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ORIGINAL ARTICLE

Ethnic-specific infant care practices and infant mortality in late Imperial Russia

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Abstract

The Russian Empire had the highest infant mortality rate in Europe at the beginning of the twentieth century. Using a variety of official statistical sources and qualitative evidence, this paper documents uniquely high infant mortality among ethnic Russians. In contrast, among other ethnic groups of the empire, infant mortality rates did not exceed those of the European countries by much. The evidence suggests that the explanation for the Russian infant mortality pattern was ethnic-specific infant care practices, such as the early introduction of solid food, which increased the incidence of lethal gastrointestinal diseases. Our findings highlight the importance of traditional infant feeding practices in mortality in pre-industrial societies.

KEYWORDS
infant care, infant mortality, Russian Empire

The Russian Empire was notorious for its infant mortality rate. At the beginning of the twentieth century, Russia had the highest infant mortality in Europe – 250 out of 1000 newborns died before they reached one year of age.[1] In contrast, the infant mortality rate was 154 in England and 160 in France.[2] Why was infant mortality in Russia so high?

This article suggests that high infant mortality in the Russian Empire was largely an ethnic-Russian phenomenon. Russians had the highest rate across all ethnic and religious groups of the empire – 317 deaths per 1000 births. In contrast, two other Orthodox ethnic groups, Ukrainians and

[1] Gundobin, the founder of Russian pediatrics, wrote: 'Every year 1 196 000 infants under the age of one year die in the European part of the Empire. No infectious disease results in comparable mortality rates. In 1887–92, only 385 000 died from cholera. Infant mortality is a fatal epidemic that annually takes hundreds of thousands of lives' (p. 7).

[2] Mitchell, *International historical statistics*.

Belarusians, had infant mortality rates not too far above the leading European economies – 192 and 203, respectively. The ethnic differences in infant mortality appear to result from ethnic-specific infant care practices rather than economic or geographic factors. The most salient practice, as documented by contemporaneous medical studies, was the timing of solid food introduction, although other unobserved ethnic-specific practices might have contributed, as well. Remarkably, the mortality of children above the age of one year, which is less dependent on feeding practices, did not differ much across ethnic groups.

Our findings rest on a combination of quantitative and qualitative evidence. We assemble three cross-sectional datasets on infant mortality, child mortality, and death causes from imperial statistical volumes. One dataset covers 503 districts (*uezd*) in 50 provinces (*gubernia*) of European Russia in 1900–3. The other two focus on within-province variation at the township (*volost'*) level in two predominantly Russian provinces with notable Ukrainian minorities – Voronezh and Saratov. Employing data at the different levels of spatial aggregation allows us to partially mitigate the ecological inference problem.[3] We supplement quantitative data with a review of contemporaneous individual-level medical studies conducted by rural doctors in Russian and Ukrainian villages in the late nineteenth and early twentieth centuries. The doctors observed peasant households and collected data on feeding practices, disease incidence, and mortality in different age groups.

The medical studies suggest that the Russian infant mortality pattern largely resulted from ethnic-specific infant feeding practices. The studies report that up to 90 per cent of Russian infants and up to 40 per cent of Ukrainian infants were introduced to solid supplements before they reached 6 months of age. As a result, child diarrhoea induced about 75 per cent of infant deaths among Russians and only 13 per cent among Ukrainians. Our township-level regressions support these observations. In Voronezh province, the share of Ukrainians is negatively and significantly associated with diarrhoea-induced child, but not adult, mortality. In Saratov province, the share of Ukrainians is negatively and significantly associated with infant, but not child, mortality.

We obtain similar results in a cross-section of 503 districts of European Russia. The regressions show that the best predictor of infant mortality is the share of ethnic Russians. The regression coefficient is stable across specifications and significant both statistically and economically; a standard deviation (SD) increase in the share of ethnic Russians is associated with a 0.46 standard deviation increase in infant mortality. The ethnic composition explains about 63 per cent of the variation in infant mortality. In contrast, all development and geographic controls explain less than 12 per cent. Supporting micro-level and township-level evidence, the share of Russians is insignificant for the mortality of children aged 1–2 and 2–5 years of age. As our results appear consistent across different levels of aggregation, ecological fallacy becomes less of a concern.

Our results are in line with similar studies on infant mortality in European demographic history. The link between traditional infant care practices and infant survival was not uniquely Russian. For example, Knodel and van de Walle show that infant mortality across southern Germany in the mid-nineteenth century was strongly correlated with the proportion of mothers who regularly breastfed their infants and the timing of weaning.[4] Brown and Guinnane suggest that changes in attitudes towards infant care mattered for the decline in infant mortality in late nineteenth-century Bavaria.[5] Botticini, Eckstein, and Vaturi show that superior childcare

[3] Data aggregation might result in the loss of variation making it harder to reject the null hypothesis. Brown and Guinnane, 'Regions and time', conduct a computational experiment using historical demographic data and show that aggregation tends to inflate standard errors.

[4] Knodel and van de Walle, 'Breastfeeding, fertility and infant mortality'.

[5] Brown and Guinnane, 'Infant mortality decline'.

practices of Jewish families, including extended breastfeeding, contributed to lower infant mortality and higher growth rates of the Jewish population in Eastern Europe from 1500 to 1930.[6]

In contrast to regional aggregates, individual-level data help to uncover the mechanisms driving the health benefits of breastfeeding. Relying on individual-level longitudinal data from Derby in 1917–22, Reid finds that earlier weaning increased mortality risk – especially from diarrhoeal diseases.[7] Davenport demonstrates that the replacement of wet-nursing with maternal breastfeeding among wealthier families increased infant survival in London in the 1750s to 1810s.[8] Arthi and Schneider study health outcomes among nearly 1000 orphaned children in turn-of-the-twentieth-century London and find that breastfeeding reduced mortality risk and raised weight-for-age in infancy, with the strongest effects for exclusively breastfed children.[9] They also show that early post-weaning advantages did not persist into mid-childhood, suggesting a catch-up growth period for initially disadvantaged children. The historical evidence is consistent with contemporary epidemiological studies, which prove the protective effects of breastfeeding against diarrhoea-induced mortality.[10]

The literature on mortality in the Russian Empire is scarce and largely descriptive. Patterson conducts a general overview of mortality patterns exploring seasonal, regional, and religious variation.[11] He documents a large difference in infant mortality between Orthodox and non-Orthodox populations. Bonneuil and Fursa reach the same conclusion using data on Don province.[12] Ransel attributes religious differentials in infant mortality to infant care practices, drawing from numerous historical and ethnographic sources.[13] Hoch studies mortality trends in one Russian village in Tambov province and finds that mortality from gastrointestinal diseases was prevalent among infants.[14] In contrast, mortality among older children was mostly induced by infectious diseases – smallpox, scarlet fever, and diphtheria.

Our study improves upon the existing literature along several lines. First, we focus on cross-ethnic variation within the Orthodox population, while previous studies examine differences across religious groups. Second, we contrast mortality patterns among infants with those of older cohorts of children. Third, we collect and survey contemporaneous medical research on infant mortality from the historical libraries in Moscow and St Petersburg. The studies were based on individual-level data and published in the late nineteenth to early twentieth centuries. Fourth, we compile a comprehensive district-level dataset on infant and child mortality for the European part of the empire from previously undigitised sources. Using these data, we conduct a regression analysis to explore economic, geographic, and cultural determinants of mortality. Finally, we supplement district-level analysis with township-level data to minimise variation in the geographic and institutional environment. The combination of diverse evidence allows us to develop the first systematic account of infant mortality in the late Russian Empire.

6 Botticini, Eckstein, and Vaturi, 'Child care and human development'.

7 Reid, 'Infant feeding and post-neonatal mortality in Derbyshire'.

8 Davenport, 'Infant-feeding practices'.

9 Arthi and Schneider, 'Infant feeding'.

10 Lamberti et al., 'Breastfeeding'.

11 Patterson, 'Mortality in late Tsarist Russia'.

12 Bonneuil and Fursa, 'Learning hygiene'.

13 Ransel, *Mothering, medicine.*

14 Hoch, 'Famine, disease'.

I | DATA

In Imperial Russia, vital events – births, marriages, and deaths – were recorded in parish registers. Parish registration of vital statistics was introduced in 1722 when Peter the Great ordered the Orthodox clergy to keep the registers for the Orthodox population. Over the next century, the government expanded parish registration to other religions: Lutherans in 1764, Catholics in 1826, Muslims in 1832, and Jews in 1835. In 1865, the government started to collect parish data from religious officials, who filled in standardised statistical forms. The new rules of data reporting allowed for the annual publication of statistical volumes *Dvizhenie naseleniya v Evropeiskoi Rossii* (Population movement in European Russia) starting from 1867. We use these volumes as our main source.

Parish registration of births and deaths could introduce a downward bias into the official data. Clergymen recorded not vital events per se, but religious ceremonies associated with them – for example, infant baptism and not births. Thus, infants who died before being baptised often remained unregistered.[15] To the extent that registration practices varied across religious groups, infant mortality rates might suffer from differential bias. To avoid comparison across religious groups, we focus on the Orthodox population composed mostly of Russians, Ukrainians, and Belarusians. According to Semyonova, the Orthodox population baptised their infants in the first days of life, believing that those who died without baptism could not enter heaven.[16] There is no evidence that registration practices differed across ethnic groups within the Orthodox denomination.[17]

Throughout the paper, we compute our main outcome variable, the infant mortality rate, as the number of deaths of children under the age of one year per 1000 live births in the same year. We measure child mortality as the number of deaths in an age group per 1000 children who have survived to that age.

An ideal dataset for the study of infant mortality would comprise individual data on ethnicity, feeding practices, disease incidence, age of death, and a set of household-level controls. Since such data do not exist, we compile three cross-sectional datasets: (i) districts (*uezd*) of European Russia, (ii) townships (*volost'*) of Voronezh province, and (iii) townships of Saratov province. District-level data include infant mortality rates, child mortality rates, ethnic structure, and measures of economic development. Township-level data on Voronezh include mortality from infectious diseases, ethnic structure, and measures of economic development. Township-level data on Saratov include infant mortality rates, child mortality rates, ethnic structure, and measures of economic development. At the township level, mortality and disease incidence are measured among the Orthodox population exclusively. We supplement statistical data with a review of contemporaneous individual-level medical studies conducted by rural doctors in Russian and Ukrainian villages in the late nineteenth to early twentieth centuries.

Contemporaneous medical studies are the only source of statistical information on infant care practices at the household level. We collected seven studies from Moscow and St Petersburg

[15] Novoselskiy, *Smertnost i prodolzhitelnost zhizni v Rossii*.

[16] Semyonova, *Village life in late Tsarist Russia*. Using individual-level data from a parish in Moscow province in 1815–1918, Avdeev, Blum, and Troitskaya, 'Narechenie imeni v Rossii', document that 96 per cent of Orthodox infants were baptized within three days after birth. According to Minello, Dalla-Zuanna, and Alfani, 'First signs of transition', early baptism was a widespread practice across Europe in the eighteenth and early nineteenth centuries.

[17] Private email exchange with Boris Mironov, the leading social historian of Imperial Russia. See also Mironov, *The standard of living and revolutions*, Chapter 3.

FIGURE 1 Geography of micro-level and township-level evidence. *Notes*: Dots depict the locations of micro-level medical studies conducted by rural doctors in the late nineteenth to early twentieth centuries. Dark dots are the Russian villages; light dots are the Ukrainian villages. The shaded polygons show provinces covered in the township-level analysis. The light polygon is Voronezh province; the dark polygon is Saratov province [Colour figure can be viewed at wileyonlinelibrary.com]

historical libraries conducted by rural doctors in different provinces of European Russia in the late nineteenth to early twentieth centuries – four studies of Russian peasants and three studies of Ukrainian peasants. The studies document feeding practices, disease incidence, and mortality in different age groups. The number of observed households varies from less than a hundred to several thousand and the length of observation, from several months to 10 years. The geography ranges from Perm province in the north-east to Kherson province in the south-west. Figure 1 shows the location of each study.

We collect data on two predominantly Russian provinces with notable Ukrainian minorities – Voronezh and Saratov. For both provinces, we digitise data on mortality, ethnic composition, development, and geography. For Voronezh province, our outcome variables measure mortality from infectious diseases – such as child and adult diarrhoea – per 1000 population in 1898.[18] The

[18] Data digitized from Tezyakov, *Zabolevaemost' naseleniya Voronezhskoi gubernii.*

sample comprises 218 townships. For Saratov province, our outcomes are infant and child mortality rates among the Orthodox population in 1899–1901.[19] The sample includes 247 townships. For both provinces, we digitise township-level maps and calculate latitude and longitude of a township centroid, terrain ruggedness, and wheat suitability using GIS software. Figure 1 shows the location of the provinces. Panels A and B in table 1 present summary statistics of the township-level data for Voronezh and Saratov, respectively.

Our district-level sample covers 503 districts in 50 provinces of European Russia. We digitise data on births and child deaths from 1900 to 1903. We focus on this period to exclude the potential effect of epidemic diseases, local famines, or peasant revolts during the 1905 Revolution. We calculate the outcomes separately for each year and then average over four years. For data sources, see table F1 in the online appendix.

We supplement mortality data with ethnic composition and various controls. We focus on differences within the largest denomination in the Russian Empire, the Orthodox. Thus, we employ data on the percentages of the Russian, Ukrainian, and Belarusian population defined by the native language from the first Imperial Census of 1897.[20] To control for development, we collect data on urbanisation, literacy, and the number of rural doctors per 1000 population from the same source. To control for the legacy of serfdom, we use the data on the share of private serfs before the emancipation.[21] Panel C in table 1 presents summary statistics of the main variables from the cross-section of districts. Table A1 in the appendix reports summary statistics for the full set of variables.

II | DESCRIPTIVE ANALYSIS

The Russian Empire had the highest infant mortality rate among European countries – approximately 250 deaths per 1000 live births in 1900. For comparison, the infant mortality rate was 230 in Germany, 174 in Italy, 160 in France, and 154 in England and Wales in 1900.[22] However, the aggregate infant mortality rate in Russia hides substantial variation. Figure 2 shows the spatial distribution of infant mortality across the provinces of European Russia averaged over 1900–3. Northern and eastern provinces experienced much higher rates than western and southern provinces. For example, the infant mortality rate was 379 in Perm province in north-eastern Russia and only 184 in the Ukrainian province of Kherson.[23]

Another salient dimension of infant mortality variation was religion.[24] Figure 3 depicts infant mortality rates for five major religious groups and three ethnic groups within the Orthodox denomination in 1900–3. Across the religious groups, the highest rate was among Orthodox Christians, followed by Catholics, Protestants, and Muslims with approximately the same infant

[19] Data digitized from Tezyakov, *Materialy po izucheniyu detskoy smertnosty.*

[20] Troinitskiy, *Pervaja vseobshhaja perepis' naselenija*.

[21] Buggle and Nafziger, 'The slow road from serfdom'.

[22] Mitchell, *International historical statistics.*

[23] The spatial distribution of infant mortality persisted over time. The correlation coefficient between infant mortality averaged over 1868–71, and infant mortality averaged over 1900–3 across 50 provinces of European Russia is 0.93; see figure C1 in the online appendix.

[24] Novoselskiy, *Smertnost i prodolzhitelnost zhizni v Rossii.*

TABLE 1 Summary statistics

Variable	Mean (1)	SD (2)	Min. (3)	Max. (4)	N (5)
Panel A: Townships of Voronezh province					
Child diarrhoea, mortality	3	2.5	0	14	218
Adult diarrhoea, mortality	0.4	1.1	0	7	218
Scarlet fever, mortality	1.1	1.4	0	8.9	218
Diphtheria, mortality	2.9	2.8	0	14.2	218
Smallpox, mortality	1.3	2.3	0	15.1	218
Whooping cough, mortality	1.2	1.6	0	14.9	218
Ukrainians (%)	41.2	45.8	0	100	218
Rural clinic, dummy	0.3	0.5	0	1	218
Population density (per sq. km)	41.5	18.1	6.1	172.6	218
Literacy (%)	7.2	3.1	1.1	19.1	218
Animals, per household	5.2	2.7	1.2	20.9	218
Panel B: Townships of Saratov province					
Infant mortality, average 1899–1901	287.5	57.5	69.3	473	247
Child mortality (1–2-year-olds), 1899–1901	109.3	40.6	34.5	276.1	247
Child mortality (2–5-year-olds), 1899–1901	112.4	58.1	32	376	247
Ukrainians (%)	6.3	20.9	0	100	247
Rural clinic, dummy	0.1	0.3	0	1	247
Population density (per sq. km)	29.4	18.1	5.5	138	247
Literacy (%)	6	2.6	0.4	16.3	247
Animals, per household	9.1	3	1.9	19.7	247
Panel C: Districts of European Russia					
Infant mortality, average 1900–3	260.4	75.1	110.1	522.5	503
Child mortality (1–2-year-olds), 1900–3	92.8	26.7	20.8	199.3	503
Child mortality (2–5-year-olds), 1900–3	101.4	24.8	31.1	198.9	503
Russians (%)	56.5	41.8	0.2	100	503
Ukrainians (%)	17.4	32	0	98.1	503
Belarusians (%)	6.6	21.3	0	90	503
Urbanisation (%)	10.2	12.7	0	96	503
Literacy (%)	23.4	14.3	7.1	82.7	503
Doctors, per 1000 population	4.4	2.9	0.4	35.9	503

Notes: District dataset covers 503 districts (*uezd*) in 50 European provinces. Dataset on Voronezh province covers 218 townships (*volost'*), and dataset on Saratov province covers 247 townships.

Source: Tezyakov, *Materialy po izucheniyu detskoy smertnosty*; Tezyakov, *Zabolevaemost' naseleniya Voronezhskoi gubernii*; Troinitskiy, *Pervaja vseobshhaja perepis' naselenija*; see sec. I and figure F1 in the online appendix.

mortality rate.[25] Jews had the lowest rate.[26] High rates of Orthodox infant mortality were driven mostly by ethnic Russians who had the highest rate across all ethnic and religious groups.

[25] Contemporaneous evidence suggests that Muslims' advantage in infant survival was unlikely to have been induced by misreporting. Doctor Ershov, *Materialy dlya sanitarnoi statistiki*, compared parish-level records from several villages in

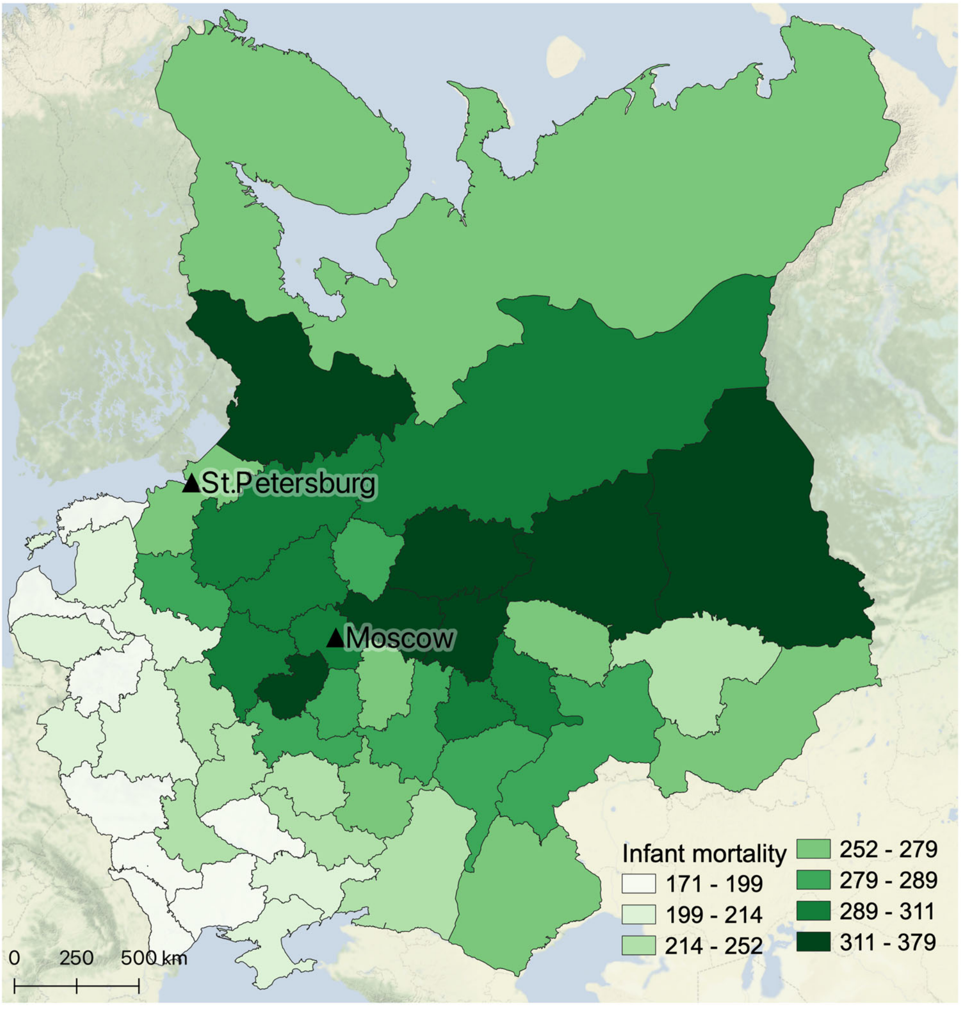

FIGURE 2 Infant mortality across provinces, 1900–3. *Notes*: Infant deaths per 1000 live births. The map is coloured using the quantile scale. *Sources*: *Dvizhenie naseleniya v Evropeiskoi Rossii*, 1900–3
[Colour figure can be viewed at wileyonlinelibrary.com]

Figure 4 shows the shares of deaths caused by different infectious diseases in 50 provinces of European Russia averaged over 1903, 1906, and 1907. The most frequent cause of death was child diarrhoea, comprising 31 per cent of recorded pathogen-induced deaths. However, the high frequency of child diarrhoea was driven mainly by provinces with predominantly Russian populations, where it amounted to 41 per cent of deaths. In contrast, in non-Russian provinces, child diarrhoea accounted for only 17 per cent, becoming the second most frequent cause of death after scarlet fever.

Kazan province with regional censuses and household lists over 27 years. He concluded that the mortality levels of Muslim children 'are not a result of shortcomings or omissions in the records' (p. 32).

[26] The lowest infant mortality rate among Jews is consistent with the study by Botticini, Eckstein, and Vaturi, 'Child care and human development'. They show that low infant and child mortality among the Jewish population in Eastern Europe resulted from superior child care practices, including extended breastfeeding.

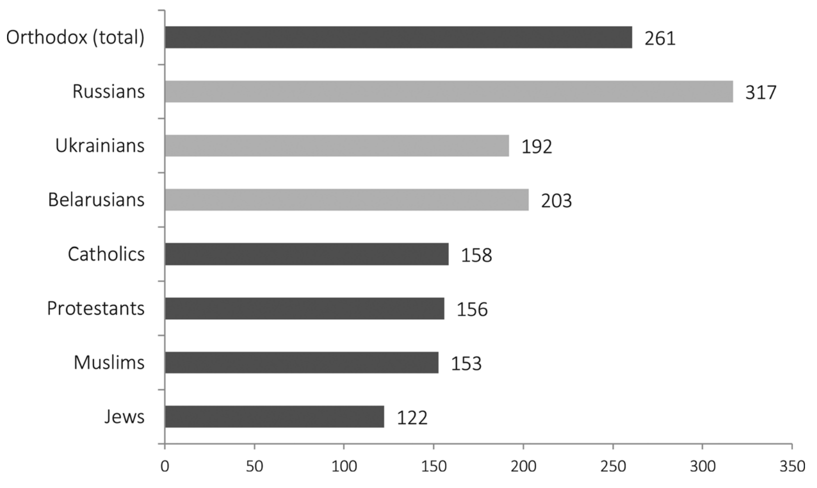

FIGURE 3 Infant mortality across religious and ethnic groups, 1900–3. *Notes*: Infant deaths per 1000 live births. Religious-specific rates (dark bars) are the number of infant deaths per 1000 live births within each group. Ethnic-specific rates (light bars) are the average infant mortality rates in predominantly Russian ($n = 232$), Ukrainian ($n = 59$), and Belarusian ($n = 23$) districts (more than 80% of the respective ethnic group). *Sources*: *Dvizhenie naseleniya v Evropeiskoi Rossii*, 1900–3

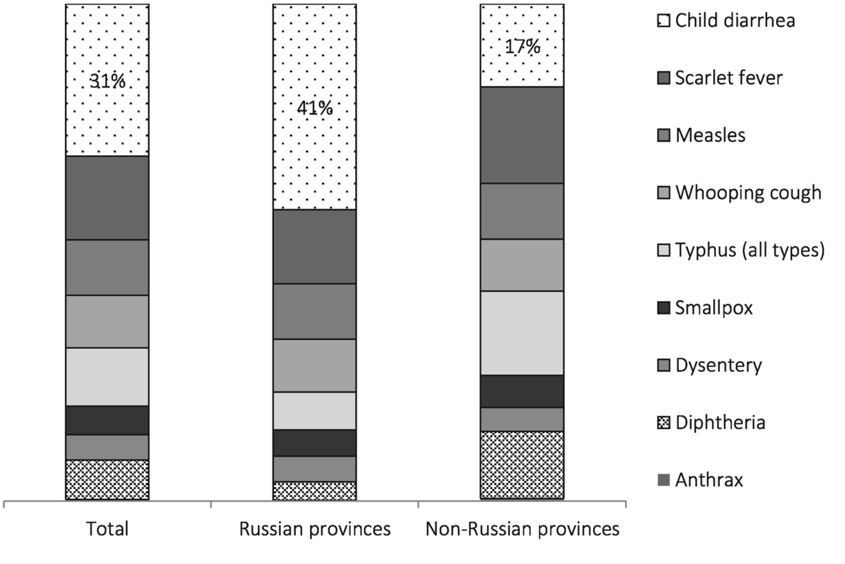

FIGURE 4 Death causes from infectious diseases, averaged over 1903, 1906, and 1907. *Notes*: Deaths per 1000 population. Data on 50 provinces of European Russia. Russian provinces are 25 provinces with the share of Russians above the median of 67%. Non-Russian provinces are 25 provinces with the share of Russians below the median. *Sources*: *Otchet o sostojanii narodnogo zdravija*, 1903, 1906, 1907

The descriptive evidence suggests that high infant mortality in the Russian Empire was largely an ethnic-Russian phenomenon. It appears there must have been something unique about Russian households that affected infants and caused higher death rates from child diarrhoea.

TABLE 2 Summaries of medical studies

Author	Year of publication	Sample and region	Ethnic group	Practices	Mortality rate	Infant death causes
Smorodintsev	1895	1809 peasant households in Perm, Ufa, and Orenburg provinces	Russians	92% of mothers introduced supplementary food to infants before five months of age; 20% of mothers did not breastfeed at all	435 among children aged 0–5 years	52% of deaths induced by diarrhoea and other gastrointestinal diseases
Zolotavin	1898	3508 peasants in the Nozhovka village in Perm province	Russians	No data	408 among infants; 504 among children aged 0–5 years	The most frequent death cause is diarrhoea (no numbers reported)
Chebotarev	1901	59 peasant Orthodox households in four villages in Samara province	Predominantly Russians	90% of infants were introduced to solid food before they reached six months of age	402 among children aged 0–5 years	75% of deaths induced by gastrointestinal diseases
Shingarev	1907	162 peasant households in two villages in Voronezh province	Russians	91 out of 93 mothers introduced supplementary food to infants in the first days of their lives	No data	Around 70% of deaths induced by gastrointestinal diseases
Shverin	1898	The universe of parish and hospital records in one district of Kherson province	Ukrainians	No data	176 among infants	13% of deaths induced by diarrhoea

(Continues)

TABLE 2 (Continued)

Author	Year of publication	Sample and region	Ethnic group	Practices	Mortality rate	Infant death causes
Avdeev	1925	38 934 peasants in Chernigov province	Ukrainians	43% of infants younger than six months of age were introduced to supplementary food; in the districts with the lowest infant mortality rates, this number was as low as 26%	161 among infants	No data
Grigoriev	1925	10 671 peasant households in Ekaterinoslav province (sample representative at the district level)	Ukrainians	28% of infants younger than six months of age were introduced to supplementary food	140 among infants	No data

Sources: Avdeev, *Sostoyanie sel'skogo naseleniya*; Chebotarev, *Nekotorye dannye*; Grigoriev, *Nekotorye dannye*; Shingarev, *Vymirayshaya derevnya*; Shverin, *Mediko-sanitarnyi obzor*; Smorodintsev, 'K voprosy o prichinah'; Zolotavin, *Zabolevaemost'*.

III | MEDICAL EVIDENCE

This section summarises the evidence reported in seven individual-level medical studies conducted by rural doctors in different provinces of European Russia in the late nineteenth to early twentieth centuries. Their authors were mostly local public health officials at the provincial self-government institutions. Four studies focussed on ethnic Russians, and three on ethnic Ukrainians, reporting data on feeding practices, death causes, and mortality rates. The number of observed households ranged from less than a hundred to several thousand; the length of observation ranged from several months to 10 years. The studies were local initiatives uncoordinated by the central government, thus not following a standardised research program. In table 2, we report the main findings of these studies in a standardised way.

The studies provide unique quantitative evidence on infant feeding practices. They document that up to 90 per cent of Russian infants got introduced to supplementary food before they reached six months of age, in contrast to 43 per cent among Ukrainians.[27] The reported infant mortality rates among Russians were considerably higher than among Ukrainians, which is consistent with figure 3. The two ethnic groups also differed in the prevalent infant death cause – diarrhoea and other gastrointestinal diseases induced up to 75 per cent of infant deaths among Russians and only 13 per cent among Ukrainians.[28]

It appears that infant mortality was associated with feeding practices. The evidence on Russian peasants shows that infant mortality rates varied with the type of supplements. Solid supplements, such as rye bread, resulted in the highest infant mortality rate – 460 deaths per 1000 births – whereas it was 274 among infants fed with cow milk.[29] The evidence on Ukrainian peasants shows that in the district with the lowest infant mortality rate – 108 deaths per 1000 births – only 25 per cent of infants younger than six months of age were introduced to supplementary food, whereas in the district with the highest infant mortality rate – 272 deaths per 1000 births – this share was as high as 59 per cent.[30]

Our review suggests that contemporaries were well aware of high infant mortality among ethnic Russians. They attributed it to unhygienic infant care practices, such as the early introduction of solid food to infants, more widespread among Russians than other Orthodox ethnic groups.[31] Ethnographic evidence suggests these practices were supported by the belief that an infant could not survive on breast milk alone, widespread among Russian peasant women.[32] The implication was that the infant's diet needed to be supplemented with bread, porridge, and cow milk as early as possible. The medical evidence reviewed in this section suggests a link between ethnic-specific infant care practices, gastrointestinal diseases, and infant mortality.

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[27] Chebotarev, *Nekotorye dannye*; Smorodintsev, 'K voprosy o prichinah'; Avdeev, *Sostoyanie sel'skogo naseleniya*. When asked to explain this practice, Russian mothers surveyed in Samara province referred to 'customs', 'traditions', and the 'wisdom of the elderly', and all of them 'were surprised that such a question could even be raised'; Chebotarev, *Nekotorye dannye*, pp. 6–7. See extract from the study on photo D1 in the online appendix.

[28] Shverin, *Mediko-sanitarnyi obzor*; Chebotarev, *Nekotorye dannye*; Shingarev, *Vymirayshaya derevnya*.

[29] Shingarev, *Vymirayshaya derevnya*. See extract from the study on photo D2 in the online appendix.

[30] Avdeev, *Sostoyanie sel'skogo naseleniya*. See extract from the study on photo D3 in the online appendix.

[31] Gundobin, *Detskaya smertnost v Rossii*. Dr Gundobin founded a charitable organization to address the problem of child mortality in Russia that advocated for the spread of hygienic knowledge among peasant women. Gundobin's study was published in the same year as Newman's famous book, *Infant mortality, a social problem*, which launched a massive European educational campaign for the benefits of breastfeeding.

[32] Popov, *Russkaya narodno-bytovaya medicina*.

IV | TOWNSHIP-LEVEL EVIDENCE

In this section, we explore variation in causes of death and child mortality within two Russian provinces with notable Ukrainian minorities – Voronezh and Saratov. Ukrainians constituted 36.2 per cent of the total population in Voronezh province and 6.2 per cent in Saratov province, according to the 1897 Census.[33] The comparison of Russian and Ukrainian peasant communities residing in the same administrative areas minimises the variation in the geographic and institutional environments. The focus on the Orthodox population of the same province helps to mitigate the concerns about differential bias in infant mortality registration across provinces and religious groups.

For both provinces, we estimate the following equation:

$$y_i = \alpha_0 \ + \alpha_0 Ukr_i + \alpha_2 D + \alpha_3 G + \epsilon_i \tag{1}$$

For Voronezh province, y_i denotes mortality from infectious diseases calculated as the number of deaths per 1000 population in 1898. We focus on mortality from child diarrhoea and juxtapose it to mortality from adult diarrhoea and childhood infectious diseases – scarlet fever, diphtheria, smallpox, and whooping cough. Data on infectious disease mortality is available only for one year, preventing us from averaging out the possible occurrence of epidemics.[34] For Saratov province, y_i denotes infant mortality averaged over 1899–1901, which we contrast to child mortality for age groups 1–2 and 2–5 years of age. The comparisons can be interpreted as placebo tests, as we expect ethnic-specific practices to affect predominantly infants through gastrointestinal mortality.[35]

Ukr_i is the share of Ukrainians in a township. The vector of development controls D includes a dummy variable for a rural clinic in a township, logarithm of population density, literacy, livestock per household, and a railroad dummy. The vector of geographic controls G includes latitude, longitude, a river dummy, wheat suitability, and terrain ruggedness. Standard errors are adjusted to spatial correlation within 50 km following Conley.[36]

Table 3 reports the results for Voronezh province. The share of Ukrainians is significantly and negatively associated with mortality from child diarrhoea, but the coefficient is insignificant for adult diarrhoea. This result documents cross-ethnic differentials in the incidence of diarrhoea-induced mortality among children but not adults.[37] The share of Ukrainians is not associated with mortality from other infectious diseases except for smallpox and diphtheria, for which the

[33] Troinitskiy, Pervaja Vseobshhaja Perepis' Naselenija.

[34] The data spanning a longer time period are available only at the province level. We collected data on mortality from smallpox, scarlet fever, diphtheria, and whooping cough in Voronezh province from 1893 to 1901 and found that 1898 did not exceed the eight-year average with the exception of whooping cough. See table B1 in the online appendix.

[35] The results of the placebo tests should be treated with caution. Higher infant mortality might lead to higher average health among survivors owing to selective culling; see Schneider, 'Collider bias in economic history research'. In this case, we would expect lower child mortality for ages 1–5 years among Russians. The fact that there is no difference in mortality among older children might suggest other ethnic-specific factors at play on top of infant feeding. For the detailed discussion, see section A in the online appendix.

[36] Conley, 'GMM estimation with cross sectional dependence'.

[37] Child and adult diarrhoeas are age-specific diseases, with adult diarrhoea affecting mostly older people. To account for potential differences in age structure between Russians and Ukrainians, we explicitly control for the shares of the population younger than six years of age and older than 60 years of age in table B2 in the online appendix. The results do not change.

TABLE 3 Mortality from infectious diseases in Voronezh province

	Child diarrhoea (1)	Adult diarrhoea (2)	Scarlet fever (3)	Diphtheria (4)	Smallpox (5)	Whooping cough (6)
Ukrainians (%)	−0.319**	−0.167	0.093	0.285**	−0.236**	−0.136
	(0.127)	(0.147)	(0.099)	(0.117)	(0.111)	(0.091)
Rural clinic, dummy	−0.013	−0.005	0.061	−0.030	−0.111**	−0.039
	(0.053)	(0.066)	(0.089)	(0.071)	(0.049)	(0.038)
Population density, log	−0.041	−0.043	−0.006	−0.000	0.025	−0.188**
	(0.066)	(0.071)	(0.055)	(0.077)	(0.059)	(0.079)
Literacy (%)	0.120*	0.026	−0.067	−0.222***	0.180*	0.147**
	(0.065)	(0.071)	(0.079)	(0.078)	(0.092)	(0.067)
Animals, per household	0.144	0.036	0.078	−0.002	0.300***	−0.065
	(0.116)	(0.050)	(0.068)	(0.066)	(0.103)	(0.048)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Mean of dependent variable	3.0	0.4	1.1	2.9	1.3	1.2
SD of dependent variable	2.5	1.1	1.4	2.8	2.3	1.6
R^2	0.256	0.104	0.158	0.145	0.227	0.059
Observations	218	218	218	218	218	218

Notes: The unit of analysis is township (*volost'*) of Voronezh province. The dependent variables are mortality rates from infectious diseases per 1000 population in 1898. Controls include railroad dummy, river dummy, terrain ruggedness, wheat suitability, and latitude and longitude of a township centroid. Standardised beta coefficients are reported. Standard errors, adjusted to spatial correlation within 50 km, are in parentheses. Standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.
Source: Tezyakov, *Zabolevaemost' naseleniya Voronezhskoi gubernii*; see sec. I and figure F1 in the online appendix.

TABLE 4 Infant and child mortality in Saratov province

	Infant mortality, average 1899–1901	**Child mortality, 1–2 years of age**	**Child mortality, 2–5 years of age**
	(1)	**(2)**	**(3)**
Ukrainians (%)	−0.131***	−0.002	0.051
	(0.049)	(0.045)	(0.047)
Rural clinic, dummy	0.014	0.040	0.038
	(0.034)	(0.035)	(0.036)
Population density, log	−0.192**	0.040	−0.068
	(0.076)	(0.074)	(0.075)
Literacy (%)	0.009	−0.078	0.044
	(0.064)	(0.078)	(0.060)
Animals, per household	0.063	0.040	0.095
	(0.070)	(0.069)	(0.058)
Controls	Yes	Yes	Yes
Mean of dependent variable	287.5	109.3	112.4
SD of dependent variable	57.6	40.6	58.1
R^2	0.173	0.174	0.298
Observations	247	247	247

Notes: The unit of analysis is township (*volost'*) of Saratov province. The dependent variables are average infant and child mortality rates in 1899–1901. Controls include railroad dummy, river dummy, terrain ruggedness, wheat suitability, latitude and longitude of a township centroid and population composition controls – the shares of Muslims, Old Believers, Jews and Germans. Standardised beta coefficients are reported. Standard errors, adjusted to spatial correlation within 50 km, are in parentheses. *p<0.10, **p<0.05, ***p<0.01.
Source: Tezyakov, *Materialy po izucheniyu detskoy smertnosty*; see sec. I and figure F1 in the online appendix.

coefficients have the opposite signs. Notably, development indicators are uncorrelated with mortality from child diarrhoea.

Table 4 reports the results for Saratov province. The share of Ukrainians is significantly and negatively associated with infant mortality and is not associated with the mortality of older cohorts of children. Lower infant, but not child, mortality among Ukrainians suggests the importance of ethnic-specific infant care practices.

We find that Russians and Ukrainians did not differ in child mortality and mortality from adult diarrhoea. However, Russians had significantly higher infant mortality and mortality from child diarrhoea than Ukrainians. This pattern might be explained by ethnic differences in infant care practices, which is consistent with contemporaneous medical studies reviewed in section III.[38] Taken together, this evidence suggests that unhealthy infant care practices among the Russian population increased the incidence of gastrointestinal diseases among infants, which contributed to higher infant mortality rates.

[38] We explicitly control for a rural health clinic as a measure of healthcare supply. However, the demand for healthcare and other health-related investments, which we cannot measure, might have also differed across ethnic groups on top of infant feeding practices.

V | DISTRICT-LEVEL EVIDENCE

In this section, we explore the relative importance of economic, geographic, and cultural correlates of infant and child mortality in a cross-section of 503 districts in 50 provinces of European Russia. We estimate the following model:

$$y_i = \beta_0 + \beta_1 Rus_i + \beta_2 Ukr_i + \beta_3 Bel_i + \beta_4 \chi + \mu_j + \varepsilon_i \tag{2}$$

where y_i is infant mortality and child mortality for ages 1–2 and 2–5 years of age in a district, averaged over four years from 1900 to 1903. Rus_i, Ukr_i, and Bel_i are the shares of Russians, Ukrainians, and Belarusians, respectively. χ is the vector of control variables that includes urbanisation, literacy, the number of doctors per 1000 population, crude birth rate, latitude and longitude of a district centroid, a logarithm of population density, distance to St Petersburg, and the share of private serfs in 1858 on the eve of the abolition of serfdom; μ_j represents province fixed effects. Standard errors are adjusted to spatial correlation within 300 km, following Conley.[39]

Table 5 reports the results. In column (1), we regress infant mortality on the shares of Russians, Ukrainians, and Belarusians. All coefficients are positive because the Orthodox had the highest infant mortality rates across all religious groups (see figure 3). The Orthodox population explains about 63 per cent of the variation in infant mortality. However, the coefficient is statistically significant only on the share of Russians. In column (2), we control for urbanisation, literacy, and the number of doctors per 1000 population. Altogether, these development covariates only add about two per cent to the explained variation in infant mortality. The inclusion of the remaining controls in column (3) and province fixed effects in column (4) does not affect our main conclusion.[40] The coefficient on Russians remains positive and highly significant both statistically and economically.[41] A one standard deviation increase in the share of Russians is associated with a 0.46 standard deviation increase in infant mortality. In terms of real measures, a province with a Russian population that was 10 percentage points larger was likely to have eight additional infant deaths per 1000 births. We estimate the same regressions separately for boys and girls and do not find any substantial difference in the magnitude of the coefficients.

If high infant mortality among Russians was a result of lower income or adverse geographic conditions, we should have observed higher mortality throughout childhood. In columns (5) and (6), we estimate the baseline regression with two alternative dependent variables – mortality of 1–2 and 2–5-year-old children. We find that the share of Russians is insignificant for the mortality of both age groups.[42] This result shows that ethnic Russians were unique in infant mortality, but

[39] Conley, 'GMM estimation with cross sectional dependence'.

[40] The coefficients on Ukrainians and Belarusians also become significant. However, the magnitude of the coefficients is about three times smaller than the coefficient on Russians. Once we control for province fixed effects, Jews become the baseline group for Ukrainians and Belarusians, because they were the third largest ethnic group in the Ukrainian and Belarusian provinces. Thus, the coefficients reflect relative infant mortality levels of the Orthodox groups in comparison to Jews.

[41] To make sure that the share of Russians is not picking up the relative absence of one of the non-Orthodox religious groups, we control for the shares of Catholics, Protestants, Muslims, and Jews in table B3 in the online appendix. The coefficient on Russians is robust to this exercise.

[42] In table B4 in the online appendix, we show that the coefficient on Russians is robust to the inclusion of crude birth rate and the share of infants in the population in the regression of infant mortality. For the mortality of older children,

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TABLE 5 Correlates of infant and child mortality across districts of European Russia

	Infant mortality				Child mortality	
	Average 1900–3				1–2 years of age	2–5 years of age
	(1)	(2)	(3)	(4)	(5)	(6)
Russians (%)	0.820***	0.706***	0.451***	0.465***	0.071	−0.075
	(0.088)	(0.081)	(0.123)	(0.088)	(0.097)	(0.158)
Ukrainians (%)	0.005	−0.103	0.033	0.143*	0.027	0.064
	(0.062)	(0.064)	(0.075)	(0.078)	(0.079)	(0.109)
Belarussians (%)	0.054	−0.016	−0.012	0.097**	0.034	0.054
	(0.047)	(0.047)	(0.057)	(0.042)	(0.059)	(0.077)
Urbanisation (%)		−0.006	0.069*	0.106***	0.025	−0.052
		(0.026)	(0.036)	(0.029)	(0.045)	(0.053)
Literacy (%)		−0.143***	−0.101*	−0.100	−0.038	−0.139
		(0.046)	(0.055)	(0.070)	(0.124)	(0.117)
Doctors, per 1000		0.013	0.010	−0.082***	0.006	−0.000
		(0.031)	(0.033)	(0.026)	(0.058)	(0.048)
Controls	No	No	Yes	Yes	Yes	Yes
Province fixed effects	No	No	No	Yes	Yes	Yes
Mean of dependent variable	260.4	260.4	260.4	260.4	92.8	101.4
SD of dependent variable	75.1	75.1	75.1	75.1	26.7	24.8
R^2	0.635	0.648	0.746	0.868	0.751	0.596
Observations	503	503	503	503	503	503

Notes: The unit of analysis is district (*uezd*) of European Russia. The dependent variables are average mortality rates over 1900–3. Infant mortality is the number of infant deaths per 1000 live births. Child mortality is the number of deaths in an age group per 1000 children who have survived to that age. Ethnic structure, urbanisation, literacy, and the number of doctors come from the 1897 census. Controls include crude birth rate, logarithm of population density, distance to St Petersburg, the share of serfs in 1859, latitude, and longitude of a district centroid. Standardised beta coefficients are reported. Standard errors, adjusted to spatial correlation within 300 km, are in parentheses.

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Source: Troinitskiy, *Pervaja vseobshhaja perepis' naselenija*; see sec. I and figure F1 in the online appendix.

not in child mortality. As the health of a child over one year of age is less susceptible to feeding practices, the effect of Russians points towards the importance of ethnic-specific infant care.[43]

VI | ON THE ORIGINS OF RUSSIAN INFANT CARE PRACTICES

Breastfeeding decisions are paramount examples of ‘parent–offspring conflict’.[44] While infants benefit unilaterally from maximal breastfeeding, it may be optimal for mothers to allocate more energy to household activities and future reproduction at the expense of an infant’s needs. The anthropological studies conducted in traditional societies document high variation in the timing of supplementary food introduction.[45] The variation follows seasonal patterns of work activity and food availability, reflecting a tradeoff between an infant’s energetic needs and maternal labour time. From this perspective, infant care practices can be interpreted as an adaptation to various environmental constraints faced by a particular ethnic group.

For ethnic Russians, one of the main environmental constraints was the length of an agricultural season. In central Russia, it lasts about four months, in contrast to about six months in Ukraine. In four months, Russian peasants had to plow the land, sow the seeds, reap the harvest, and prepare the land for the winter crops. This required extensive labour inputs in a relatively short period of time, and additional labour was provided by women. Qualitative evidence suggests that Russian peasant women spent nearly as many hours on agricultural labour, on top of household work, as did the men.[46]

Figure 5 shows the monthly distribution of infant deaths – deaths in a month divided by total deaths in a year – in the two provinces with the maximum shares of Ukrainians and Russians, respectively. White bars denote Poltava province with 93 per cent Ukrainians, grey bars denote Vladimir province with 98 per cent ethnic Russians, and the dashed black line denotes the benchmark of uniform distribution (one-twelfth for each month). Among Russians, a summer peak of infant deaths is much more pronounced than among Ukrainians. Around 45 per cent of infant deaths in the Russian province occurred in summer and only 20 per cent in winter. In the Ukrainian province, infant deaths spread more evenly within a year – about 28 per cent in summer and 25 per cent in winter. Figure 6 shows the deaths distribution of children aged 2–5 years in the same two provinces. In contrast to infants, there is almost no difference between the Ukrainian and the Russian provinces, and the distribution is closer to the uniform benchmark.

Taken together, the evidence suggests that a shorter agricultural season in central Russia accentuated the tradeoff between maternal care and women’s labour inputs, compelling Russian peasant women to participate in the summer fieldwork at the expense of infant care. Hence,

the coefficient on Russians remains insignificant even when we control for crude birth rate and the share of respective cohorts in the population.

[43] In table B5 in the online appendix, we control for the share of women employed in agriculture. The coefficient on Russians in the regression of infant mortality remains positive and highly significant, while the coefficient on female agricultural employment is insignificant and close to zero.

[44] Trivers, ‘Parent–offspring conflict’.

[45] For example, Sellen, ‘Weaning, complementary feeding’, studies several ethnic groups in East Africa and finds that supplementation before the age of six months was observed in more than 70 per cent of populations, with standard deviations of age at liquid and solid food introduction as high as or higher than the mean (4.5 ± 6.0 and 5.0 ± 4.0 months, respectively).

[46] Bolshakov, *Sovremennaja derevnja*. See also photo E4 in the online appendix documenting Russian women working along with men in the fields.

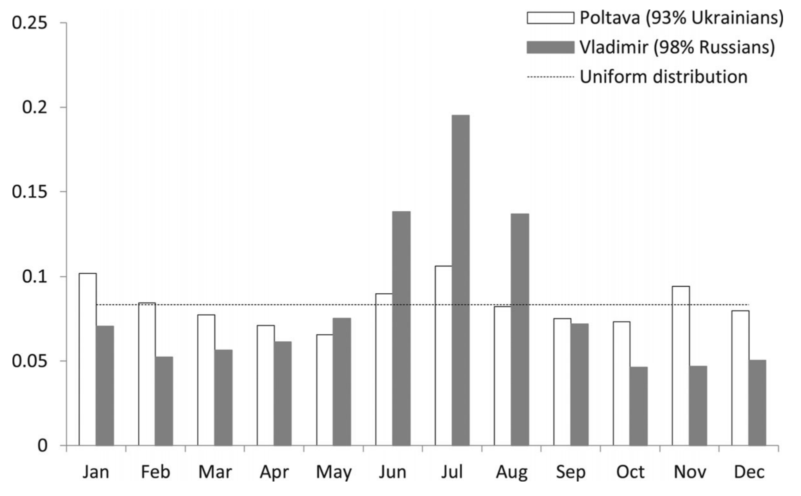

FIGURE 5 Monthly distribution of infant deaths, 1900–3. *Notes*: Infant deaths in a month divided by total infant deaths in a year, averaged over 1900–3. White bars denote Poltava province with 93% Ukrainians, grey bars denote Vladimir province with 98% ethnic Russians, and the dashed black line denotes the benchmark of uniform distribution (one-twelfth for each month). *Sources*: *Dvizhenie naseleniya v Evropeiskoi Rossii*, 1900–3

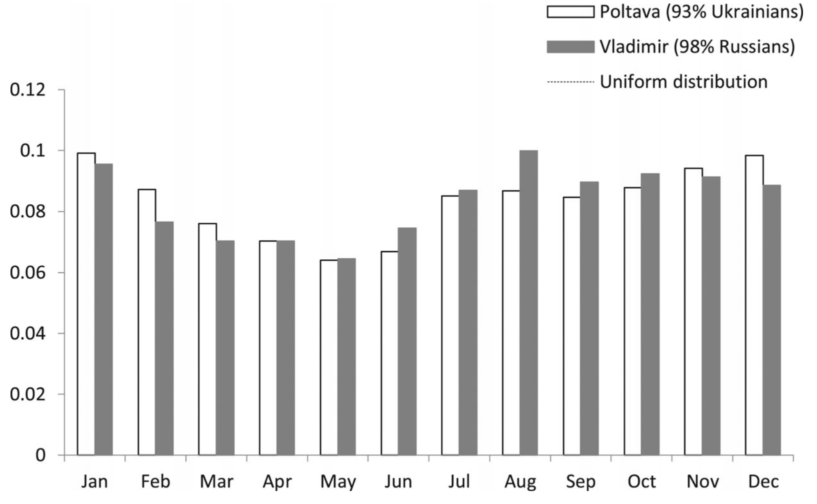

FIGURE 6 Monthly distribution of deaths among children aged 2–5 years, 1900–3. *Notes*: 2–5-year-old child deaths in a month divided by total child deaths in the same age cohort in a year, averaged over 1900–3. White bars denote Poltava province with 93% Ukrainians, grey bars denote Vladimir province with 98% ethnic Russians, and the dashed black line denotes the benchmark of uniform distribution (one-twelfth for each month). *Sources*: *Dvizhenie naseleniya v Evropeiskoi Rossii*, 1900–3

Russian infant feeding practices appear as an environmental adaptation that persisted well into the early twentieth century in the absence of alternative sources of information due to the cultural homogeneity of central Russia.[47]

[47] By the end of the nineteenth century, Russians, Belarusians, and Ukrainians had been living in the same country for a little more than a century. Prior to 1795, the territories populated by Belarussians and Ukrainians were controlled by

VII | CONCLUSION

This article studies the patterns of infant mortality in late imperial Russia. We find that ethnic Russians had the highest infant mortality rates across all ethnic and religious groups of the empire, including other Orthodox ethnic groups – Ukrainians and Belarusians. Our evidence suggests that ethnic differentials in infant mortality largely resulted from ethnic-specific infant care practices, namely, the introduction of solid food. Russian mothers started to introduce supplements, such as rye bread, from the first weeks of infants' lives, which increased the risk of lethal gastrointestinal diseases.

The Russian Empire was not unique in the relationship between traditional infant care practices and infant mortality. Studies in European demographic history suggest that changing infant feeding practices contributed to the decline in infant mortality rates prior to the twentieth century.[48] Russia followed the same path but lagged behind Europe for several decades. The decline started at the beginning of the twentieth century and accelerated with growing urbanisation. While there are no studies on changing feeding practices in the Soviet period, we can speculate that urbanisation played a major role in changing traditional child care practices into modern ones.[49]

Recently, the growing body of literature has emphasised the importance of cultural practices in shaping infant mortality. For example, Derosas documents the differences in infant mortality rates between Catholics and Jews that cannot be explained by income or education, using data from nineteenth-century Venice.[50] In the contemporary context, Bhalotra, Valente, and van Soest show that Indian Muslims exhibit a substantial advantage in child survival despite being, on average, poorer and less educated than high-caste Hindus.[51] In a follow-up study, Geruso and Spears explain this puzzle with healthier sanitation practices among Muslims.[52] Supplementing the existing literature, our paper demonstrates the importance of the ethnic dimension of infant mortality, revealing variation within the same religious group.

Unpacking the 'black box' of traditional healthcare practices is the next step in studying the causes of infant mortality in Russia and worldwide. What explains the variation in infant care practices across ethnic groups? Why do some communities maintain unhealthy healthcare practices? Can best practices spread from high- to low-performing groups? What determines the success of the diffusion? These questions are still to be explored.

the Polish–Lithuanian Commonwealth. Limited migration between the former Polish territories and central Russia precluded communication and the exchange of traditional know-how between Russians on the one hand, and Belarusians and Ukrainians on the other. According to the 1897 census, Russians constituted less than 5 per cent of the population in the former Polish provinces, whereas less than 10 per cent of Ukrainians and Belarusians lived in the provinces of central Russia. This is especially true for peasants, who were substantially less mobile than the urban dwellers.

[48] For example, in 1800, the infant mortality rate in Sweden was around 220 deaths per 1000 live births, which literature attributed to irregular breastfeeding and artificial feeding among other factors; Brändström, 'Infant mortality in Sweden'; Edvinsson, Garðarsdóttir, and Thorvaldsen, 'Infant mortality in the Nordic countries'. A steady decline began in 1810, and by 1900, the infant mortality rate reached 99; Mitchell, *International historical statistics*. The decline was partially enabled by the systematic training of physicians, midwives, and clergymen in infant care by the Swedish government.

[49] The Soviet government also created a nationwide network of maternity hospitals, women's health clinics, and research centres and launched a massive educational campaign to promote modern medical knowledge on child care among the general population; see Avdeev, 'Mladencheskaja Smertnost'.

[50] Derosas, 'Watch out for the children!'.

[51] Bhalotra, Valente and van Soest, 'The puzzle of Muslim advantage'.

[52] Geruso and Spears, 'Neighborhood sanitation'.

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DATA AVAILABILITY STATEMENT

The data and replication package for this paper can be downloaded from OpenICPSR at: https://doi.org/10.3886/E178561V1.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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Appendix

TABLE A1 Summary statistics

Variable	Mean (1)	SD (2)	Min. (3)	Max. (4)	N (5)
Panel A: Townships of Voronezh province					
Child diarrhoea, mortality	3	2.5	0	14	218
Adult diarrhoea, mortality	0.4	1.1	0	7	218
Scarlet fever, mortality	1.1	1.4	0	8.9	218
Diphtheria, mortality	2.9	2.8	0	14.2	218
Smallpox, mortality	1.3	2.3	0	15.1	218
Whooping cough, mortality	1.2	1.6	0	14.9	218
Ukrainians (%)	41.2	45.8	0	100	218
Rural clinic, dummy	0.3	0.5	0	1	218
Population density (per sq. km)	41.5	18.1	6.1	172.6	218
Literacy (%)	7.2	3.1	1.1	19.1	218
Animals, per household	5.2	2.7	1.2	20.9	218
River dummy	0.3	0.5	0	1	218
Railroad dummy	0.1	0.3	0	1	218
Wheat suitability	78.7	12.4	34	100	218
Terrain ruggedness index	46.2	15.8	12.5	77.3	218
Latitude (degrees)	50.9	0.7	49.7	52.8	218
Longitude (degrees)	39.6	1.1	37.6	42.7	218
Panel B: Townships of Saratov province					
Infant mortality, average 1899–1901	287.5	57.5	69.3	473	247
Child mortality (1–2-year-olds), 1899–1901	109.3	40.6	34.5	276.1	247
Child mortality (2–5-year-olds), 1899–1901	112.4	58.1	32	376	247
Ukrainians (%)	6.3	20.9	0	100	247
Rural clinic, dummy	0.1	0.3	0	1	247
Population density (per sq. km)	29.4	18.1	5.5	138	247
Literacy (%)	6	2.6	0.4	16.3	247
Animals, per household	9.1	3	1.9	19.7	247
Crude birth rate	60.5	15.9	10	113.9	247
River dummy	0.2	0.4	0	1	247
Railroad dummy	0.3	0.5	0	1	247
Wheat suitability	71.5	18.8	22.1	100	247
Terrain ruggedness index	42.2	15.9	16.1	97.2	247
Latitude (degrees)	52	0.8	48.7	53.3	247
Longitude (degrees)	45.1	1.4	42.7	48	247
Muslims (%)	3.2	10.7	0	77.4	247

(Continues)

TABLE A1 (Continued)

Variable	Mean (1)	SD (2)	Min. (3)	Max. (4)	N (5)
Old Believers[#] (%)	4.8	9.3	0	83.4	247
Germans (%)	0.2	0.5	0	4.9	247
Panel C: Districts of European Russia					
Infant mortality, average 1900–3	260.4	75.1	110.1	522.5	503
Child mortality (1–2-year-olds), 1900–3	92.8	26.7	20.8	199.3	503
Child mortality (2–5-year-olds), 1900–3	101.4	24.8	31.1	198.9	503
Russians (%)	56.5	41.8	0.2	100	503
Ukrainians (%)	17.4	32	0	98.1	503
Belarusians (%)	6.6	21.3	0	90	503
Urbanisation (%)	10.2	12.7	0	96	503
Literacy (%)	23.4	14.3	7.1	82.7	503
Doctors, per 1000 population	4.4	2.9	0.4	35.9	503
Crude birth rate, average 1900–3	51.9	9.6	16.9	74	503
Population density (per sq. km)	42.9	45.8	0.1	759.9	503
Distance to St Petersburg (km)	936.3	394.5	22	2020.1	503
Private serfs in 1858 (%)	37.8	25.3	0	85.2	503
Latitude (degrees)	54.1	3.9	44.6	67.9	503
Longitude (degrees)	37.1	8.5	21.2	63.3	503

Notes: District dataset covers 503 districts (*uezd*) in 50 European provinces. Dataset on Voronezh province covers 218 townships (*volost'*), and dataset on Saratov province covers 247 townships.

Source: Tezyakov, *Materialy po izucheniyu detskoy smertnosty*; Tezyakov, *Zabolevaemost' naseleniya Voronezhskoi gubernii*; Troinitskiy, *Pervaja vseobshhaja perepis' naselenija*; see sec. I and figure F1 in the online appendix.

[#] Old Believes are a subgroups of Orthodox Christians who maintain the ritual practices of Russian Orthodox Church as they were before the mid-17th century schism – a conflict over the Church reform.