

# The Gestational Age Pattern of Human Mortality

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# onto|gen|ecence, noun

“**Ontogenescence** is a population-level phenomenon in which the death rate of each cohort tends to decrease with increasing age between conception and maturity.”  
(Levitis 2011)

# The Age Pattern of Ontogenescence

802 D. A. Levitis *Review. Mortality before senescence*

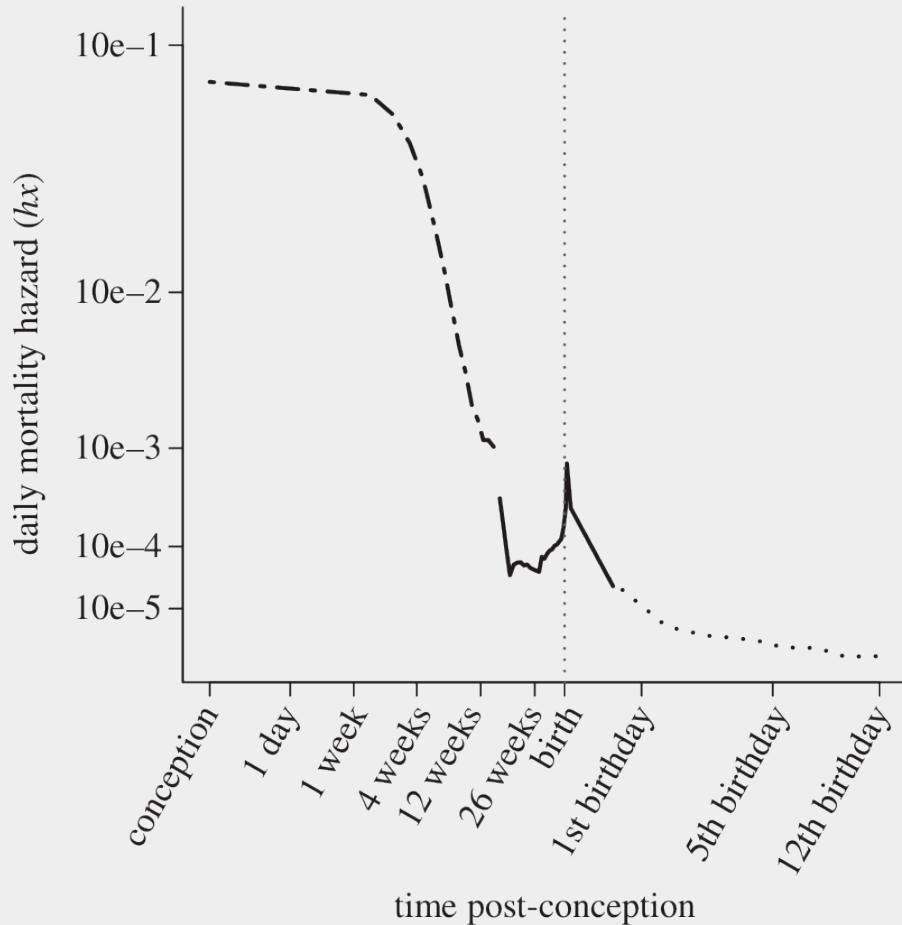
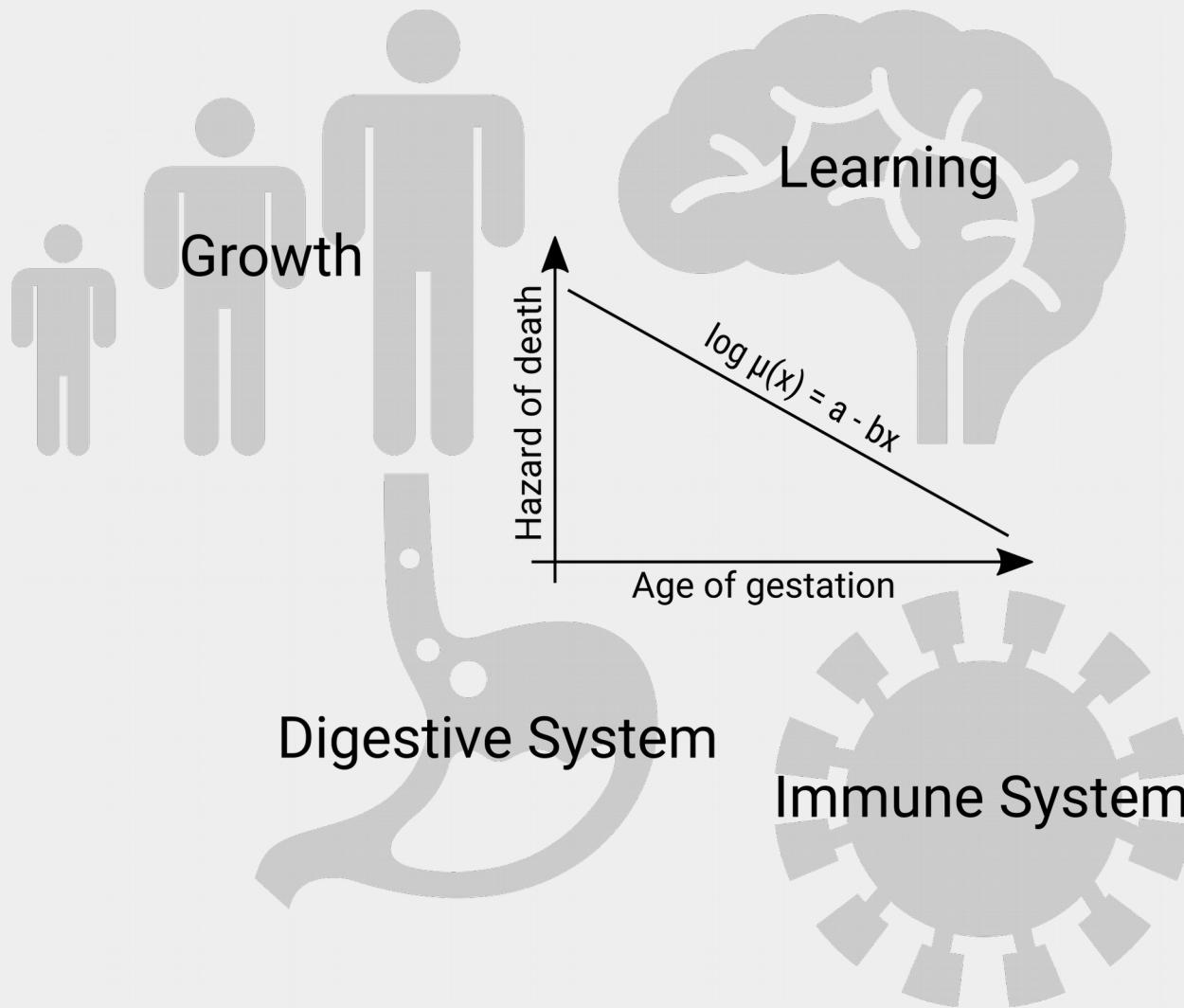


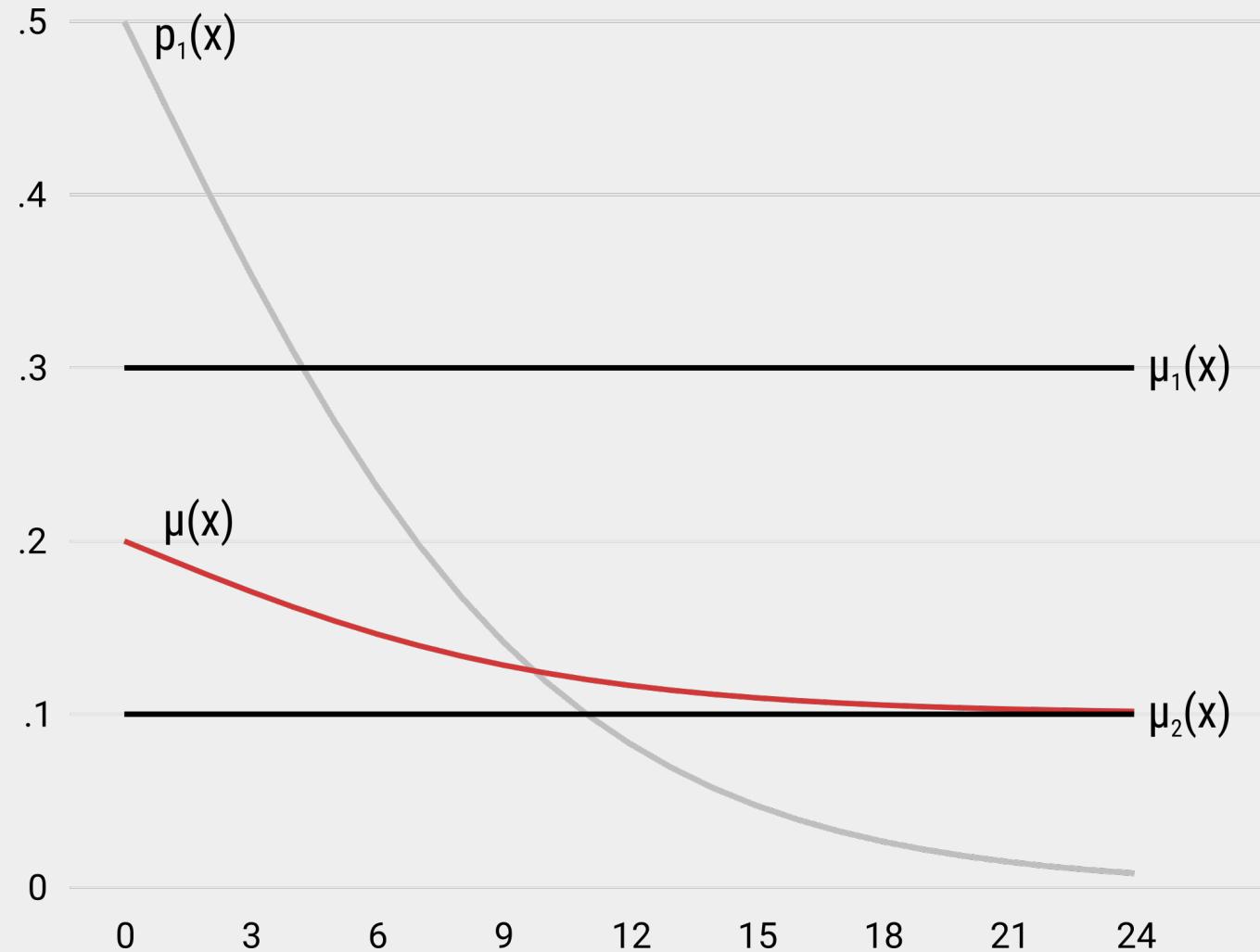
Figure 1. Mortality hazard from conception to 12th birthday.

Levitis, Daniel A. (2011). "Before senescence: the evolutionary demography of ontogenesis". In: *Proceedings of the Royal Society B* 278, pp. 801–809.

# Acquired Robustness

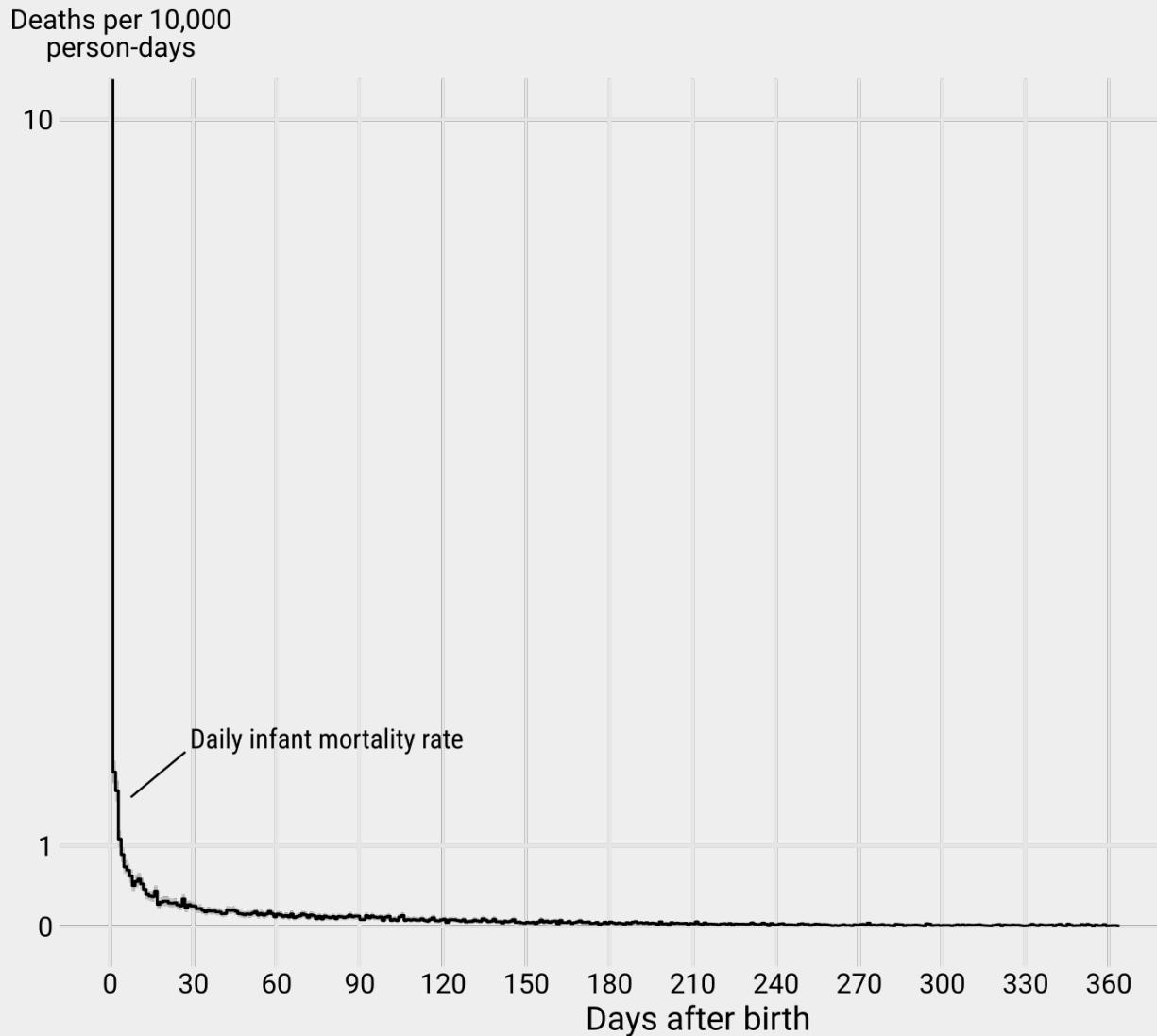


# Mortality Selection



See Vaupel, James W. and Yashin, A. I. (1985). "Heterogeneities Ruses. Some Surprising Effects of Selection on Population Dynamics. In: *The American Statistician*. 39, 3, 176–185.

# Transition of Birth



US conception cohort 2009, males & females. Data on births and infant deaths: Division of Vital Statistics.

# Postnatal- & Gestational Age

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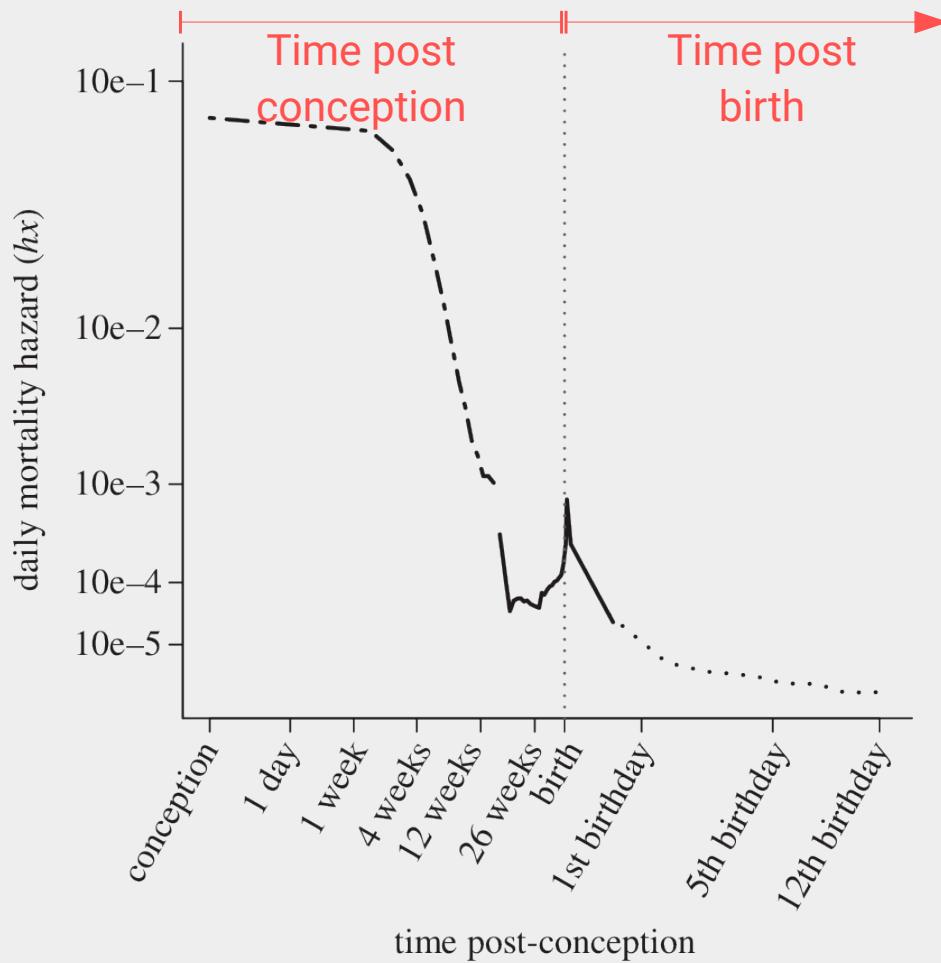
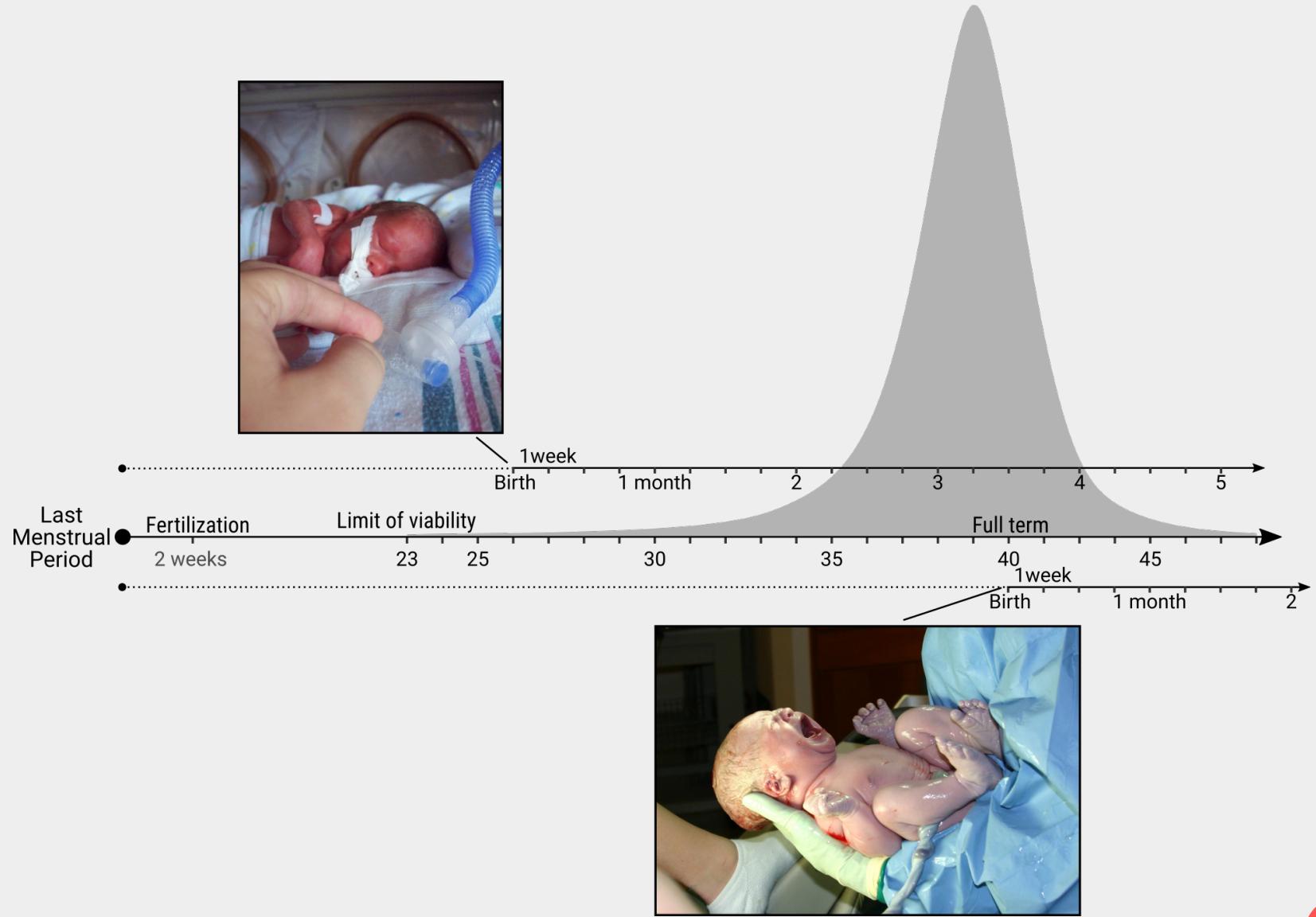


Figure 1. Mortality hazard from conception to 12th birthday.

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# Postnatal- & Gestational Age

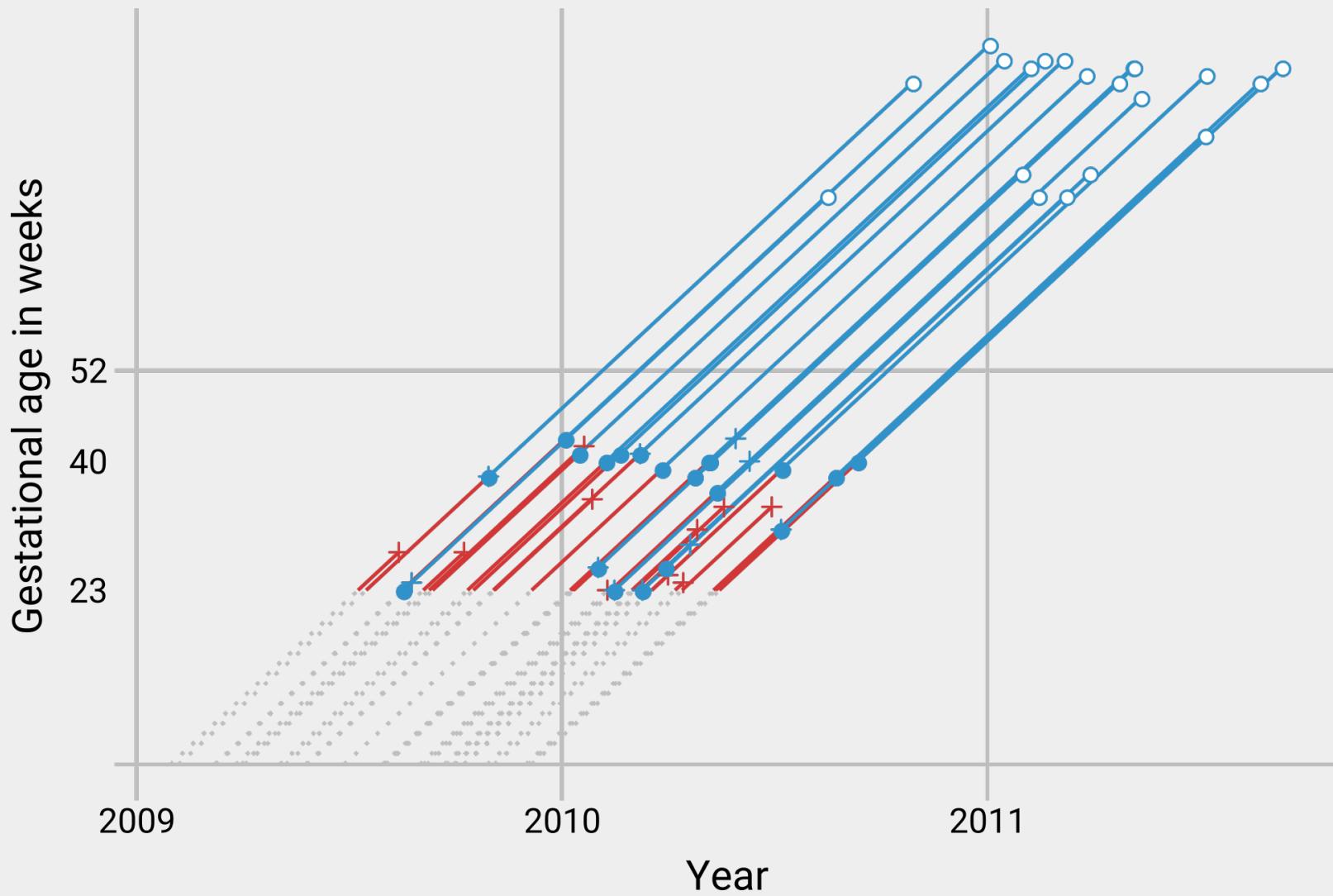


# US Certificates for Birth, Fetal- & Infant Death

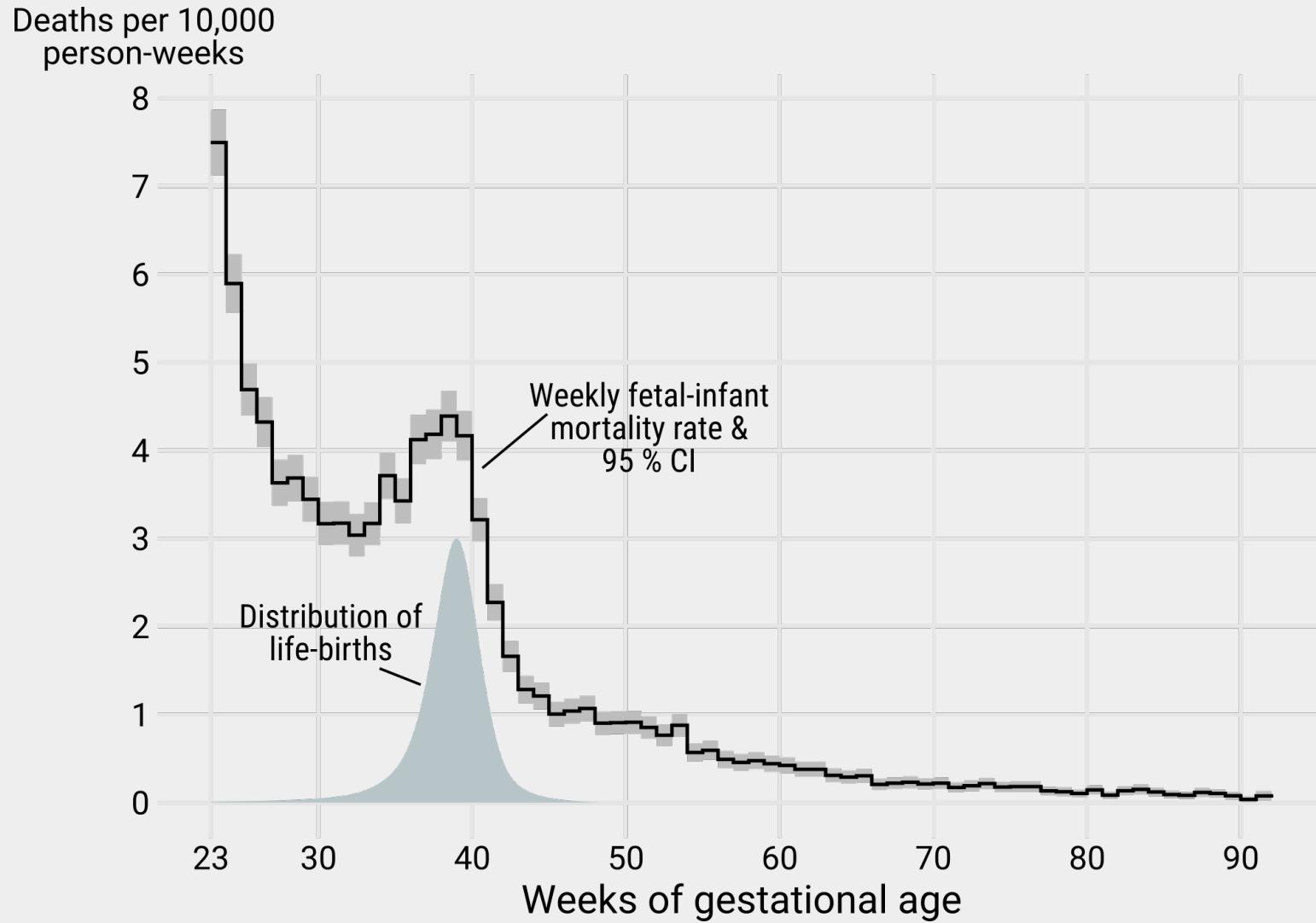
[cdc.gov/nchs/data\\_access/Vitalstatsonline.htm](http://cdc.gov/nchs/data_access/Vitalstatsonline.htm)

US STANDARD REPORT OF FETAL DEATH											
1. NAME OF FETUS (optional-at the discretion of the parents )		2. TIME OF DELIVERY (24hr)		3. SEX (M/F/u/r)		4. DATE OF DELIVERY (MoDayYY)		STATE FILE NUMBER			
5a. CITY, TOWN, OR LOCATION OF DELIVERY		7. PLACE WHERE DELIVERY OCCURRED (Check one)		8. FACILITY NAME (If not institution, give street and number)		3/60891 31986 . . . 1148352519994835251999999 . 11238064451112108090815310123144801351651622112066666111					
<input type="checkbox"/> Hospital		<input type="checkbox"/> Freestanding birthing center				3760892 31986 . . . 1148352519994835251999999 . 11240494451112106071712408144151101221341502115022022111					
5b. ZIP CODE OF DELIVERY		<input type="checkbox"/> Home Delivery Planned to deliver at home? <input type="checkbox"/> Yes <input type="checkbox"/> No		9. FACILITY ID (NPI)		3760893 31986 . . . 1148352519994835251999999 . 1124007445111210809101240812315010131231302109033033111					
<input type="checkbox"/> Clinic/Doctor's office		<input type="checkbox"/> Other (Specify) _____				3760894 31986 . . . 1148352519994835251999999 . 112400744791121070910122088134151101241541502114044033111					
10a. MOTHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix)		10b. DATE OF BIRTH (MoDayYY)				3760895 31986 . . . 1148352519994835251999999 . 112400744791121080910122088134151101241541502114044033111					
10c. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last, Suffix)		10d. BIRTHPLACE (State, Territory, or Foreign Country)				3760896 31986 . . . 1148352519994835251999999 . 112400744791121080910123088134150101271439902116458055111					
11a. RESIDENCE OF MOTHER STATE		11b. COUNTY		11c. CITY, TOWN, OR LOCATION		3760897 31986 . . . 1148352519994835251999999 . 11240944791121080909126089123151011281461702114033033111					
11d. STREET AND NUMBER		11e. APN NO.		11f. ZIP CODE		3760898 31986 . . . 1148352519994835251999999 . 112420944791121080909126089123151011281461702114033033111					
11g. INSIDE CITY LIMITS <input type="checkbox"/> Yes <input type="checkbox"/> No						3760899 31986 . . . 1148352519994835251999999 . 1124209447911210910991220881231519921121251604316022022111					
12a. FATHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix)		12b. DATE OF BIRTH (MoDayYY)		12c. BIRTHPLACE (State, Territory, or Foreign Country)		3760900 31986 . . . 1148352519994835251999999 . 11244094479112107091013711112151101441771802110044044111					
13. METHOD OF DISPOSITION: <input type="checkbox"/> Burial <input type="checkbox"/> Cremation <input type="checkbox"/> Hospital Disposition <input type="checkbox"/> Donation <input type="checkbox"/> Removal from State <input type="checkbox"/> Other (Specify) _____						3760901 31986 . . . 1148352519994835251999999 . 112410844791121080910124088123127091271251602109022022111					
ATTENDANT AND REGISTRATION INFORMATION		14. ATTENDANT'S NAME, TITLE, AND NPI NAME _____ NPI: _____ TITLE: <input type="checkbox"/> MD <input type="checkbox"/> DO <input type="checkbox"/> CNM/CM <input type="checkbox"/> OTHER MIDWIFE <input type="checkbox"/> OTHER (Specify) _____		15. NAME AND TITLE OF PERSON COMPLETING REPORT Name _____ Title _____		16. DATE REPORT COMPLETED MM / DD / YYYY		17. DATE RECEIVED BY REGISTRAR MM / DD / YYYY		3760902 31986 . . . 1148352519994835251999999 . 11139064479112108090813210123105081291241502113033033111	
18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH											
CAUSE OF FETAL DEATH		18a. INITIATING CAUSE/CONDITION (AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS) Maternal Conditions/Diseases (Specify) _____									
		18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS (SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18a) Maternal Conditions/Diseases (Specify) _____									
Complications of Placenta, Cord, or Membranes		Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Proplased cord <input type="checkbox"/> Chorionamnionitis <input type="checkbox"/> Other (Specify) _____									
Other Obstetric or Pregnancy Complications (Specify) _____		Other Obstetric or Pregnancy Complications (Specify) _____									
Fetal Anomaly (Specify) _____		Fetal Anomaly (Specify) _____									
Fetal Injury (Specify) _____		Fetal Injury (Specify) _____									
Fetal Infection (Specify) _____		Fetal Infection (Specify) _____									
Other Fetal Conditions/Disorders (Specify) _____		Other Fetal Conditions/Disorders (Specify) _____									
Unknown _____		Unknown _____									
18c. WEIGHT OF FETUS (grams preferred, specify unit)		18d. ESTIMATED TIME OF FETAL DEATH <input type="checkbox"/> Dead at time of first assessment, no labor ongoing <input type="checkbox"/> Dead at time of first assessment, labor ongoing <input type="checkbox"/> Died during labor, after first assessment <input type="checkbox"/> Unknown time of fetal death		18f. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Planned		18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Planned				18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATIONS RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
18d. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY (completed weeks)											
Mother's Name _____ Mother's Medical Record No. _____											
REV. 11/2000											

# The Conception Cohort

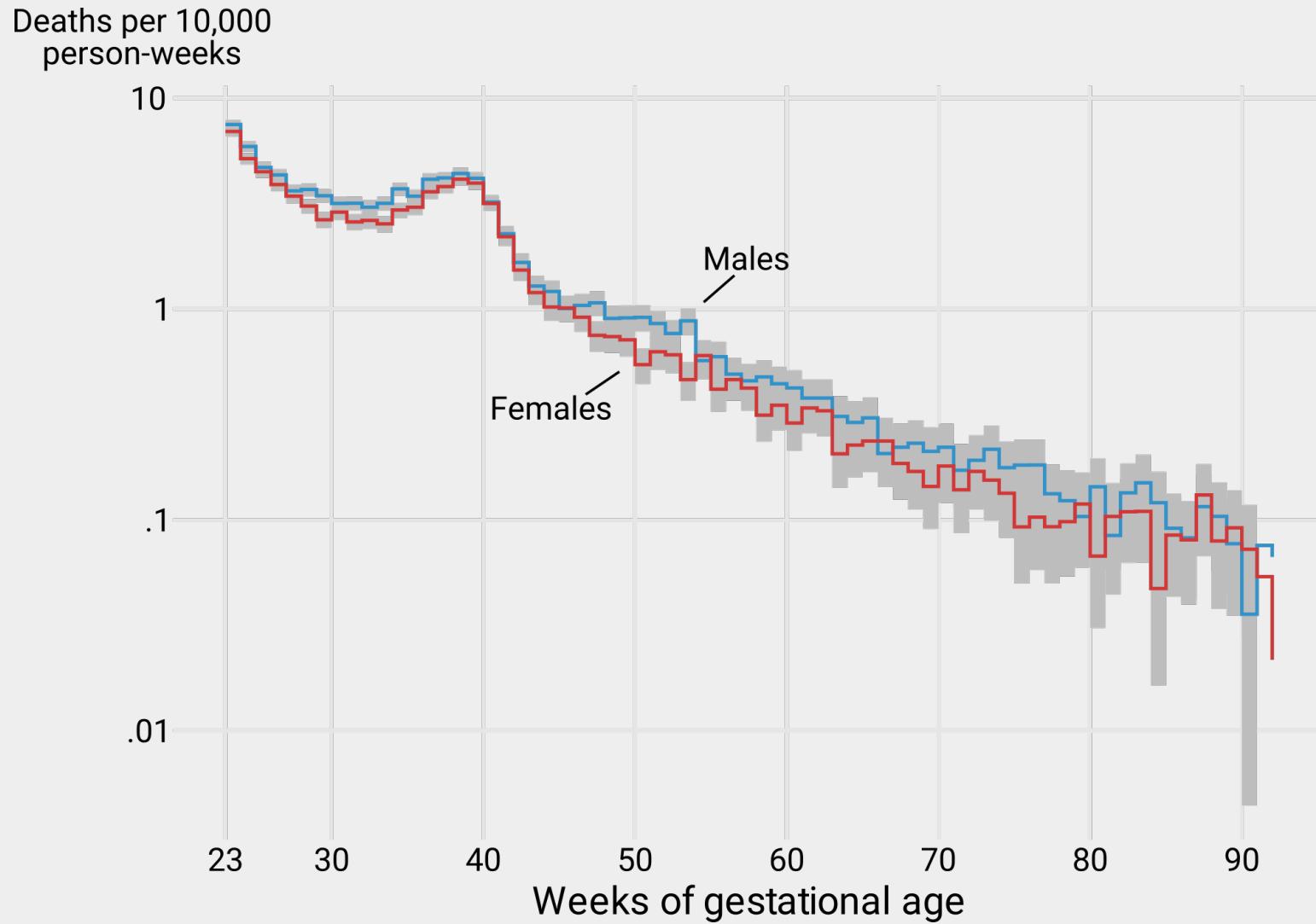


# Fetal-Infant Gestational Age Mortality, US 2009, Male



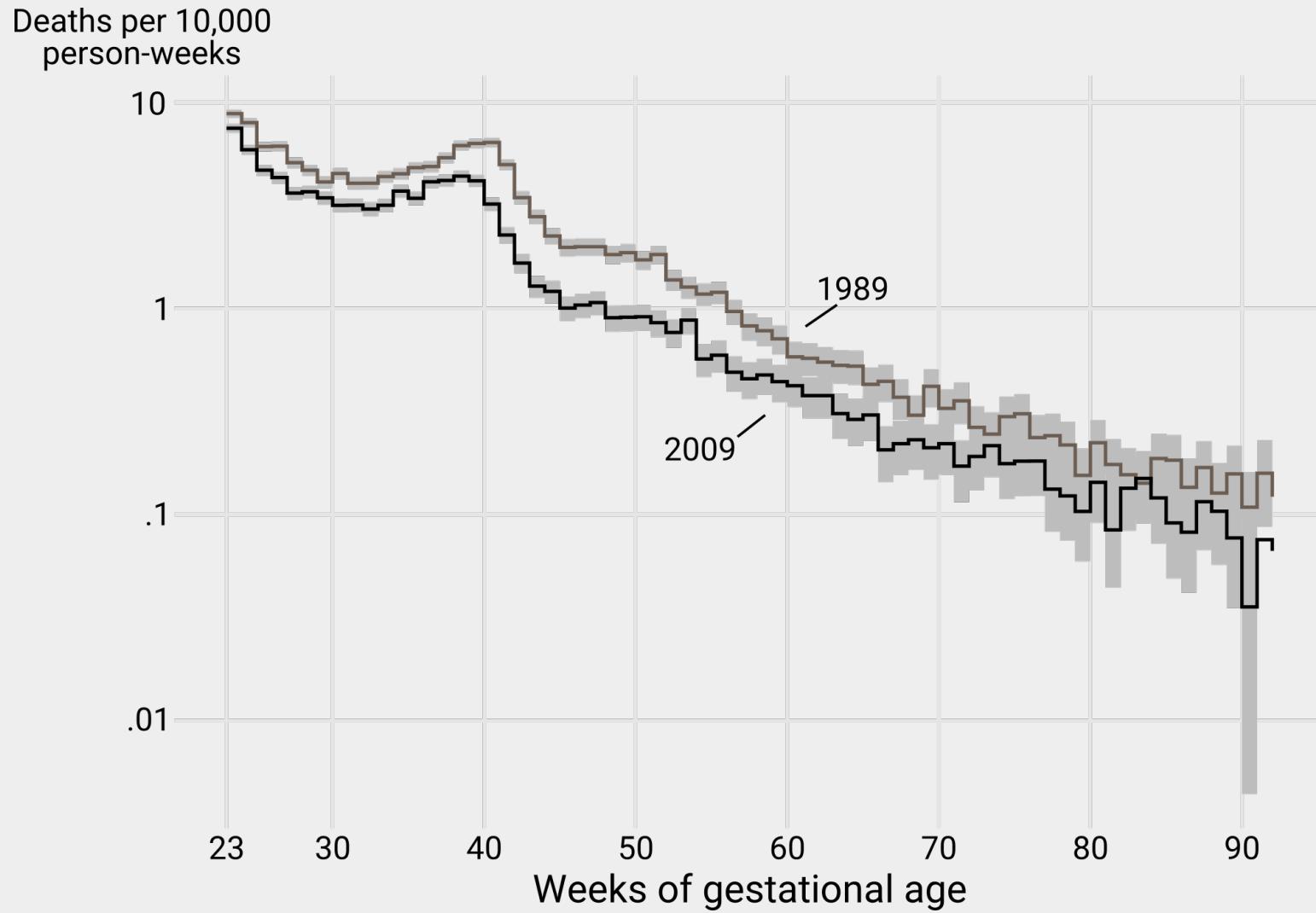
US conception cohort 2009, males. Data on births, fetal- and infant deaths: Division of Vital Statistics.

# Fetal-Infant Gestational Age Mortality, US 2009



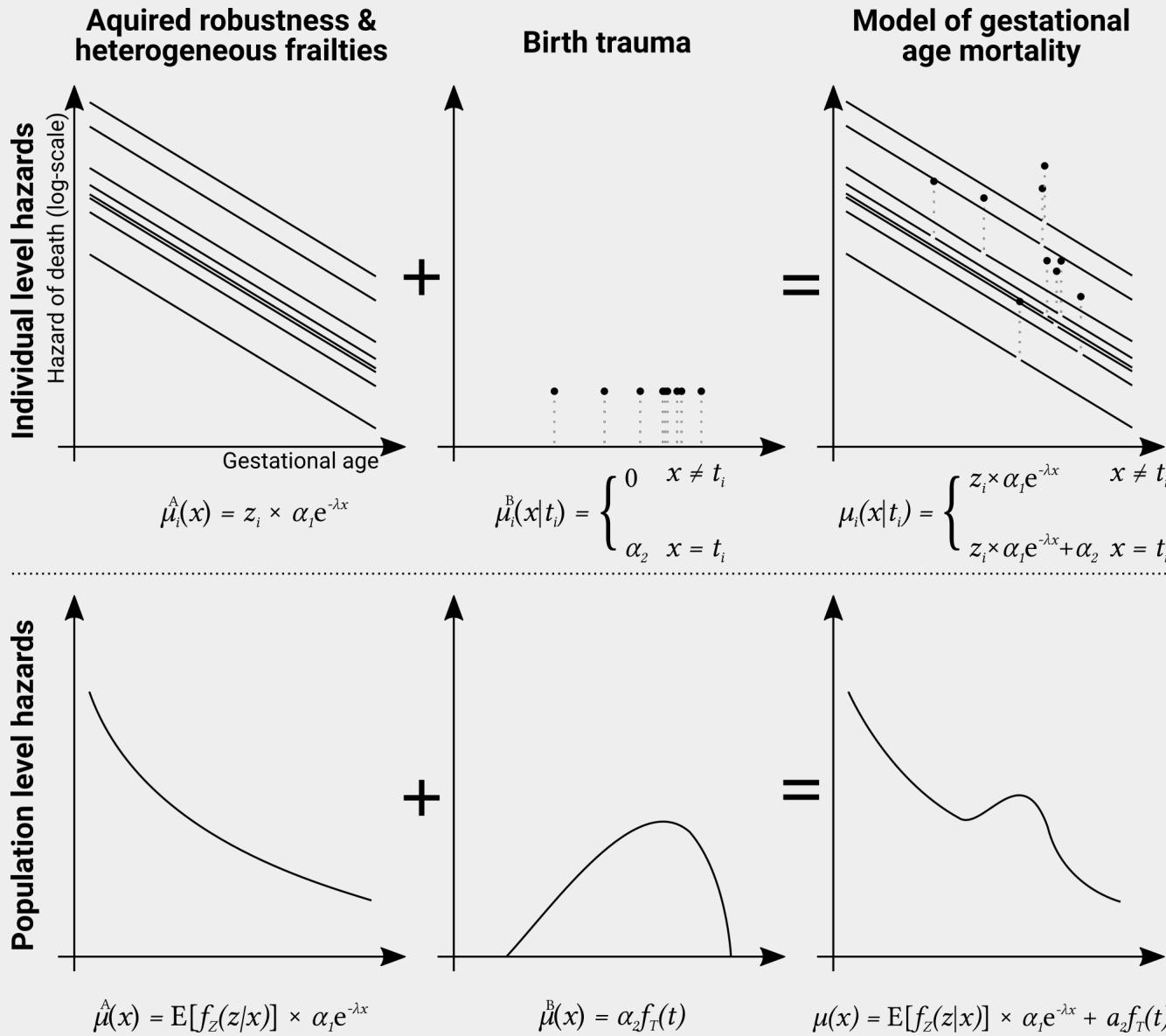
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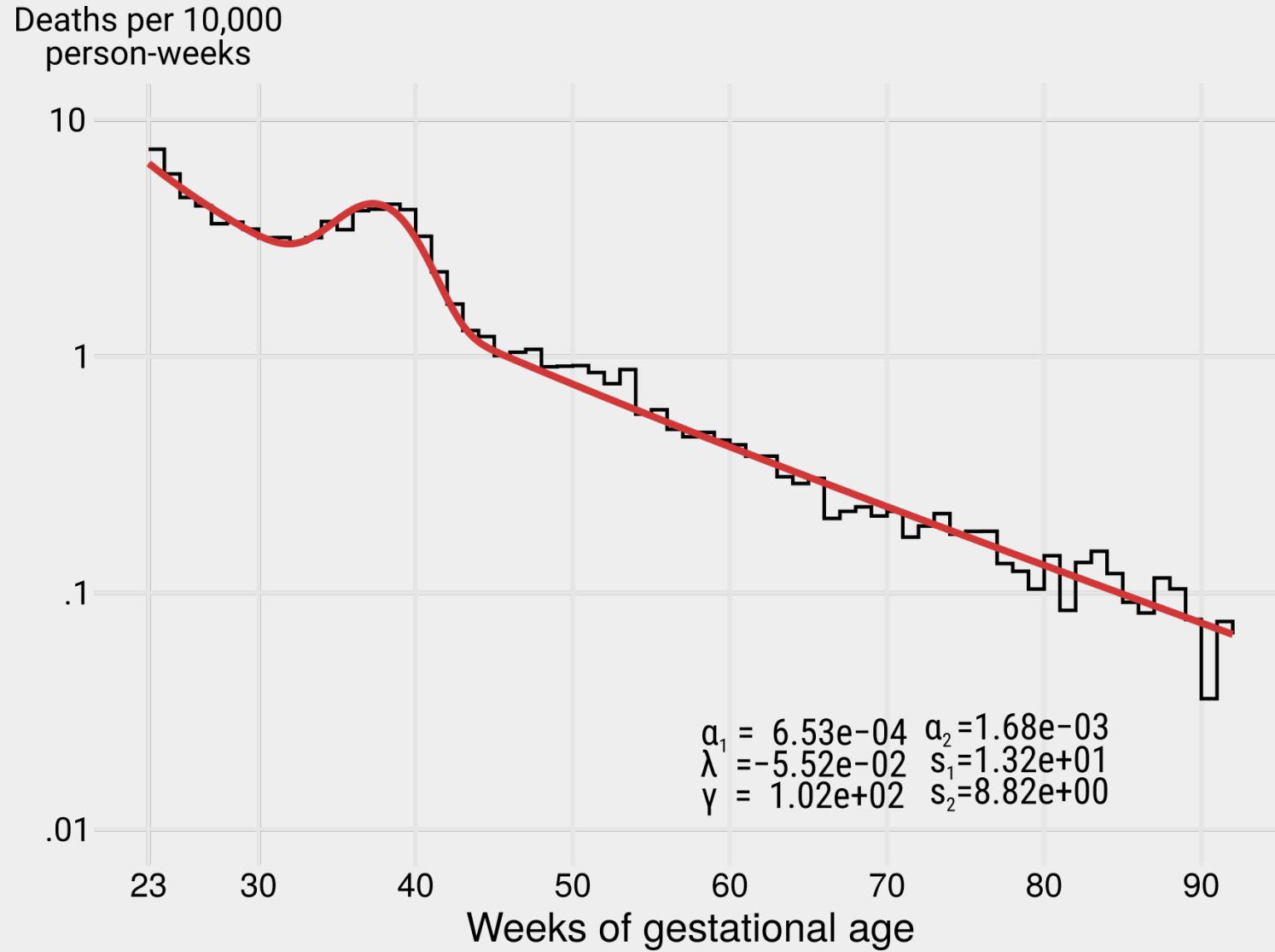


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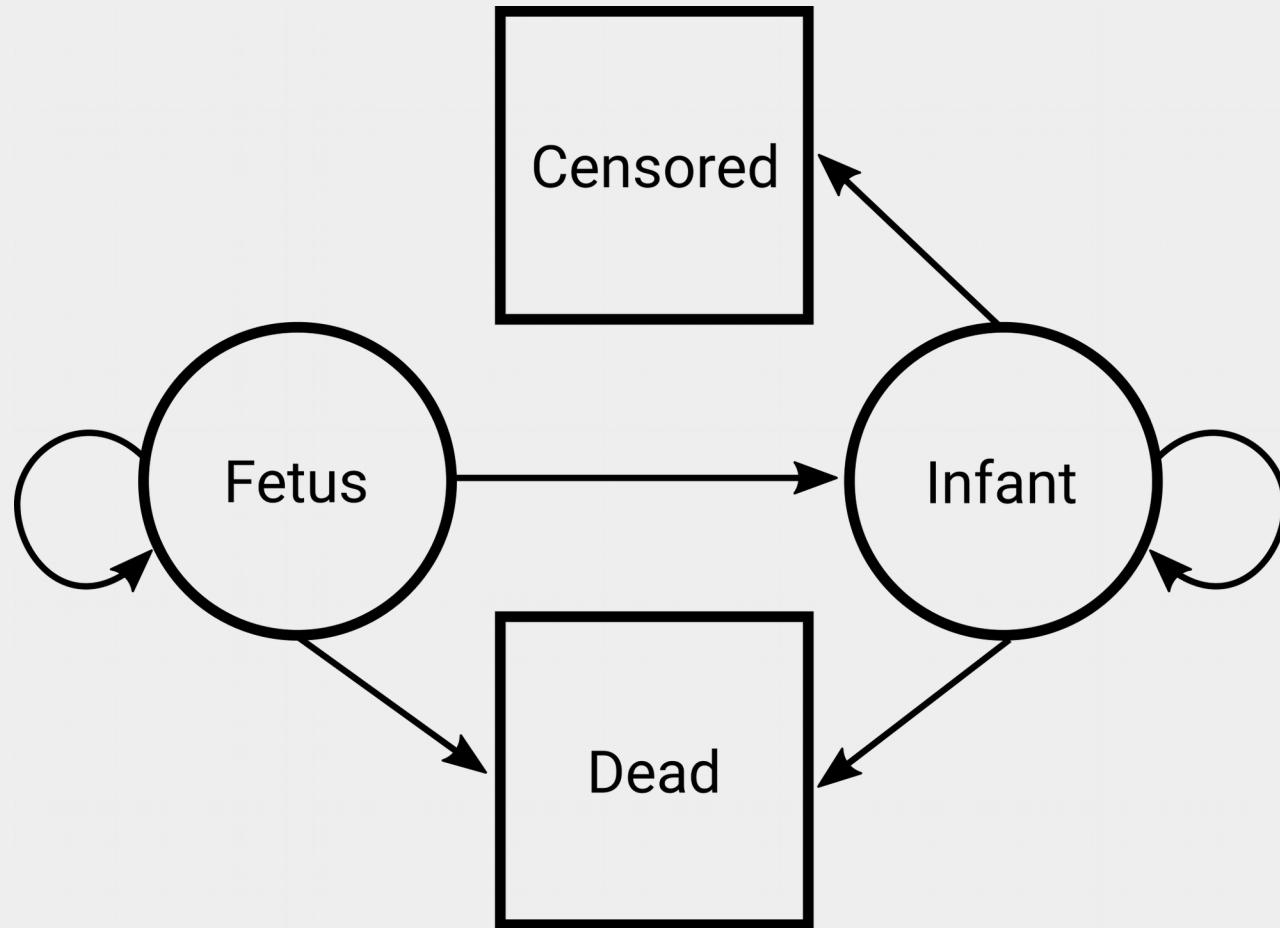
# A Model of Ontogenescent Mortality



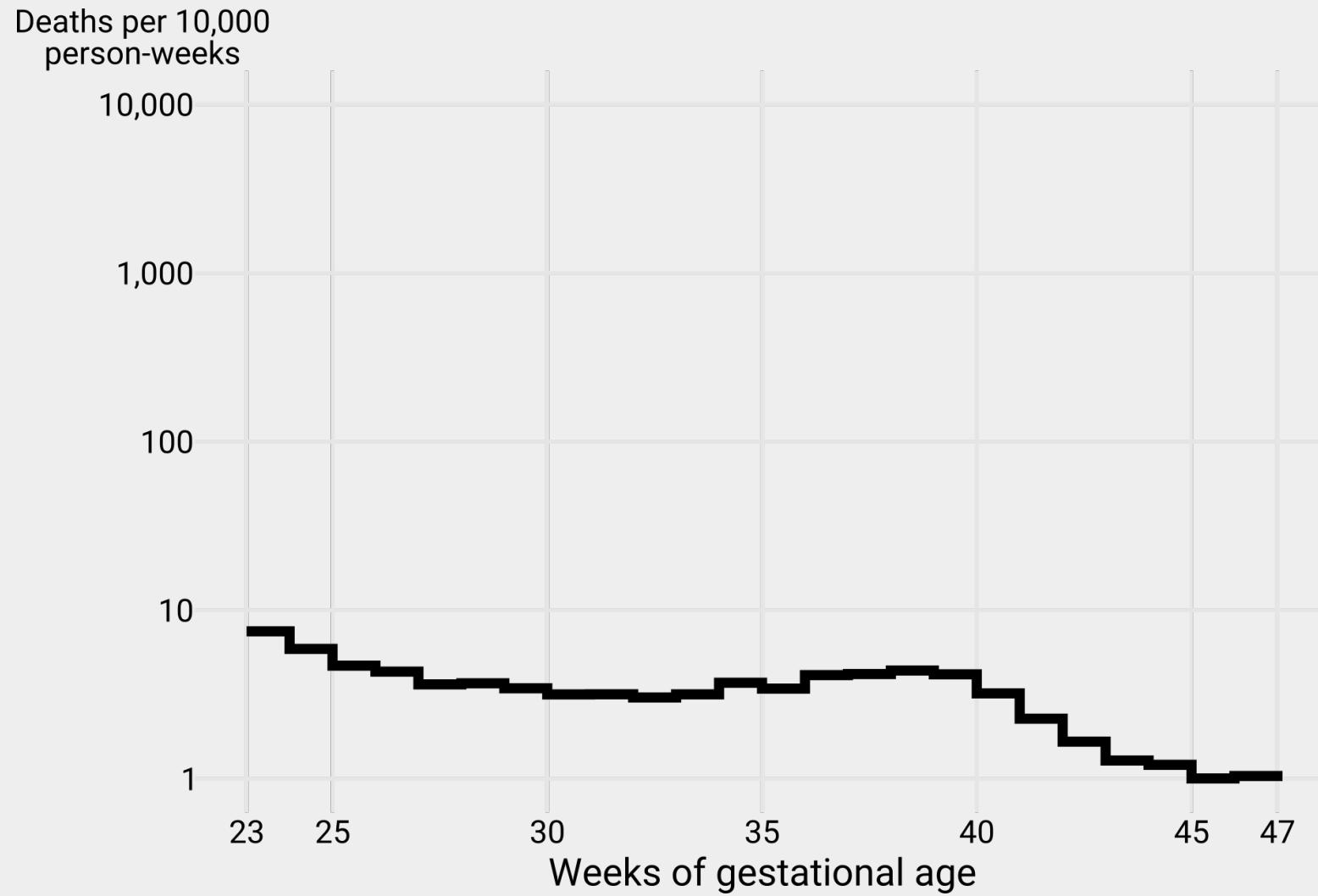
# A Model of Ontogenescent Mortality



# A Multistate Fetal-Infant Lifetable

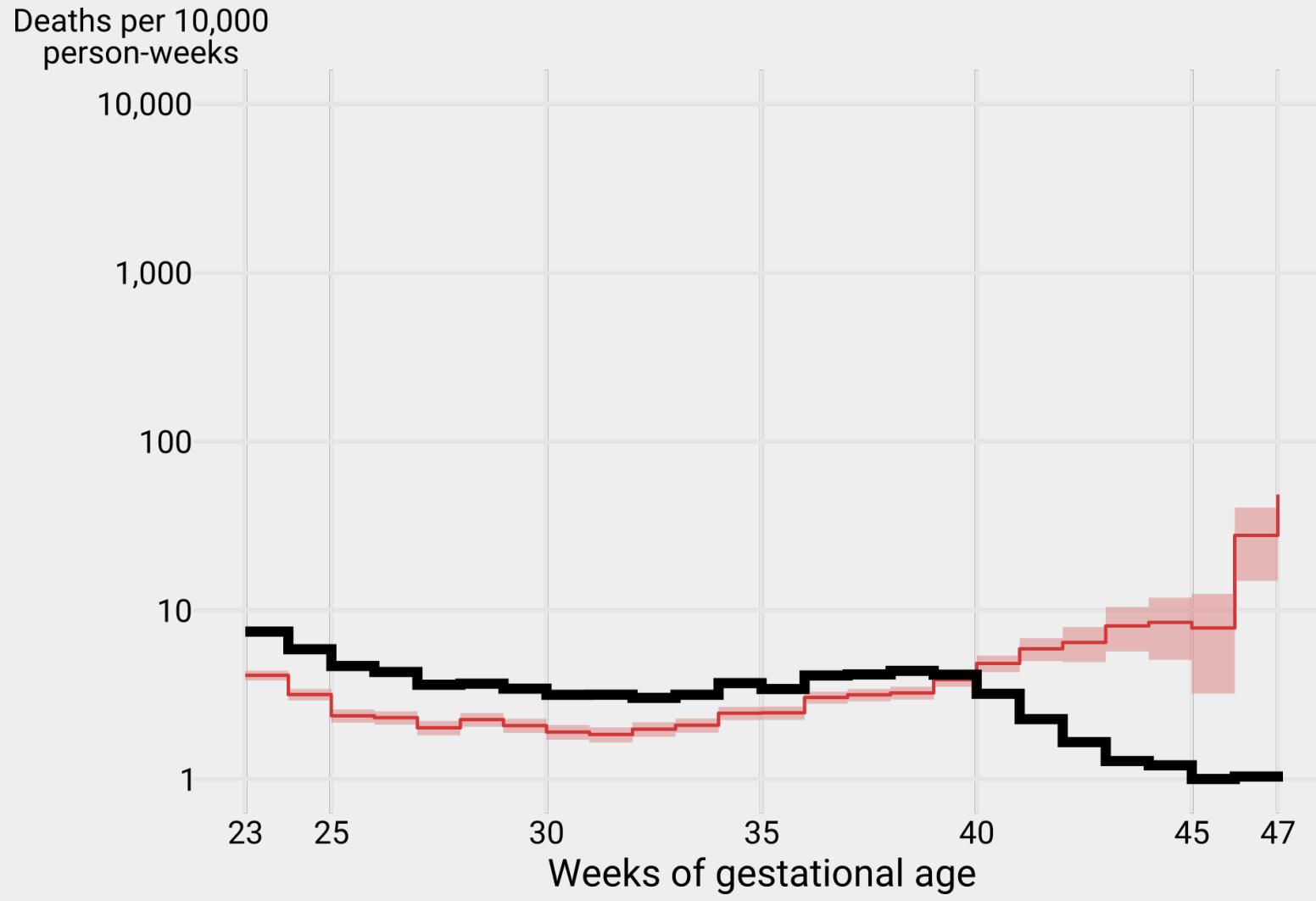


# A Multistate Fetal-Infant Lifetable



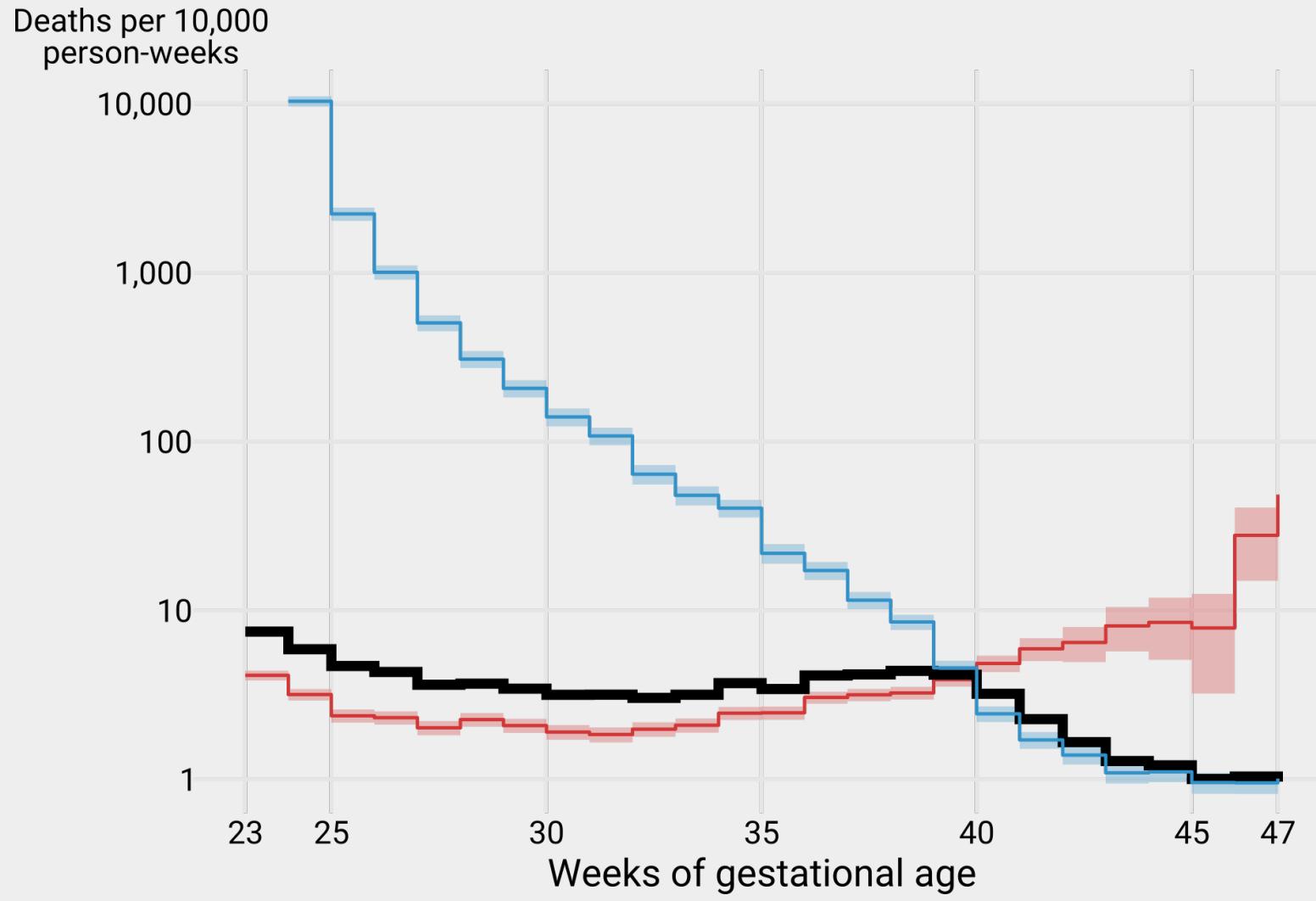
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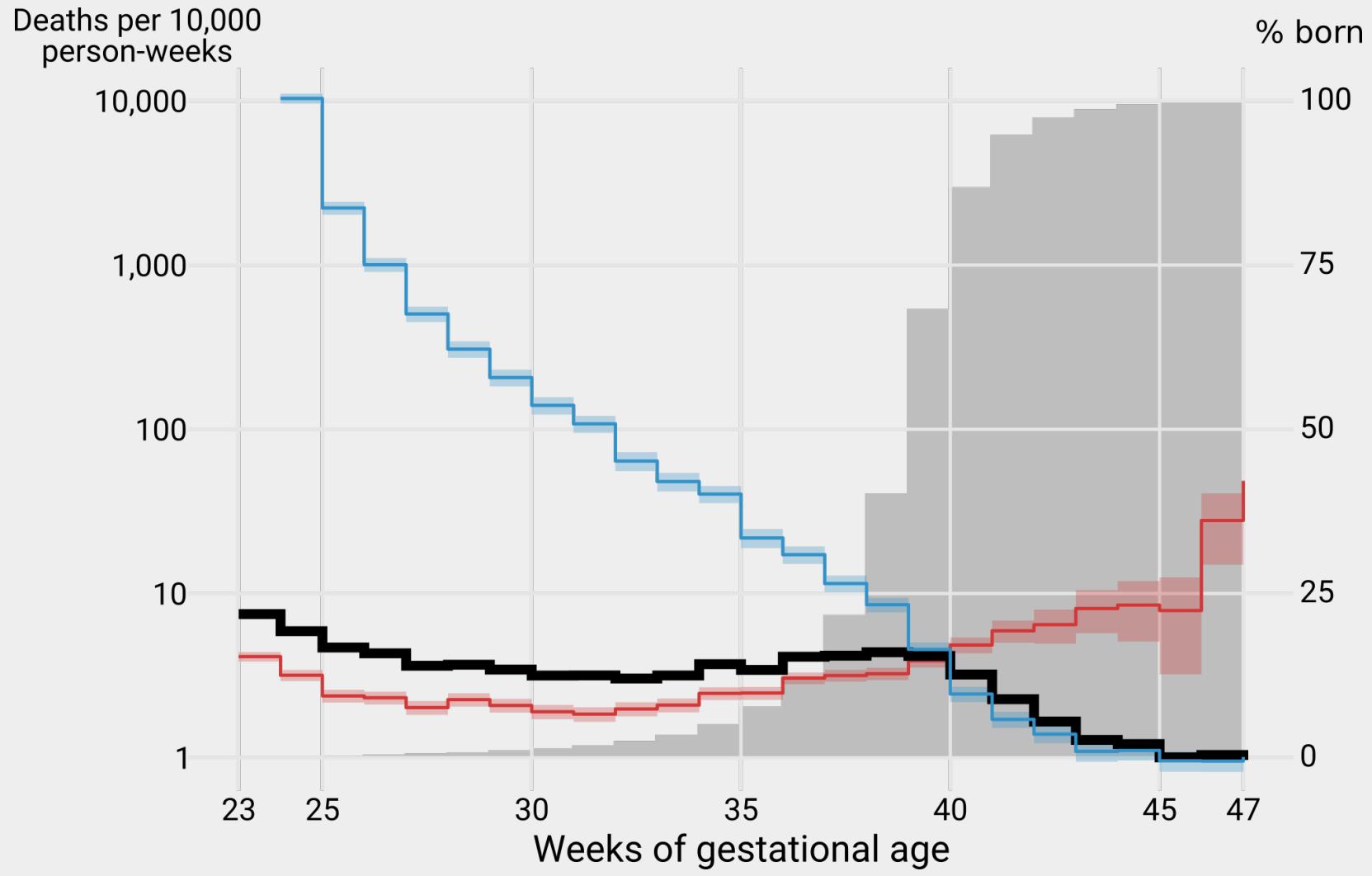
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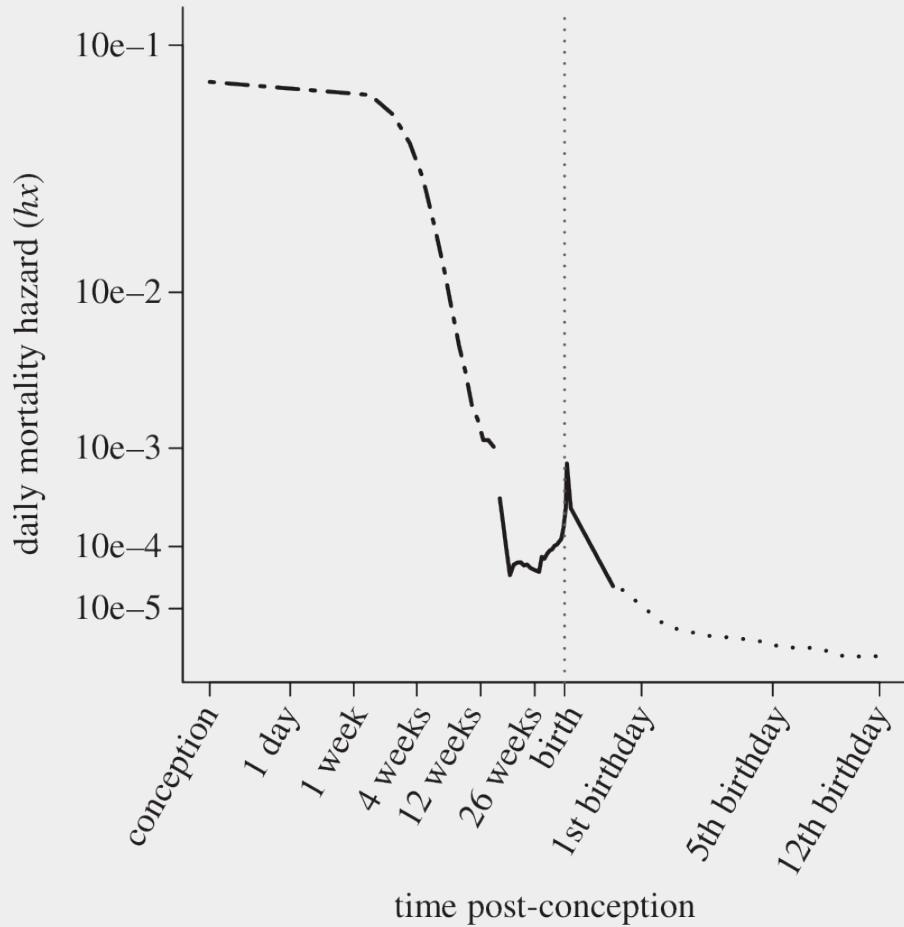


Figure 1. Mortality hazard from conception to 12th birthday.

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**Raw data on US births, fetal- & infant deaths**  
[cdc.gov/nchs/data\\_access/Vitalstatsonline.htm](http://cdc.gov/nchs/data_access/Vitalstatsonline.htm)

**Reproducible analysis**  
[github.com/jschoeley/fimort-agepat](https://github.com/jschoeley/fimort-agepat)

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