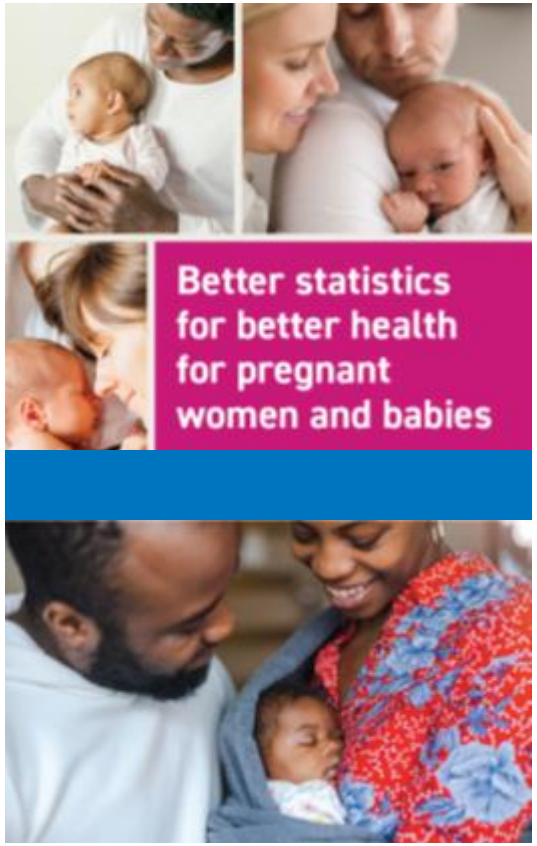


Cesarean section in Europe

Data and analysis from the Euro-Peristat project

Jennifer Zeitlin
Obstetrical, Perinatal and Pediatric Epidemiology Research Team
Center for Epidemiology and Statistics

Outline

- Background: the importance of investigating cesarean section (CS) rates in Europe and the Euro-Peristat project
- Variation between countries in CS rates, by risk factors and over time
- Association of CS rates with perinatal outcomes
- Discussion and concluding remarks

Background

- CS is a lifesaving procedure for mother and child
- CS is also associated with multiple health risks for the mother and child, although absolute risks are low:
  - Maternal morbidity
  - Complications in subsequent pregnancies: placenta accreta, placenta praevia, placental abruption, and stillbirth
  - Birth by CS may elevate risks of asthma, allergies and obesity.
- Unnecessary CS should be avoided

➢CS time trends – termed by some as the CS “epidemic” suggest over-use

Deneux-Tharaux et al. *Obstet Gynecol* 2006, Keag et al. *PLoS Med* 2018

Betran AP, Ye J, Moller A-B, et al. Trends and projections of caesarean section rates: global and regional estimates. BMJ Global Health 2021;6:e005671. doi:10.1136/bmjgh-2021-005671

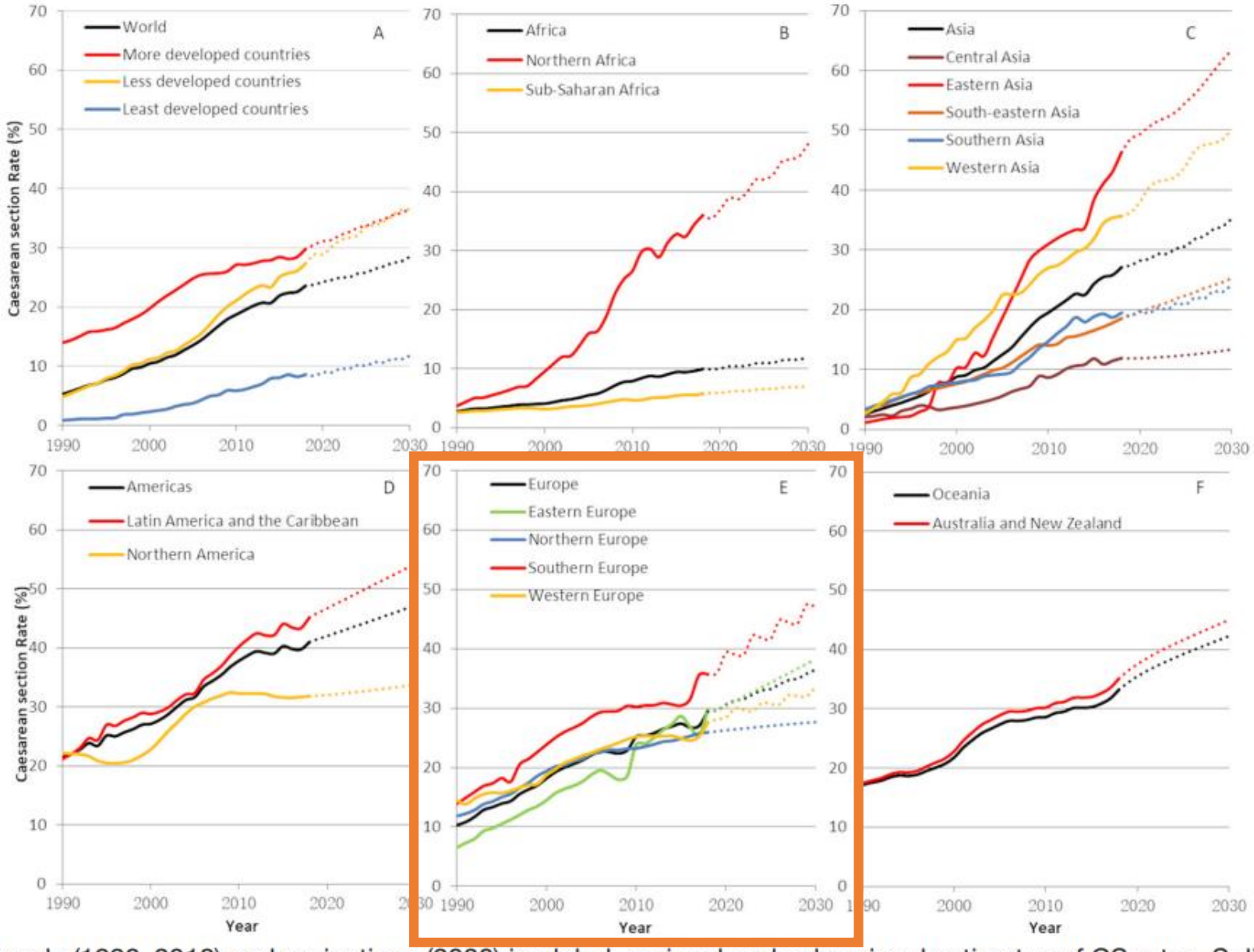


Figure 1 Trends (1990–2018) and projections (2030) in global, regional and subregional estimates of CS rates. Solid lines are trend estimates and dotted lines are projections. (A) World; (B) Africa; (C) Asia; (D) Americas; (E) Europe; (F) Oceania. Rates and projections for the Melanesia, Micronesia, and Polynesia were not calculated due to the low coverage of data in this subregion of Oceania.

European context

- High income countries – similar standards of living
- Similar access to scientific knowledge about care
- Health insurance for pregnant women and children
- Maternity benefits

➢ But high diversity in practices and policies

The Euro-Peristat Project

- **Aim** : to monitor maternal, fetal and infant health associated with pregnancy, delivery and the postpartum period
- Using valid and reliable **routine national indicators** collected with a common protocol (vital statistics, birth registers, hospital discharge abstracts and routine surveys)

- 10 core and 20 recommended indicators, collected by risk group, including CS (parity, presentation, multiplicity, previous CS, preterm/term)
- Representatives from 31 European countries

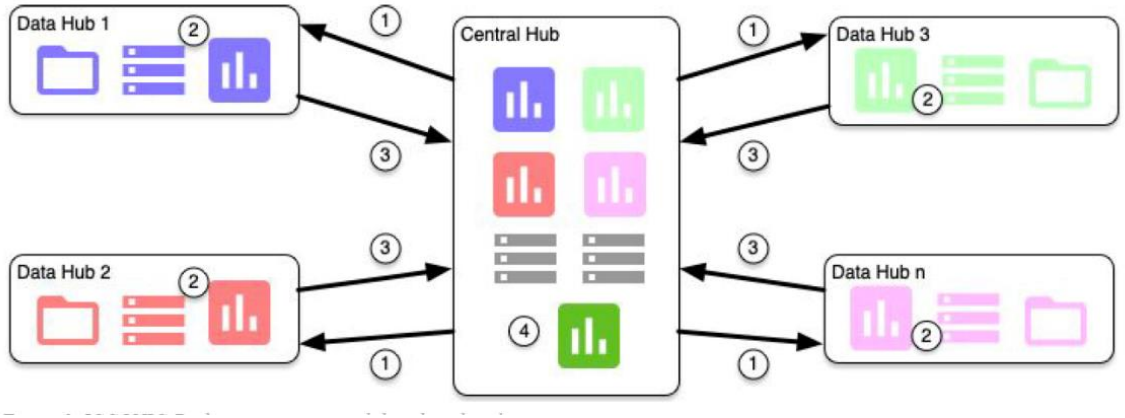
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 101018317

Data Collection & Reports

- For the year 2000
  - *the European Journal of Obstetrics and Gynecology,* Vol 111, Supp 1, 28 November 2003
- For the year 2004
  - European Perinatal Health Report (2008)
- For the year 2010
  - European Perinatal Health Report (2013)
- For the year 2015
  - European Perinatal Health **Core** Indicator Report (2018)
- For the years 2015 to 2019
  - European Perinatal Health **Core** Indicator Report (2022)

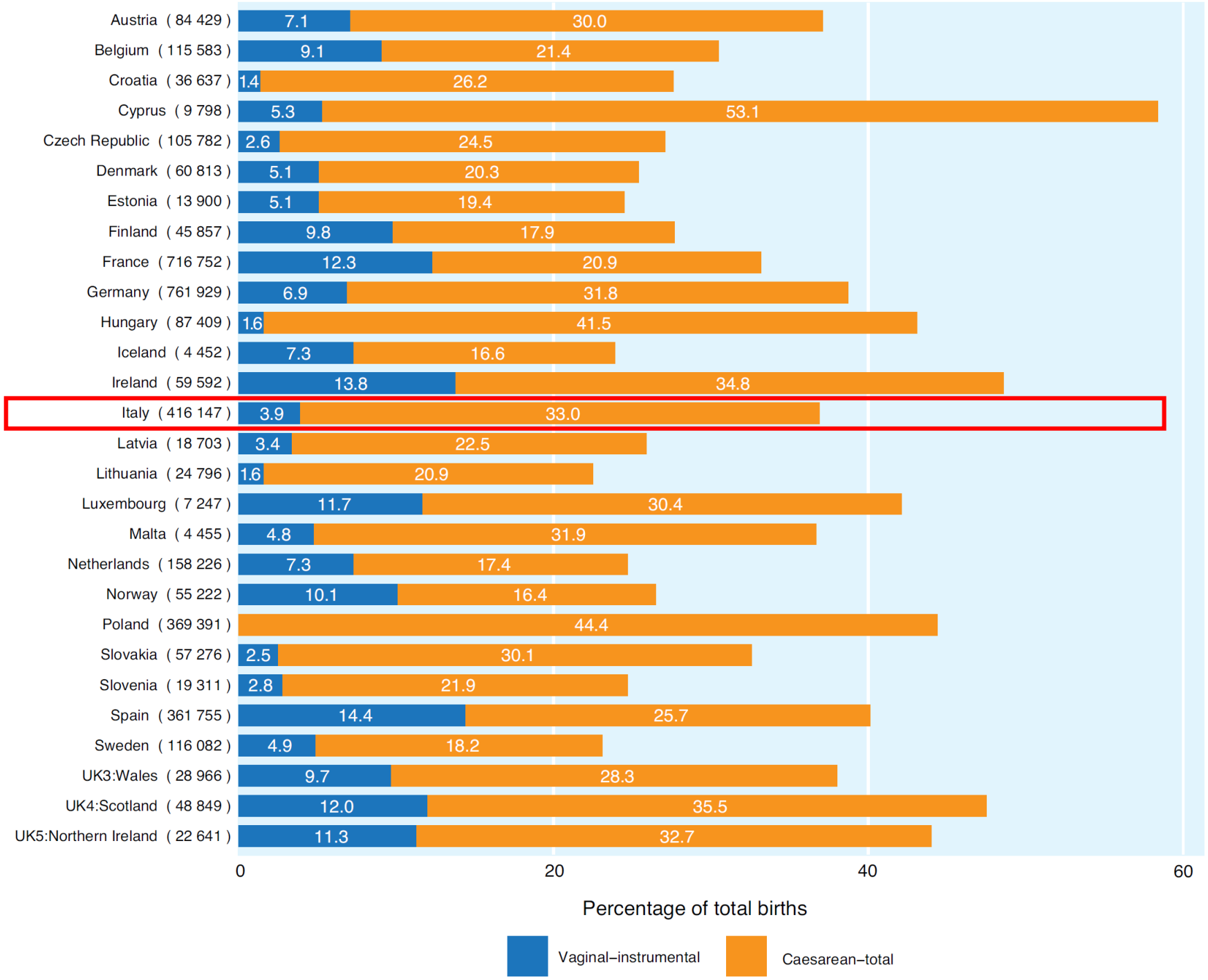
EURO PERISTAT

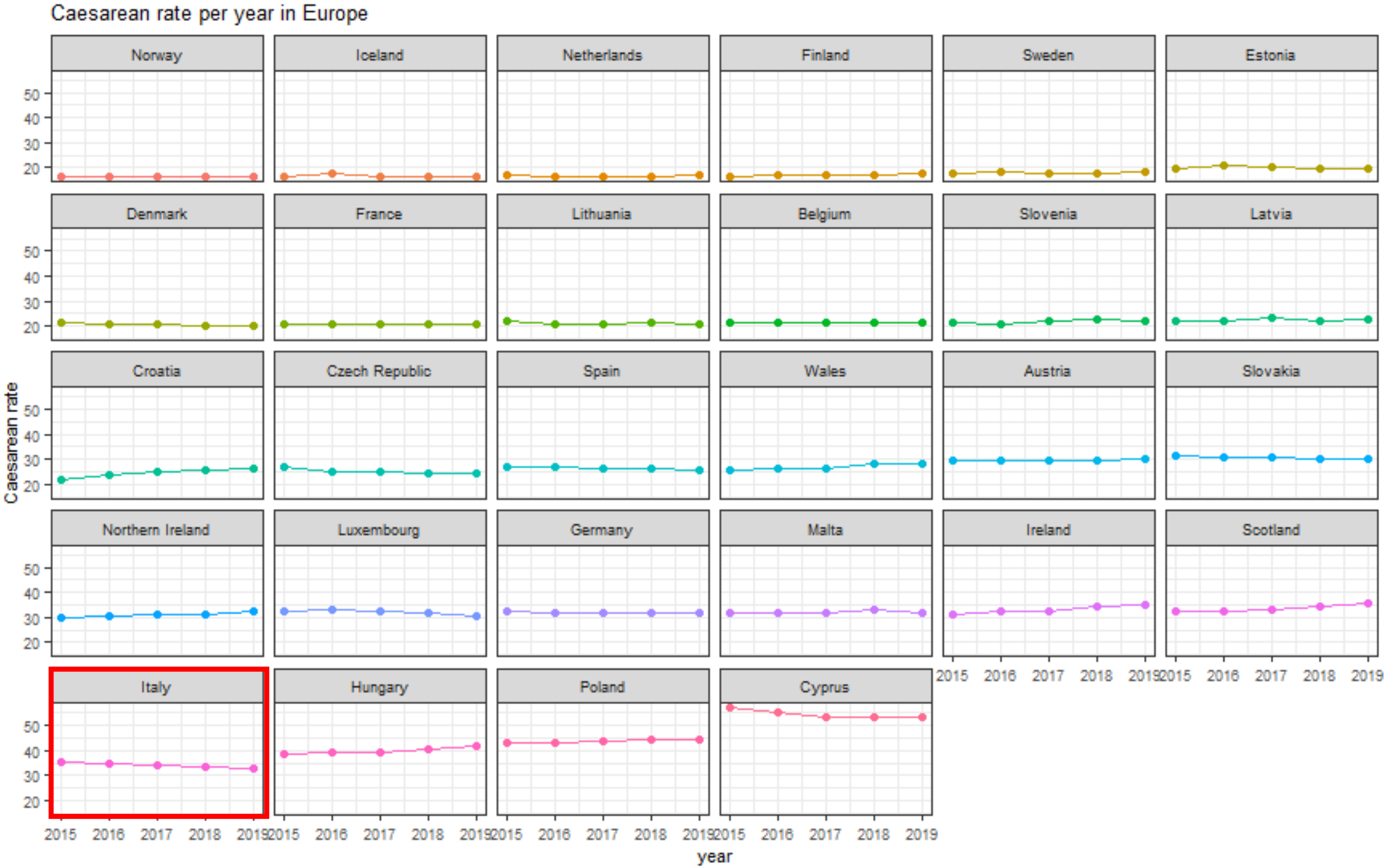
Mode of delivery



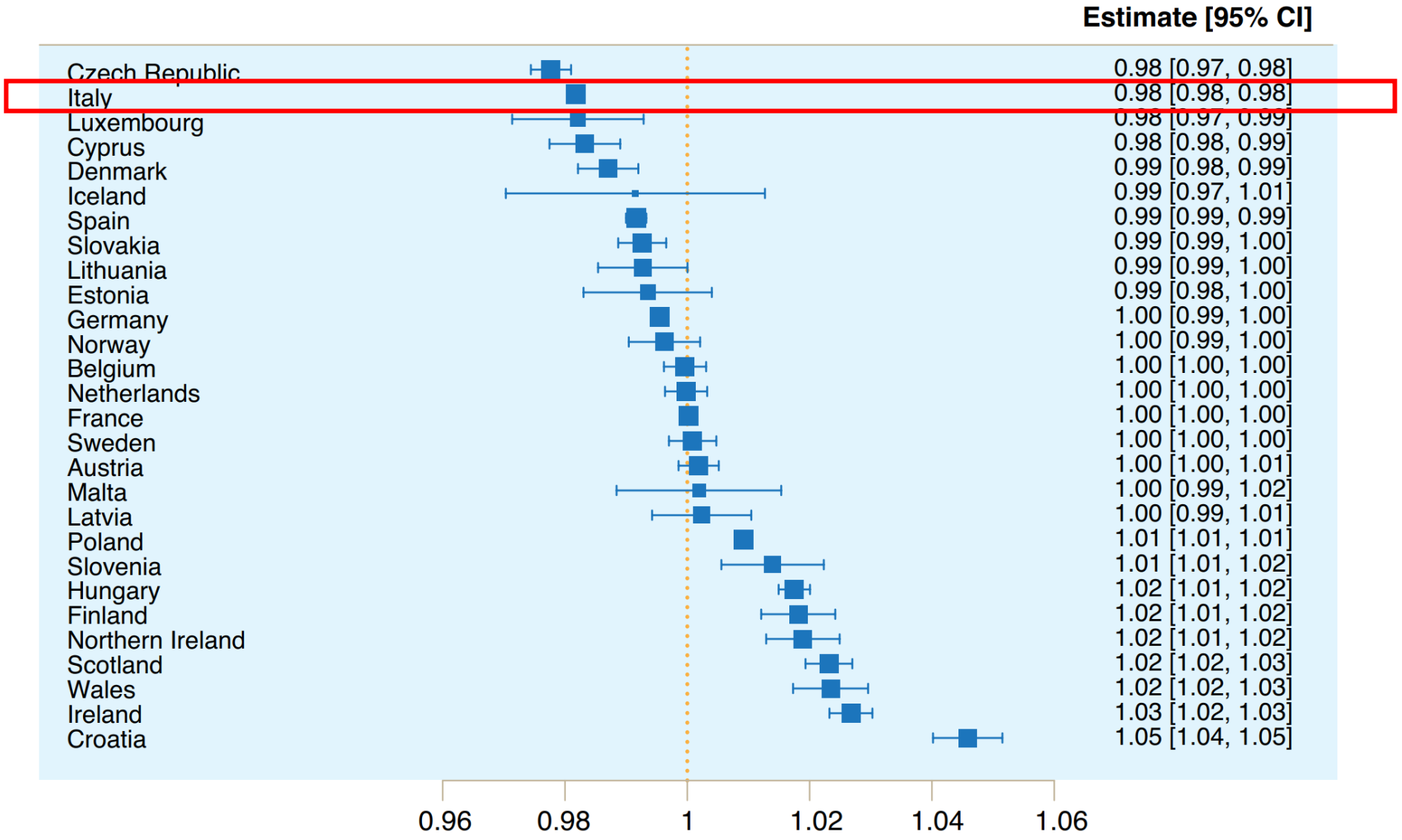
CS rate in 2019
Median: 26.9
IQR: 20.3-32.7
Range: 16.4-53.1

Instrumental delivery rate
Median: 6.1
IQR: 3.1-9.8
Range: 1.4-13.8



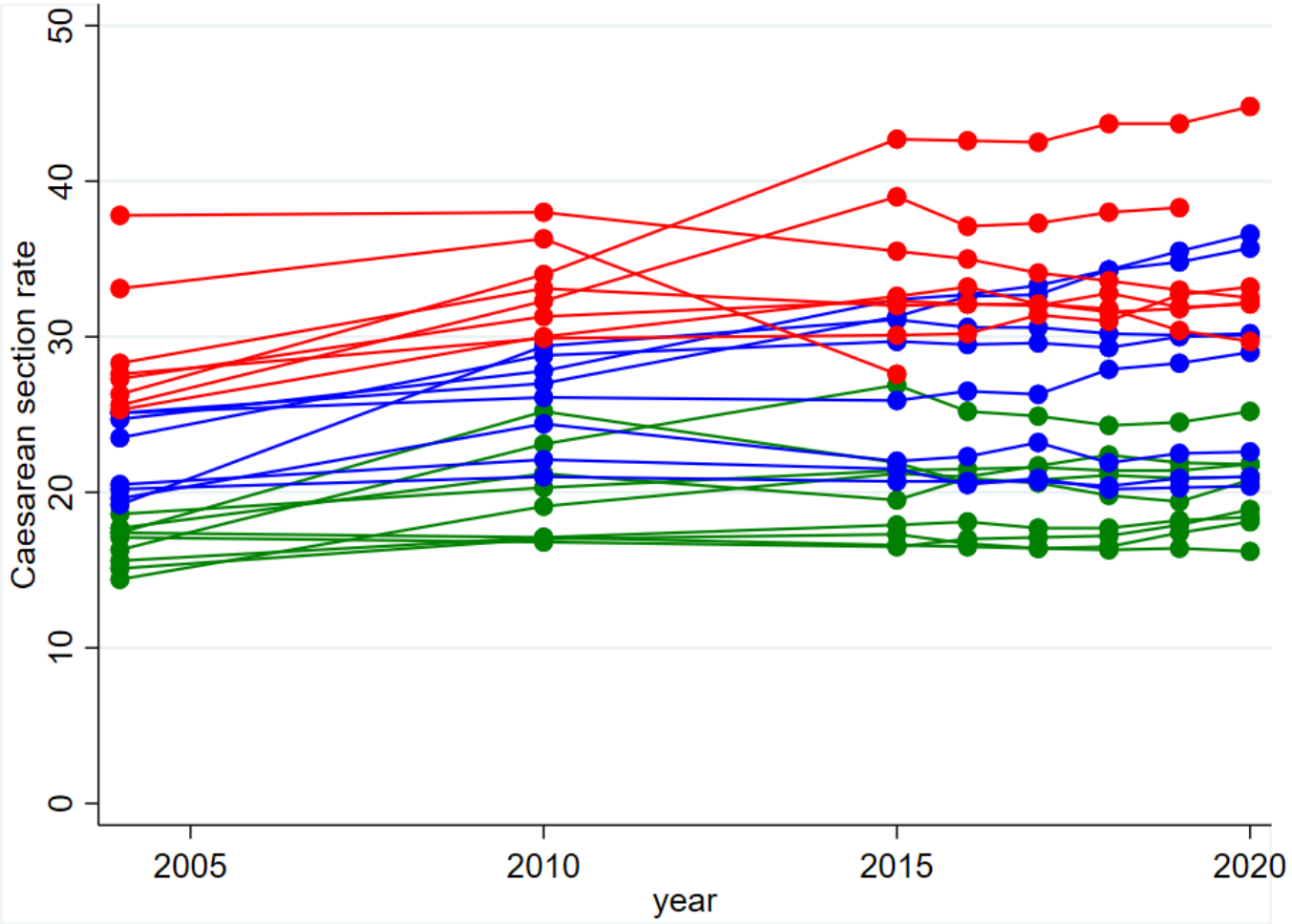

Caesarean rate per year in Europe
Norway
Iceland
Netherlands
Finland
Sweden
Estonia
Denmark
France
Lithuania
Belgium
Slovenia
Latvia
Croatia
Czech Republic
Spain
Wales
Austria
Slovakia
Northern Ireland
Luxembourg
Germany
Malta
Ireland
Scotland
Italy
Hungary
Poland
Cyprus
Caesarean rate
20
30
40
50
2015
2016
2017
2018
2019
year

Average annual change in the caesarean section rate 2015 to 2019



NOTE: This graph presents the average yearly percentage change in the caesarean section rate for each country (for example, 0.98 is equal to an average 2% annual reduction and 1.02 is equal to a 2% increase). CI: confidence interval.

CS trends over a longer time period (2005-2020)

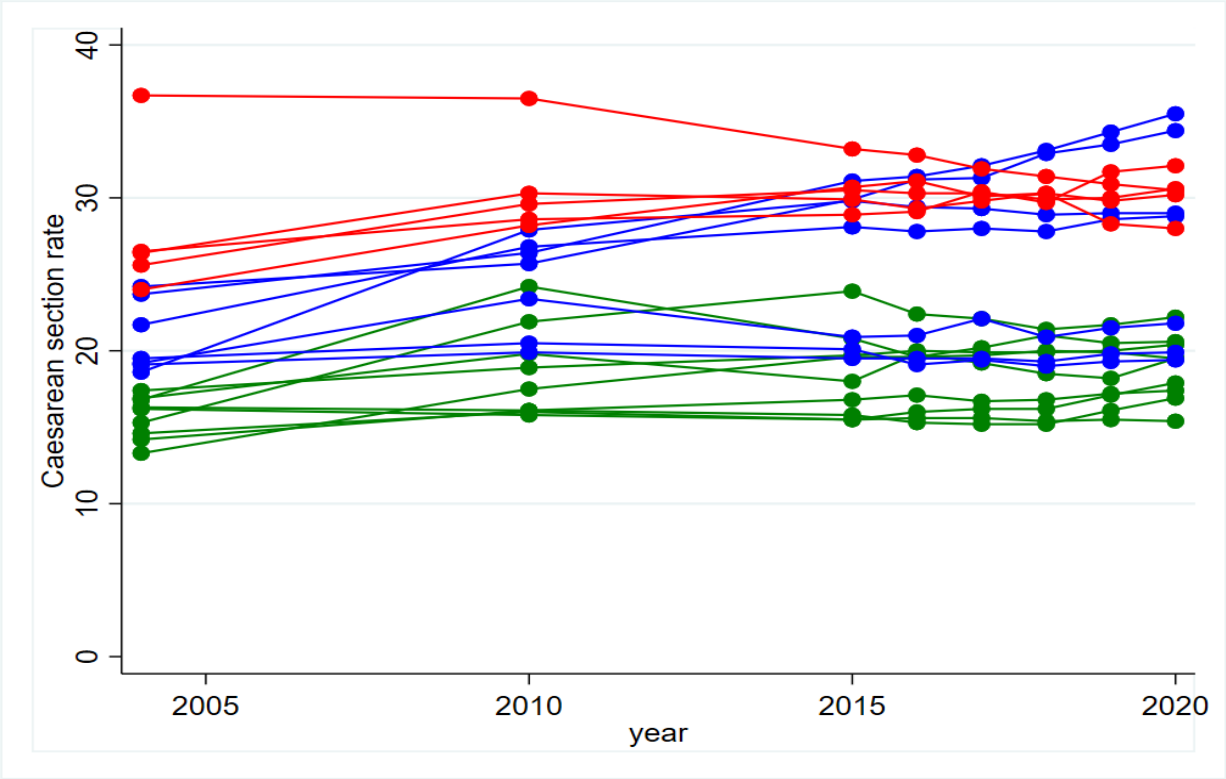


1st Tercile:
Belgium, Czech Republic, Estonia, Finland, Lithuania, Netherlands, Norway, Slovenia, Sweden

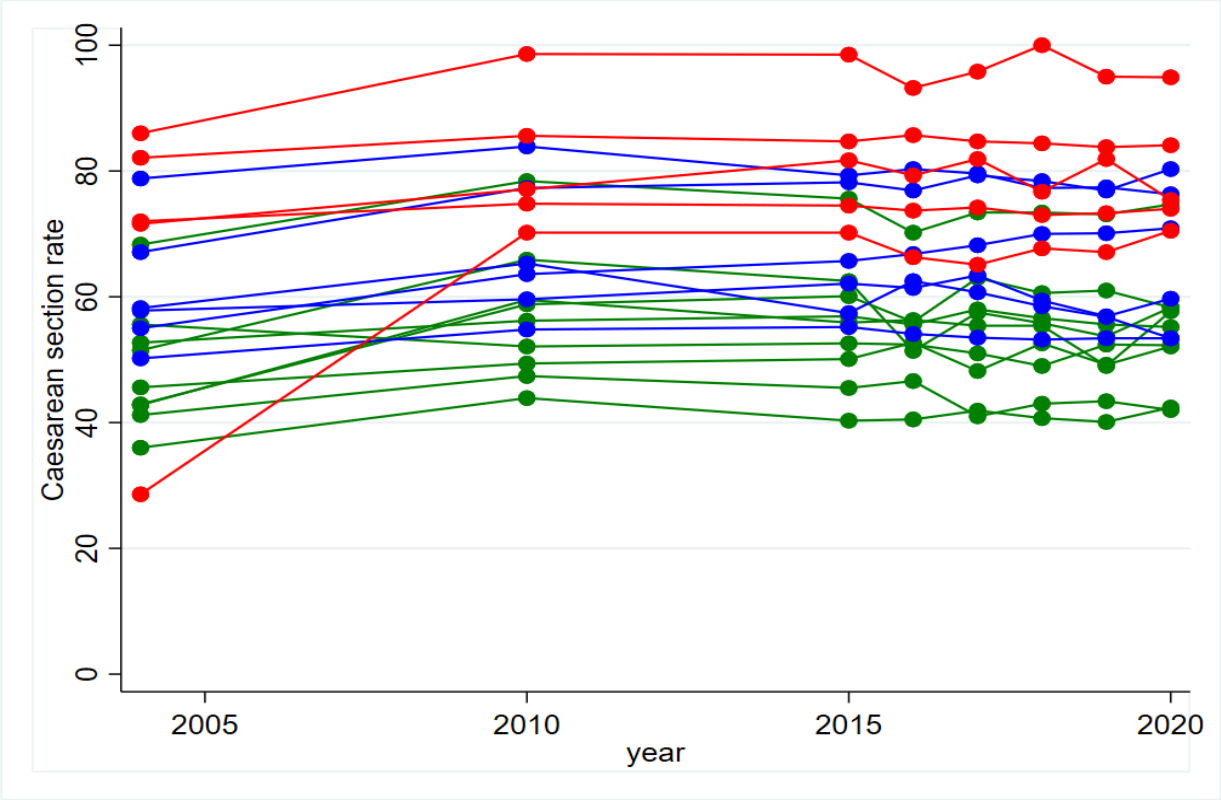
2nd Tercile:
Austria, Denmark, France, Ireland, Latvia, Slovakia, UK: Wales, UK: Scotland

3rd Tercile:
Germany, **Italy,** Hungary, Luxembourg, Malta, Poland, Portugal, UK: Northern Ireland

Trajectories by sub-group: multiplicity



CS rates for singletons



CS rates for multiples

Insights when using the Robson classification

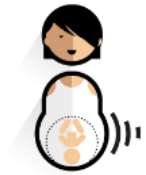
DOI: 10.1111/1471-0528.16634
www.bjog.org

Original Article
Epidemiology

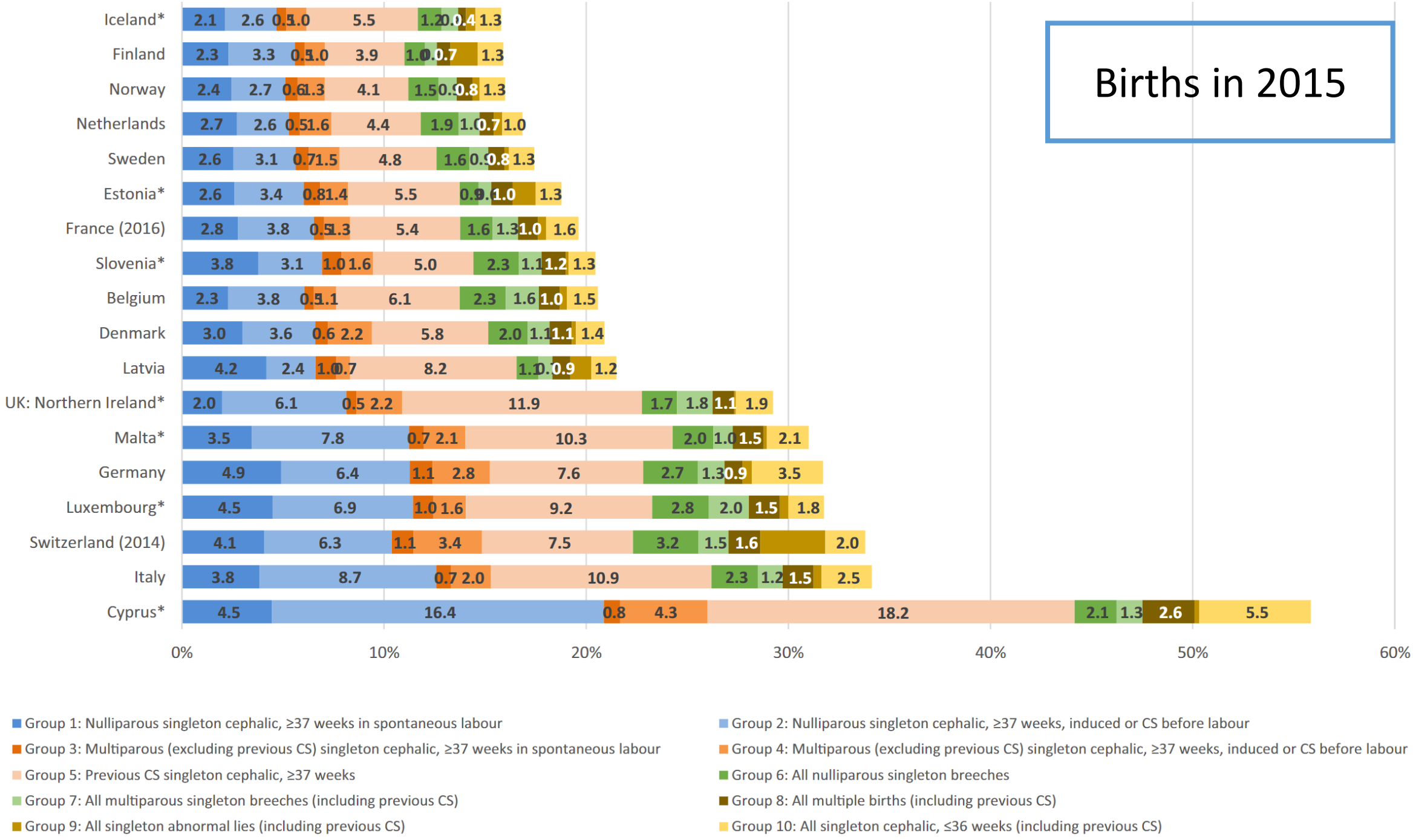
Using Robson's Ten-Group Classification System for comparing caesarean section rates in Europe: an analysis of routine data from the Euro-Peristat study

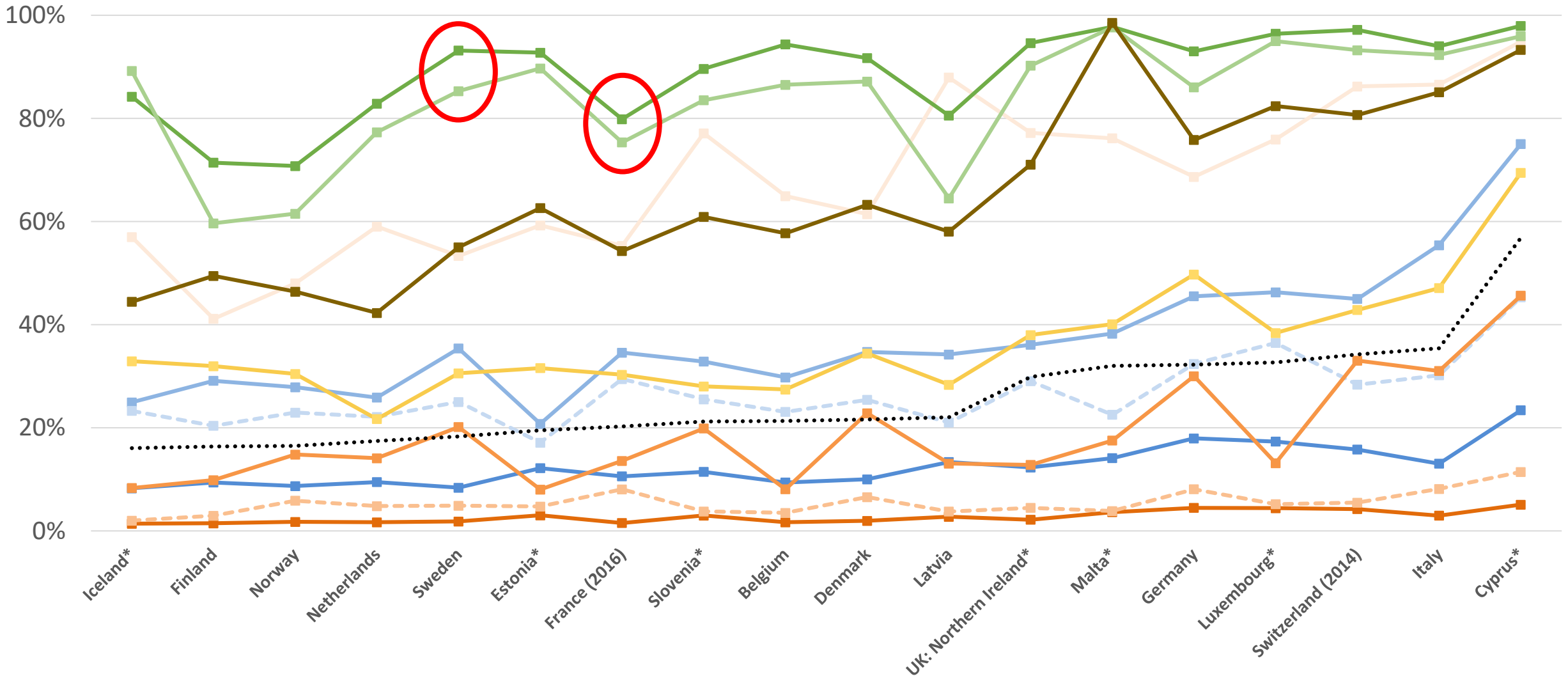
J Zeitlin,[a] M Durox,[a] A Macfarlane,[b] S Alexander,[c] G Heller,[d] M Loghi,[e] J Nijhuis,[f] H Sól Ólafsdóttir,[g,h] E Mierzejewska,[i] M Gissler,[i] B Blondel,[j,k] the Euro-Peristat Network[k]

The 10-Group Classification

	**Group 1**	**Nulliparous** Women with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
	**Group 2**	**Nulliparous** women with a single cephalic pregnancy, ≥37 weeks gestation who either had labour induced or were deliverd by caesarean section before labour
	**Group 3**	**Multiparous women without a previous CS**, with a single cephalic pregnancy, >37 weeks gestation in spontaneous labour
	**Group 4**	**Multiparous women whitout a previous CS**, with a single cephalic pregnancy, >37 weeks gestation who either had labour induced or were delivered by caesarean section before labour
	**Group 5**	All multiparous women with **at least one previous CS**, with a single cephalic pregnancy, >37 weeks gestation

	**Group 6**	All **nulliparous** women with a single **breech**
	**Group 7**	All **multiparous** women with a single **breech**, including women with previous CS
	**Group 8**	All women with **multiple pregnancies**, including women with previous CS
	**Group 9**	All women with a single pregnancy with a **transverse or oblique lie**, including women with previous CS
	**Group 10**	All women with a single cephalic pregnancy **<37 weeks** gestation, including women with previous CS


Births in 2015
Iceland* 2.1 2.6 0.5 1.0 5.5 1.2 0.0 0.4 1.3
Finland 2.3 3.3 0.5 1.0 3.9 1.0 0.0 0.7 1.3
Norway 2.4 2.7 0.6 1.3 4.1 1.5 0.0 0.8 1.3
Netherlands 2.7 2.6 0.5 1.6 4.4 1.9 1.0 0.7 1.0
Sweden 2.6 3.1 0.7 1.5 4.8 1.6 0.0 0.8 1.3
Estonia* 2.6 3.4 0.8 1.4 5.5 0.9 0.1 1.0 1.3
France (2016) 2.8 3.8 0.5 1.3 5.4 1.6 1.3 1.0 1.6
Slovenia* 3.8 3.1 1.0 1.6 5.0 2.3 1.1 1.2 1.3
Belgium 2.3 3.8 0.5 1.1 6.1 2.3 1.6 1.0 1.5
Denmark 3.0 3.6 0.6 2.2 5.8 2.0 1.1 1.1 1.4
Latvia 4.2 2.4 1.0 0.7 8.2 1.1 0.0 0.9 1.2
UK: Northern Ireland* 2.0 6.1 0.5 2.2 11.9 1.7 1.8 1.1 1.9
Malta* 3.5 7.8 0.7 2.1 10.3 2.0 1.0 1.5 2.1
Germany 4.9 6.4 1.1 2.8 7.6 2.7 1.3 0.9 3.5
Luxembourg* 4.5 6.9 1.0 1.6 9.2 2.8 2.0 1.5 1.8
Switzerland (2014) 4.1 6.3 1.1 3.4 7.5 3.2 1.5 1.6 2.0
Italy 3.8 8.7 0.7 2.0 10.9 2.3 1.2 1.5 2.5
Cyprus* 4.5 16.4 0.8 4.3 18.2 2.1 1.3 2.6 5.5
0% 10% 20% 30% 40% 50% 60%
Group 1: Nulliparous singleton cephalic, ≥37 weeks in spontaneous labour
Group 2: Nulliparous singleton cephalic, ≥37 weeks, induced or CS before labour
Group 3: Multiparous (excluding previous CS) singleton cephalic, ≥37 weeks in spontaneous labour
Group 4: Multiparous (excluding previous CS) singleton cephalic, ≥37 weeks, induced or CS before labour
Group 5: Previous CS singleton cephalic, ≥37 weeks
Group 6: All nulliparous singleton breeches
Group 7: All multiparous singleton breeches (including previous CS)
Group 8: All multiple births (including previous CS)
Group 9: All singleton abnormal lies (including previous CS)
Group 10: All singleton cephalic, ≤36 weeks (including previous CS)



Group 1: Nulliparous singleton cephalic, ≥37 weeks in spontaneous labour

Group 2: Nulliparous singleton cephalic, ≥37 weeks, induced or CS before labour

Group 2a: Nulliparous singleton cephalic, ≥37 weeks, induced labour

Group3: Multiparous (excluding previous CS) singleton cephalic, ≥37 weeks in spontaneous labour

Group 4: Multiparous (excluding previous CS) singleton cephalic, ≥37 weeks, induced or CS before labour

Group4a: Multiparous (excluding previous CS) singleton cephalic, ≥37 weeks, induced labour

Group 5: Previous CS singleton cephalic, ≥37 weeks

Group 6: All nulliparous singleton breeches

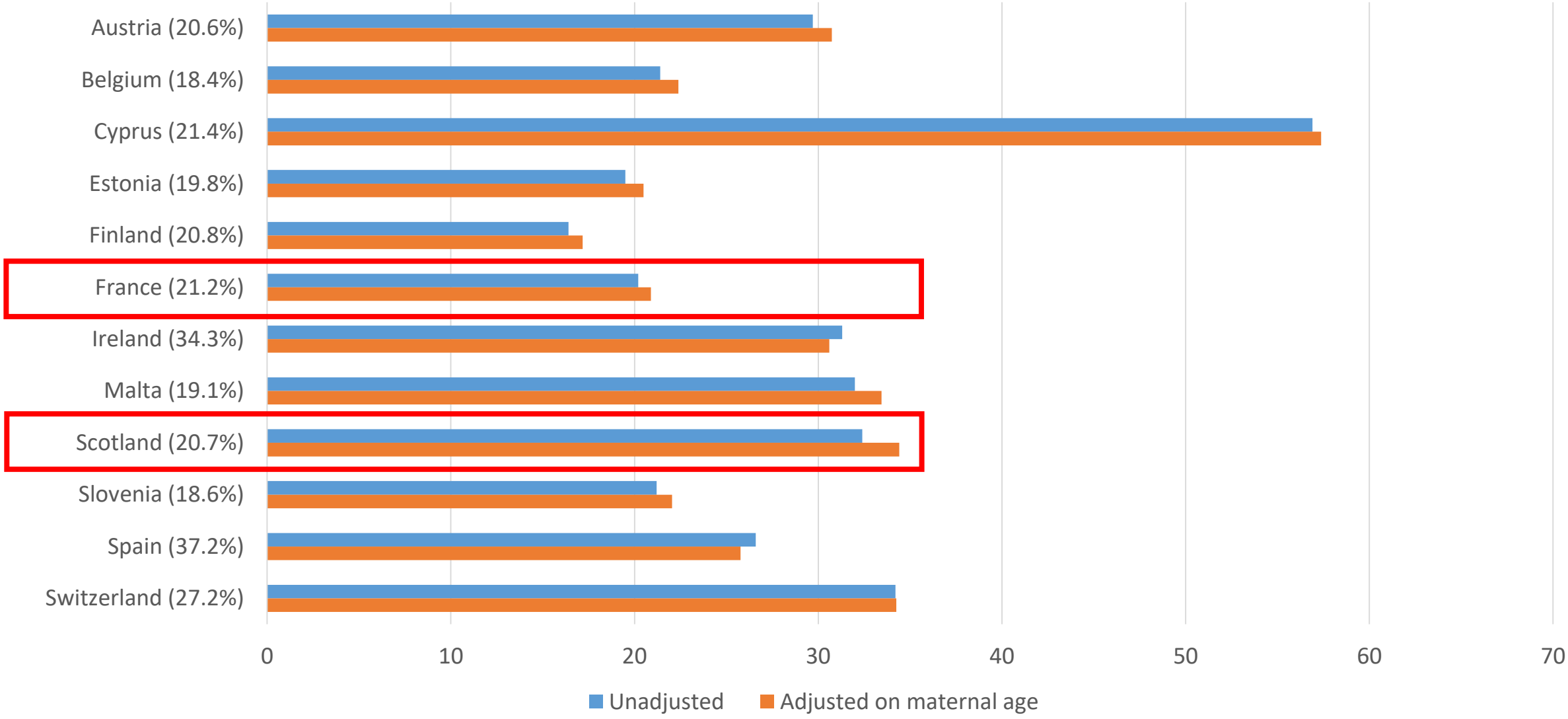
Group 7: All multiparous singleton breeches (including previous CS)

Group 8: All multiple births (including previous CS)

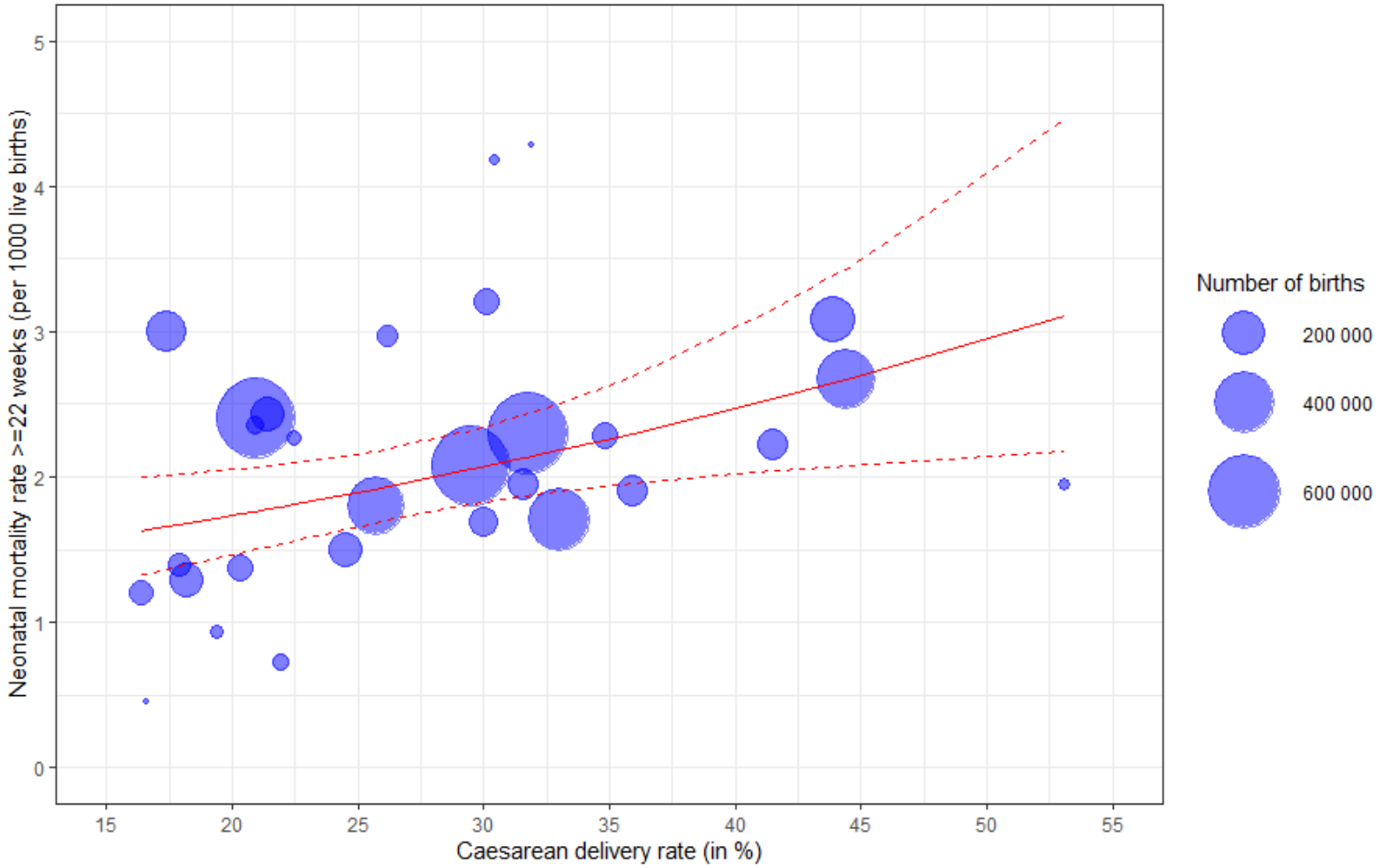
Group 10: All singleton cephalic, ≤36 weeks (including previous CS)

% CS stated (report) (based on births)

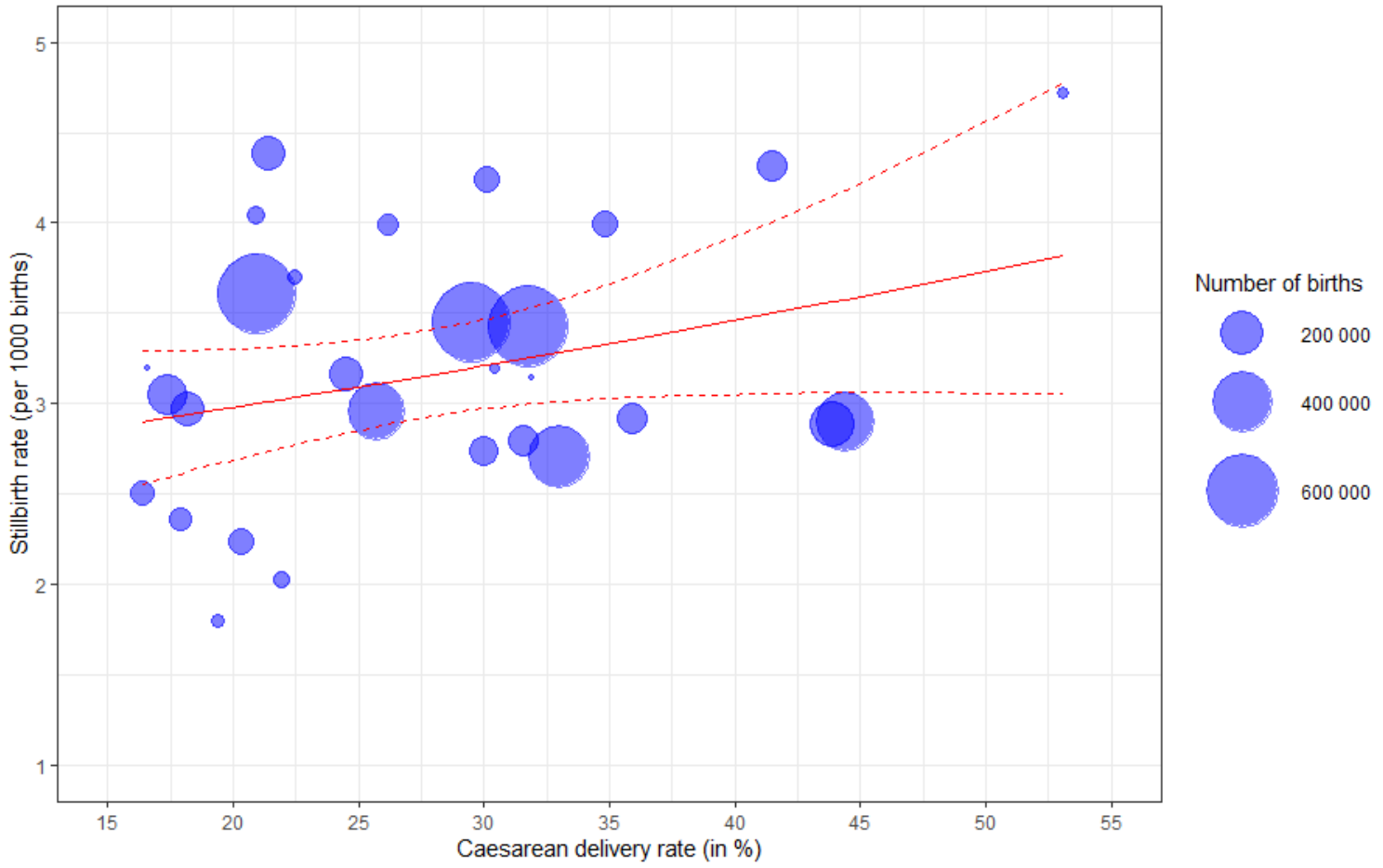
Adjustments for maternal age (2015 data)



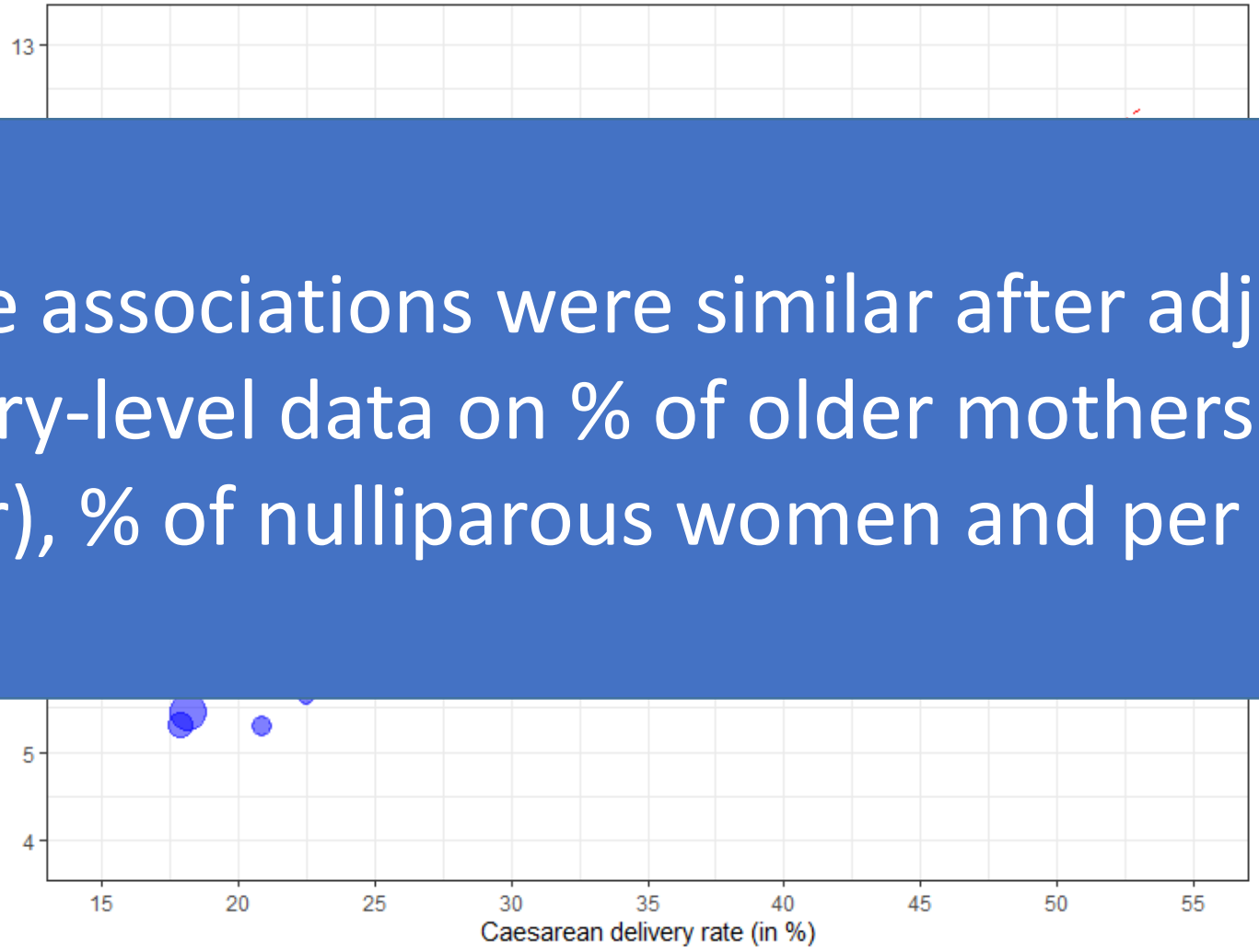
Association of neonatal mortality rate and CS rate in 2019



Association of stillbirth rate and CS rate in 2019



Association of Preterm birth rate with CS rate in 2019



These associations were similar after adjustment for country-level data on % of older mothers (35 years or older), % of nulliparous women and per capita GDP.

Summary

- Large differences in CS rates in Europe which have not narrowed over time
- Similar variability across clinical risk groups, with some exceptions
- Variations in maternal age do not account for differences
- Higher CS do not achieve better outcomes – seem to be correlated with worse outcomes

Discussion - Hypotheses to explain variability

- Quality and interpretations of scientific evidence on risks versus benefits
- Implementation of evidence-based medicine
- Models of care – role of midwives in care provision
- Other organizational and contextual factors:
  - Private versus public care
  - Defensive medicine
  - resource availability (lack of resources)
- Maternal preferences (can these be independent of above?)

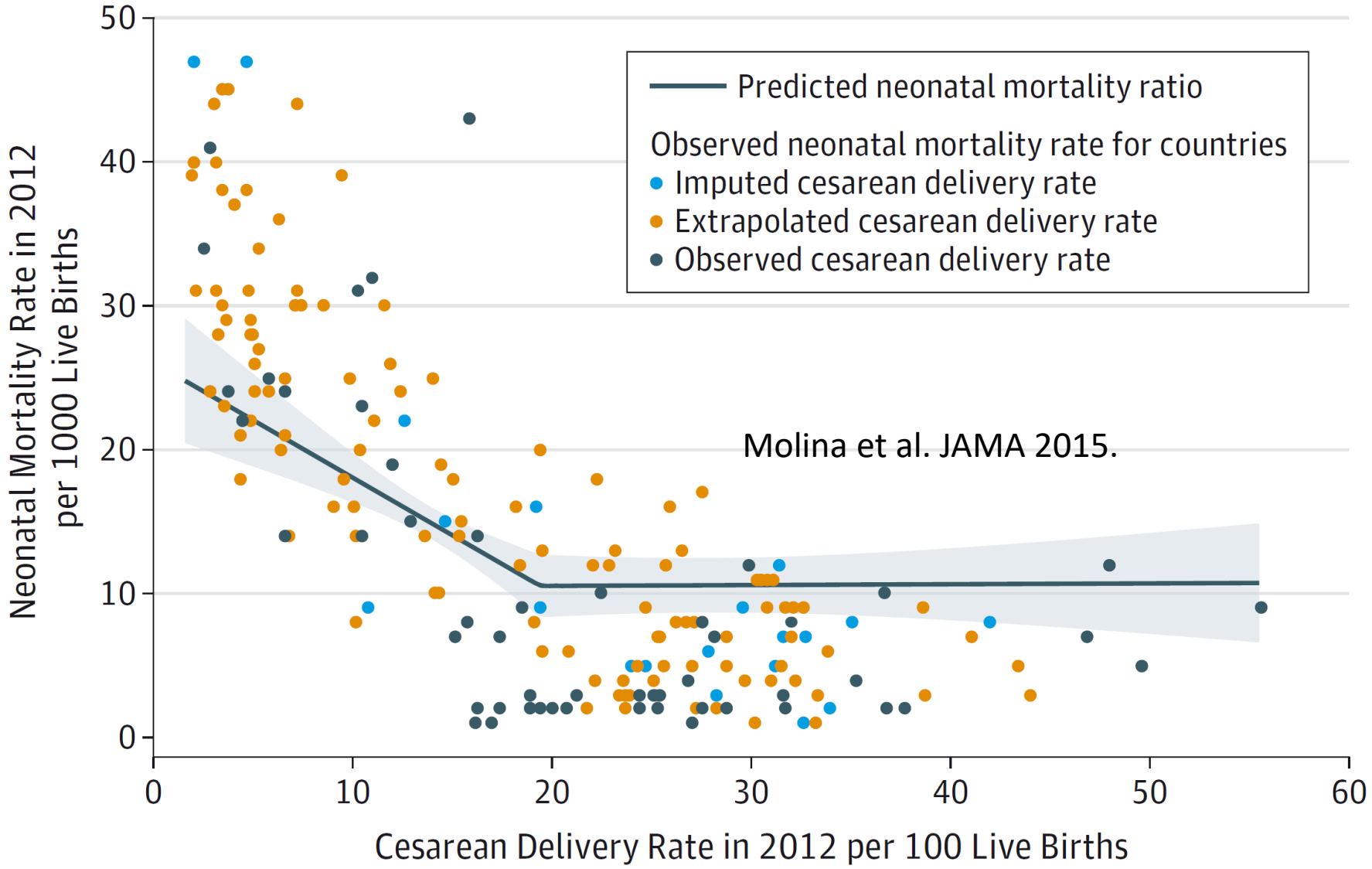
Pratilas, *Lancet* 2019 (letter), Kim*, BMC Pregnancy Childbirth* 2019; Hoxha, *BMJ Open* 2017

Discussion – effect on health outcomes

- Supports previous studies showing no benefit or worse outcomes of higher CS on neonatal and infant mortality, extends to the stillbirth rate

Appropriate technology for birth. *Lancet* 1985; Betran et al. *BJOG* 2016, Betran et al. *Reprod Health*. 2015. Molina et al. *JAMA* 2015. Xie et al. *Birth* 2015, Athalbe et al. *Birth* 2006.

Figure 2. Relation Between Neonatal Mortality Rate (per 100 Live Births in 2012) and Cesarean Delivery Rate (per 100 Live Births) in 2012 for 191 Countries



Discussion – effect on health outcomes

- Supports previous studies showing no benefit or worse outcomes of higher CS on neonatal and infant mortality, extends to the stillbirth rate
- Previously no focus on CS and Preterm birth rates
- Could results reflect reverse causality ? (unlikely)
- High CS rates are markers of other country-level factors which affect mortality and preterm birth rates:
  - use of evidence-based practices
  - availability of resources

Appropriate technology for birth. *Lancet* 1985; Betran et al. *BJOG* 2016, Betran et al. *Reprod Health*. 2015. Molina et al. *JAMA* 2015. Xie et al. *Birth* 2015, Athalbe et al. *Birth* 2006..

Discussion – implications for research and practice

- Include preterm birth among potentially advers
  associated with high CS rates

- Are we asking the right question in focusing on

Rather than a "call" for cesarean delivery rate reductions of a specific and arbitrary magnitude, we need further attention to defining an evidence-based optimal target.

Current Commentary

Defining a Cesarean Delivery R
Optimizing Maternal and Neonatal Outcomes

Ann M. Bruno, MD, Torri D. Metz, MD, MS, William A. Grobman, MD, MBA, and Robert M. Silver, MD

Discussion – implications for research and practice

- Include preterm birth among potentially adverse outcomes associated with high CS rates

- Are we asking the right question in focusing on « optimal » CS rates.

- Low nationalCS rates with good outcomes are possible

- Question: how can we create the conditions to achieve low CS and best maternal and child (and adult) outcomes
  - **Evidence-based obsteric care (organisation and practice) AND**
  - **health promotion and prevention**

Discussion – implications for research and practice

- Include preterm birth among potentially adverse outcomes associated with high CS rates

- Are we asking the right question in focusing on « optimal » CS rates.

- **Low national CS rates with good outcomes are possible**

- Question: how can we create the conditions to achieve low CS and best maternal and child (and adult) outcomes
  - **Evidence-based obsteric care (organisation and practice) AND**
  - **health promotion and prevention (pre-conceptional care, healthy weights)**

Power of comparative research

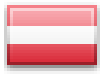
Better is possible → Generate ideas and motivation for change

"My team is having trouble thinking outside the box. We can't agree on the size of the box, what materials the box should be constructed from, a reasonable budget for the box, or our first choice of box vendors."

Euro-Peristat Network

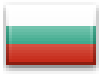
www.europeristat.com

Austria



Belgium

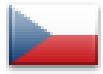
Bulgaria



Croatia

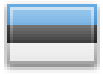
Cyprus

Czech Rep.



Denmark

Estonia



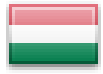
Finland

France

Germany

Greece

Hungary

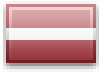


Iceland

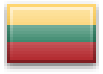
Ireland

Italy

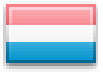
Latvia



Lithuania

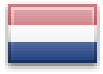


Luxembourg



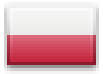
Malta

Netherlands



Norway

Poland



Portugal

Romania

Slovakia

Slovenia

Spain

Sweden

Switzerland

UK

PHIRI

Population Health Information Research Infrastructure

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 101018317