

# Perinatal demography

## Studying the transition from fetus to infant

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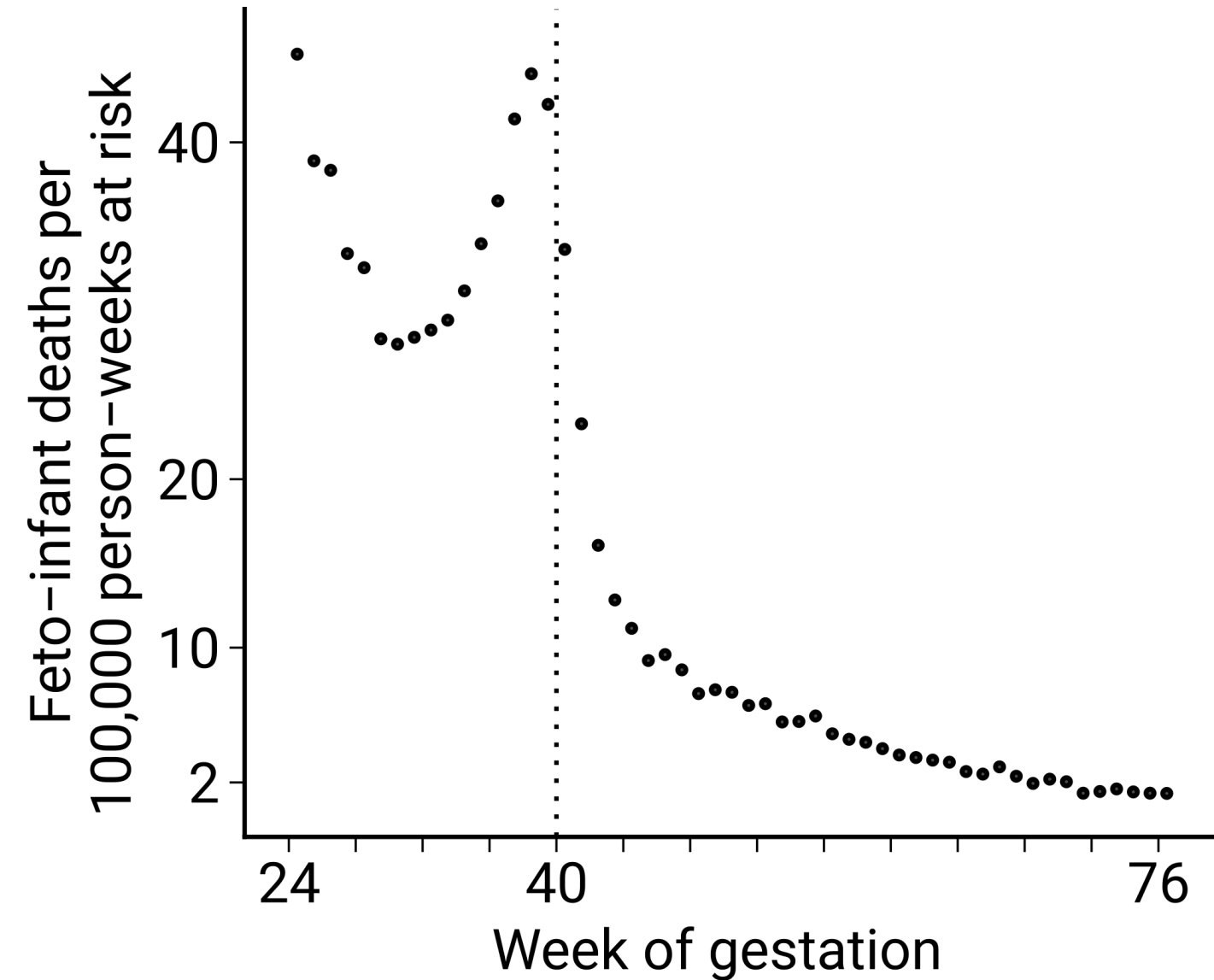
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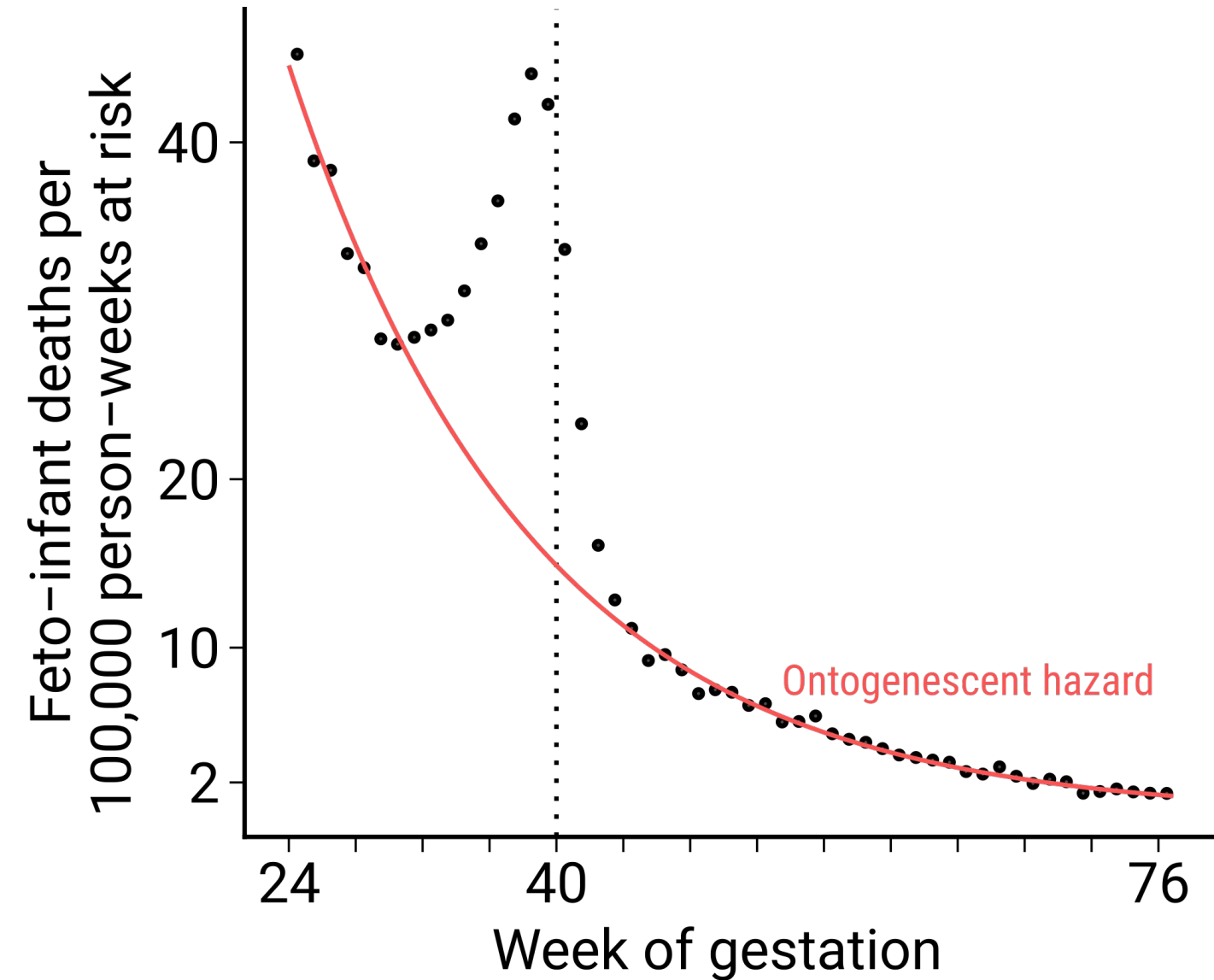


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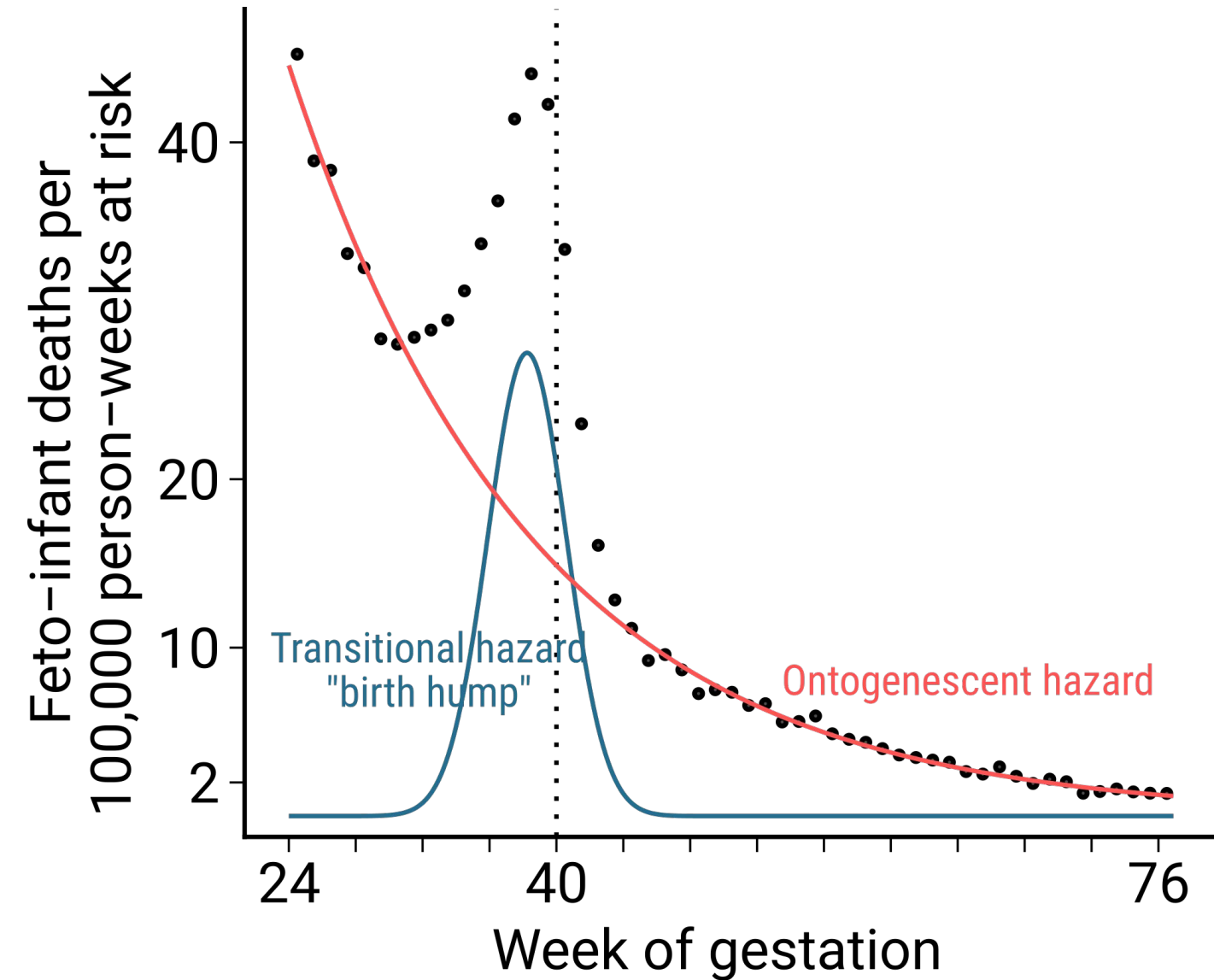
# The transitional shock of birth



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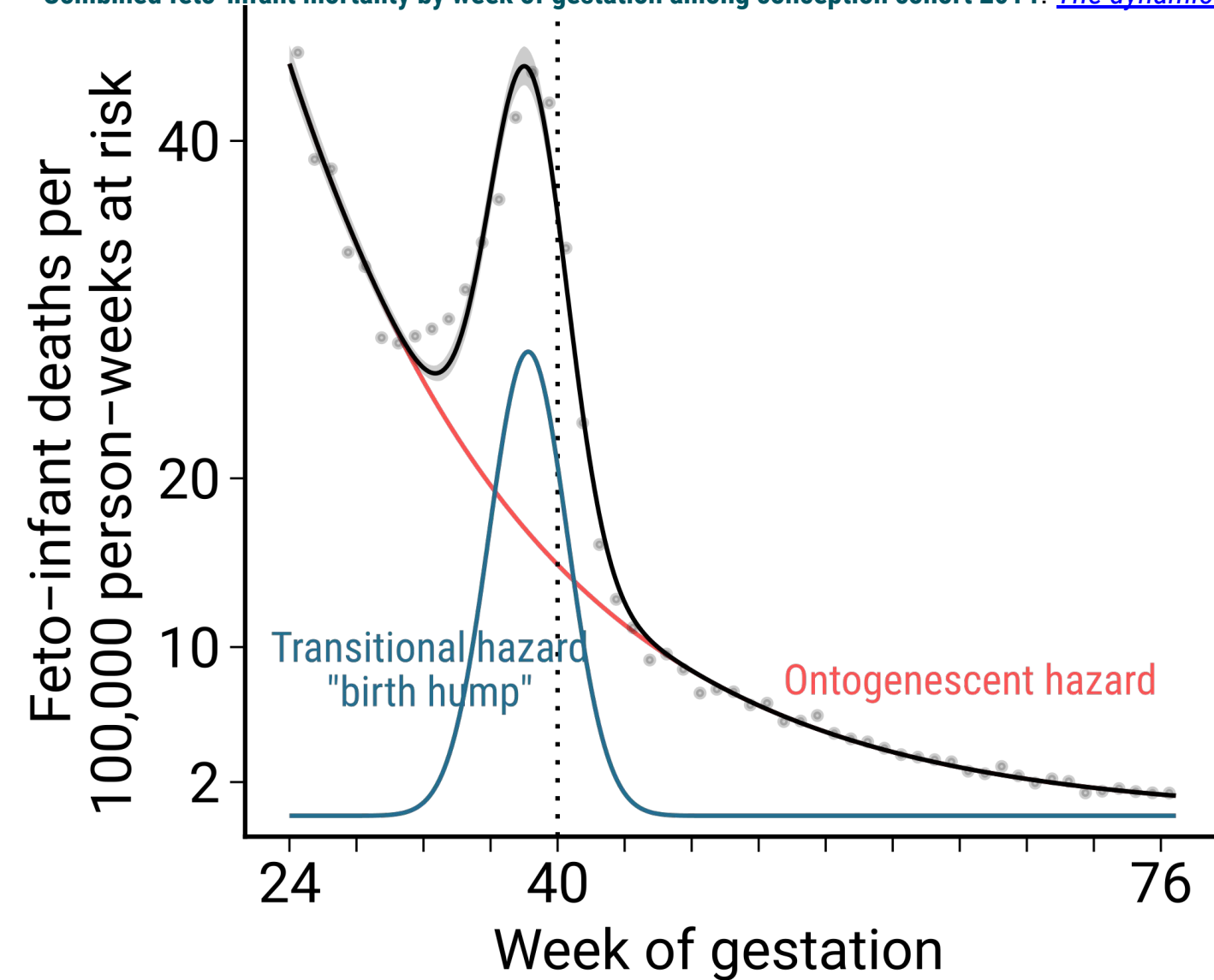


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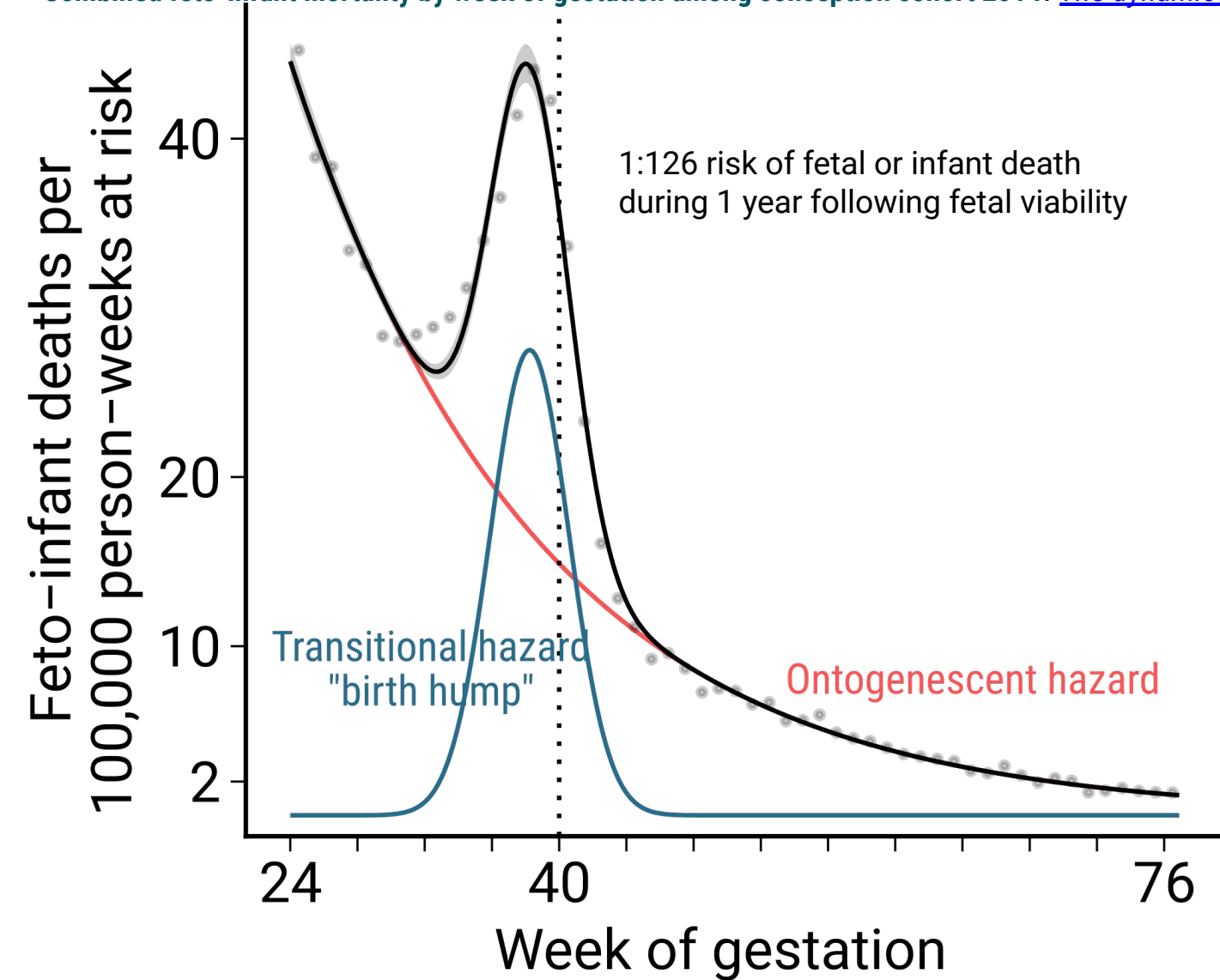
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Combined feto-infant mortality by week of gestation among conception cohort 2014. [The dynamics of ontogenescence](#). Raw data: CDC/NCHS.



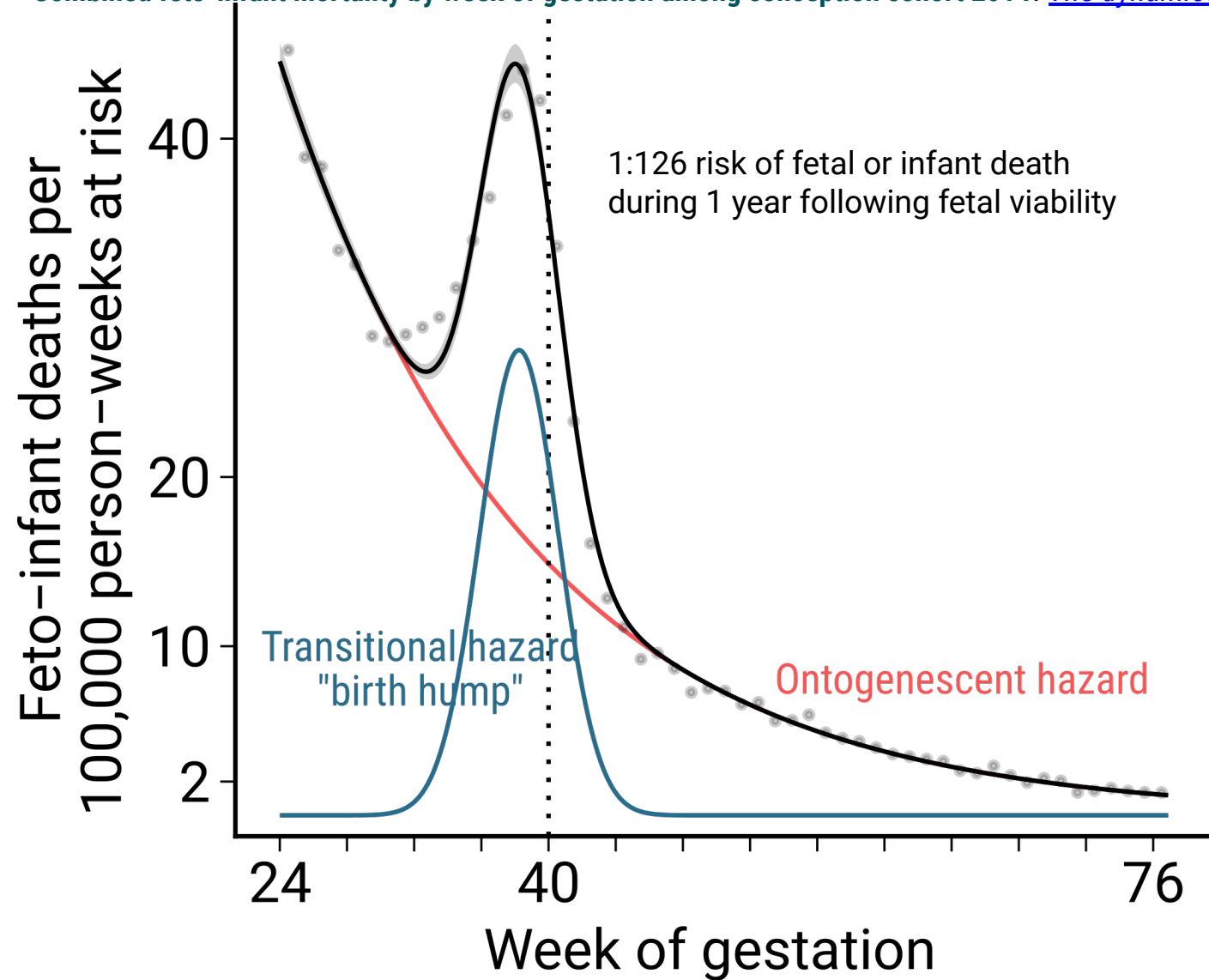
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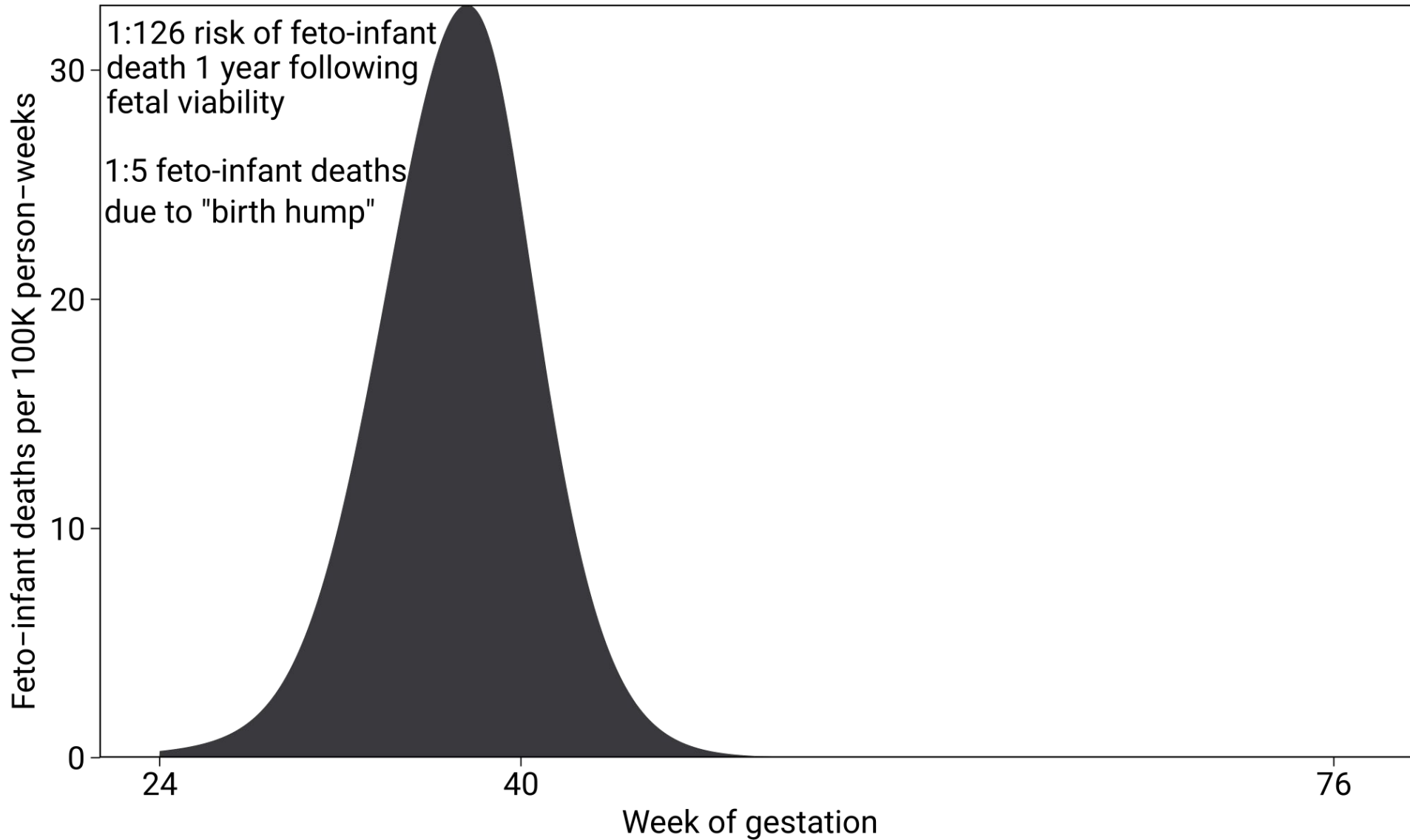
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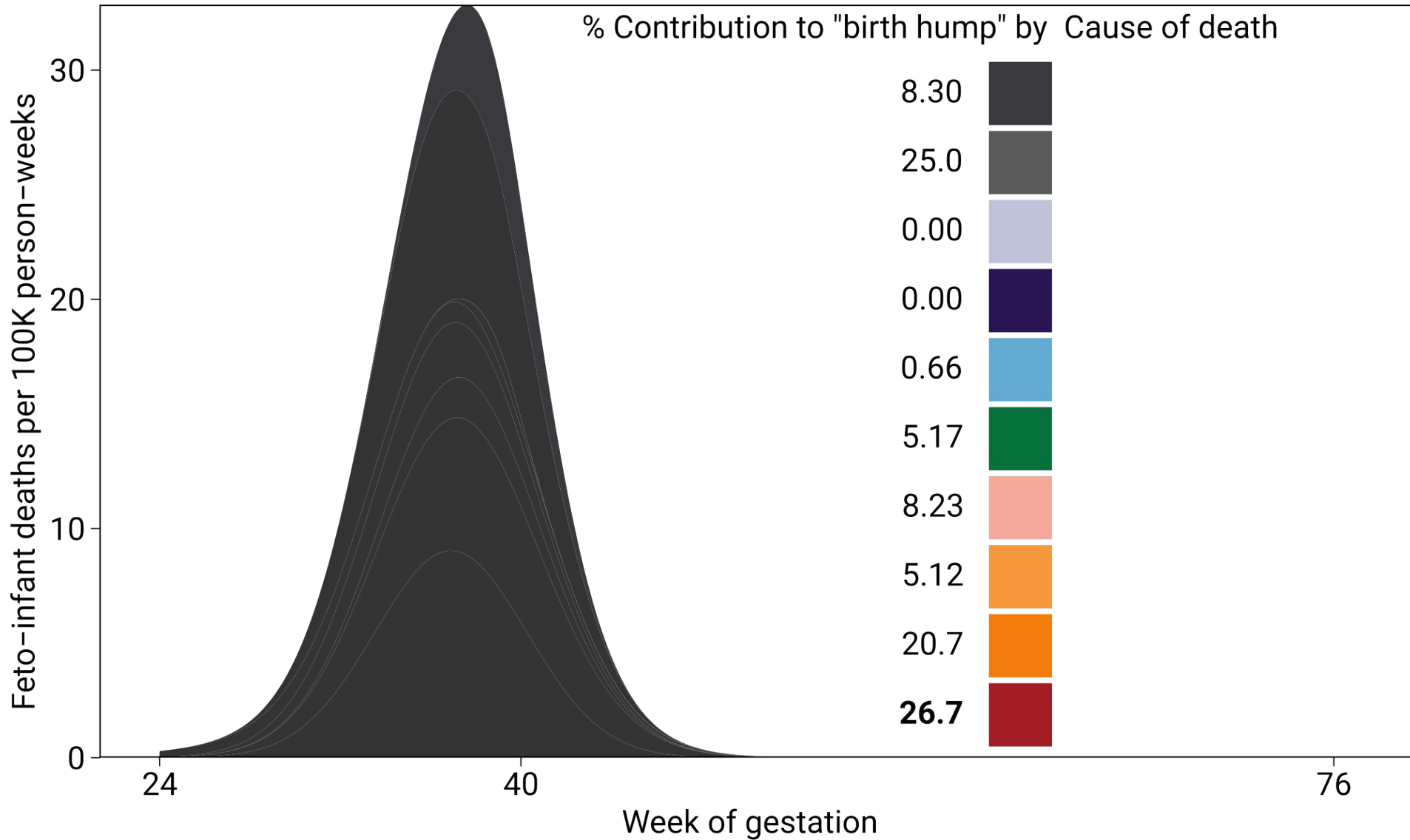
**Table 1:** Parametric specification of the feto-infant mortality trajectory over age of gestation and derived quantities.

Ontogenescent component	Transitional component
<p><i>Ontogenescent hazard</i> The instantaneous risk of fetal or infant death at gestational age <math>t = x + 24</math> due to causes with a continuously declining incidence.</p> $h^O(x) = a_1 \exp(-bx)$	<p><i>Transitional hazard</i> The instantaneous risk of fetal or infant death at gestational age <math>x</math> due to causes associated with the timing of onset of labor.</p> $h^T(x) = a_2 \exp\left(-\frac{(x-c)^2}{2\sigma^2}\right)$
<p><i>Cumulative ontogenescent hazard</i></p> $H^O(x) = \int_0^x h^O(s) ds = \frac{a_1 - a_1 \exp(-bx)}{b}$	<p><i>Cumulative transitional hazard</i></p> $H^T(x) = \int_0^x h^T(s) ds = a_2 \sigma \sqrt{\pi/2} [\operatorname{erf}(A) + \operatorname{erf}(B)],$ <p>where <math>A = \frac{c}{\sqrt{2}\sigma}</math>, <math>B = \frac{x-c}{\sqrt{2}\sigma}</math>, and <math>\operatorname{erf}(\cdot)</math> is the Gaussian error function.</p>
<p><math>a_1</math> <i>Level of feto-infant mortality</i> The approximate hazard of feto-infant death at age of fetal viability.</p>	<p><math>a_2</math> <i>Magnitude of birth hump</i> The instantaneous risk of fetal or infant death contributed by the birth-hump component at its peak.</p>
<p><math>b</math> <i>Rate of ontogenescence</i> The relative rate of feto-infant mortality decline over gestational age in absence of birth hump.</p>	<p><math>c</math> <i>Location of birth hump</i> The gestational age <math>t = c + 24</math> coinciding with the peak of the risk of fetal or infant death contributed by the birth-hump component.</p>
	<p><math>\sigma</math> <i>Spread of transitional shock</i> The curvature of the risk of feto-infant death around its peak. Higher values flatten the birth hump.</p>
Combined hazard	
<p><i>Hazard of feto-infant death</i> The instantaneous risk of fetal or infant death <math>x</math> weeks past fetal viability.</p>	$h(x) = h^O(x) + h^T(x)$
<p><i>Feto-infant survival curve</i> The probability of surviving <math>x</math> weeks past fetal-viability.</p>	$S(x) = \exp\left(-H^O(x) - H^T(x)\right)$
<p><i>Cumulative incidence of feto-infant death</i> Probability of fetal or infant death <math>x</math> weeks past fetal-viability.</p>	$F(x) = 1 - S(x)$
Competing risks inference	
<p>Cumulative incidence of feto-infant death due to causes associated with the timing of onset of labor.</p>	$F^T(x) = \int_0^x S(s)h^T(s) ds$
<p>Share of feto-infant deaths over <math>x</math> weeks following fetal viability contributed by the "birth hump".</p>	$\rho(x) = \frac{F^T(x)}{F(x)}$

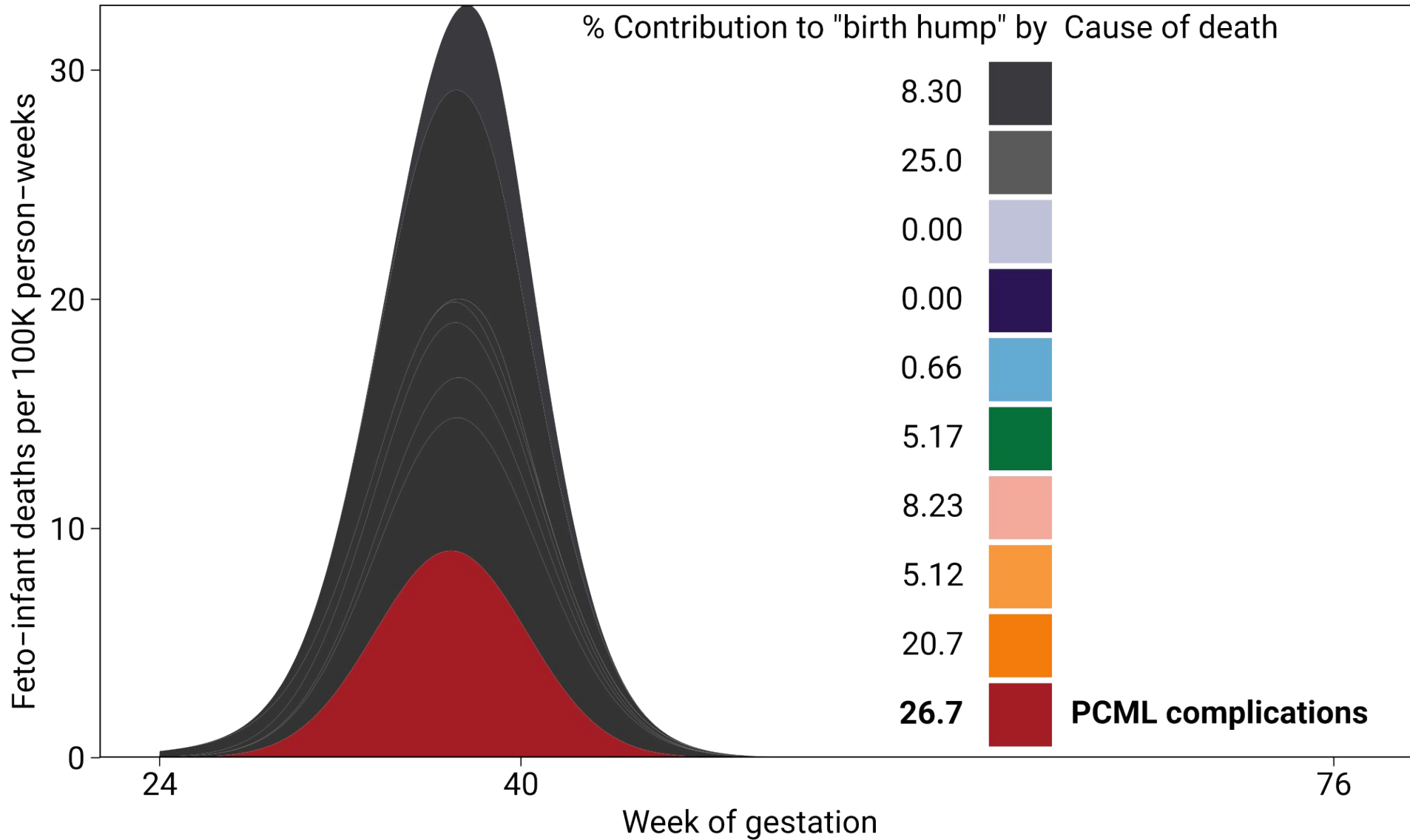
# Deconstructing the “birth hump”



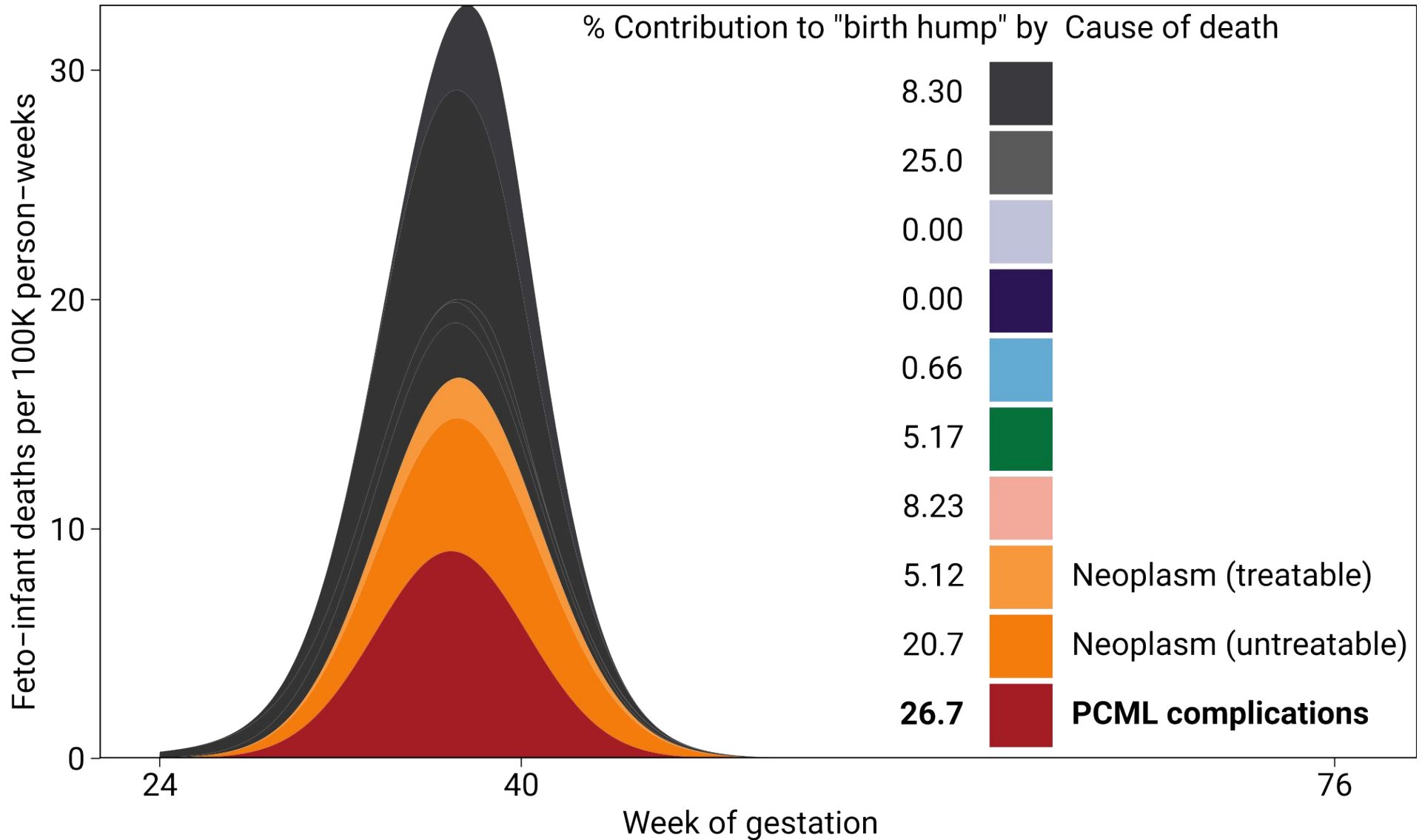
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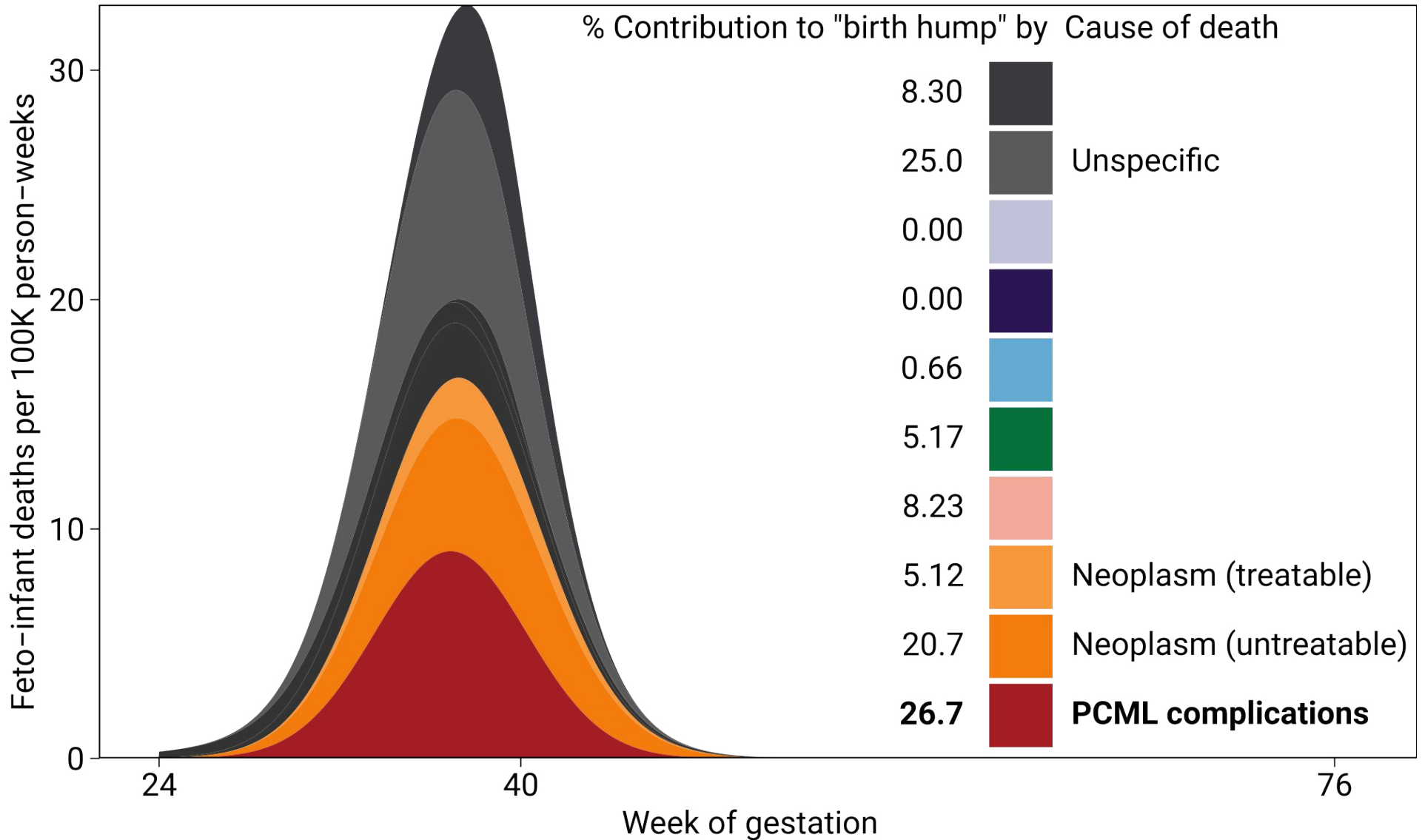
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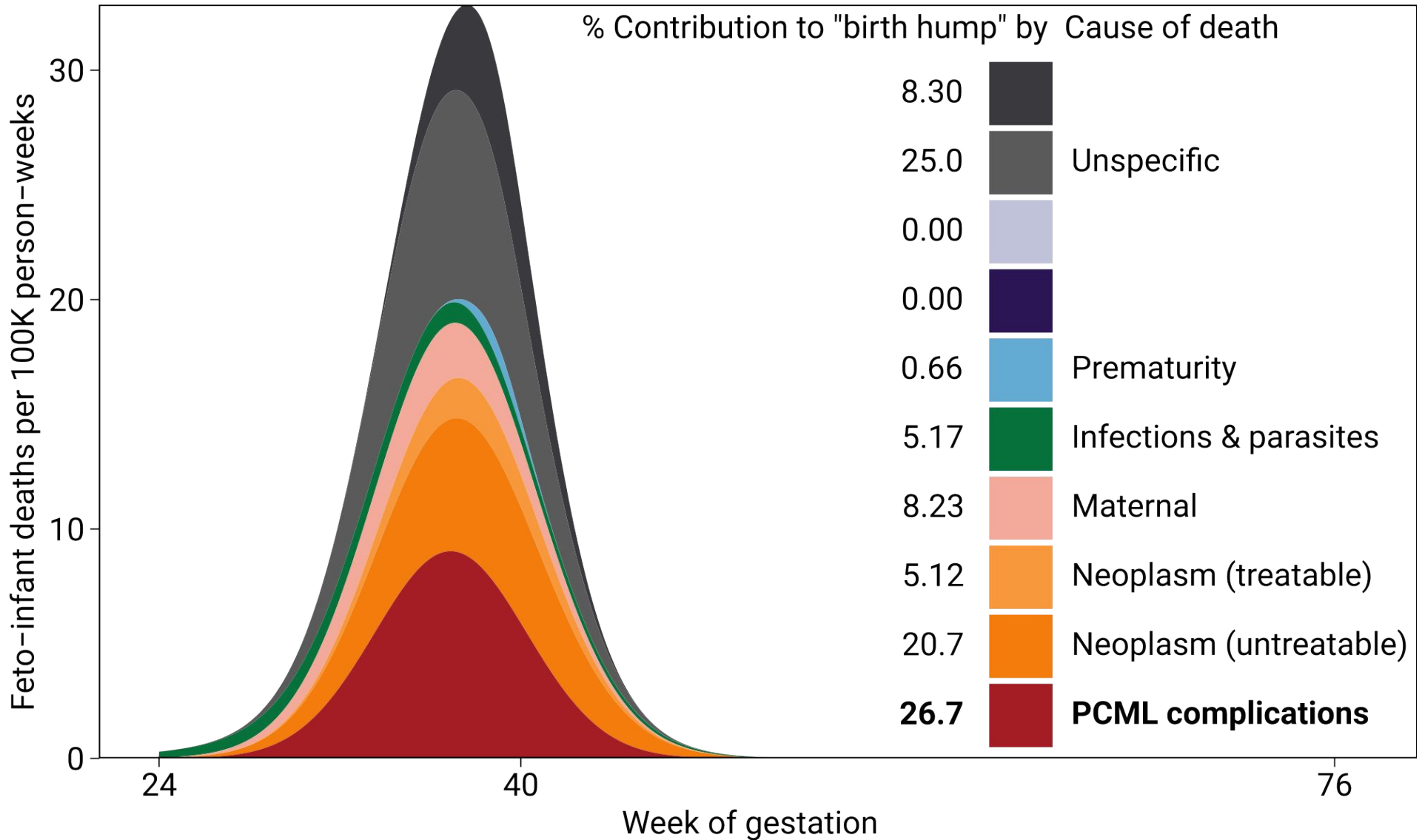
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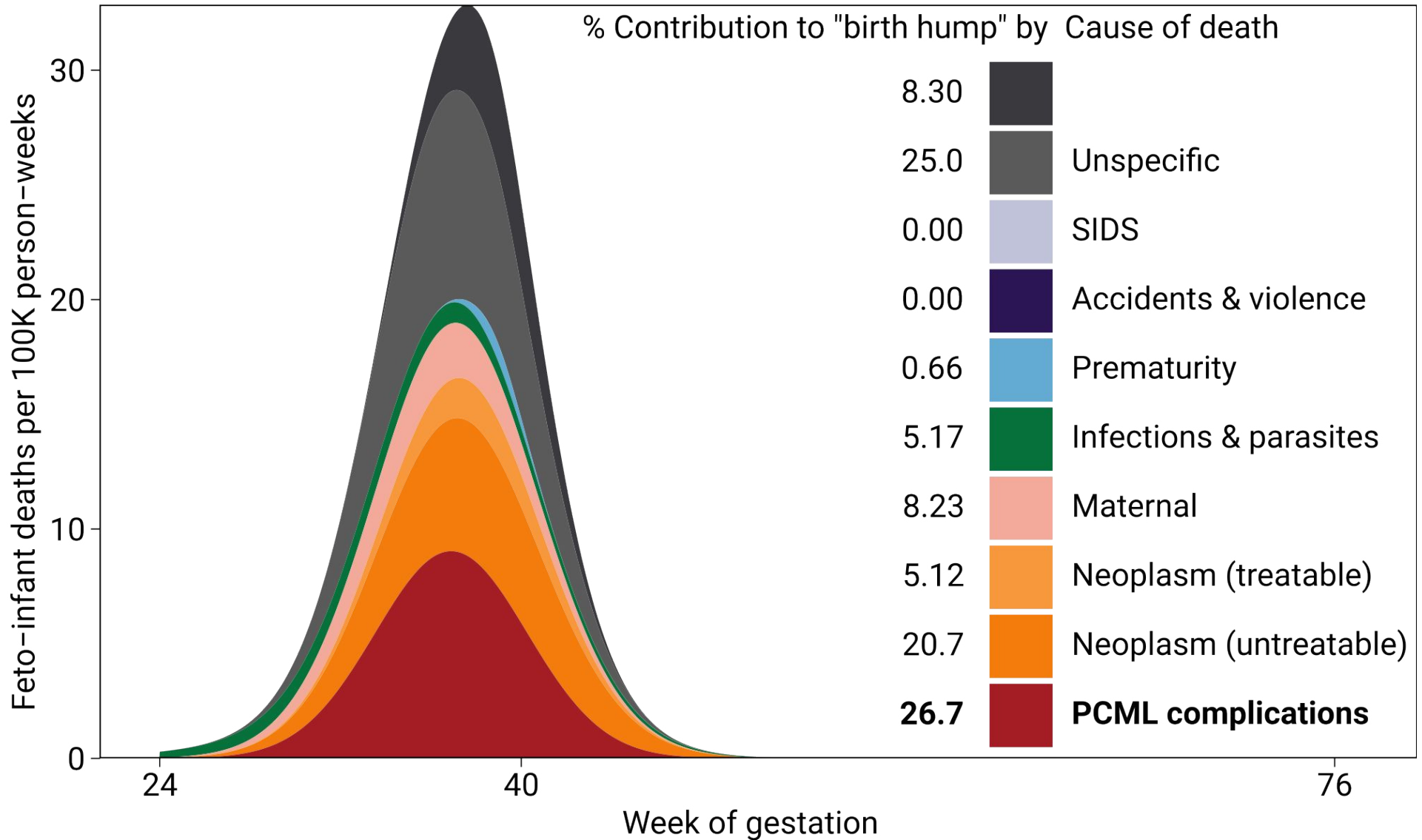
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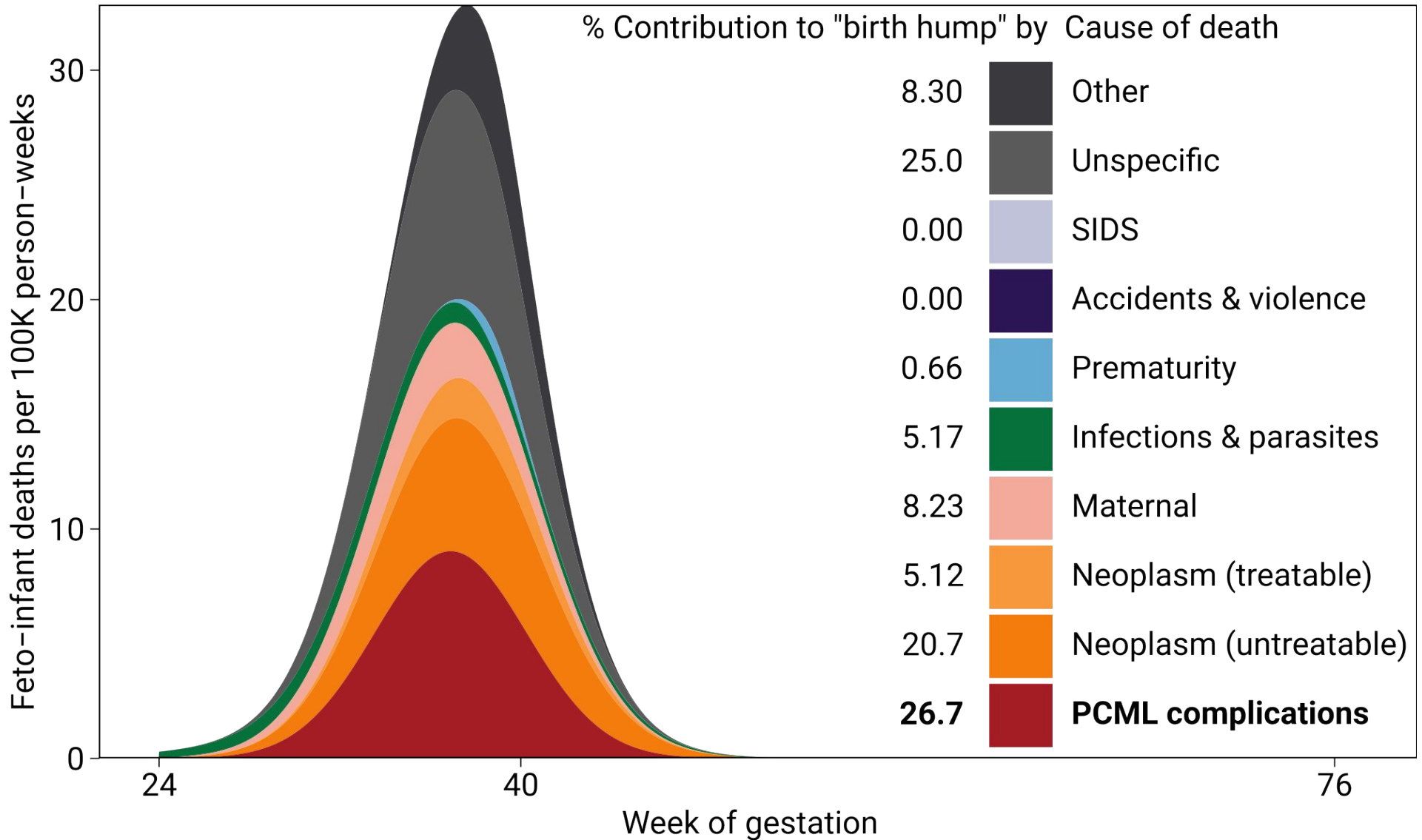
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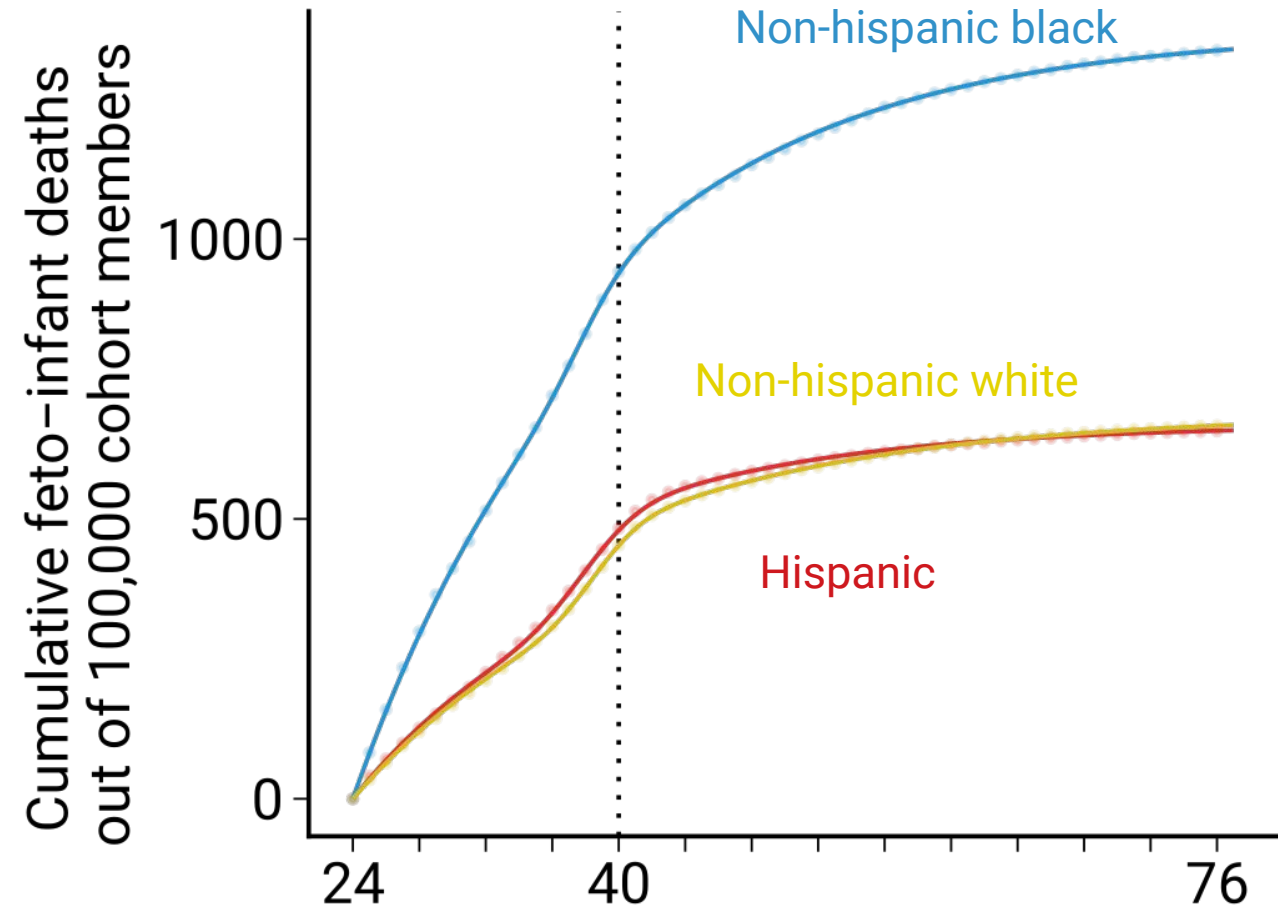
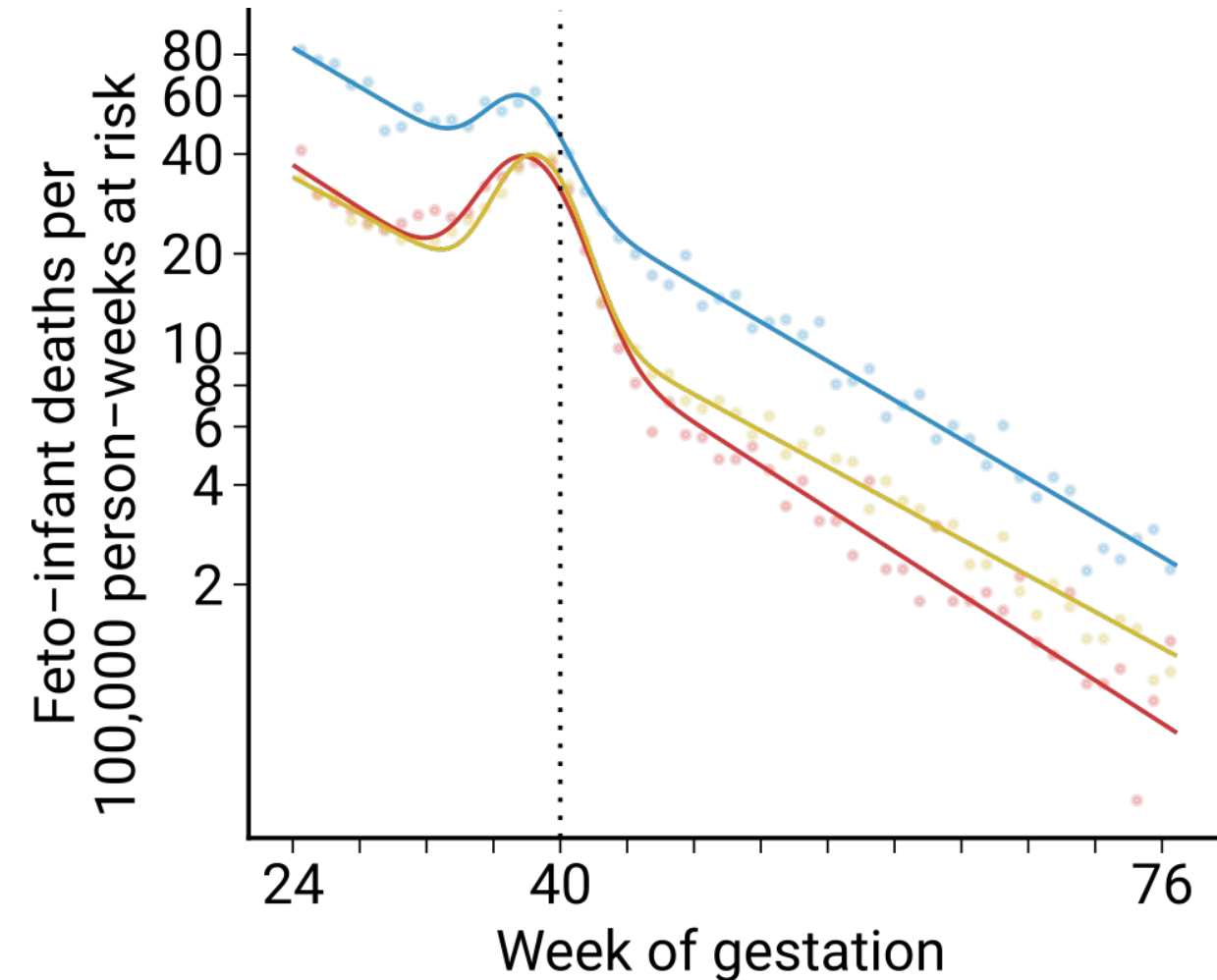


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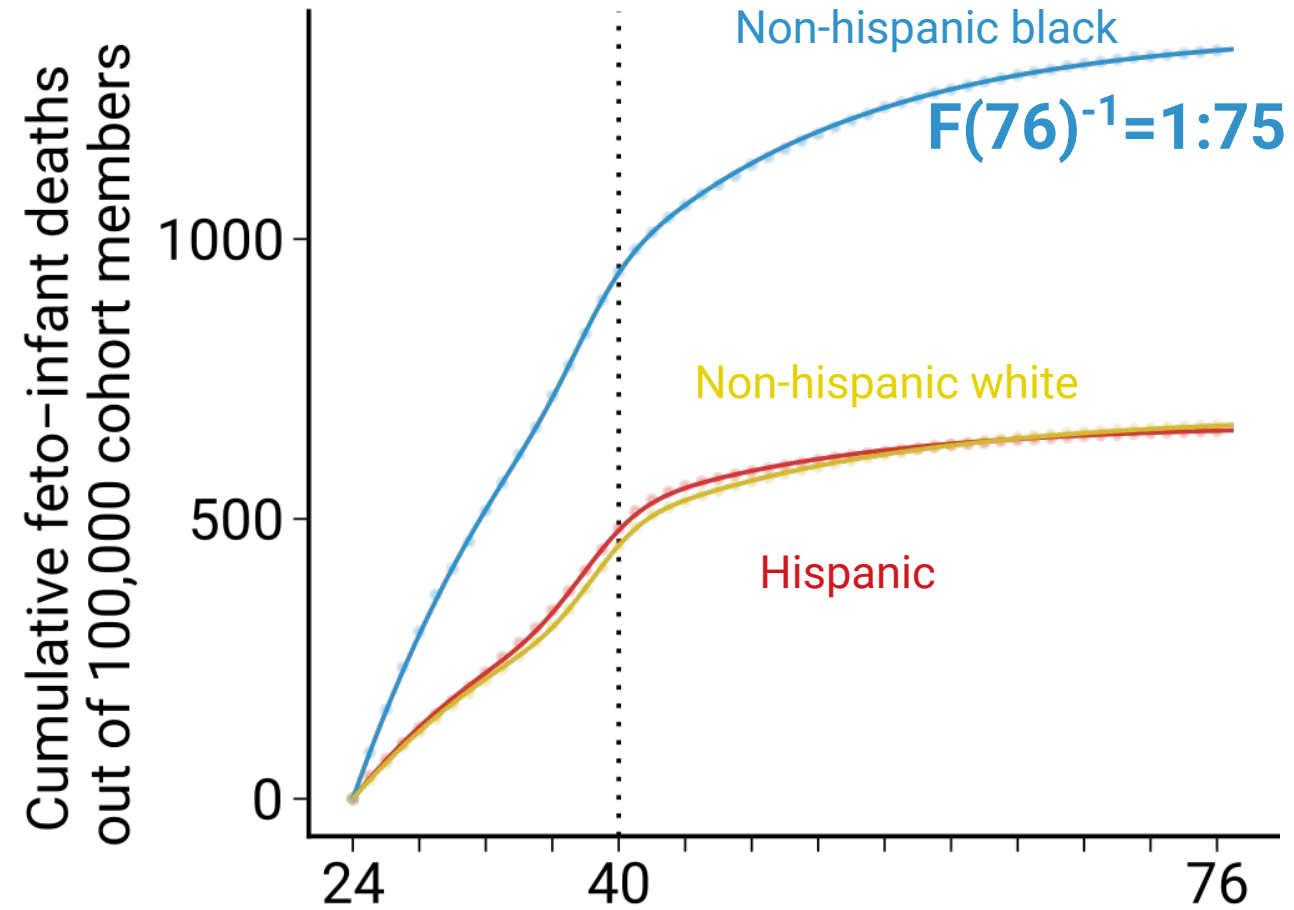
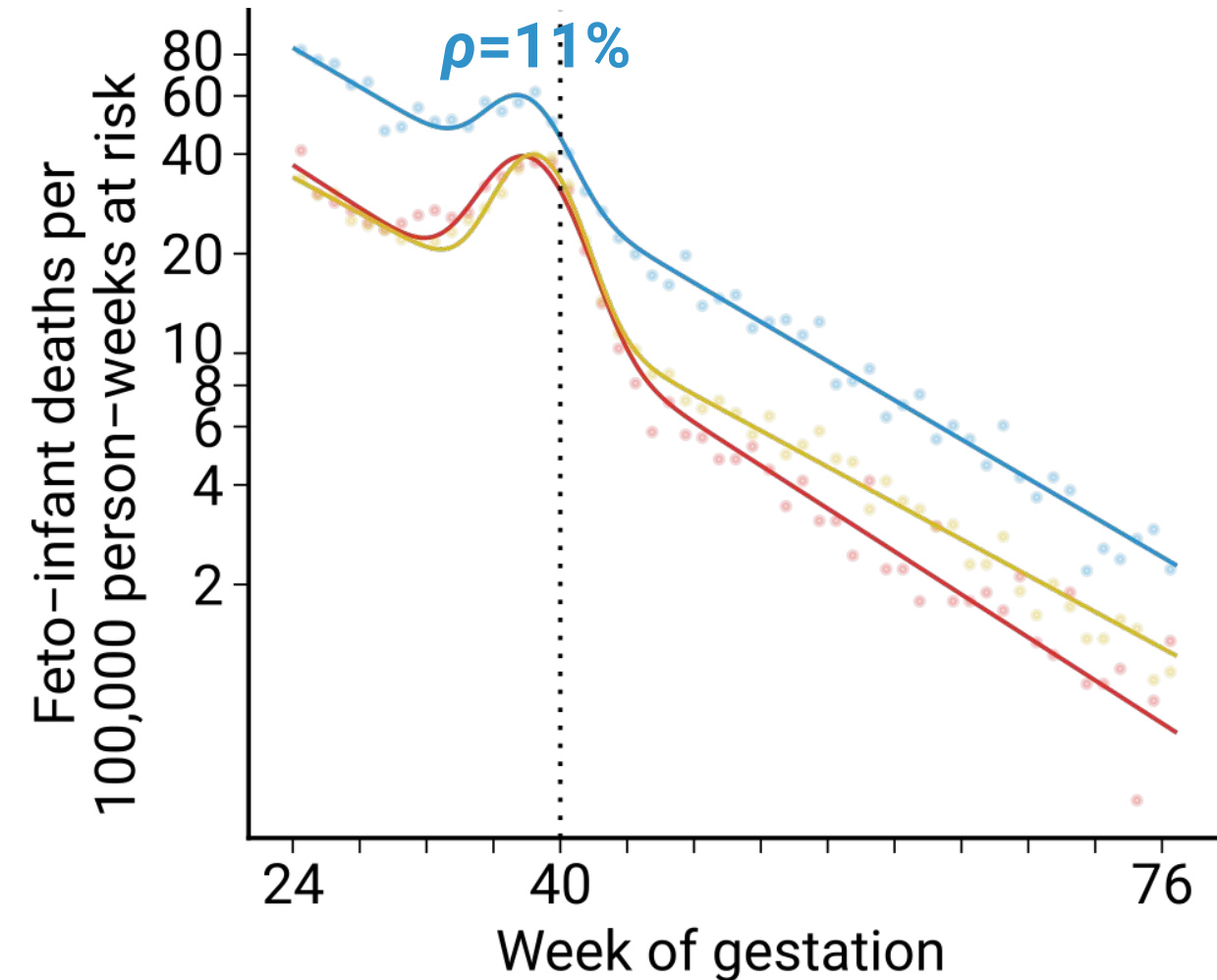
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Combined feto-infant mortality by maternal origin among conception cohort 2014. [The dynamics of ontogenescence](#). Raw data: CDC/NCHS.



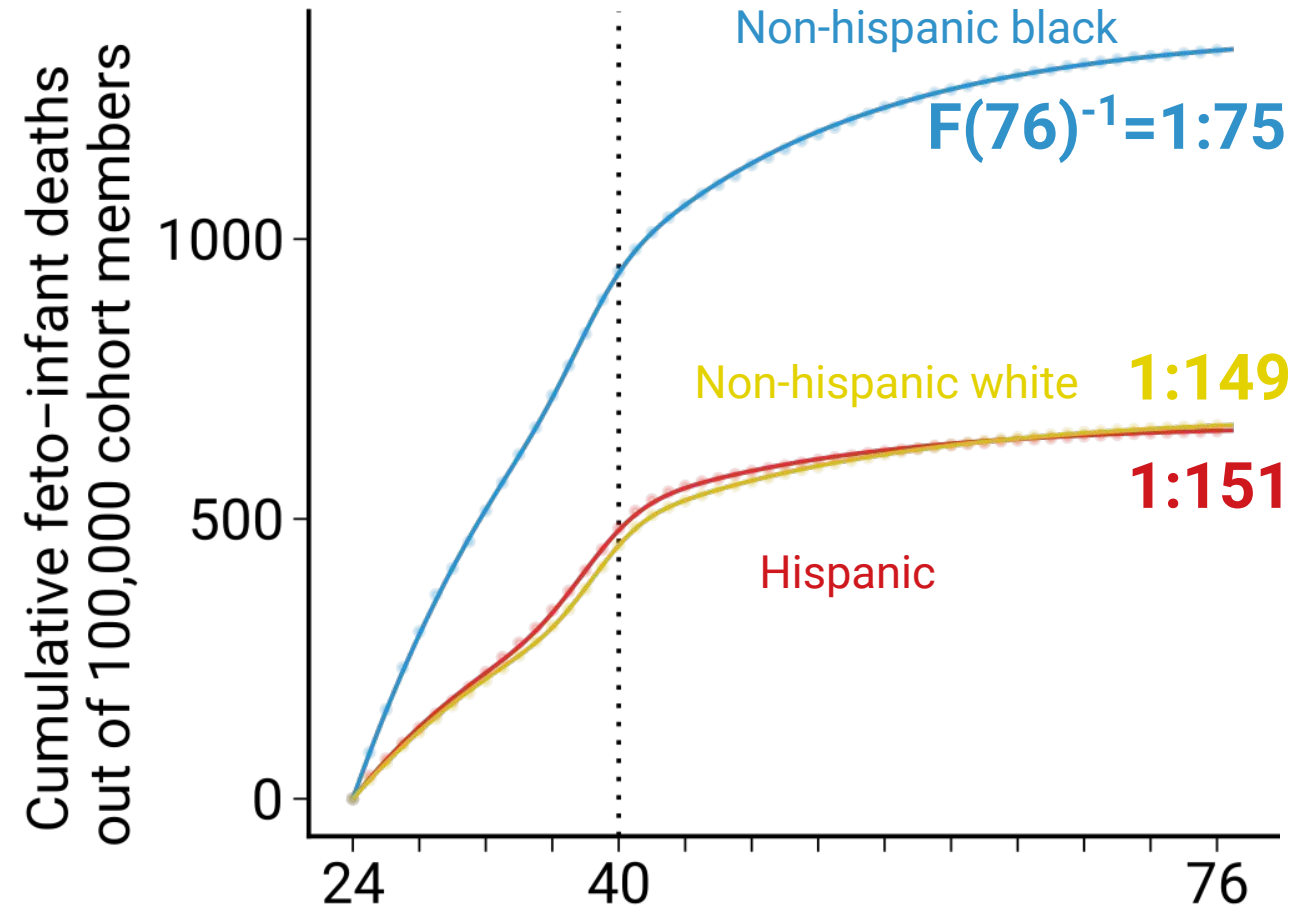
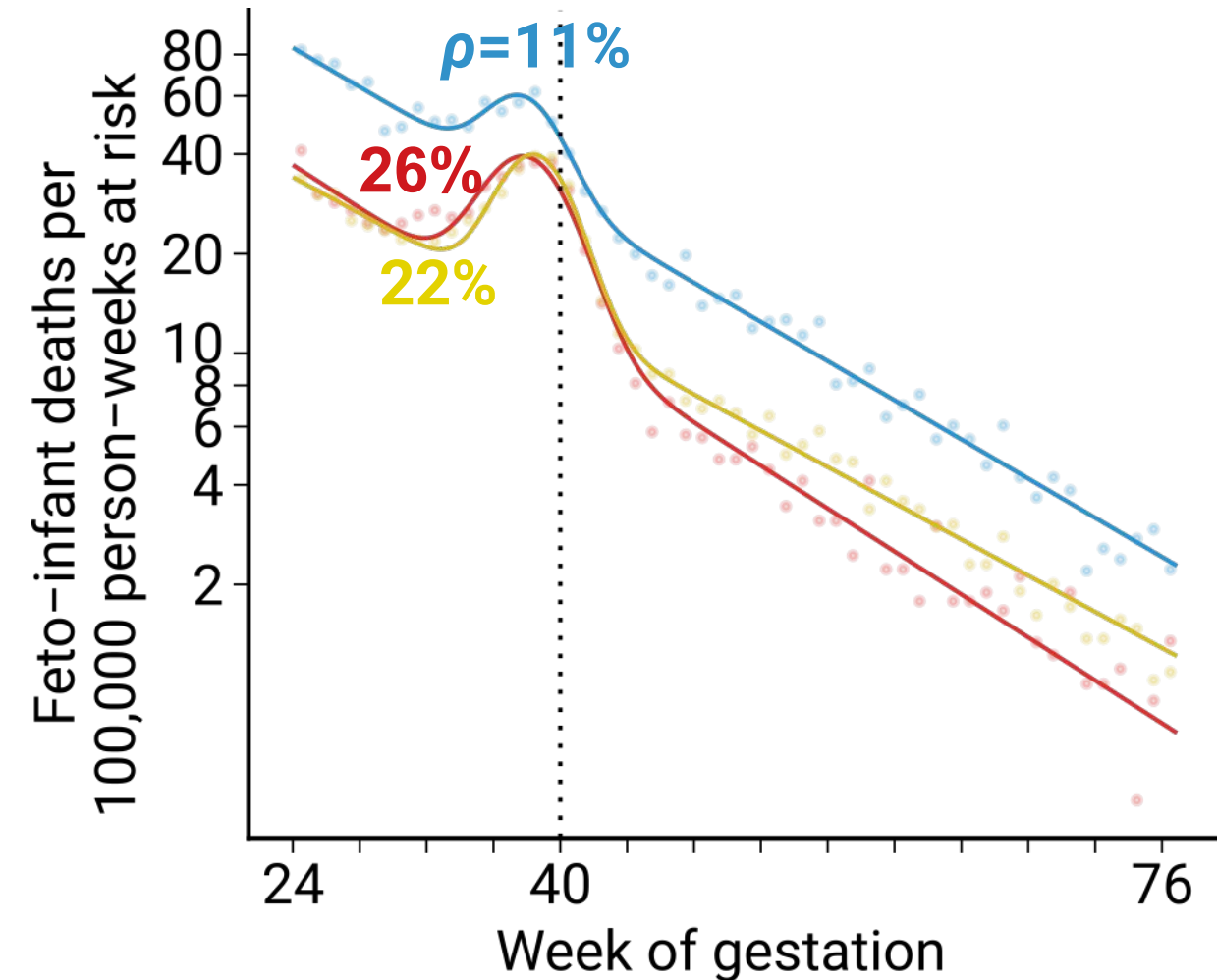
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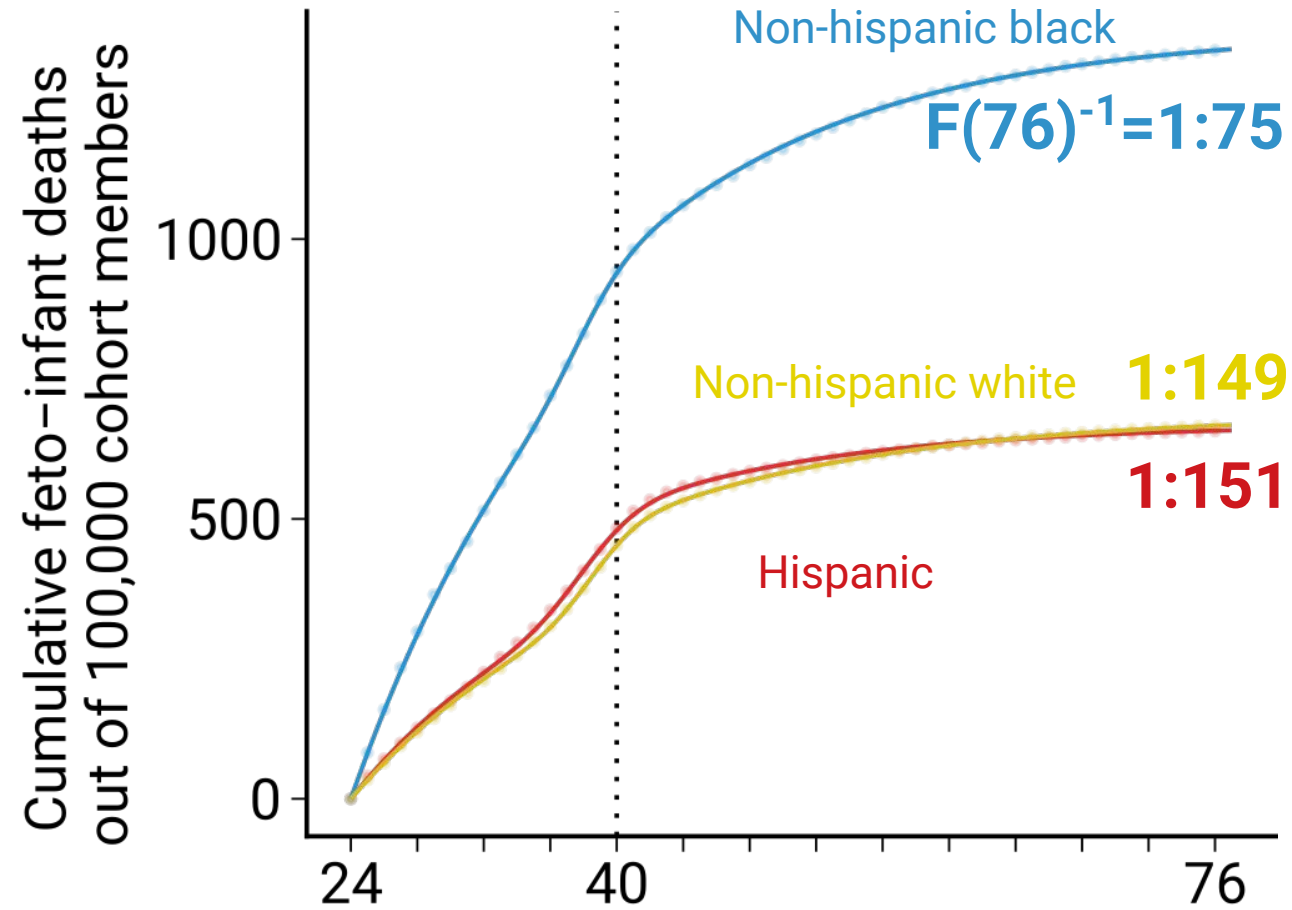
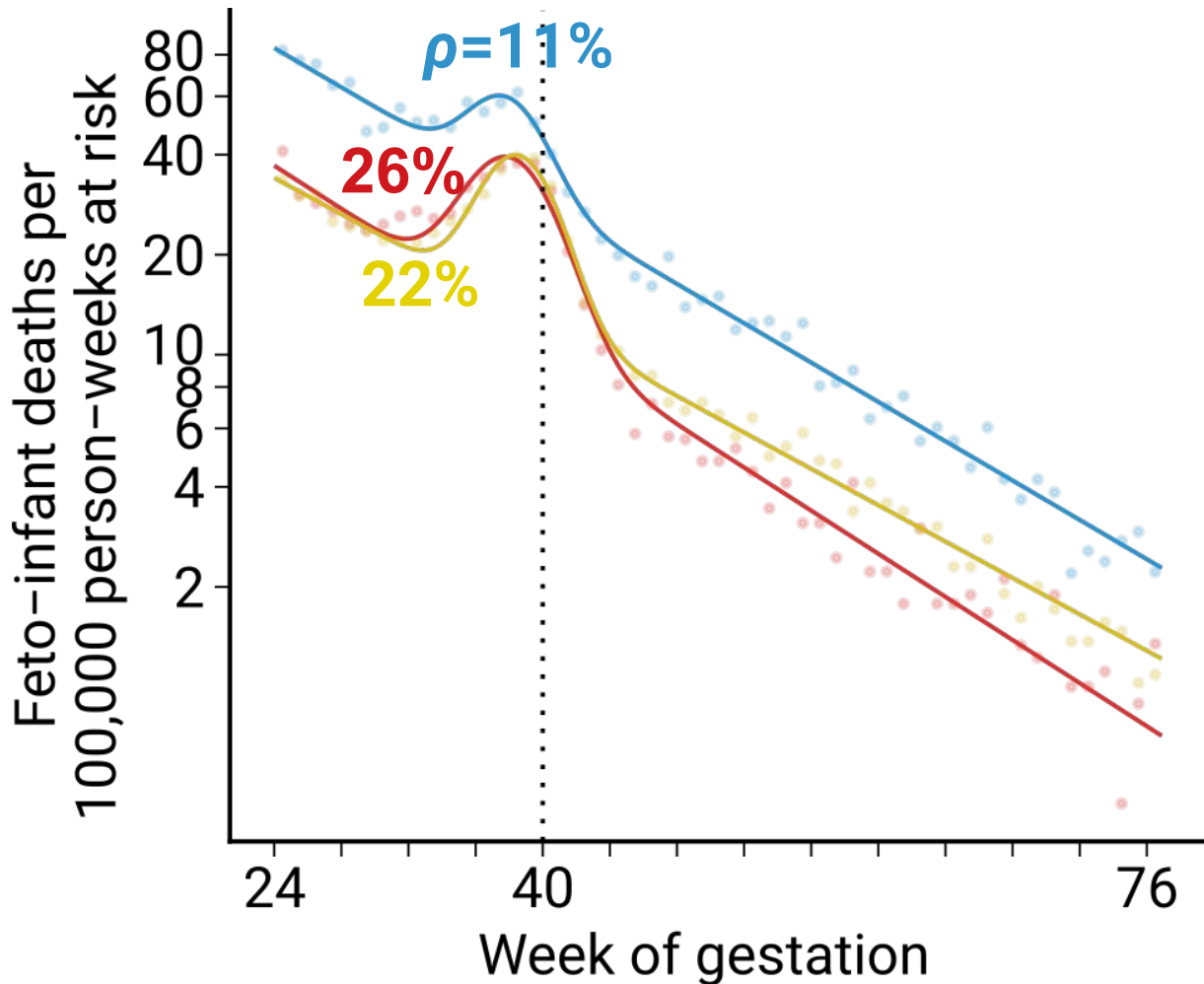
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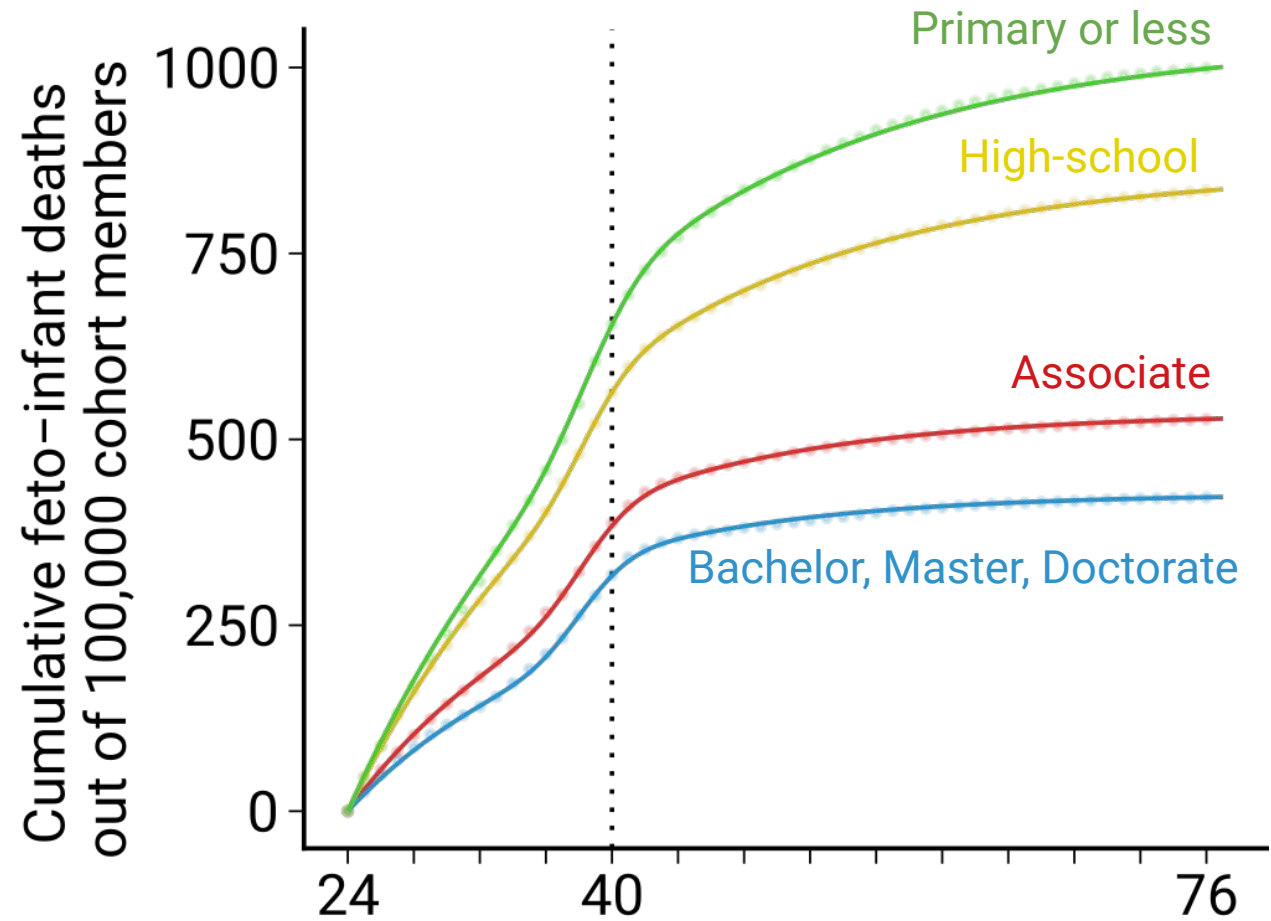
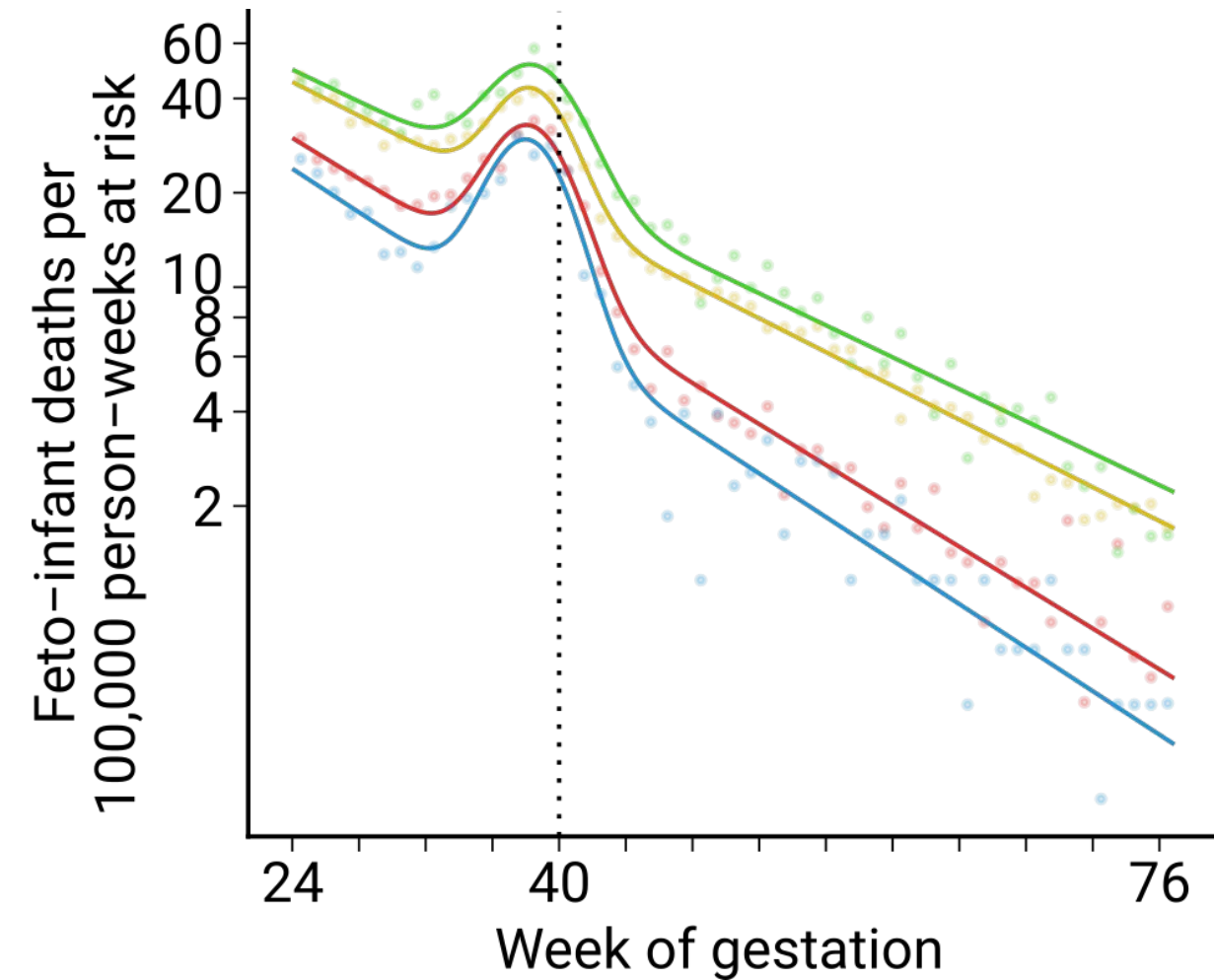
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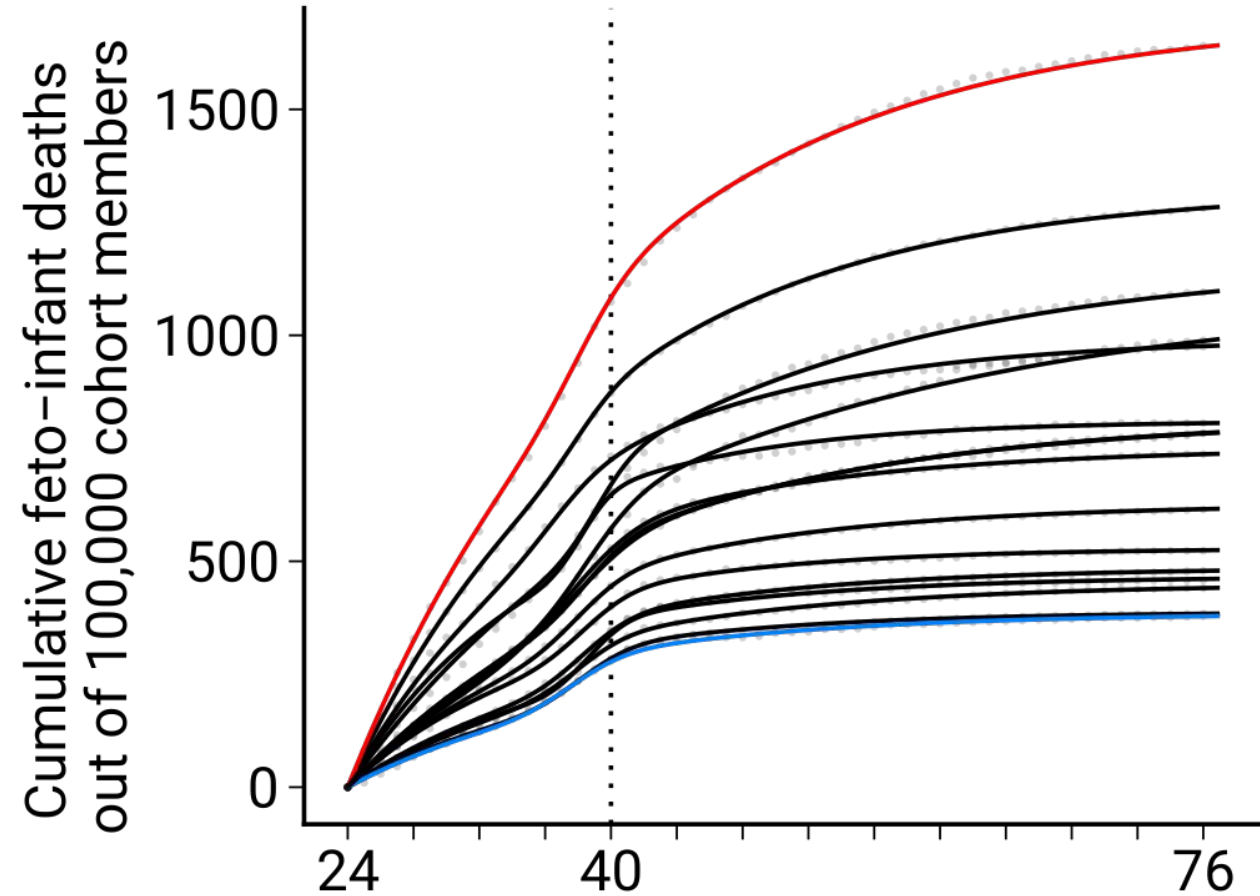
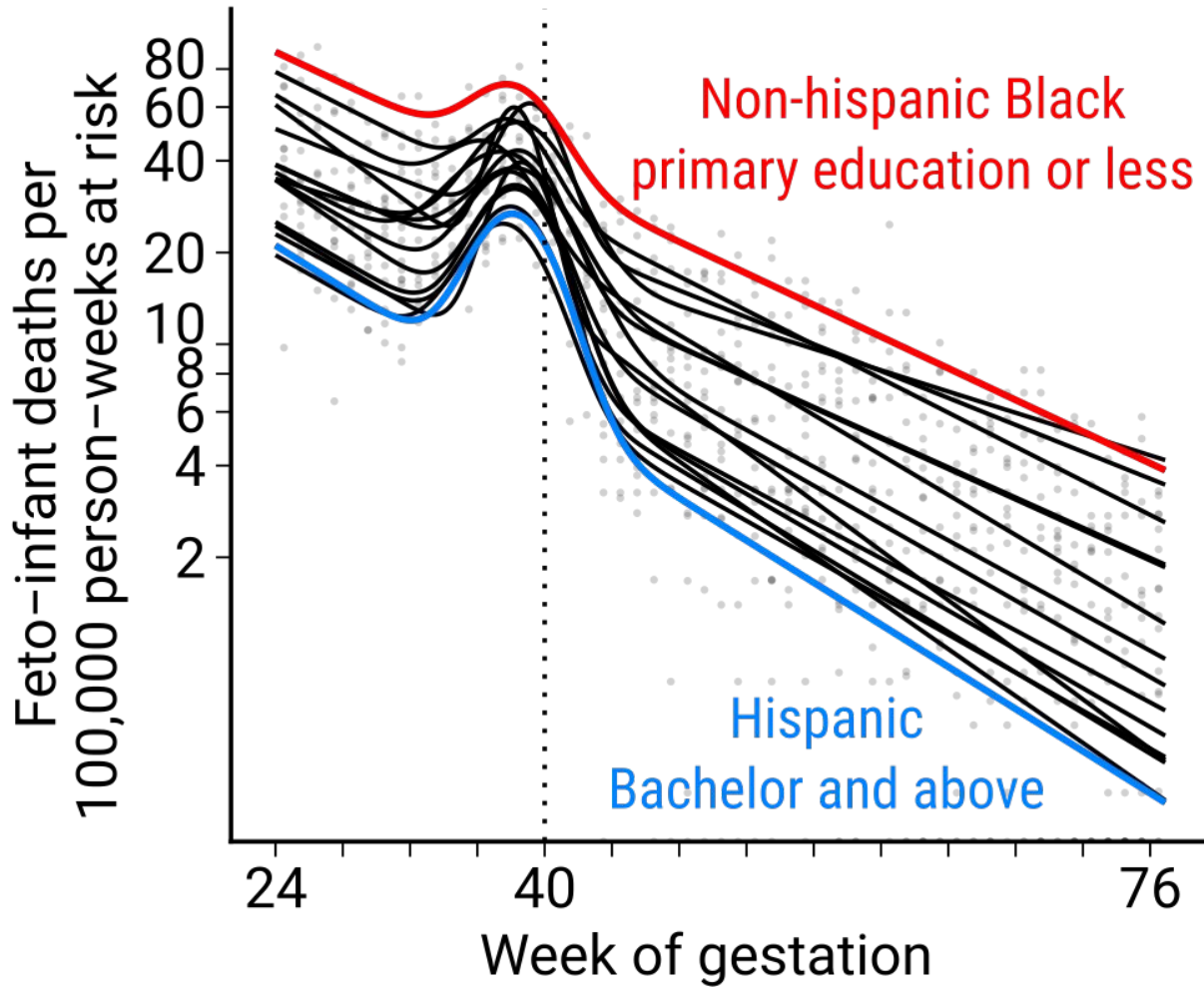
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Combined feto-infant mortality by maternal education among conception cohort 2014. Raw data: CDC/NCHS.

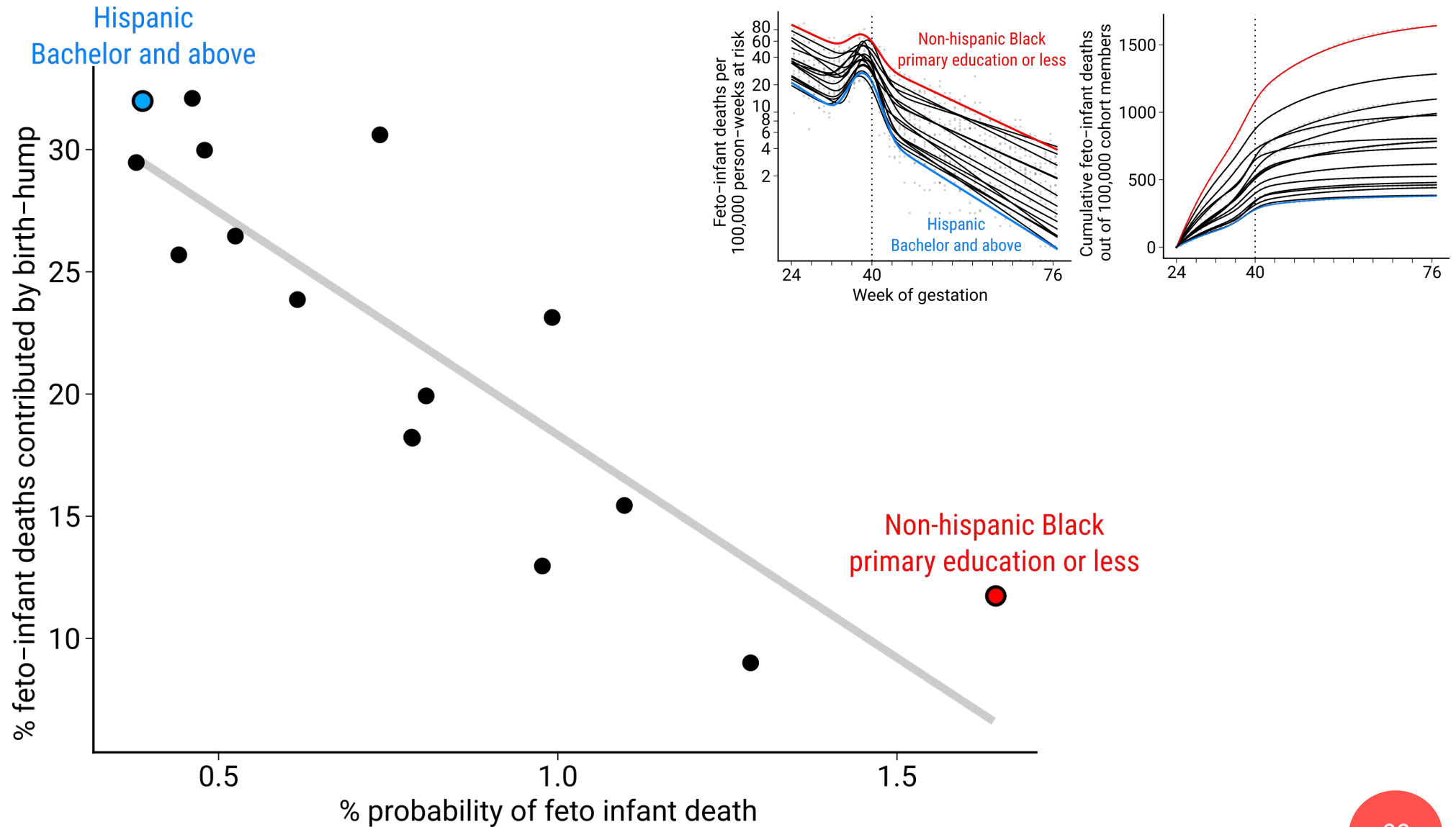


# Mortality compression towards birth

Combined feto-infant mortality by maternal origin and education among conception cohort 2014. Raw data: CDC/NCHS.



# Mortality compression towards birth



# Reproducible analysis

[github.com/jschoeley/bhump](https://github.com/jschoeley/bhump)

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