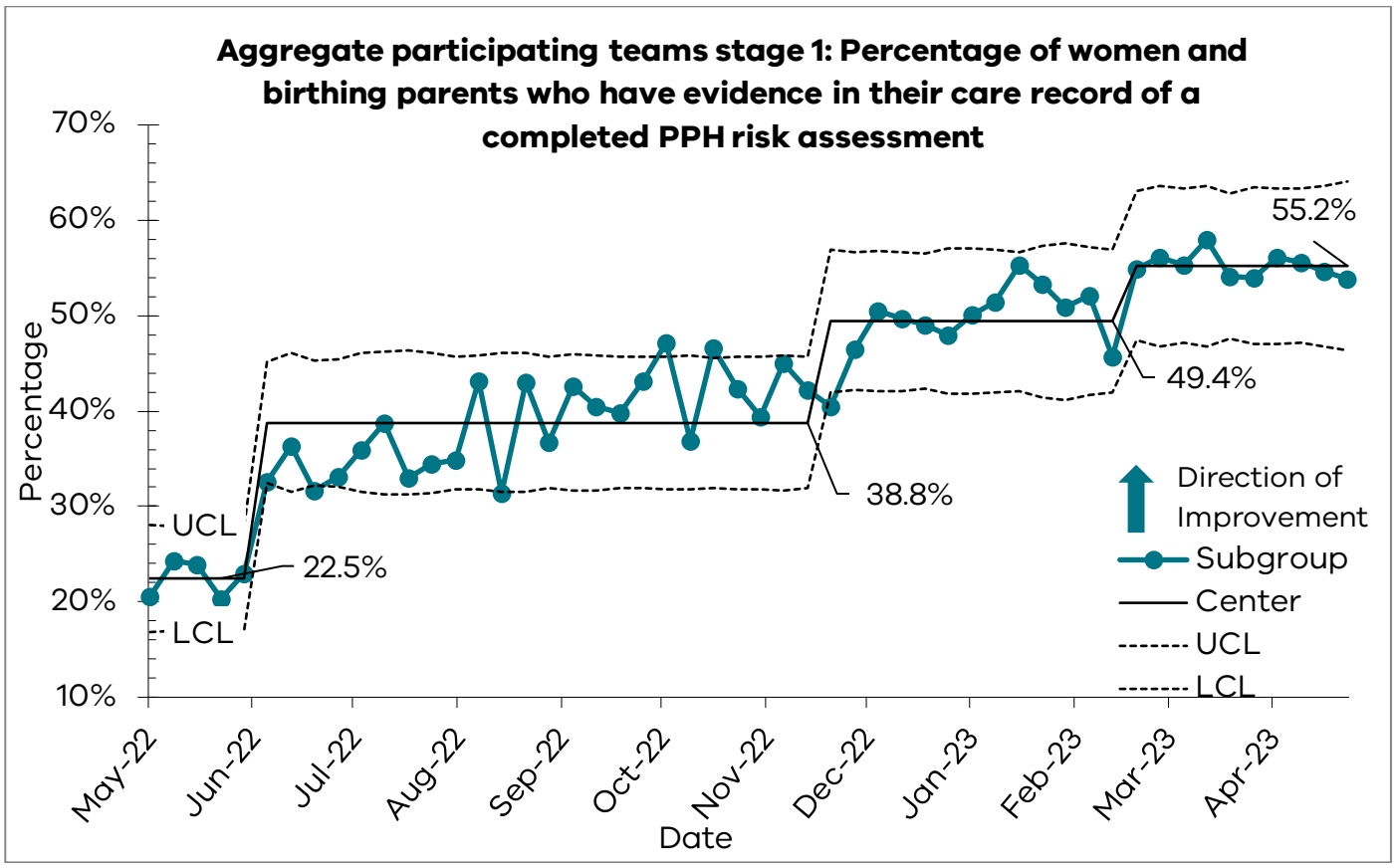

Figure 7. Aggregated percentage of women with evidence of having received a PPH risk assessment.

Insights:

- The aggregated results indicate an increase from 22.5 per cent of birthing women to 55.2 per cent of birthing women receiving a PPH risk assessment, representing a relative increase of 145 per cent in the number of documented risk assessments for PPH completed.
- This measure was not collected prior to the Collaborative and therefore retrospective baseline data is not available.
- Some services had robust processes in place for risk assessment prior to commencing the Collaborative and therefore had less opportunity for improvement however, 14 services demonstrated significant improvement, including a change from 5 per cent to 95 per cent at one health service.

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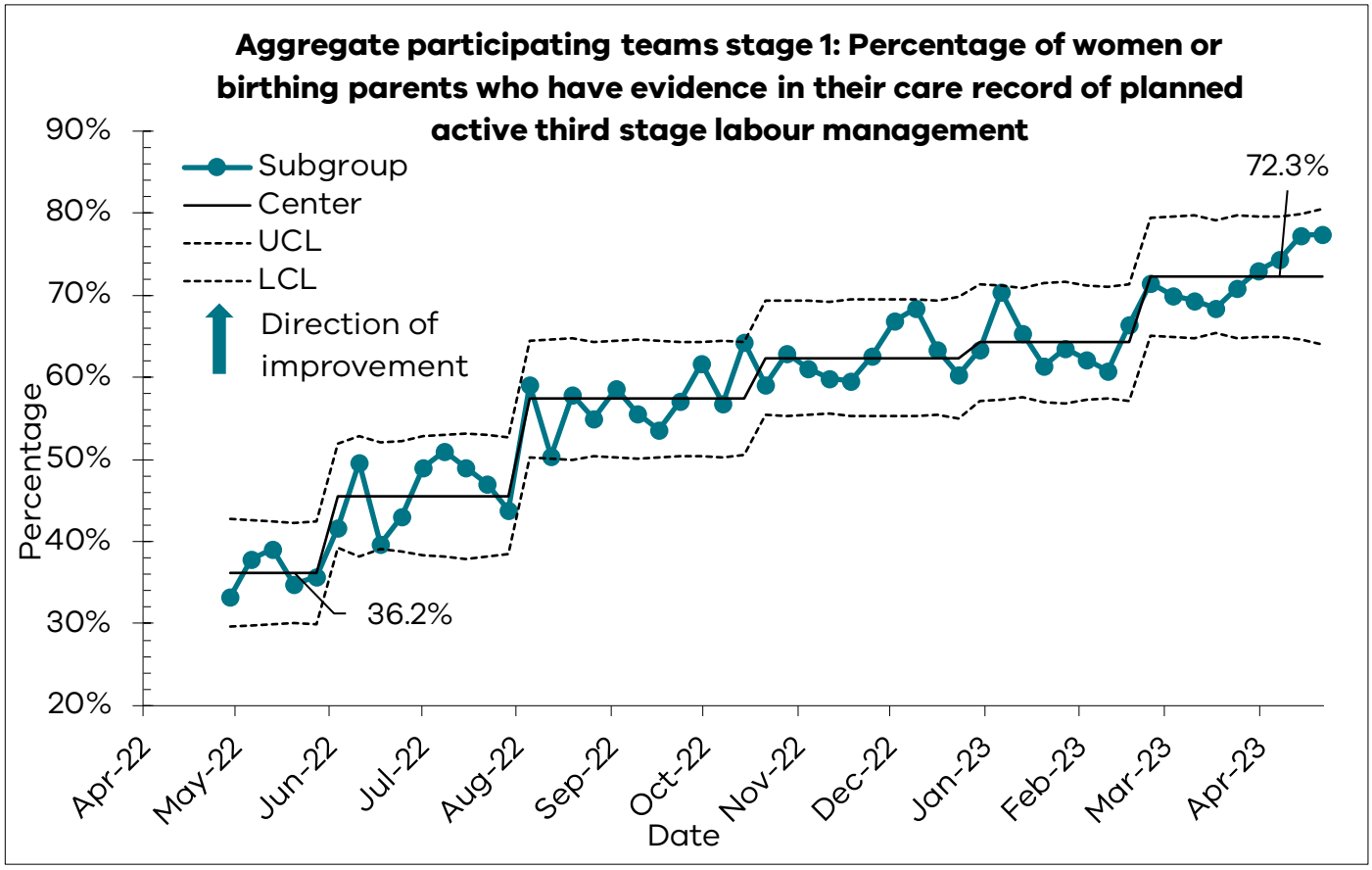

Figure 8. Aggregated percentage of women with documented evidence of third stage labour management.

Insights:

- The aggregated results indicate an increase from 36.2 per cent of women to 72.3 per cent with a third stage labour plan, representing a relative increase of 99.7 per cent.
- Fifteen services demonstrated sustainable improvements in this measure with the largest improvements at the ranging from (19 per cent to 98 per cent) and (18 per cent to 95 per cent).
- There remains significant variation across the Collaborative with regards to documentation of third stage management plans. This represents a possible opportunity for further improvement in some services.
- This measure was not collected prior to the Collaborative and therefore retrospective baseline data is not available.

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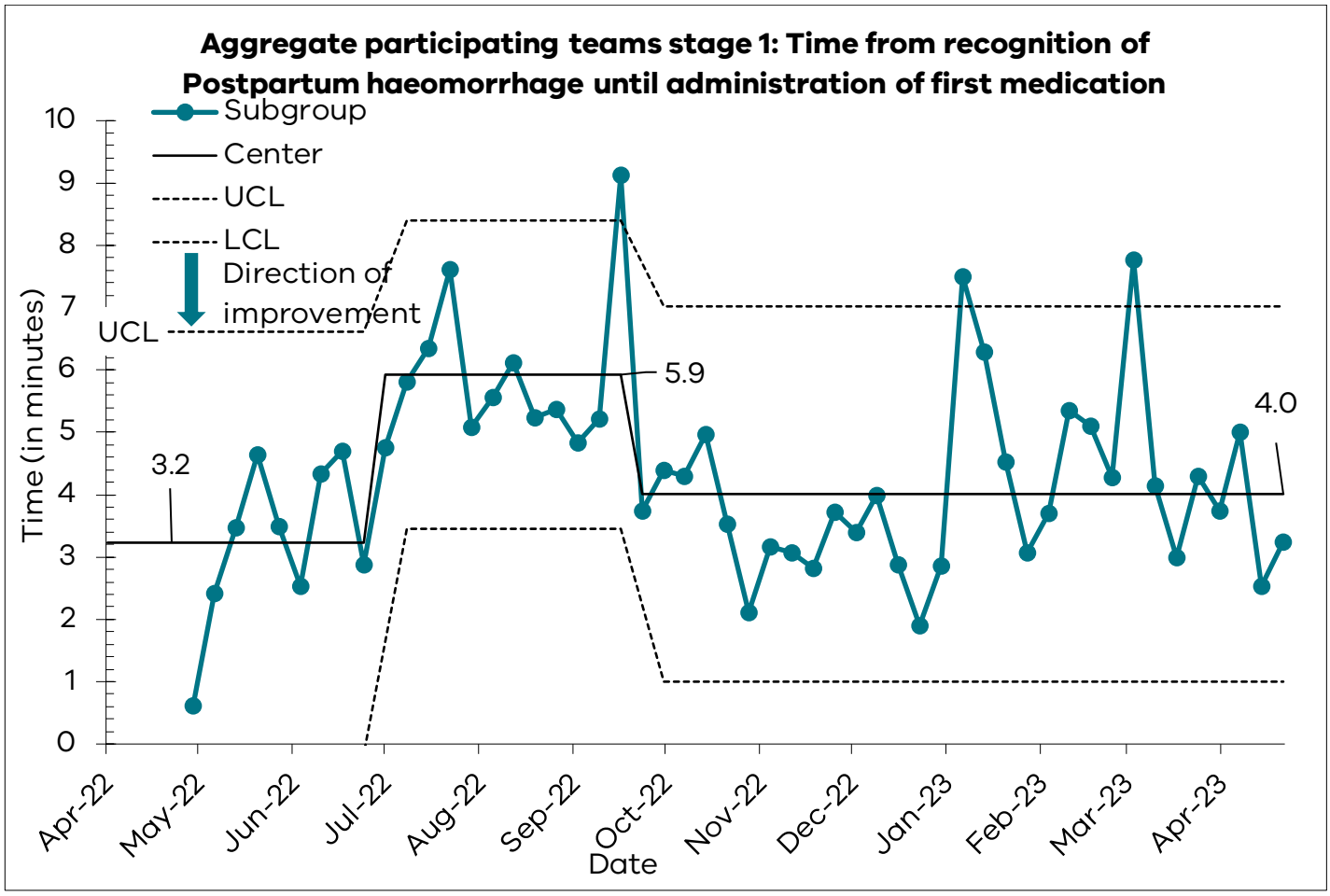

Figure 9. Average time from recognition of PPH to administration of medication

Insights:

- A reduction in the average time to administration of medication was observed in 17 services.
- Two services achieved large reductions in this measure, (reduction from 12 minutes to 4 minutes) and (reduction from 7.5 minutes to 4 minutes). This data was manually collected and was not easily available in all services.
- Between May and November 2022 at least 20 services regularly contributed data to this measure. After November 2022 the number of services gradually reduced.
- After January 2023 only five services contributed to the measure consistently. Any changes in the aggregated measure are likely due to differences in reporting from week to week.

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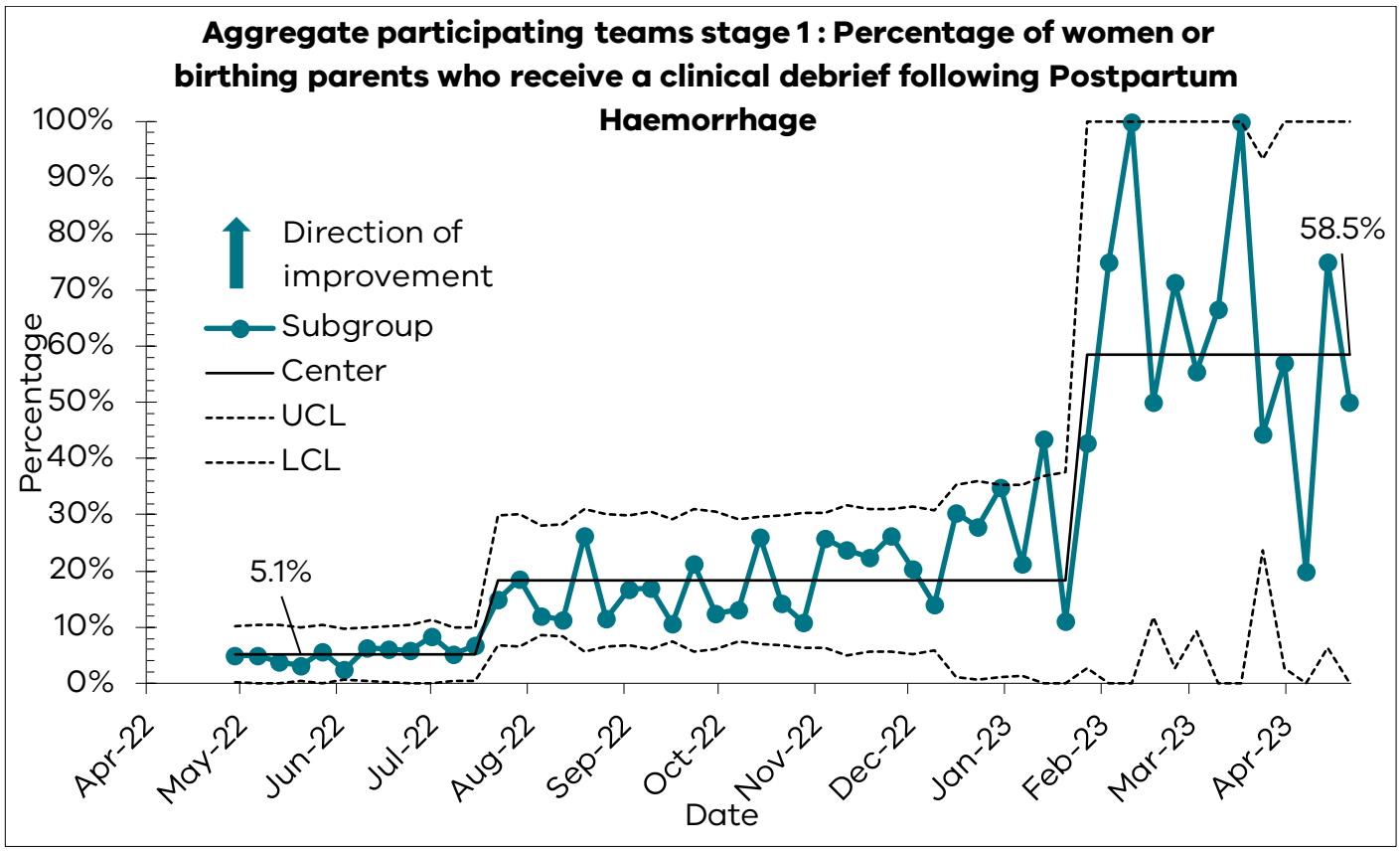

Figure 10. Aggregated percentage of women who experience PPH who receive a clinical debrief.

Insights:

- Six services were able to demonstrate sustainable improvement in the percentage of women who experience PPH who receive a clinical debrief.
- The increase in the aggregated measure from 5.1 per cent to 58.5 per cent has largely been driven by improvements in these services.
- The most notable improvement was at one service where the rate increased from 10 per cent to 100 per cent correlating to the introduction of a Perinatal Liaison Midwife position.
- The aggregated measure must be interpreted with care as it includes women with different severity of PPH in different services.
- Smaller services included women who had experienced smaller volume PPH than the project measure due to insufficient data to demonstrate improvement because of the low numbers of larger volume PPH within their services.

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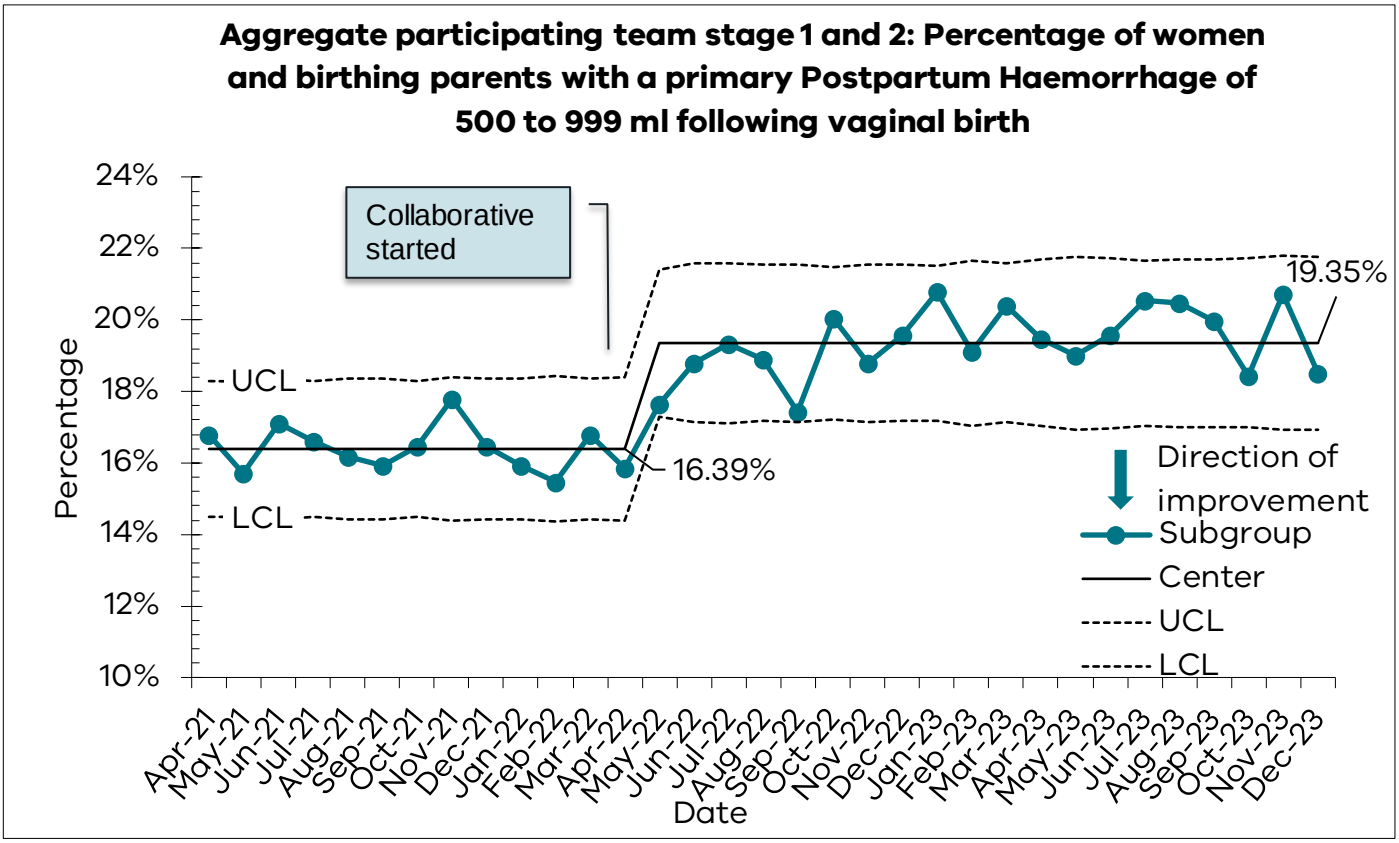

Figure 11. Aggregated percentage of women or birthing parents with a primary postpartum haemorrhage 500 to 999 ml following vaginal birth.

Insights:

- On aggregate level, an increase in the rate of PPH between 500 to 900ml was observed from May to October 2022. This corresponds to the increased uptake of QBL.
- This increase was sustained for the duration of the Collaborative.
- There are significant differences across the health services relating to the rate of PPH between 500 to 999mL Nineteen services demonstrated increased rates, three services showed reduced rates and the remainder had no observable change.
- Increases in the rate of PPH between 500 to 900ml were of a large magnitude in some services. One service increased from 12.9 per cent to 22.9 per cent of births and another increased from 8.3 per cent to 14.3 per cent of births. There was one outlier with a decrease from 30.7 per cent of births to 25.0 per cent of births.

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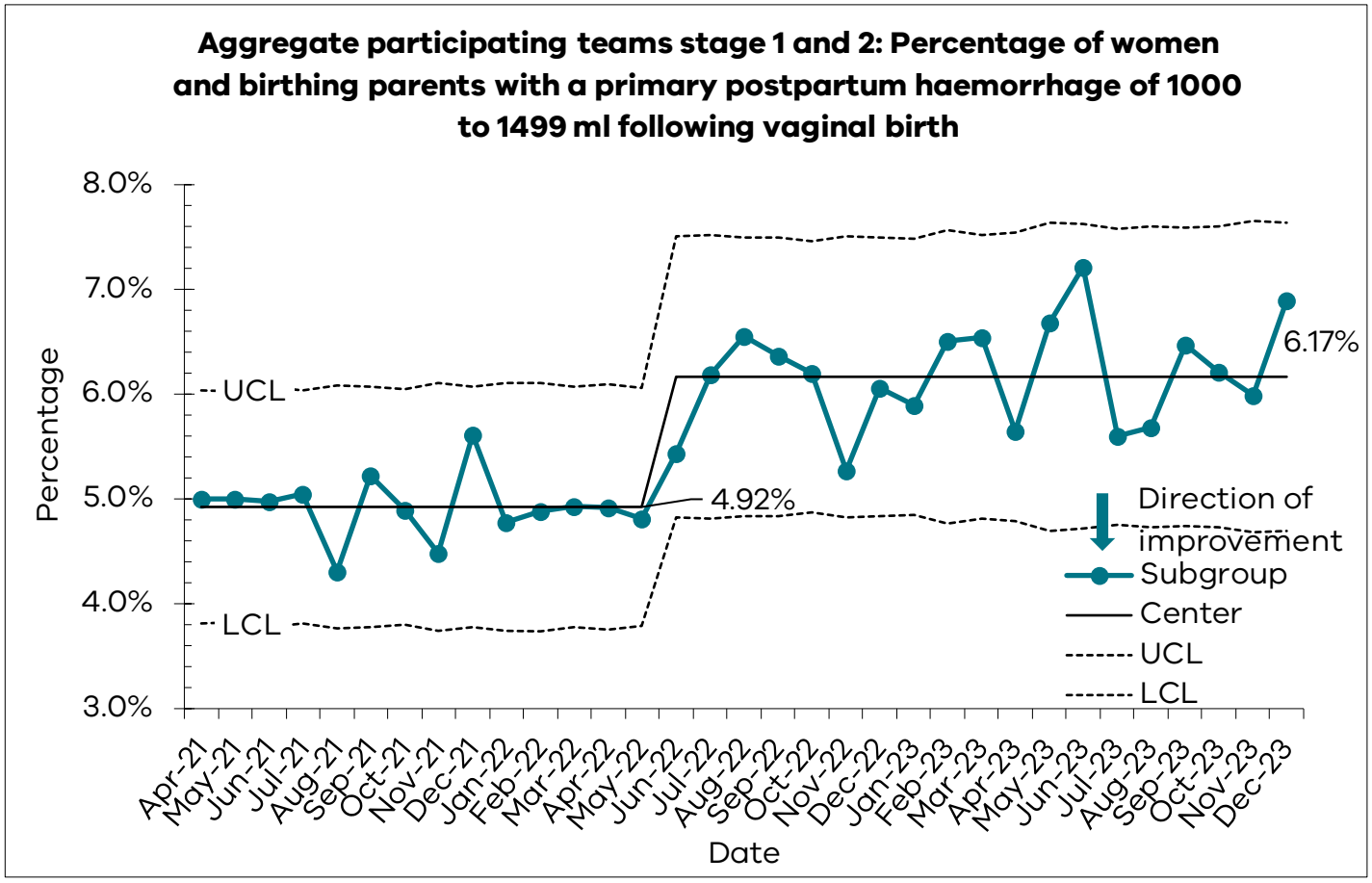

Figure 12. Aggregated percentage of women or birthing parents with a primary postpartum haemorrhage 1000 to 1499 ml following vaginal birth.

Insights:

- There was an increase in the rate of women experiencing a PPH 1000-1499ml from a mean of 4.92 per cent to 6.17 per cent. This represents an increase of 25.4 per cent relative to the baseline mean rate.
- The shift in the mean rate, between April and June 2022 corresponds temporarily to the adoption of QBL by most teams.
- On an individual team basis, 13 teams demonstrated a significant increase in this measure.
- Three services had a reduction in this measure.

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