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Trends and Differences in Infant Mortality Rates in Rural and Metropolitan Counties in the United States, 2021–2023

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Key findings

Data from the National Vital Statistics System

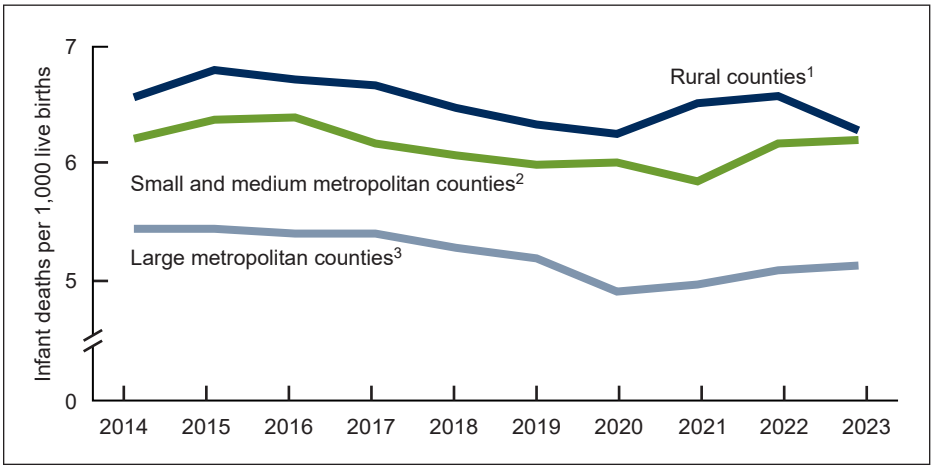
- The infant mortality rate declined from 2014 to 2020 for all urbanization levels, and then had varying trends across urbanization levels from 2020 to 2023.
- During 2021–2023, total infant, neonatal, and postneonatal mortality rates were higher in rural and small and medium metropolitan counties compared with large metropolitan counties.
- Infant mortality rates were higher in rural and small and medium metropolitan counties compared with large metropolitan counties for infants of mothers of all age groups in 2021–2023.
- Infant mortality rates were higher in rural and small and medium metropolitan counties compared with large metropolitan counties for infants of most maternal race and Hispanic-origin groups.

Although infant mortality has declined in the United States over time, previous research shows that differences persist across geographic areas and by maternal and infant characteristics (1–6). An earlier report based on 2014 vital statistics data examined differences in infant mortality by urbanization level (1). This report presents trends in infant mortality among rural, small and medium metropolitan, and large metropolitan counties in the United States from 2014 through 2023, and infant mortality rates by age at death, mother's age, and maternal race and Hispanic origin for combined years 2021–2023.

After declining in all urbanization levels from 2014 to 2020, infant mortality rate trends varied from 2020 through 2023.

- In large metropolitan counties, the infant mortality rate declined 10% from 2014 to 2020, from 5.44 infant deaths per 1,000 live births to 4.91.

Figure 1. Infant mortality rate, by urbanization level: United States, 2014–2023



[1]Rate increased from 2020 to 2022 and was statistically unchanged from 2022 to 2023 ($p < 0.05$).
[2]Rate was statistically unchanged from 2020 to 2021 and increased from 2021 to 2023 ($p < 0.05$).
[3]Rate increased from 2020 through 2023 ($p < 0.05$).
NOTES: Significant decreasing trend for all county types from 2014 through 2020 ($p < 0.05$). All differences between urbanization levels were significant for all years except for between rural and small and medium metropolitan counties in 2020 and 2023 ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.
SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

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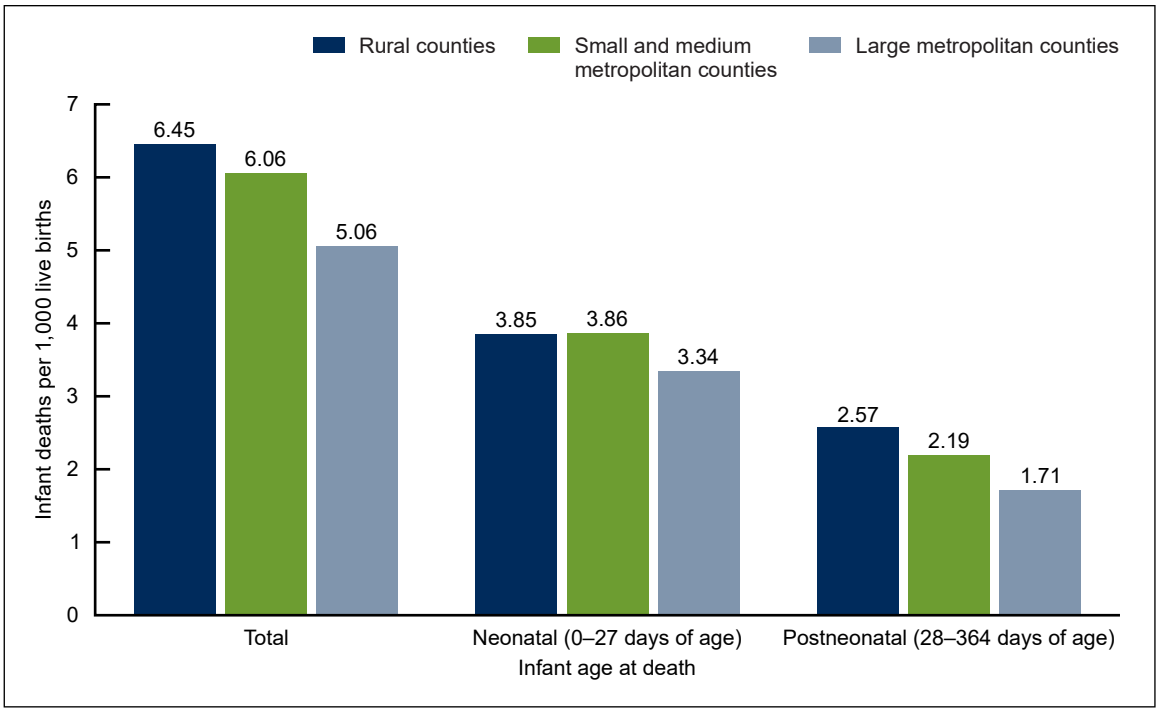
The rate then increased 5% from 2020 to 2023 (5.13) for an overall decline of 6% from 2014 to 2023 (Figure 1, Table 1).

- In small and medium metropolitan counties, the infant mortality rate declined 3% (nonsignificant) from 2014 (6.20) to 2020 (6.00). The rate was essentially unchanged from 2020 to 2021 (5.84) and rose 6% from 2021 to 2023 (6.19), resulting in no change for 2014 to 2023.
- In rural counties, the infant mortality rate declined 5% from 2014 (6.55) to 2020 (6.24). The rate then increased 5% from 2020 to 2022 (6.56) and was essentially unchanged from 2022 to 2023 (6.27), resulting in no change from 2014 to 2023.

During 2021–2023, total, neonatal, and postneonatal mortality rates were higher in rural and small and medium metropolitan counties compared with large metropolitan counties.

- For 2021–2023, the total infant mortality rate was 27% higher in rural counties (6.45 infant deaths per 1,000 live births) compared with large metropolitan counties (5.06). The rate for small and medium metropolitan counties (6.06) was 20% higher than that of large metropolitan counties (Figure 2, Table 2).

Figure 2. Infant mortality rate, by urbanization level and infant age at death: United States, 2021–2023



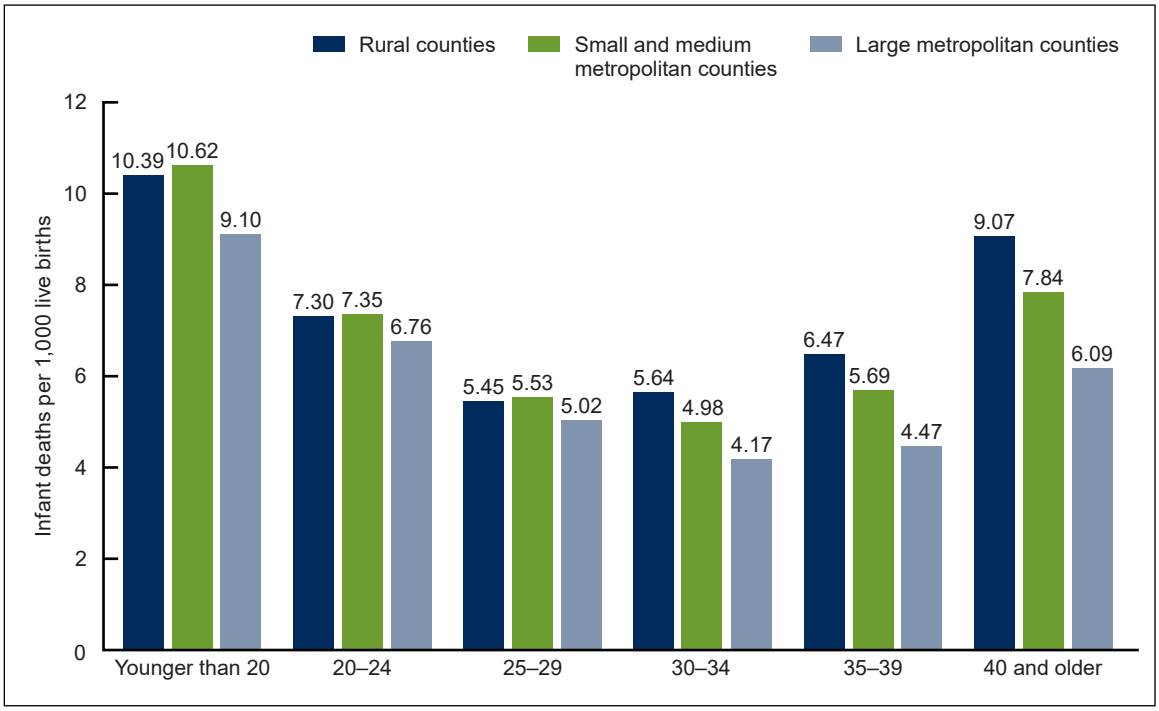
NOTES: All differences between rural and large metropolitan and small and medium metropolitan and large metropolitan counties are significant ($p < 0.05$). Differences between rural and small and medium metropolitan counties are significant for total and postneonatal mortality rates ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.
SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

- The neonatal (0–27 days of age) mortality rate was 15% higher in rural (3.85) and 16% higher in small and medium metropolitan (3.86) counties compared with large metropolitan counties (3.34).
- The postneonatal (28–364 days of age) mortality rate was 50% higher in rural counties (2.57) compared with large metropolitan counties (1.71). The rate was 28% higher in small and medium metropolitan counties (2.19) compared with large metropolitan counties.

The mortality rate was higher in rural and small and medium metropolitan counties compared with large metropolitan counties for infants of mothers of all ages.

- In 2021–2023, for infants of mothers younger than age 20, the infant mortality rate was 14% higher in rural (10.39) and 17% higher in small and medium metropolitan (10.62) counties than in large metropolitan counties (9.10) (Figure 3, Table 3).
- For infants of mothers ages 20–29, the infant mortality rate was 8%–9% higher in rural counties compared with large metropolitan counties and 9%–10% higher in small and medium metropolitan counties compared with large metropolitan counties.
- For infants of mothers ages 30–39, the infant mortality rate was 35%–45% higher in rural counties compared with large metropolitan counties and 19%–27% higher in small and medium metropolitan counties compared with large metropolitan counties.

Figure 3. Infant mortality rate, by urbanization level and age of mother: United States, 2021–2023



NOTES: All differences between rural and large metropolitan and small and medium metropolitan and large metropolitan counties are significant ($p < 0.05$). Differences between rural and small and medium metropolitan counties are significant for infants of mothers age 30 and older ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.
SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

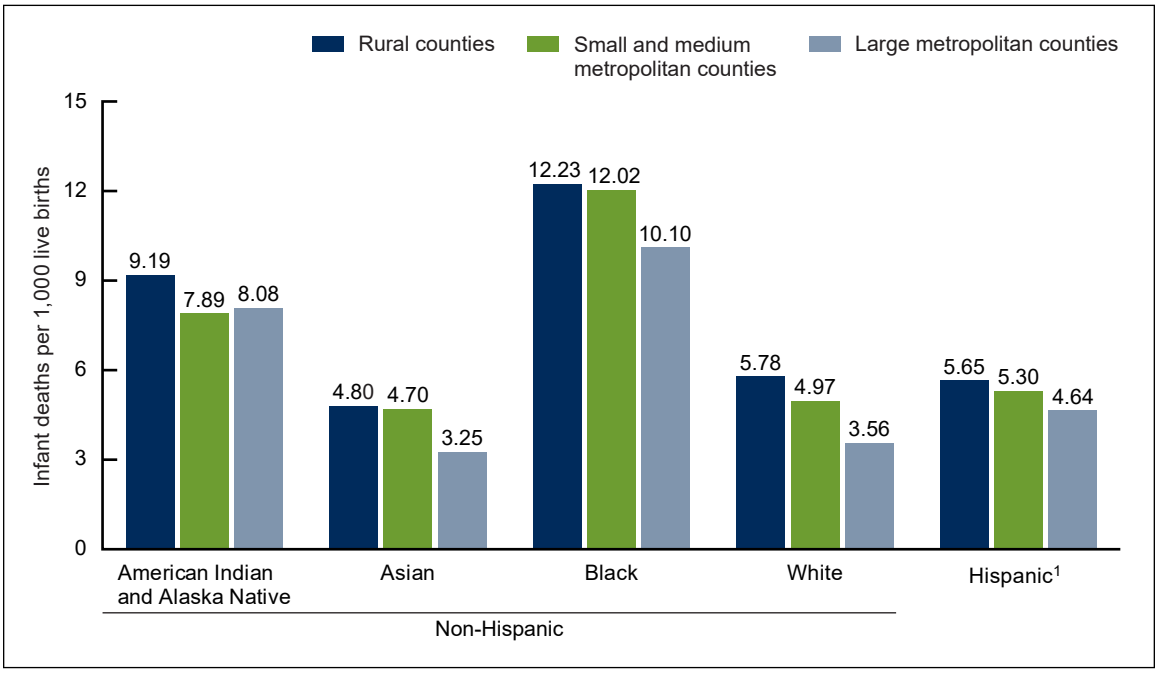
- For infants of mothers age 40 and older, the infant mortality rate was 49% higher in rural (9.07) and 29% higher in small and medium metropolitan (7.84) counties compared with large metropolitan counties (6.09).

Mortality rates were higher in rural and small and medium metropolitan counties compared with large metropolitan counties for infants of mothers of most race and Hispanic-origin groups.

- In 2021–2023, the infant mortality rate was higher in rural counties compared with large metropolitan counties for infants of mothers of most race and Hispanic-origin groups: Asian non-Hispanic (subsequently, Asian) mothers had a rate of 4.80 infant deaths per 1,000 live births compared with 3.25; Black non-Hispanic (subsequently, Black), 12.23 compared with 10.10; White non-Hispanic (subsequently, White), 5.78 compared with 3.56; and Hispanic, 5.65 compared with 4.64. For infants of American Indian and Alaska Native non-Hispanic (subsequently, American Indian and Alaska Native) mothers, differences between rural and large metropolitan counties were not significant (9.19 compared with 8.08) (Figure 4, Table 4).

- The infant mortality rate was higher in small and medium metropolitan counties compared with large metropolitan counties for infants of mothers of most race and Hispanic-origin

Figure 4. Infant mortality rate, by urbanization level and race and Hispanic origin of mother: United States, 2021–2023



[1]People of Hispanic origin may be of any race.
NOTES: All differences between rural and large metropolitan and small and medium metropolitan and large metropolitan counties are significant except for infants of American Indian and Alaska Native non-Hispanic mothers ($p < 0.05$). Difference between rural and small and medium metropolitan counties significant for infants of White non-Hispanic mothers ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.
SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

groups: Asian mothers had a rate of 4.70 compared with 3.25; Black, 12.02 compared with 10.10; White, 4.97 compared with 3.56; and Hispanic, 5.30 compared with 4.64. For infants of American Indian and Alaska Native mothers, differences between small and medium metropolitan and large metropolitan counties were not significant (7.89 compared with 8.08).

- The smallest differences between rural and large metropolitan counties were among infants of Black mothers (21% higher in rural) and the largest differences were among infants of White mothers (62% higher).

Summary

The infant mortality rate varied by urbanization level and key maternal and infant characteristics. From 2014 through 2020, the mortality rate declined for infants in counties of all urbanization levels. In large metropolitan counties, the rate increased from 2020 to 2023. In small and medium metropolitan counties, the rate was essentially unchanged from 2020 to 2021 and increased from 2021 to 2023. In rural counties, the rate increased from 2020 to 2022 and was essentially unchanged from 2022 to 2023. From 2014 through 2023, in large metropolitan counties, an overall decline of 6% was seen in the infant mortality rate. Essentially no change was observed in the rate for small and medium metropolitan and rural counties. The infant mortality rate was higher for rural and small and medium metropolitan counties compared with large metropolitan counties for each year from 2014 through 2023. For combined years 2021–2023, total infant, neonatal, and postneonatal mortality rates were higher in rural and small and medium metropolitan counties compared with large metropolitan counties, as well as for infants of mothers in all age groups and all maternal race and Hispanic-origin groups except American Indian and Alaska Native (nonsignificant difference).

Definitions

Infant mortality rate: Number of infant (younger than 1 year) deaths per 1,000 live births.

Neonatal and postneonatal infant deaths: Neonatal infant deaths occur within the first 27 days after birth. Postneonatal infant deaths occur from 28 to 364 days after birth.

Urbanization level: County classification as urban or rural is based on the county of maternal residence (3). Counties were classified according to their metropolitan status using the National Center for Health Statistics (NCHS) Urban–Rural Classification Scheme, by merging the county of maternal residence geographic federal information processing standard (FIPS) codes with county-level FIPS codes from the 2013 NCHS Urban–Rural Classification Scheme data set (3). Metropolitan counties include large central counties, the fringes of large counties (suburbs), medium counties, and small counties. Nonmetropolitan counties include micropolitan statistical areas and noncore areas, including open countryside, rural towns (populations of less than 2,500), and areas with populations of 2,500–49,999 that are not part of larger labor market areas (metropolitan areas). Due to the variation in metropolitan county sizes, metropolitan counties were put into two levels, large (large central and the fringes of large cities) and small and medium (including medium and small cities), for comparisons in this report. In this report, rural counties include micropolitan and noncore counties.

Data source and methods

This report contains data from the period linked birth/infant death file, which is part of the National Vital Statistics System (7). The period linked birth/infant death file includes all infant deaths younger than age 1 year reported on death certificates and all live births reported from birth certificates (7). The period linked birth/infant death file is the primary data set for analyzing infant mortality trends and patterns in the United States and is the only source for examining infant mortality by maternal race and Hispanic origin and other factors related to birth (7). Data for 2021–2023 were combined to produce more reliable rates for subgroups with a small number of annual deaths. Linked birth/infant death data sets are available from: https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm.

The race and Hispanic-origin groups shown in this report follow the 1997 Office of Management and Budget standards and differ from the bridged-race categories in reports before 2017 (8).

The NCHS Urban–Rural Classification Scheme data provide geographic FIPS codes and NCHS Urban–Rural Classification Scheme information for all counties in the United States. The NCHS county classification scheme data are available from: https://www.cdc.gov/nchs/data-analysis-tools/urban-rural.html?CDC_AAref_Val=https://www.cdc.gov/nchs/data_access/urban_rural.htm.

References to differences in rates indicate that differences are statistically significant at the 0.05 level based on a two-tailed *z* test. References to trends in rates across years for Figure 1 were evaluated using the Joinpoint Regression Program (9). A maximum of one joinpoint was allowed during the 2014–2020 period, which is the default setting. The default settings were also selected for the other parameters of the analysis (10).

About the author

Danielle M. Ely is with the National Center for Health Statistics, Division of Vital Statistics.

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Figure tables

Data table for Figure 1. Infant mortality rate, by urbanization level: United States, 2014–2023

Year	Rural counties[1]	Small and medium metropolitan counties[2]	Large metropolitan counties[3]
		Infant deaths per 1,000 live births	
2014	6.55	6.20	5.44
2015	6.78	6.36	5.44
2016	6.70	6.38	5.40
2017	6.65	6.16	5.40
2018	6.46	6.06	5.28
2019	6.32	5.98	5.19
2020	6.24	6.00	4.91
2021	6.50	5.84	4.97
2022	6.56	6.16	5.09
2023	6.27	6.19	5.13

[1]Rate increased from 2020 to 2022 and was statistically unchanged from 2022 to 2023 ($p < 0.05$).
[2]Rate was statistically unchanged from 2020 to 2021 and increased from 2021 to 2023 ($p < 0.05$).
[3]Rate increased from 2020 through 2023 ($p < 0.05$).

NOTES: Significant decreasing trend for all county types from 2014 through 2020 ($p < 0.05$). All differences between urbanization levels were significant for all years except for between rural and small and medium metropolitan counties in 2020 and 2023 ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

Data table for Figure 2. Infant mortality rate, by urbanization level and infant age at death: United States, 2021–2023

Characteristic	Rural counties	Small and medium metropolitan counties	Large metropolitan counties
	Infant deaths per 1,000 live births		
Total	6.45	6.06	5.06
Neonatal (0–27 days of age)	3.85	3.86	3.34
Postneonatal (28–364 days of age)	2.57	2.19	1.71

NOTES: All differences between rural and large metropolitan and small and medium metropolitan and large metropolitan counties are significant ($p < 0.05$). Differences between rural and small and medium metropolitan counties are significant for total and postneonatal mortality rates ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

Data table for Figure 3. Infant mortality rate, by urbanization level and age of mother: United States, 2021–2023

Age	Rural counties	Small and medium metropolitan counties	Large metropolitan counties
		Infant deaths per 1,000 live births	
Younger than 20	10.39	10.62	9.10
20–24	7.30	7.35	6.76
25–29	5.45	5.53	5.02
30–34	5.64	4.98	4.17
35–39	6.47	5.69	4.47
40 and older	9.07	7.84	6.09

NOTES: All differences between rural and large metropolitan and small and medium metropolitan and large metropolitan counties are significant ($p < 0.05$). Differences between rural and small and medium metropolitan counties are significant for infants of mothers age 30 and older ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

Data table for Figure 4. Infant mortality rate, by urbanization level and race and Hispanic origin of mother: United States, 2021–2023

Race and Hispanic origin	Rural counties	Small and medium metropolitan counties	Large metropolitan counties
		Infant deaths per 1,000 live births	
Non-Hispanic:			
American Indian and Alaska Native	9.19	7.89	8.08
Asian	4.80	4.70	3.25
Black	12.23	12.02	10.10
White	5.78	4.97	3.56
Hispanic[1]	5.65	5.30	4.64

[1]People of Hispanic origin may be of any race.

NOTES: All differences between rural and large metropolitan and small and medium metropolitan and large metropolitan counties are significant except for infants of American Indian and Alaska Native non-Hispanic mothers ($p < 0.05$). Difference between rural and small and medium metropolitan counties is significant for infants of White non-Hispanic mothers ($p < 0.05$). County designation is based on mother's county of residence. County classification is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

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