Maternal deaths in Mexico, 2010-2013:

disentangling the effect of individual and system level factors by a multivariate analysis of health information systems data

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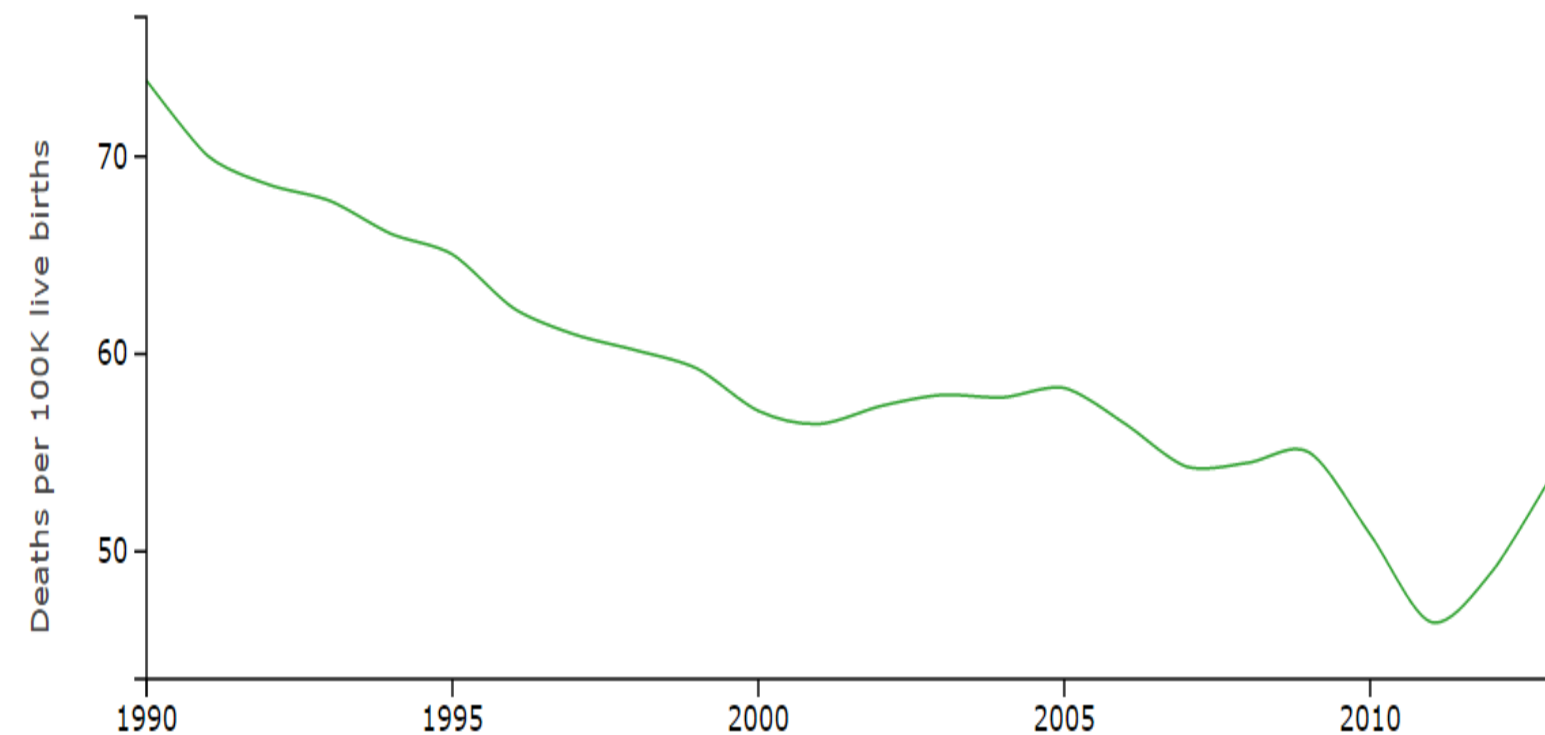**National Institute Of Public Health of Mexico**

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The Mexican background

Maternal Mortality is still a problem in Mexico:

> 54 deaths per 100,000 live births (est. 2013); 108 in the world[1]

> The decrease in the MMR from the year 2000 did not meet the the Millenium Development Goal for the country

1. Kassebaum N.J., Bertozzi-Villa A., Coggeshall M.S., et al. Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2014: 1-25.

Suprisingly… limited data on <u>risk factors</u> for maternal deaths

✓ There are studies but…

- – Often limited in spatio/temporal scope

✓ There is a rich source of spatio/temporal data on maternal deaths from health information systems but…

- – Due to methodological complexities, these sources are often only used for simple, univariate or bivariate analyses
- – **Challenge:** How to incorporate data on the denominator of the MMR?
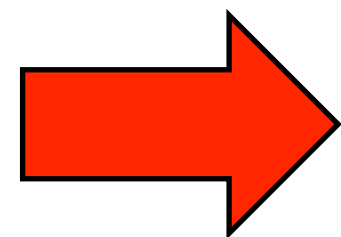- – Quality of data is poor, with important amount of missing/non-specified data

➢ INSP

➢ Data sources & analytic strategy

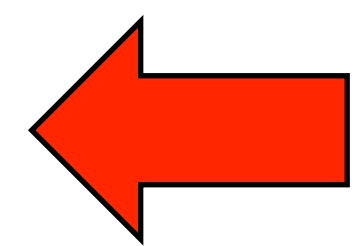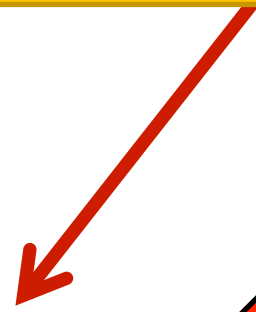**Probabilistic imputation of missing and non-defined values, using MICE**

Intentional Search and Reclassification of Maternal Deaths (BIRMM)

Birth Information System (SINAC)

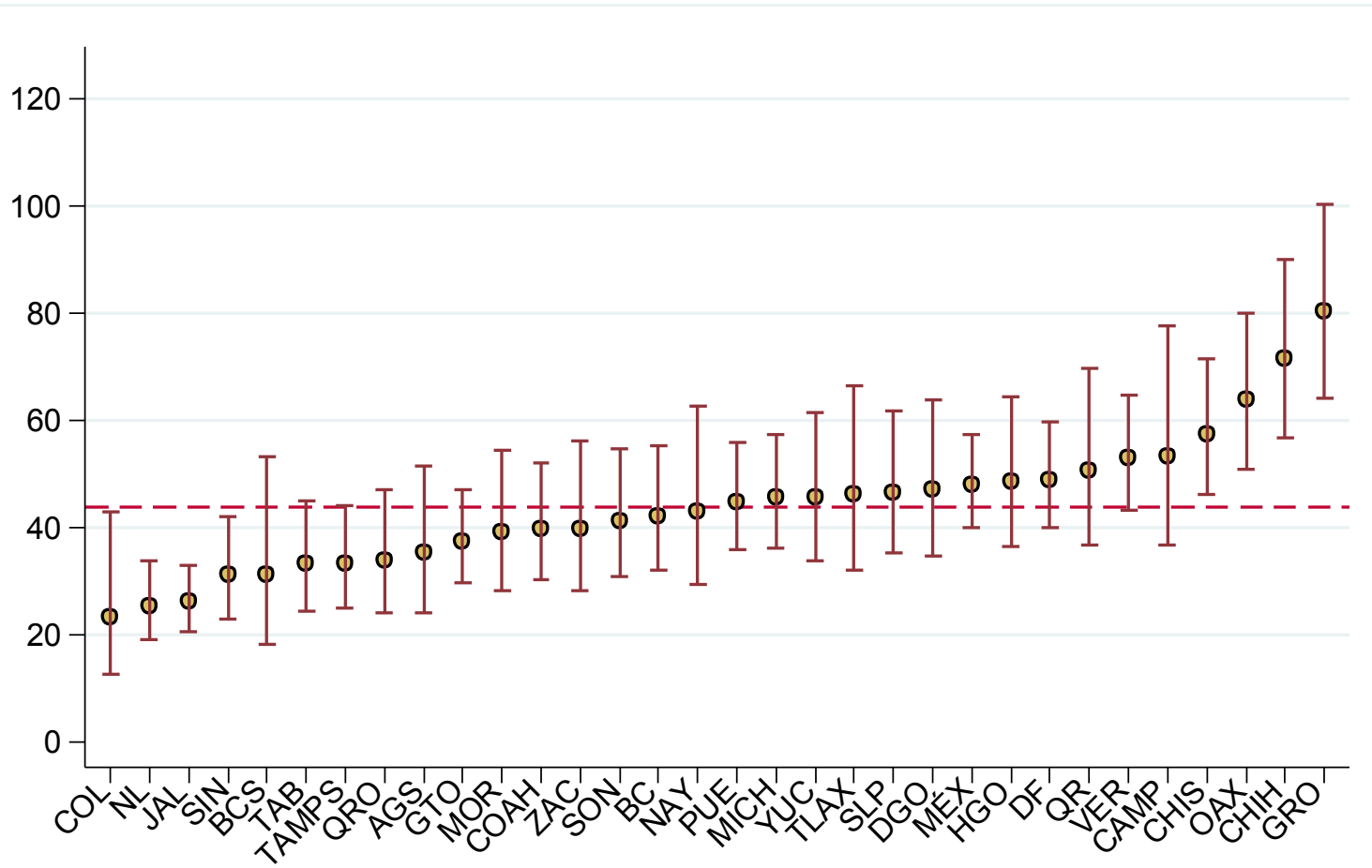**Merging by covariate patterns**

4217 deaths; ~8,000,000 births

2010-2013

Analysis: Count Data models
"Multidimensional contingency table"

Adjusted geograhical distribution of Maternal Deaths

Models adjusted for maternal age, parity, education; day and hour of birth, geography & health provider

MMR by type of health service provider: the public health provider for government workers has a significantly larger risk...

Models adjusted for maternal age, parity, education; day and hour of birth ,geography & health provider

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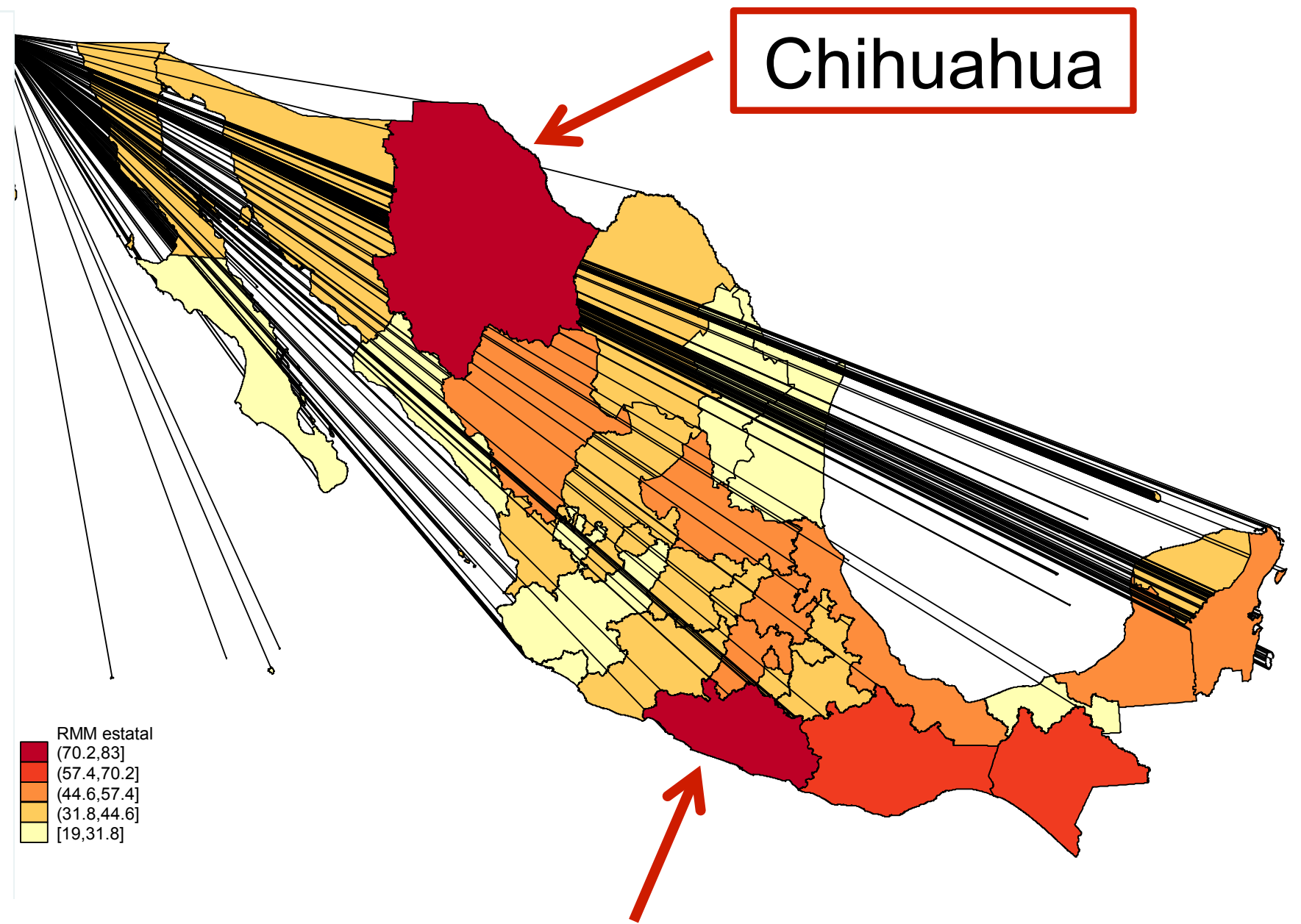
➤ **After adjusting, MMR in Sundays is greater than average**

Maternal deaths per 100,000 live births

Uncertainty Interval 95%

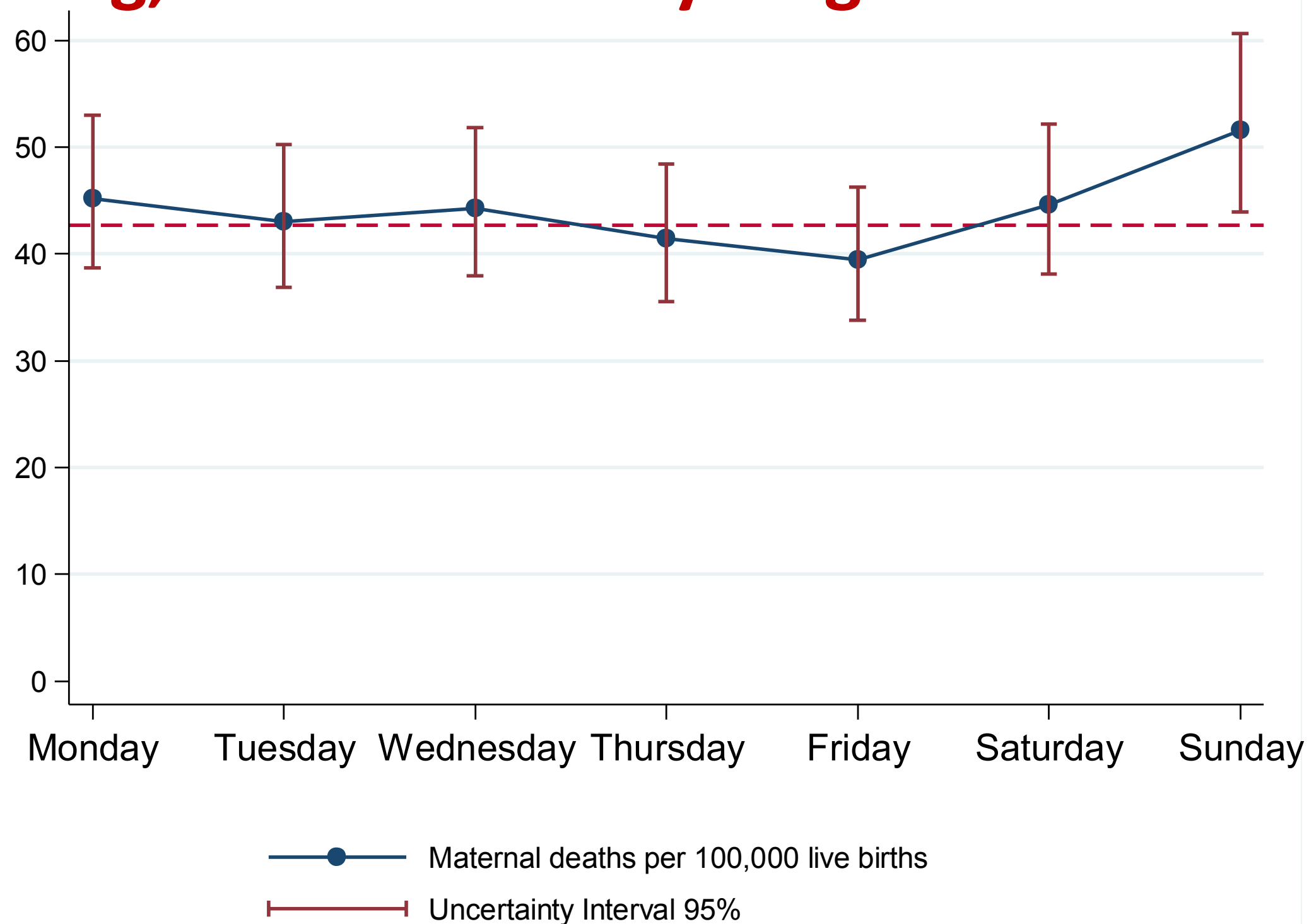Models adjusted for maternal age, parity, education; day and hour of birth ,geography & health provider

➤ INSP

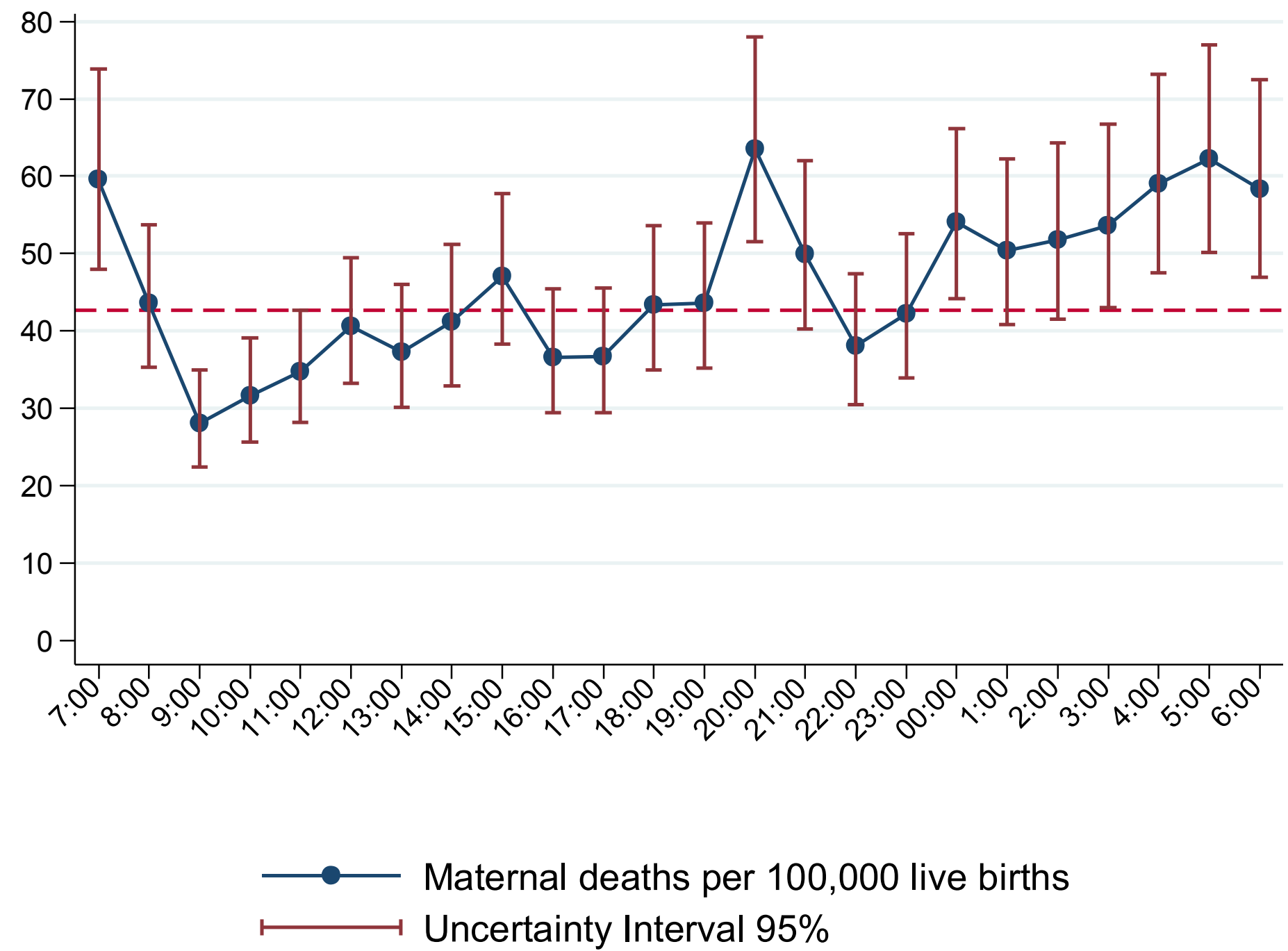# A peak in risk is observed during the afternoon- night shift change, risk consistently higher after midnight...
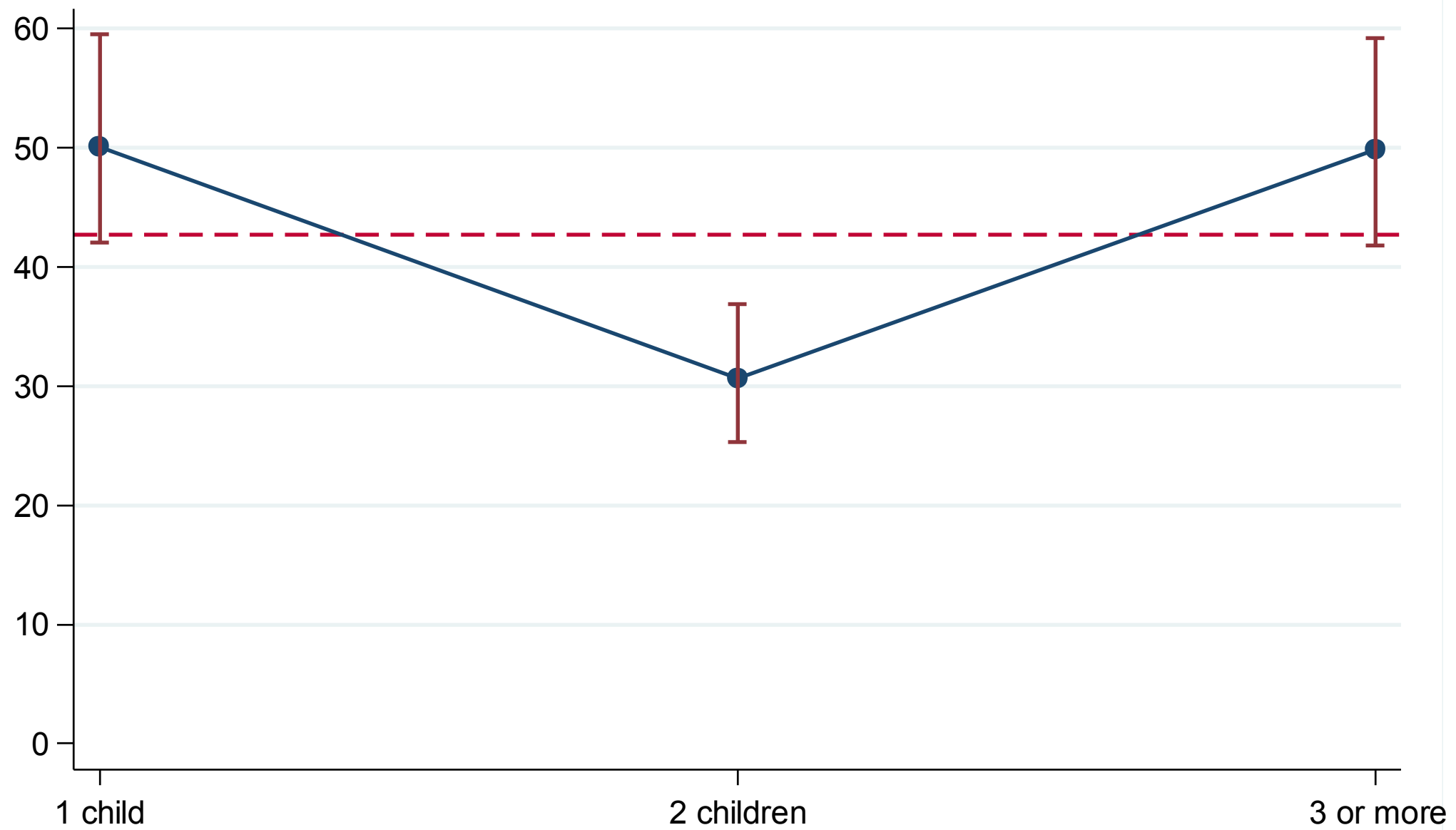

Models adjusted for maternal age, parity, education; day and hour of birth

Risk increses with age, after proper adjustment youngest women show the lowest risk

Maternal deaths per 100,000 live births

Uncertainty Interval 95%

Models adjusted for maternal age, parity, education; day and hour of birth, geography & health

INSP
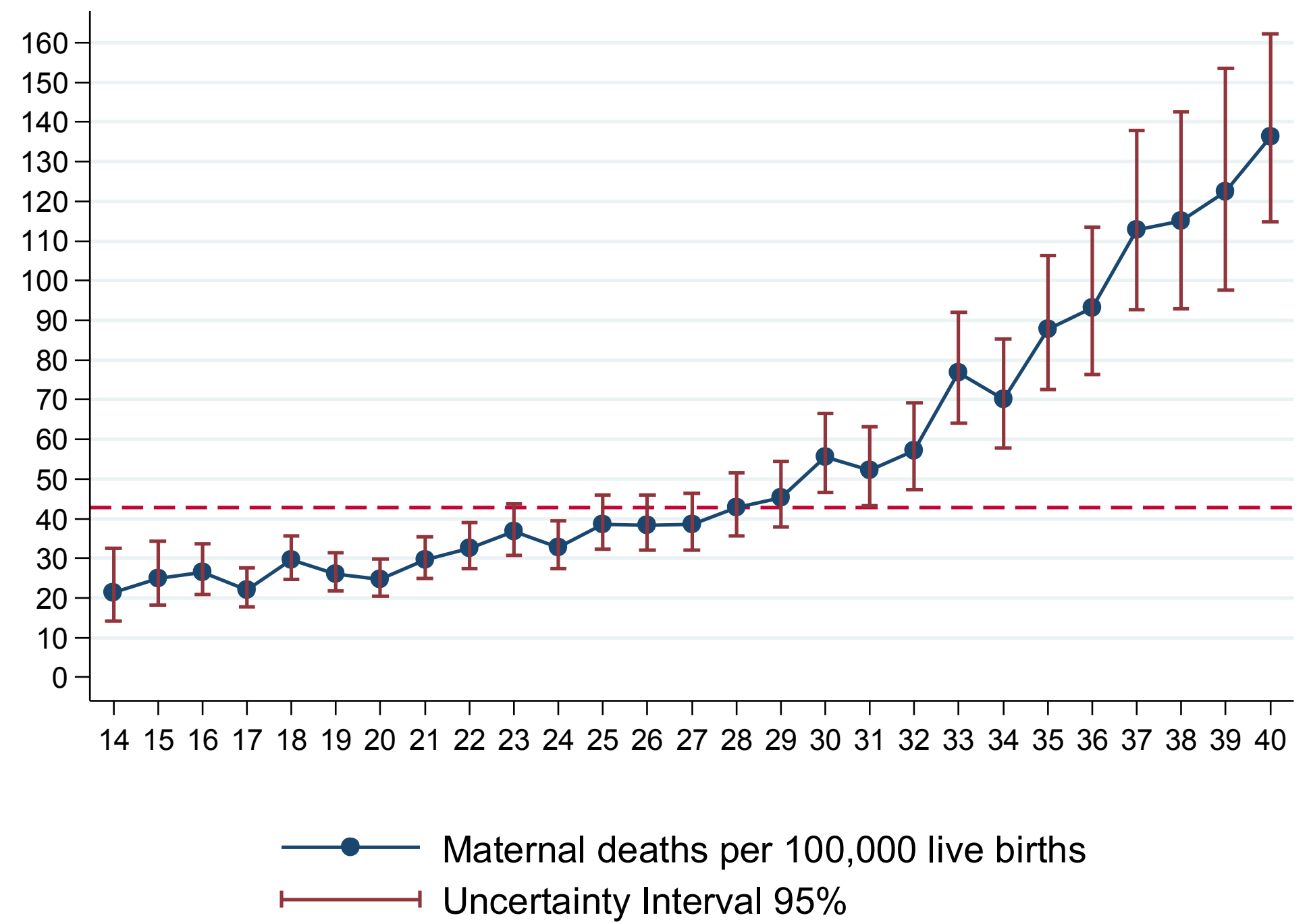
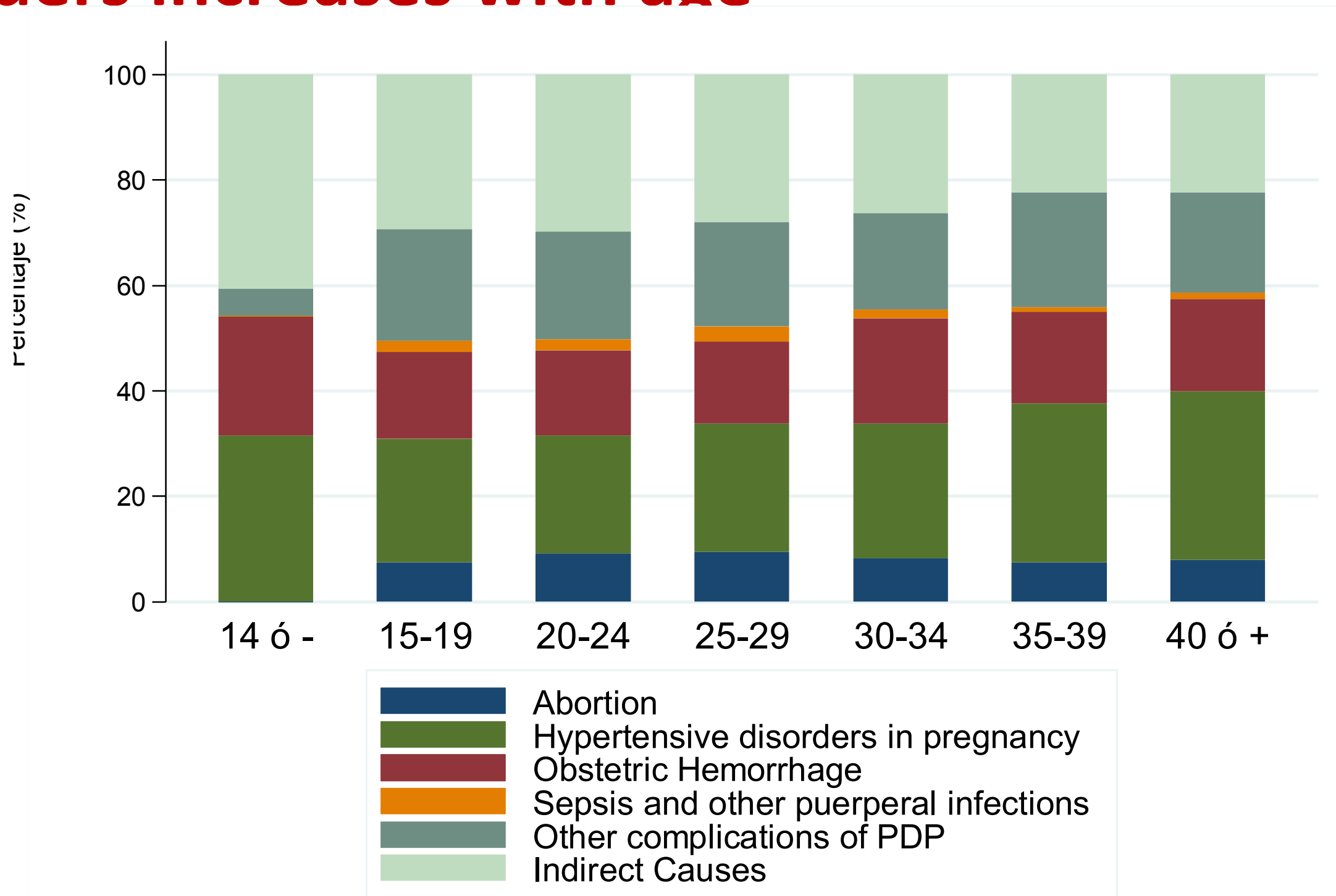# Increased risk in primiparous and multiparous women

Legend:
- Maternal deaths per 100,000 live births
- Uncertainty Interval 95%

Models adjusted for maternal age, parity, education; day and hour of birth, geography & health provider
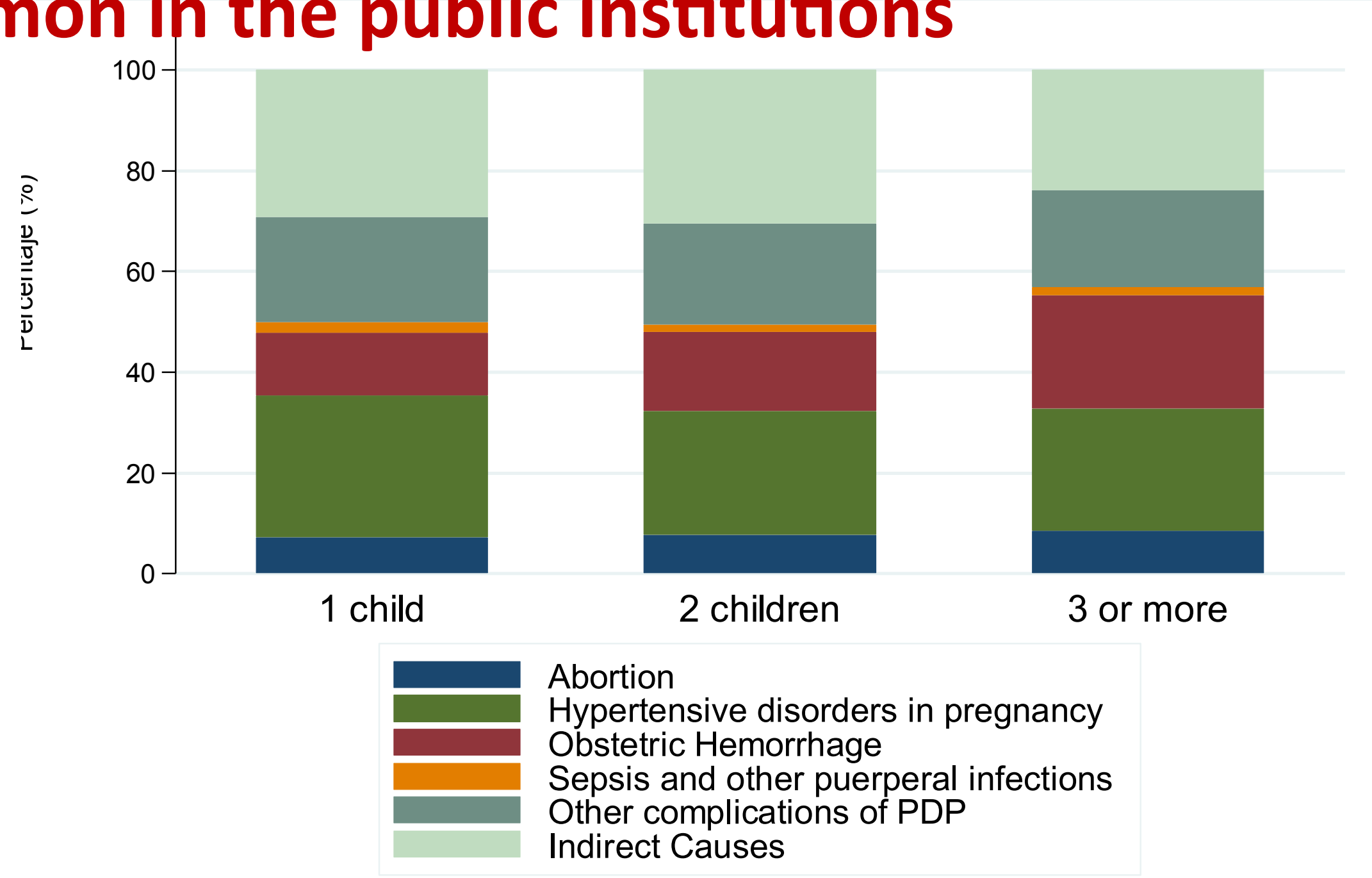
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Proportion of women dying from hypertensive disorders increases with age

Multinomial logit model derechohabiencia adjusted for age, schooling, parity and marital status of the mother; municipal-level index of marginalization, year, place, day, hour and birth attendant

Death by hemorraghe is more likely in private institutions, death by hypertensive disorders is more common in the public institutions

Women who died after being attended by a midwife were more likely to die of hemorraghe

Multinomial logit model derechohabiencia adjusted for age, schooling, parity and marital status of the mother; municipal-level index of marginalization, year, place, day, hour and birth attendant
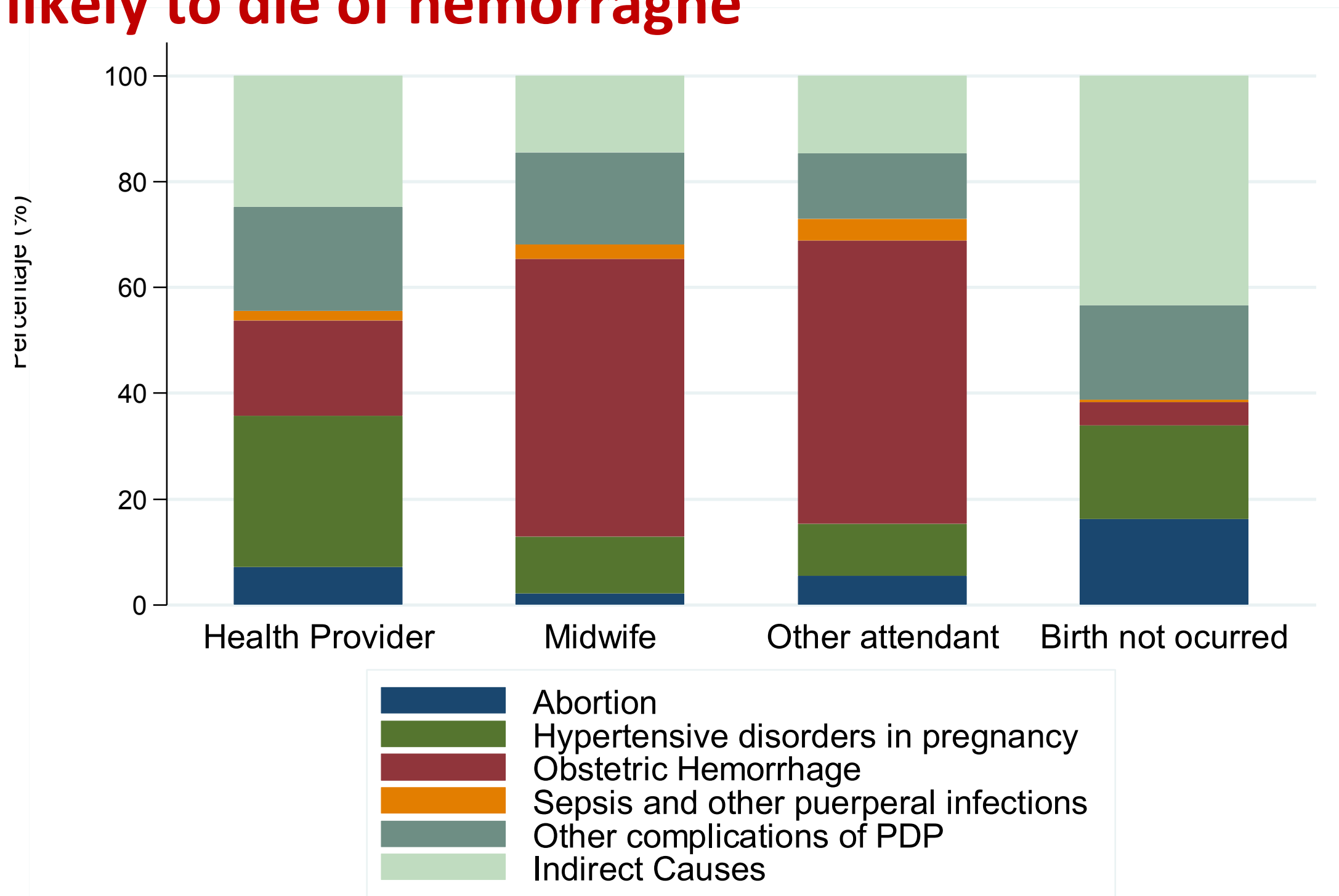
Conclusions

✓ This is the first time in Mexico that datasets from HIS are used to multivariately model Maternal Mortality Ratios.

✓ Differing death rates by day of the week and time of day reflects **institutional culture problems and a failure of the continuity of care**: neglecting of night and weekend shifts, possibly both in terms of availability and competence of personnel.

✓ The death cause profile differs by age, parity and **type of health provider** attending delivery, suggesting heterogeneous preventive strategies might prove more effective.

✓ After adjusting for factors related to teen pregnancy**, young mothers do not appear to be at a particularly high risk of death**, which contradicts the prevailing views on the matter.

➤ INSP