

# Letter to Editor: Re: Impact of analysis technique on our understanding of the natural history of labour

Bradley de Vries<sup>1</sup>, Mark Lauer<sup>2</sup>, Jon Hyett<sup>3</sup>, Sarah McDonald<sup>4</sup>, Hala Phipps<sup>3</sup>, Farmey Joseph<sup>5</sup>, Rhett Morton<sup>3</sup>, and Kevin McGeechan<sup>6</sup>

<sup>1</sup>Sydney Institute of Women, Children and their Families

<sup>2</sup>Sigma-squared T, Sydney

<sup>3</sup>Royal Prince Alfred Hospital

<sup>4</sup>Baymatob Operations Pty Ltd

<sup>5</sup>RPA Women and Babies

<sup>6</sup>The University of Sydney

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Letter to Editor:

Re: Impact of analysis technique on our understanding of the natural history of labour

## **Authors:**

1. Bradley S. DE VRIES
2. Mark LAUER
3. Sarah MCDONALD
4. Farmey A. JOSEPH
5. Rhett MORTON
6. Jon A. HYETT
7. Hala PHIPPS
8. Kevin McGEECHAN

1. Bradley S. DE VRIES; Sydney Institute for Women, Children and their Families, Sydney, New South Wales, Australia; Faculty of Medicine and Health, The University of Sydney School of Public Health, University of Sydney, Sydney, New South Wales, Australia; MBBS, PhD
2. Mark LAUER; Sigma-squared T, Sydney, Australia; BSc(hons) PhD
3. Sarah MCDONALD; Baymatob Operations Pty Ltd, Sydney, New South Wales, Australia; PhD (Medicine), BEng (Mechatronics)
4. Farmey A. JOSEPH; RPA Women and Babies, Royal Prince Alfred Hospital, Sydney, New South Wales, Australia; SM, MBBS
5. Rhett MORTON; RPA Women and Babies, Royal Prince Alfred Hospital, Sydney, New South Wales, Australia; BEng, MBBS
6. Jon A. HYETT; Sydney Institute for Women, Children and their Families, Sydney, New South Wales, Australia, Sydney, New South Wales, Australia; MBBS, MD
7. Hala PHIPPS; Sydney Local Health District, Sydney, New South Wales, Australia; Sydney Institute for Women, Children and their Families, Sydney, New South Wales, Australia; PhD

8. Kevin MCGEECHAN; Faculty of Medicine and Health, The University of Sydney School of Public Health, University of Sydney, Sydney, NSW, Australia; PhD

### Corresponding Author:

Bradley S. DE VRIES; Sydney Institute for Women, Children and their Families, Sydney, New South Wales, Australia.

Email: [bradley.deVries@health.nsw.gov.au](mailto:bradley.deVries@health.nsw.gov.au)

Phone: +61295158356; Fax +61295651595

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### Abstract:

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### Main Text:

Sir,

We respond to comments made by Zhang *et al* about our recent simulation study published in BJOG.<sup>1</sup> We thank the authors for providing us with their original SAS code, and we are grateful for their response.

The central finding of our paper was that *if* there is an acceleration phase in the first stage of labour *then* it would not be detected by the statistical methods that had been used. For the polynomial regression models, missing data at earlier cervical dilatations seen in shorter labours was a significant source of bias. This is an example of *missing data not at random*, a crucial violation of the methodological assumptions.<sup>2</sup>

We have provided the requested graph (Figure 1), noting that as for the analyses by Zhang *et al*, random intercepts were not assumed. We disagree with the contention that in Figures 3B, S4, and S5 some of the underlying curves are close to the underlying labour pattern, because the acceleration phase in the underlying data was lost. In these figures, a resemblance can only be seen from 5cm cervical dilatation onwards, and then only when examinations are performed more frequently than occurs in clinical practice. We suspect that the papers published by Zhang *et al*, based on retrospective data, relied on cervical examinations more than one to two hours apart.<sup>3</sup>

In our opinion an accurate understanding of the range of normal patterns of human labour is essential to inform future research and, ultimately, clinical practice. We agree with Zhang *et al* that variation in rates of cervical dilatation in the active phase of the first stage of labour has not been clearly defined, and that multiple patterns may co-exist. We can confirm that, by design, our simulated data cm-by-cm transit times followed a log-normal distribution. We agree that it is likely that not all labours enter the active phase at 4cm but note that assuming a range of points of onsets would not improve the ability of Zhang *et al*'s model to detect a true acceleration phase.

We agree that a rigid one-curve-for-all may be too simplistic and that can have important clinical consequences. For example, the ACOG / SMFM Consensus states that active phase arrest should not be diagnosed before 6cm cervical dilatation, and that a caesarean section should not be performed for a prolonged passive phase even of more than 20 hours in nulliparous women.<sup>4</sup> As pointed out by Cohen and Friedman

and others,<sup>5</sup> this recommendation potentially leads to excessive delay in performing a caesarean section for women with arrest disorders at less than 6cm cervical dilatation which may lead to increased complications such as post-partum haemorrhage, endometritis, uterine rupture and adverse perinatal outcomes.

Despite the findings of our simulation studies, we believe that regression methods have the potential to help us understand patterns of human labour and that further research is warranted. We also note that we did not perform simulations for some analyses such as the proposed partograms by Zhang *et al* and cannot comment on the accuracy of these analyses.<sup>3</sup>

## References:

1. de Vries BS, McDonald S, Joseph FA, et al. Impact of analysis technique on our understanding of the natural history of labour: a simulation study. *BJOG* 2021.
2. Newman DA. Missing Data: Five Practical Guidelines. *Organizational research methods* 2014; **17** (4): 372-411.
3. Zhang J, Landy HJ, Branch DW, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. *Obstet Gynecol* 2010; **116** (6): 1281-7.
4. American College of Obstetricians and Gynecologists, Society for Maternal-Fetal Medicine. Obstetric care consensus no. 1: safe prevention of the primary cesarean delivery. *Obstet Gynecol* 2014; **123** (3): 693-711.
5. Cohen WR, Friedman EA. Perils of the new labor management guidelines. *Am J Obstet Gynecol* 2015; **212** (4): 420-7.

## Disclosure of interests

The authors have no interests to declare.

## Details of ethics approval

N/A

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## Contribution to Authorship

BdV conducted statistical analysis and wrote the first draft of the manuscript. ML and KM provided advice about the statistical analysis and statistical aspects of the letter. ML, SM, FJ, RM, JH, HP, KM critically revised and edited the manuscript for publication.

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