Why Is Infant Mortality Higher in the United States than in Europe?

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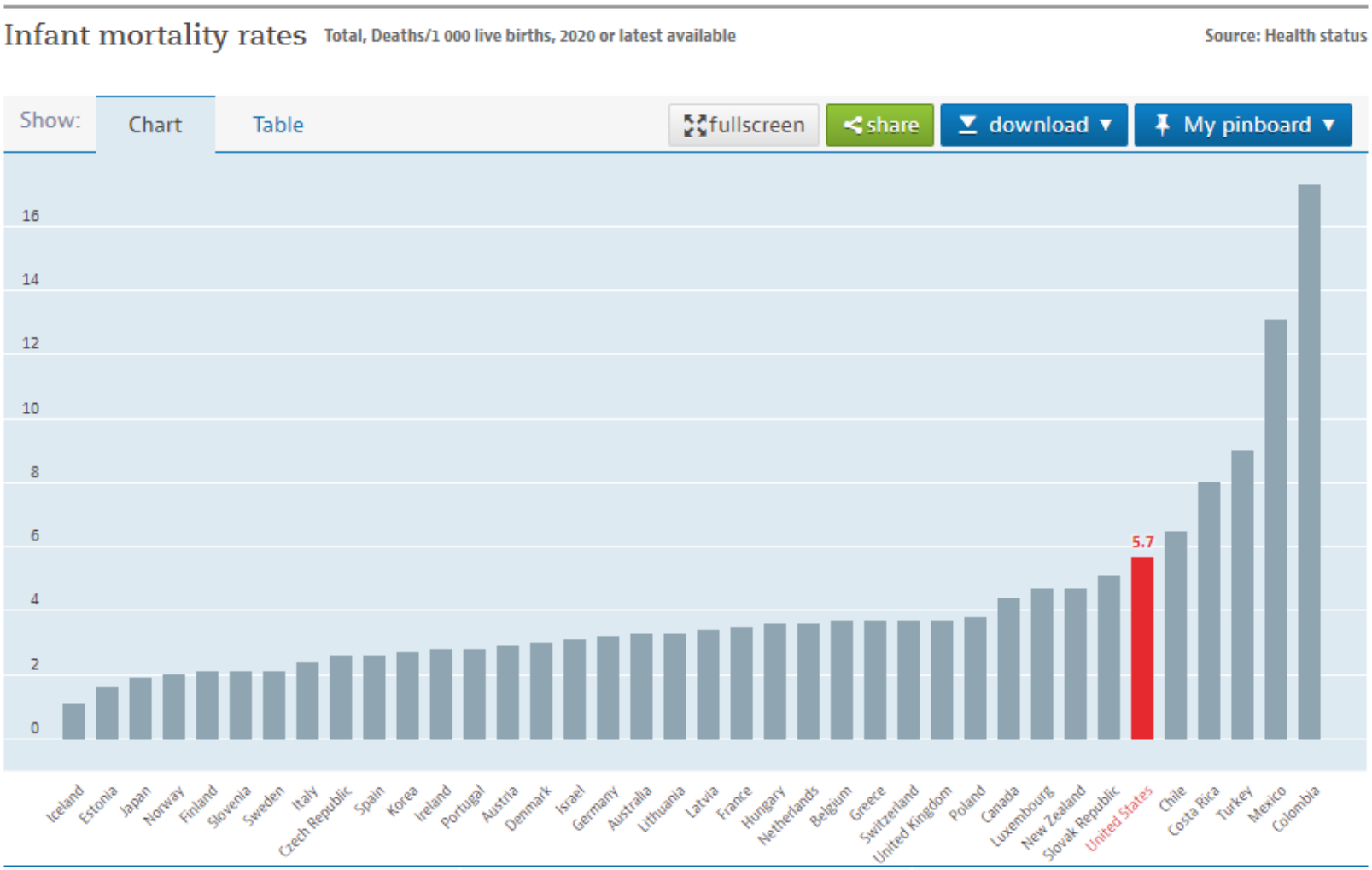
Motivation: High infant mortality in the US

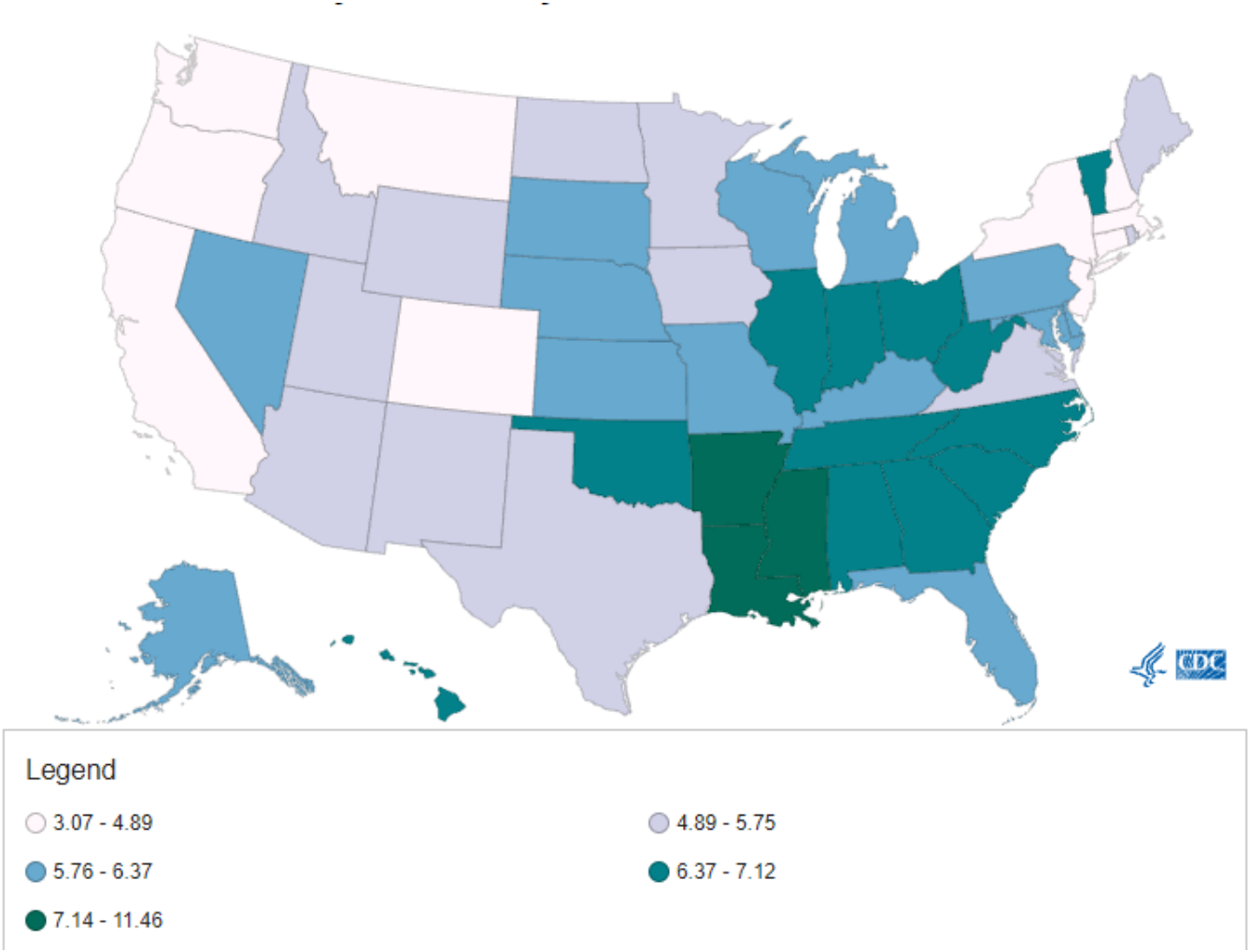


OECD (2021), Infant mortality rates (indicator). doi: 10.1787/83dea506-en (Accessed on 18 October 2021)

Motivation: High infant mortality in the US

The infant mortality rate is defined as the number of deaths of children under one year of age, expressed per 1 000 live births. Some of the international variation in infant mortality rates is due to variations among countries in registering practices for premature infants. The United States and Canada are two countries which register a much higher proportion of babies weighing less than 500g, with low odds of survival, resulting in higher reported infant mortality. In Europe, several countries apply a minimum gestational age of 22 weeks (or a birth weight threshold of 500g) for babies to be registered as live births. This indicator is measured in terms of deaths per 1 000 live births.

Motivation: Infant mortality disparities within the US



CDC National Center for Health Statistics. 2019 infant mortality rates are crude death rates per 1,000.

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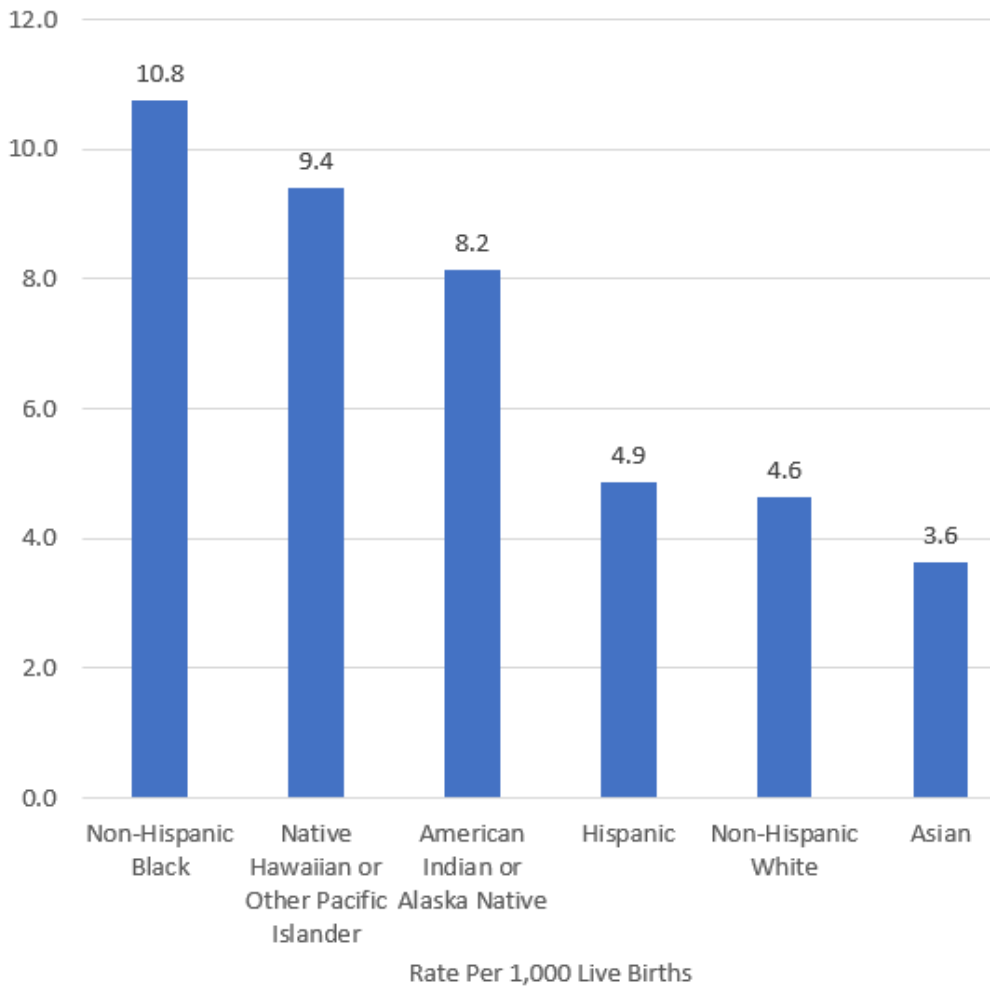

CDC (2019),Infant Mortality in the United States, 2018: Data from the Period Linked Birth/Infant Death File. Rates calculated via CDC WONDER using latest available data by subpopulation (2018).

Goal of Paper

Policy-relevant characterization of US infant mortality disadvantage:

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Policy-relevant characterization of US infant mortality disadvantage:

1. Resolve reporting problem and generate comparable rates for US and four peer countries
2. Reveal factors that drive the US disadvantage
   - Health at birth
   - Neonatal vs. postneonatal mortality
   - Role of geographic and socio-economic inequality

Resolving reporting problems

Birth Data

- Births from 2000-2005
- Would like to observe infants who die within one year of birth

	US	Austria	Finland	UK	Belgium
Data Structure	Microdata	Microdata	Microdata	500g bins	100g bins
Deaths	Individually linked	Individually linked	Individually linked	Count by birth-weight and age at death bins	Count by birth-weight and age at death bins
Sample	All reported live births	All reported live births	All reported live births	500g-4000g, singleton births, 22w+ gestation	500g-, singleton births, 22w+ gestation

Sample Restriction

Restricting the sample reduces the US disadvantage

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- Does this method successfully resolve the reporting problem?
- What else could this sample restriction be masking?

Sample Restriction

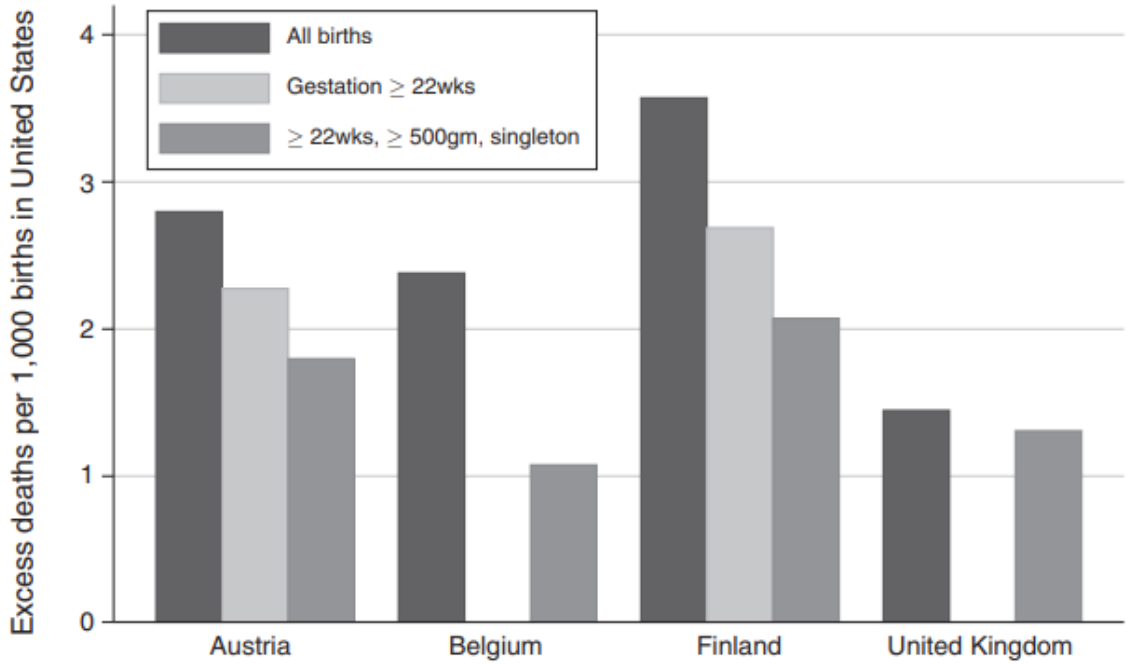

FIGURE 2. US IMR DISADVANTAGE: FULL SAMPLE AND RESTRICTED SAMPLES

Notes: This figure shows the number of excess US deaths per 1,000 births compared to Austria and Finland overall (the first set of bars), in the sample restricted to births ≥ 22 weeks of gestation (second set of bars), and in the sample restricted to singleton births ≥ 22 weeks of gestation and ≥ 500 grams (third set of bars). For the United Kingdom and Belgium the first set of bars come directly from the World Development Indicators database; the second set of bars cannot be calculated for these countries because gestational age data are not available in the tabulations we obtained for these countries.

Across country differences

Conditions at Birth

Split infant mortality into health at birth and postneonatal mortality (1+ month)

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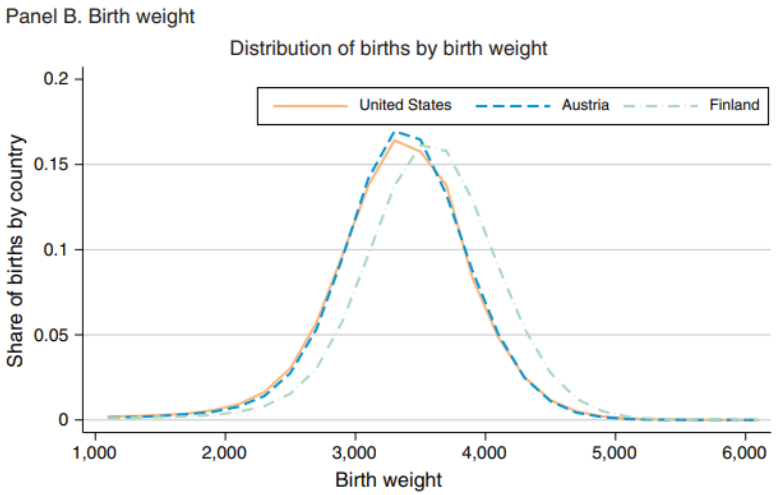
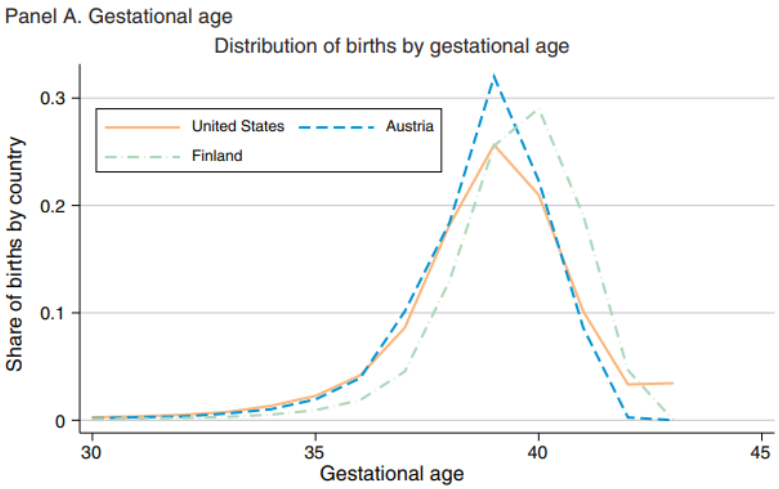
- In the comparably reported sample
  - Birthweight and gestational age are similar in US and other countries, except Finland where babies are larger





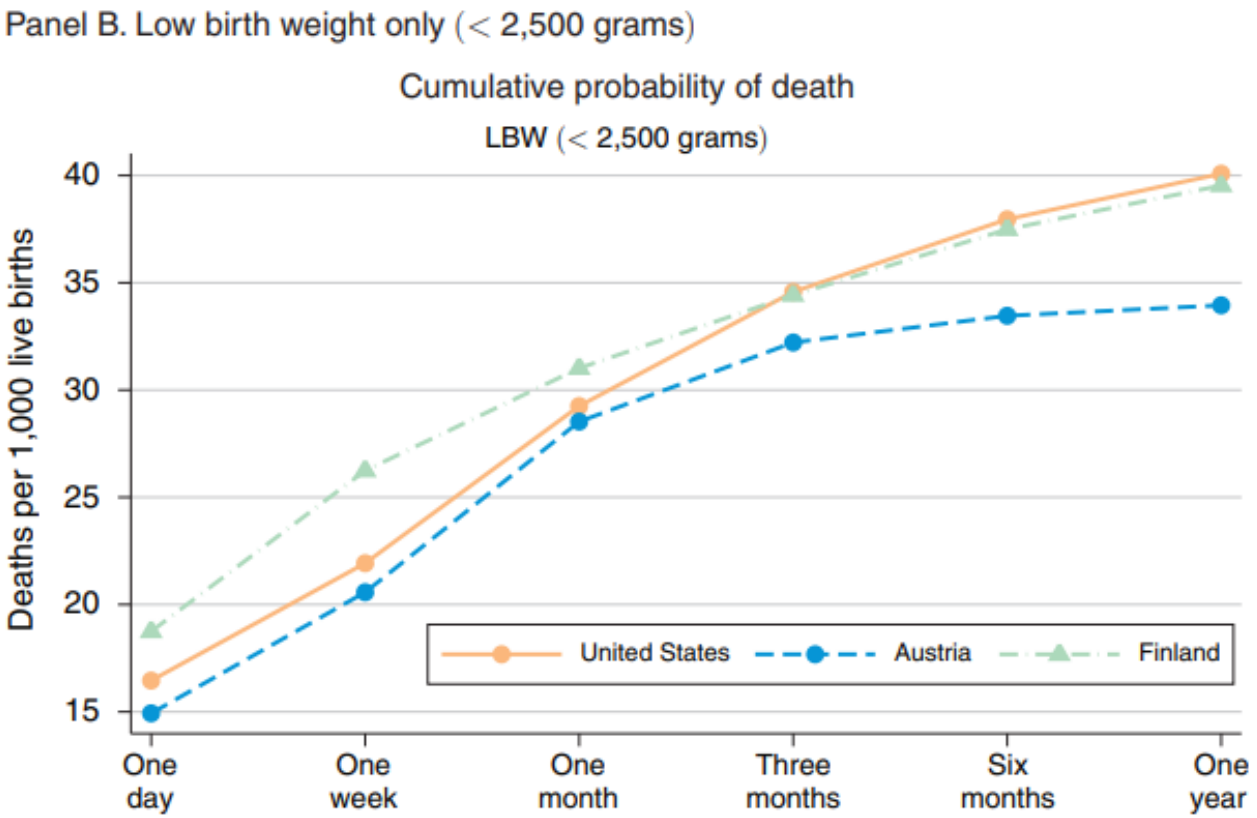
Role of Birthweight

TABLE 3—CROSS-COUNTRY DIFFERENCES IN MORTALITY

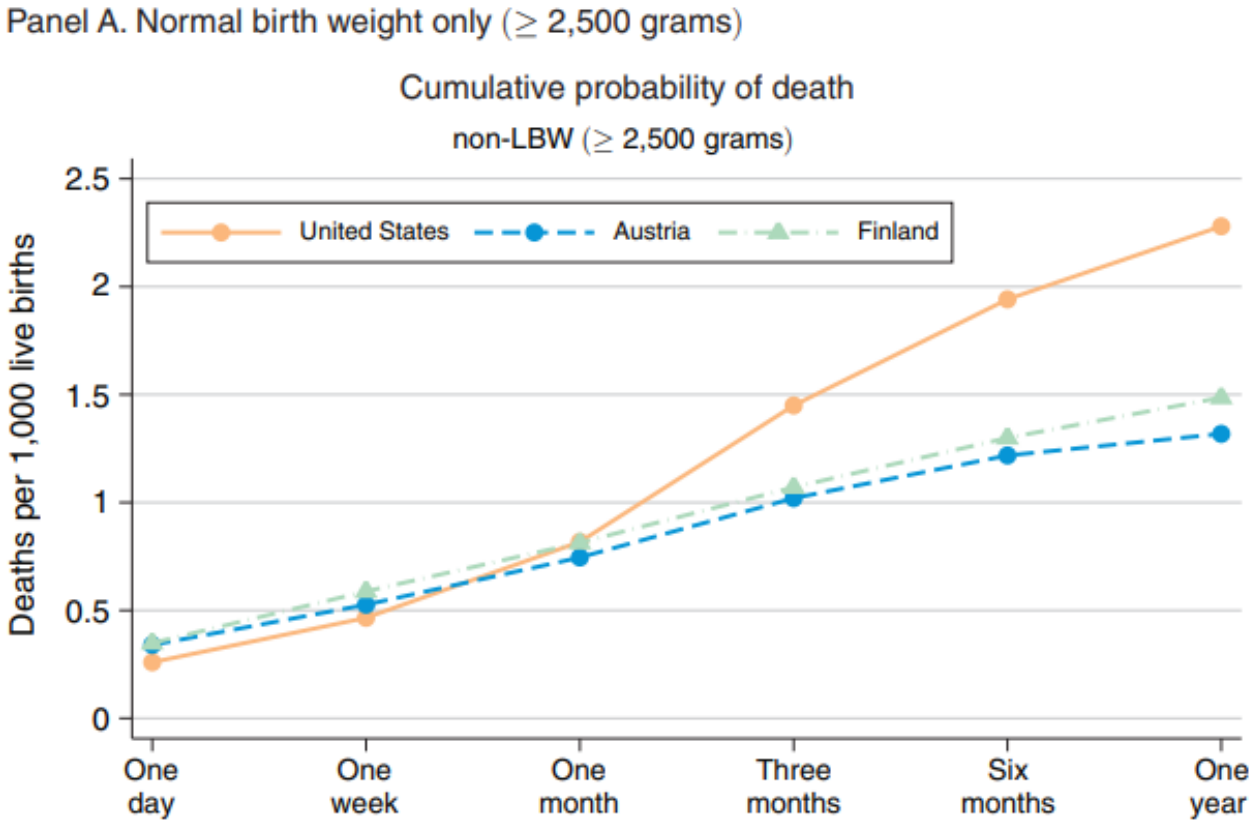
Sample, controls:	Comparable sample, no controls	Comparable sample, birth weight controls	Comparable sample, birth weight controls	Comparable sample, birth weight controls	Comparable sample, birth weight controls
Mortality (in 1,000s):	First year (1)	First year (2)	< 1 week (3)	1 week to 1 month (4)	1 to 12 months (5)
Panel A. United States versus Finland					
United States	2.008***	0.533***	−0.276***	0.164***	0.647***
	(0.091)	(0.088)	(0.063)	(0.033)	(0.054)
Cumulative effect, United States			−0.276	−0.112	0.535
Observations	23,738,885	23,738,885	23,738,885	23,695,461	23,677,125

- In comparable samples birthweight accounts for:
  - 75% of the IMR gap between US and Finland/Belgium
  - only 30% of the gap between US and Austria/UK
- Similar pattern in all countries: no US disadvantage immediately after birth, becomes disadvantage over time

Timing


Panel B. Low birth weight only (< 2,500 grams)
Cumulative probability of death
LBW (< 2,500 grams)
Deaths per 1,000 live births
40
35
30
25
20
15
United States
Austria
Finland
One day
One week
One month
Three months
Six months
One year

Timing


Panel A. Normal birth weight only (≥ 2,500 grams)
Cumulative probability of death
non-LBW (≥ 2,500 grams)
Deaths per 1,000 live births
2.5
2
1.5
1
0.5
0
United States
Austria
Finland
One day
One week
One month
Three months
Six months
One year

Takeaways

Two drivers of US excess IMR:

1. Birthweight explains between 35 and 70 percent of the US IMR disadvantage
2. Among LBW and normal birthweight babies, the US has the largest disadvantage in the postneonatal period (1 month - 1 year)

Postneonatal mortality NOT driven by:

- Delay in US deaths (keep vulnerable babies alive at first)
  - Healthy babies at birth (bw, APGAR) have high postneonatal mortality in US
- Demographic differences across countries
- Black births (difference persists in all white sample)

Cause of Postneonatal Death

"No smoking gun"

TABLE 4—POSTNEONATAL CAUSE OF DEATH, BY COUNTRY

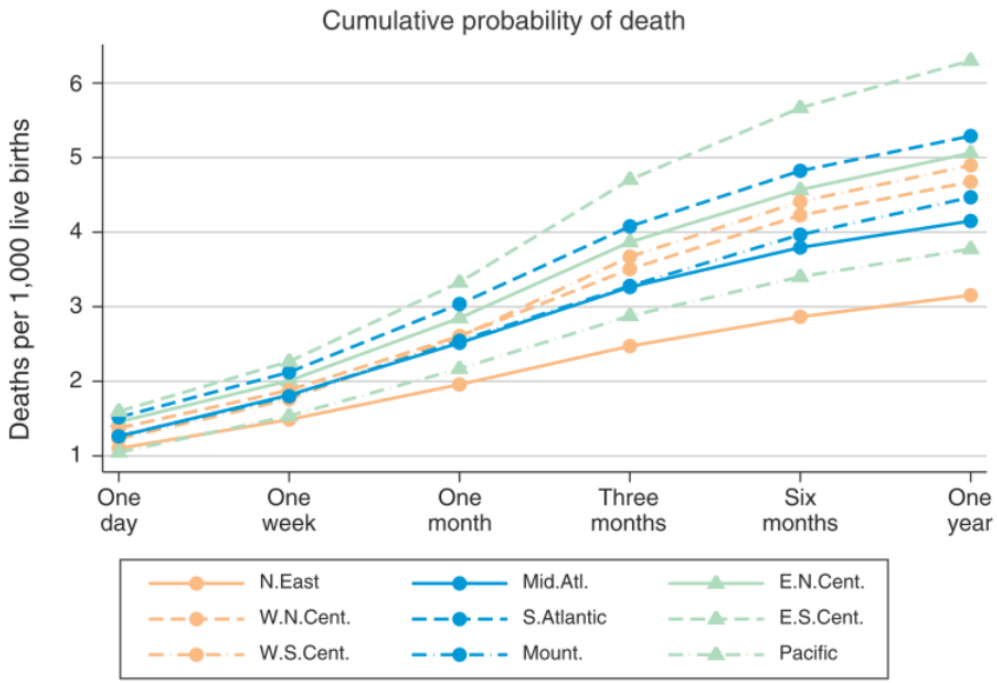
Cause of death:	Congenital abnormalities and low birth weight (1)	Respiratory (2)	SIDS and other sudden deaths (3)	Accident (4)	Assault (5)	Other (6)
United States	0.380	0.068	0.699	0.208	0.064	0.613
Finland	0.325	0.021	0.226	0.044	0.003	0.287
Austria	0.377	0.007	0.185	0.030	0.013	0.175
United States-Finland						
Raw difference	0.055	0.047	0.473	0.164	0.061	0.326
As share of Finland	17%	224%	209%	373%	2,033%	114%
United States-Austria						
Raw difference	0.003	0.061	0.514	0.178	0.051	0.438
As share of Austria	1%	871%	278%	593%	392%	250%

Notes: This table shows the difference in postneonatal mortality from each cause of death across countries. All means are computed on the sample of infants alive at one month. Means are in units of 1,000 deaths. Data for all countries cover 2000–2005; as described in the text, the sample is limited to singleton births at $\geq$ 22 weeks of gestation and $\geq$ 500 grams with birth weight and gestational age observed.

Within-US differences

Regional Differences in US IMR

- Substantial geographic variation in IMR (3.2 per 1,000 in Northeast vs. 6.3 in East South Central)
- Birth weight explains ≈45% of cross-census division variation
- Deaths occurring from one month to one year account for 67% of birth-weight adjusted IMR gaps

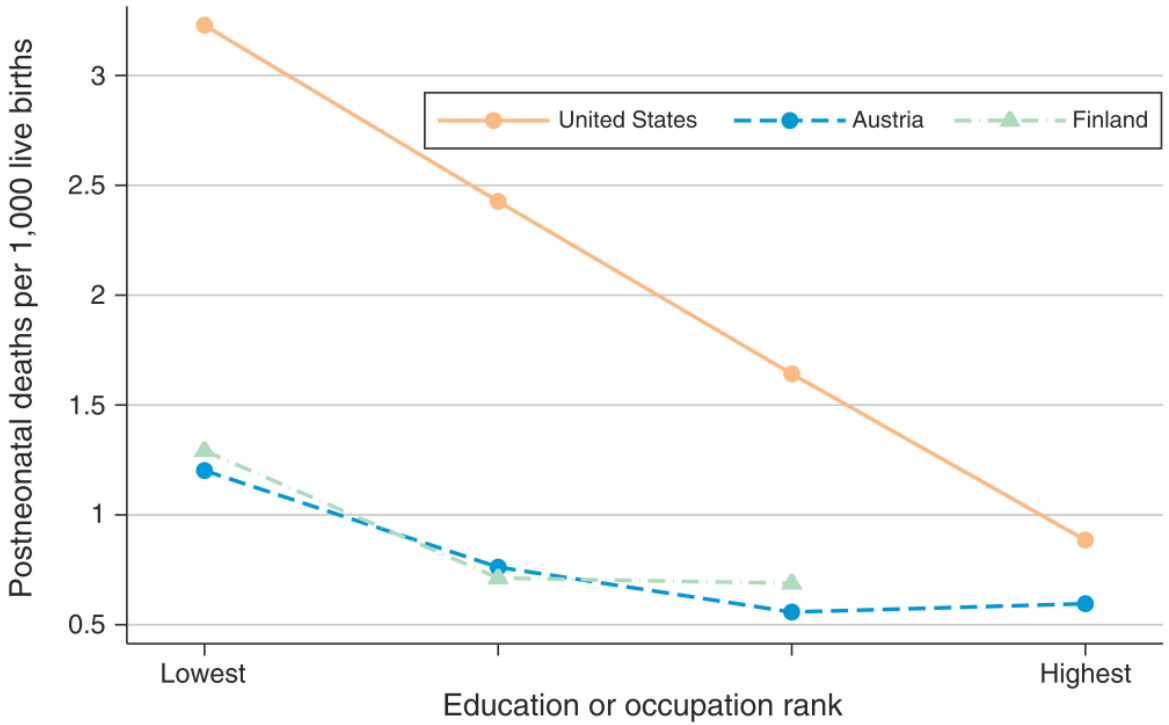


Demographics of the Postneonatal Disadvantage

Demographics of the Postneonatal Disadvantage

- US has higher inequality than Europe and large regional inequality
- Three questions:
  - How does postneonatal mortality vary by demographic group?
  - Which demographic groups are most important in explaining variation?
  - Is variation in IMR driven by variation in income?

US has steeper socioeconomic gradient in postneonatal deaths than Europe...



...and this gradient is mainly driven by poor outcomes in the "less advantaged" US groups

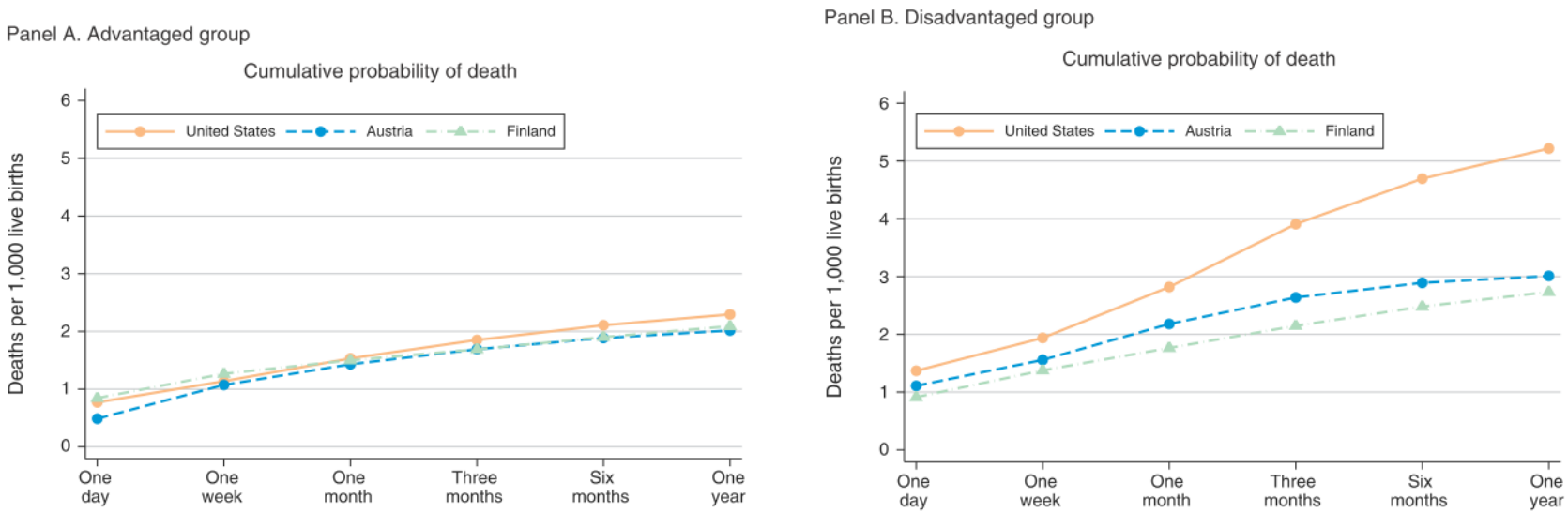


Figure 7: Cumulative Probability of Death, by Country, by Socioeconomic Group. "Advantaged" is defined as mothers who are high education/occupation, married, and white (US) or nonimmigrant (Austria).

Do Income Differences Explain Observed Gaps?

TABLE 8—POSTNEONATAL DISADVANTAGE WITHIN INCOME GROUPS

	United States versus Finland			Within United States across divisions		
	Excess US mortality, 1–12 months (1)	Median income, US [2005 US$] (after taxes) (2)	Median income, Finland [2005 US$] (after taxes) (3)	Average difference across divisions, 1–12 months (4)	Median income, richest division (5)	Median income, poorest division
Income group 1	1.751*** (0.214) [1,055,295]	$19,205	$20,583	0.987 [1,040,820]	$27,873	$23,421
Income group 2	1.190*** (0.397) [1,054,913]	$28,809	$27,892	0.631 [1,040,783]	$39,555	$37,284
Income group 3	1.002*** (0.289) [1,058,082]	$33,987	$34,367	0.580 [1,043,016]	$46,243	$45,101

After dividing individuals into deciles based on the mean income of their demographic cell, comparisons were made between (1) similar income groups across countries and (1) similar income groups across US census divisions.

→ Main Takeaway: Higher US postneonatal mortality relative to Europe is due almost entirely to higher mortality among disadvantaged groups & is not explained by income differences

Final Thoughts Discussion

Unanswered questions

- Disaggregate by more than "advantaged" and "disadvantaged". How important is being married? Non-white? What interactions are important? (low income + low education, race + geography etc.)
- Do socioeconomic gradients in birthweight differ across countries?
- Can we get more detail on causes of death?
- What drives the gradient...

Hypotheses

What drives observed postneonatal IMR gaps between advantaged and disadvantaged groups in the US? How could we test the hypotheses?

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- Access to (high-quality) healthcare?
- Exposure to pollution?
- Parental leave / access to safe childcare?
- Nutrition?
- Safe housing, home environment?
- Tobacco, substance use?
- Abortion access? Gruber, Levine and Staiger (1999) QJE: *"the marginal child would have been 40–60 percent more likely to live in a single-parent family, to live in poverty, to receive welfare, and to die as an infant"*

Thank you!