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Shaken to the Core: Analyzing the Effect of Nepal's 2015 Earthquake on Infant Death and Developmental Losses

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Abstract

The 2015 Nepal earthquake, which affected approximately 8 million people and resulted in an economic loss of $10 billion, provides a unique possibility to examine the impact of natural disasters on infant mortality in a developing country context. This study exploits the quasi-random spatial and temporal variation in ground tremor intensity to evaluate the causal effect of the earthquake on individual-level infant death. Employing the difference-in-differences research design, we find a statistically significant increase in the probability of infant death in districts severely affected by the earthquake. Our results further indicate that this effect is not substantially more pronounced in the seven most severely impacted districts. Additionally, heterogeneity analysis reveals a gender disparity, with male infants experiencing a higher probability of death compared to female infants. To summarize, these results provide compelling evidence that natural disasters like earthquakes can substantially elevate infant mortality rates in developing countries, posing immediate and long-term developmental loss. These findings contribute to the literature on the economic consequences of natural disasters and provide robust evidence of their significant impact on infant mortality in developing economies, with implications for disaster preparedness and response policies, as well as for immediate support.

Keywords: Development loss, earthquake, gender, infant death, natural disaster

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Recent data from the Center for Research on the Epidemiology of Disasters (CRED), a reputable Belgium-based research institution that provides a disaster-related database, indicates a substantial rise in economic damage from natural disasters, from USD 246.8 billion in 2005 to USD 366.1 billion in 2011. Furthermore, the U.S. Geological Survey (USGS) reports that earthquakes alone have caused over 800,000 fatalities globally between 2000 and 2015. CRED has documented a significant global incidence of natural disasters over the past two decades. These statistics highlight the substantial human and economic costs of natural disasters, underscoring the importance of rigorous economic analysis to inform policy decisions on disaster preparedness, mitigation, and recovery.

The Epidemiology of Disasters data compiled by the United Nations Disaster Risk Reduction (UNDRR) indicates that, between 2000 and 2020, 7,348 natural disasters occurred worldwide. These events resulted in approximately 1.23 million fatalities and imposed substantial economic costs, estimated at $2.97 trillion. This magnitude of human and economic loss underscores the importance of understanding the full impact of natural disasters on various socioeconomic outcomes, particularly in vulnerable regions and populations. Literature like Sayili et al. (2024) has highlighted the effect of natural disasters on economic growth (Cavallo et al., 2013; Fomby et al., 2013), macroeconomic indicators (Horwich, 2000; Noy, 2009), and local labor market outcomes (Belasen & Polachek, 2009; Kirchberger, 2017; McIntosh, 2008; Shakya et al., 2022). In particular, Goda et al. (2015) highlighted that the 2015 earthquake affected approximately 8 million people and caused an economic loss of $10 billion, equivalent to about half of Nepal's Gross Domestic Product (GDP).

While focusing on immediate and long-term developmental effects on people and the country as a whole, there are heterogeneous outcomes depending on social, economic, physical, psychological, and transnational factors. The consequences of natural disasters like the 2015 earthquake in Nepal have a longer-term and disproportionate impact on maternal, newborn, and child health in resource-poor environments. Likewise, indirect disasters, such as delayed governmental response and wider socio-political limits (like fuel shortages and slowing rebuilding), are a significant impediment to the household's ability to sustain mothers and young children. Therefore, a long-term integrated socio-political context, along with promising health policies and research, is to be made (Ronen et al., 2016; Brunson, 2017). The study conducted by Khatri et al. (2020) posits that even if there is no direct effect of an earthquake on infant birth, the mental health effects of women during pregnancy notably hamper the birth weight of a child, which is prone to infant death. The evidence shows that because of the disrupted essential maternal and infant health services along with worsening living conditions available in earthquake-affected areas, there are added adversities in infant healthcare outcomes (Sayili et al., 2024). That is why disasters like the 2015 Nepal earthquake reversed existing healthcare indicators and hampered the achievement of SDG-3 in terms of "Good health and wellbeing" (Ministry of Health, 2017).

The purpose of this study is to evaluate the impact of the 2015 earthquake on infant death and long-term developmental loss in Nepal, and the study aims to explore the underlying factors contributing to this elevated infant mortality rate and propose targeted interventions to help reduce it in Nepal. An earthquake with a magnitude of 7.8 likely had significant effects on infant mortality due to the widespread destruction of infrastructure and healthcare facilities, displacement of communities, and interruption of essential services. The earthquake severely damaged hospitals and clinics, reducing access to maternal and neonatal care, which is crucial for infant survival (Chen et al., 2016). Additionally, the loss of livelihoods and economic instability caused by the earthquake may have further exacerbated the risk of infectious diseases and malnutrition among infants, as families struggled to afford basic necessities and healthcare. Therefore, we expect these factors likely contributed to an increase in infant mortality rates following the disaster.

Methods and Materials

We employ difference-in-differences research design to analyze the impact of an intervention by comparing how outcomes change before and after the intervention for both affected and unaffected groups to assess changes in the probability of infant death between districts that were severely affected by the earthquake (‘treated’) and those that were not (‘control’), even though there might be vast socio-economic, cultural, and other development aspects. The treatment group comprises 14 districts identified by the National Reconstruction Authority (NRA), the government agency responsible for coordinating reconstruction efforts after the April 2015 earthquake in Nepal. The control group includes the remaining 61 districts. To estimate the impact of the 2015 earthquake on infant death, we use Nepal's demographic health survey data for 2011, 2016, and 2022. Our variable of interest, infant death, is a dummy variable that takes the value 1 if a child died within one year of birth.

Empirical Approach

We start our analysis by examining how the change in infant death differs between districts severely affected by the event and those that remained unaffected. To quantify this difference, we employ a standard difference-in-differences (DID) model, which can be expressed by the following equation:

$$\textit{Infant death}_{idt} = \beta_0 + \beta_1 (treat_d \times post_t) + \beta_2\, treat_d + \beta_3\, post_t + X_i\theta + \zeta_d + \delta_t + \varepsilon_{it} \quad (1)$$

where index i represents the individual child born between 2010 and 2019, and t represents birth year of the child. Moreover, index d represents the district where the child was born. Infant death is the outcome variable of interest, which is defined as

$$\text{Infant death}_{idt} = \begin{cases} 1 & \textit{if a child i born in a year t died within } \frac{his}{her} \textit{ first birthday in district d} \\ 0 & \textit{Otherwise} \end{cases}$$

$treat_i$ is a binary indicator which takes a value of 1 if individual i lives in one of the severely affected districts (treated group) and 0 for other districts (comparison group). $post_t$ takes a value of 1 for post-April 2015 earthquake and 0 otherwise. The interaction $treat_i \times post_t$ is the binary treatment indicator, which takes a value of 1 if a child died within one year in one of the severely affected districts after the April 2015 earthquake and 0 otherwise. X is the set of control variables related to infant mortality. η_a is the mother's age group fixed effects that capture the time-invariant mother's age-related unobserved heterogeneity. δ_t is the district-fixed effect that addresses the time-invariant district-level unobserved heterogeneity, and δ_t are the year-fixed effect. ε_{it} denotes the individual child's error term. However, the child death intensity and population heterogeneity are defined by the data available in the municipal as well as national-level official records (Khanal, 2022).

The coefficient β_0 is an intercept term which gives the probability of pre-earthquake infant death among untreated comparison districts. The coefficient of treatment, β_2 provides the difference in probability of pre-earthquake infant death between individuals in treated and untreated comparison districts. The sum of β_0 and β_2 provides the probability of infant death among severely affected earthquake districts (treated group). The coefficient of post, β_3 shows the difference in infant death in post- and post-earthquake periods among comparison districts. Finally, β_1 is the parameter of interest that quantifies the change in the probability of infant death in treated districts severely affected by the earthquake compared to the unaffected comparison group after controlling for time and district-invariant unobserved heterogeneity.

Results and Discussion

Descriptive Results

The findings of the study indicate that the Nepal earthquake of 2015 caused a statistically and economically significant increase in the infant mortality rate of around 8% in the most affected districts in the post-earthquake period, which is statistically robust regardless of the specification of the model, controlling for family size, age at first birth, and paternal factors. Infant mortality rates all over the country showed a general decrease post the earthquake; however, districts hit by the earthquake had significantly higher infant mortality rates than would have been observed otherwise (Khanal, 2022). The study also uses a triple-difference approach to identifying gender-differentiated impacts. The rate of infant mortality for females was found to be statistically significantly lower in earthquake-affected districts than the rate of infant mortality for males (at 1% level) of 0.002. The results of this study might represent the greater biological resilience and immune response seen in female infants during times of poor health system functioning and underscore the need for continued study of social and biological factors affecting infant survival after disaster.

The analysis is based on the Nepal Demographic and Health Survey (NDHS) 2011, 2016 and 2022 that contain detailed data on infant mortality, child and maternal birth histories, child characteristics, socioeconomic status of mother and father, utilization of health services, sanitation, and household conditions. From the sample of 38,252 children, the average infant mortality was 4.8 per 100 children, with a 2.1/2.7 ratio for females/males, which indicated some issue of gender imbalance. The average age of women in the sample at the time of their first birth was 19.62 years, and most had low levels of education, with a 66.7% employment rate. Limited access to education and to knowledge and resources about health and reproduction, as well as early childbearing, may limit women's opportunities and have negative consequences on child health outcomes. While women are employed, many of these jobs are informal or subsistence and do not enable them to care for and provide resources for their infants. Improving child survival and socioeconomic well-being requires increasing educational, economic, and childcare opportunities for women.

Analysis of pre- and post-earthquake periods indicates that after the earthquake, infant mortality rates decreased by 0.014 (around 38.9%). This decrease occurred at the same time as a decline in fertility rates, better education for women, and higher ages at first birth. This was also driven by better access to healthcare, with the average distance to health facilities decreasing from 26.05 km to 25.50 km. However, there is still some difference in remote districts, like Dolpa and Humla. These developments, however, have failed to prevent earthquakes from having impacts on infant health outcomes, such as damage to buildings, disruption of maternal and child health services, increased disease burden, reduced food security, displacement, and psychosocial stress (Thapa et al., 2020; Khanal, 2022). The comparison between the earthquake-affected districts and non-earthquake-affected districts shows that the infant mortality in the earthquake-affected districts is lower (0.040) as compared to non-earthquake-affected districts (0.048), specifically for female infants. Women in the affected districts were older, had fewer children, and had their first birth compared to women in the control districts. These population shifts and improved health interventions and awareness after the earthquake could partly account for the lower observed mortality figures. These patterns can, however, not be uniformly applicable across regions, especially in the parts of Karnali and Madhesh Provinces.

Impact of the 2015 Earthquake on Infant Death

Data demonstrate that the post-earthquake coefficient is negative and significant, showing that infant mortality across the country has generally decreased, but the positive coefficient for earthquake-affected districts implies that there may be continued negative influence in highly affected districts. The analysis also reveals that there is a relationship between higher fertility and increased infant mortality risks and between younger maternal age at first birth and increased infant mortality risks. The existing impact of infant death rate are shown in Table 1.

Table 1

Impact of the 2015 Earthquake on Infant Death

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Post 2015 x Treatment District	0.00970	0.0139	0.0132	0.0134	0.0673**
	(0.0112)	(0.0110)	(0.0109)	(0.0110)	(0.0310)
Post Earthquake	-0.00562	-0.00585	-0.0207***	-0.0206***	-0.0592***
	(0.00413)	(0.00410)	(0.00672)	(0.00679)	(0.0210)
Earthquake-Affected Districts	-0.00876	0.0285	0.0293	0.0313	-0.0141
	(0.00613)	(0.0243)	(0.0237)	(0.0233)	(0.0282)
Observations Controls	15281	15281	15281	15281	1728
District FE					YES YES
	NO	YES	YES	YES	
Year FE	NO	NO	YES	YES	YES
Mother's Age FE	NO	NO	NO	YES	YES

Standard errors in parentheses

*p < 0.1, *p* < 0.05, *p**< 0.01

Table 1 shows the results of Difference-in-Differences (DID) estimation using the effect of the Nepal earthquake of 2015 on infant mortality. In five different model specifications that account for demographic and socioeconomic variables, the interaction term Post 2015 × Treatment District is positive and significant in Models 4 and 5. The coefficient (0.004) means that districts with severe impact had an infant mortality rate that was about 8% higher than the pre-earthquake rate (0.050). This finding is of economic significance as infant mortality is one of the indicators used to assess socioeconomic development and the well-being of populations (Banerjee & Maharaj, 2020; Eriksson et al., 2018).

Likewise, the models include fixed effects for location (district), year, and maternal age-group, which helps to clarify the effect of earthquakes on infant survival rates. Similar to Table 4, the interaction term becomes positive and significant in Models 4 and 5, indicating that infant mortality increased by about 0.003 in the post-earthquake period. Even in regions that were receiving significant relief and reconstruction assistance, the result implies earthquake disruptions continued to have an impact on infant mortality.

Impacts of the 2015 Earthquake on Infant Death by Gender

A Triple Difference (DDD) method is used to analyze the differences between genders. The included interaction between Post-2015 and Treatment District, and the interaction between Post-2015 and Female are both negative and statistically significant in Models 4 and 5, suggesting a decrease in the probability of female infant mortality by 0.002 compared to male infant mortality in affected districts. As in past studies, the overall infant mortality was affected by the earthquake, with greater effects on male infants. This trend could be attributed to biological variations, as infant girls tend to have a more robust immune system and tolerance to health issues when health services are disrupted. Access to maternal and neonatal health care was hampered as health facilities, transport, and essential infrastructure were destroyed, which made infants more vulnerable. Interruption in healthcare services had a higher risk of mortality of male infants, who are also more vulnerable to infections and health shocks. This study reveals the interaction between biological risk and infrastructure on birth outcomes.

The Infant Mortality and Development Decay

The rise in infant deaths after the 2015 earthquake, therefore, is a sign of a more fundamental structural challenge in the functioning of the development system in Nepal. The results, as in past research conducted by Khatri et al. (2020) and Tearne et al. (2021), show an unequal impact of the inequities in health, social protection, and infrastructure on vulnerable groups. The earthquake can be seen as a shock that worsened the existing lack of health and living standards, and thereby, the risks of infant mortality. Based on Sen's (1999) Capability Approach, the earthquake can be seen as a shock that magnified the existing deprivation in health and living conditions and, consequently, the risk of infant mortality. Overall, the findings align with the disaster resilience approach of the United Nations Office for Disaster Risk Reduction (UNDRR, 2015), which focuses on systems that are resilient to disasters. The observed increase in infant mortality illustrates Nepal's vulnerability to the disaster and the fragility of health and delivery systems. The impact of disruptions to antenatal care, skilled birth attendance, immunization, and postnatal services may have exacerbated poor infant health, underscoring the need to strengthen maternal and child health systems prior to disasters (Kruk et al., 2015).

Conclusion

The study examines the impact of the 2015 Nepal earthquake on infant mortality using a difference-in-differences approach. The results indicate that the earthquake led to an approximately 8% increase in infant mortality rates in severely affected districts during the post-earthquake period, a change that is both statistically and economically significant. This effect persisted even after controlling for various demographic and socioeconomic factors and different fixed effects. More importantly, we show heterogeneous impacts by gender, with male infants experiencing a higher probability of death compared to female infants in affected districts after the earthquake. This gender disparity in infant death by the 2015 earthquake is most likely attributed to biological differences, with female infants generally possessing stronger immune systems, which may have conferred a survival advantage in the context of disrupted healthcare services. The study also noted a general decrease in infant mortality rates across Nepal in the post-earthquake period, possibly due to overall improvements in health services or other interventions implemented after the disaster. These findings highlight the complex interplay between natural disasters, biological factors, and healthcare access in shaping infant survival outcomes, emphasizing the need for targeted interventions in disaster preparedness and response policies. Placing the analysis within the context of modern developmental discourse, the study provides valuable insights for policymakers, researchers, and practitioners seeking to create more resilient and equitable societies. Finally, to mitigate infant mortality in the context of disasters, it is necessary not only to provide immediate humanitarian assistance but also to promote the long-term elimination of predisposing factors and the principles of inclusive development.

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Annex

Table 2

Difference between Pre and Post Earthquake in Outcome Variables

	Pre-Earthquake		Mean Differ.	Post-Earthquake		Mean Differ.	Difference
	Treatment	Control	(D1)	Treatment	Control	(D2)	(D2-D1)
Infant Death	0.0033	0.0254	-0.0221	0.0011	0.0069	-0.0058	0.0163
Female Infant Death	0.0018	0.0123	-0.0105	0.0002	0.0031	-0.0029	0.0077
Male Infant Death	0.0015	0.0131	-0.0116	0.0009	0.0038	-0.0029	0.0086
Male-Female Ratio	1.1318	1.0740	0.0578	0.9707	1.1534	-0.1827	-0.2404

Table 3

Summary Statistics

Variable	Mean	SD	Min	Max	N (%)
Infant Death	0.040	0.195	0	1	15,281
Infant Death (Female)	0.019	0.136	0	1	15,281
Infant Death (Male)	0.021	0.143	0	1	15,281
Sex	0.478	0.500	0	1	15,281
Mother Currently Working	0.628	0.483	0	1	15,281
Use of Tobacco (Mother)	0.907	0.291	0	1	15,281
Mother’s Age	29.472	6.288	15	49	15,281
Total Number of Children	2.885	1.630	1	15	15,281
Age at First Birth	19.759	3.288	11	42	15,281
Number of Union (Mother)	0.039	0.194	0	1	15,279
Smoker (Father)	0.360	0.481	0	1	275
Number of Union (Father)	0.091	0.288	0	1	3,791
Father Working	0.919	0.272	0	1	3,835
Father’s Age	33.415	6.671	17	49	3,835
Age at Death (in months)	5.500	14.625	0	132	688
Age at First Sex (Mother)	17.621	3.018	8	40	14,915
Father away from home (Days)	6.422	9.333	0	90	1,895
Age at First Birth (Father)	23.526	4.305	13	44	3,826

Table 4

Summary Statistics (Contd...)

Variable	N (%)
Ethnicity	
Hill Brahmin	1,270 (8.3%)
Hill Chhetri	3,585 (23.5%)
Terai Brahmin/Chhetri	146 (1.0%)
Other Terai Caste	2,192 (14.4%)
Hill Dalit	1,838 (12.0%)
Terai Dalit	925 (6.1%)
Newar	289 (1.9%)
Hill Janajati	2,926 (19.2%)
Terai Janajati	1,216 (8.0%)
Muslim	868 (5.7%)
Other	4 (0.0%)
Respondent's Occupation	
Professional/Technical/Managerial	491 (4.4%)
Clerical	123 (1.1%)
Sales and Service	924 (8.4%)
Skilled Manual	3,570 (32.3%)
Unskilled Manual	444 (4.0%)
Agriculture	5,502 (49.8%)
Respondent Employed All Year/Seasonal	
All Year	6,492 (57.1%)
Seasonal	4,163 (36.6%)
Occasional	711 (6.3%)
Occupation	
Professional/Technical/Managerial	289 (8.9%)
Clerical	116 (3.6%)
Sales and Service	662 (20.3%)
Skilled Manual	1,009 (31.0%)
Unskilled Manual	489 (15.0%)
Agriculture	695 (21.3%)
Employment All Year/Seasonal	
All Year	2,733 (72.2%)
Seasonal	942 (24.9%)
Occasional	109 (2.9%)

Table 5

Mean Difference between the Treatment and Control (Pre-Treatment)

(1)			(2)		(1)-(2)	
Earthquake Affected			Control		Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean diff.
Infant Death	1262	0.033	10316	0.041	11578	-0.008
		(0.005)		(0.002)		
Infant Death(Female)	1262	0.016	10316	0.020	11578	-0.004
		(0.004)		(0.001)		
Infant Death(Male)	1262	0.017	10316	0.021	11578	-0.004
		(0.004)		(0.001)		
Sex	1262	0.469	10316	0.482	11578	-0.013
		(0.014)		(0.005)		
Mother Currently Working	1262	0.748	10316	0.631	11578	0.117***
		(0.012)		(0.005)		
Mother's Age	1262	30.934	10316	29.885	11578	1.049***
		(0.182)		(0.062)		
Age at First Birth	1262	20.462	10316	19.601	11578	0.861***
		(0.102)		(0.031)		
Number of Union (Mother)	1261	0.043	10315	0.041	11576	0.001
		(0.006)		(0.002)		
Number of Union (Father)	335	0.110	2501	0.091	2836	0.019
		(0.017)		(0.006)		
Father Working	339	0.938	2526	0.923	2865	0.015
		(0.013)		(0.005)		
Father's Age	339	34.737	2526	33.802	2865	0.935**
		(0.364)		(0.131)		
Age at Death(in months)	49	4.020	488	6.250	537	-2.230
		(1.236)		(0.736)		
Father away from home(Days)	159	6.830	1367	6.522	1526	0.308
		(0.879)		(0.258)		
Age at First Birth (Father)	338	23.849	2521	23.408	2859	0.441*
		(0.232)		(0.086)		

Significance: ***=.01, **=.05, *=.1

Table 6

Mean Differences between Before and After the Earthquake

	(1)		(2)		(1)-(2)	
Post-Earthquake			Pre-Earthquake		Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean difference
Infant Death	3703	0.038	11578	0.040	15281	-0.003
		(0.003)		(0.002)		
Infant Death(Female)	3703	0.016	11578	0.020	15281	-0.003
		(0.002)		(0.001)		
Infant Death(Male)	3703	0.021	11578	0.021	15281	0.000
		(0.002)		(0.001)		
Sex	3703	0.469	11578	0.481	15281	-0.012
		(0.008)		(0.005)		
Mother Currently Working	3703	0.577	11578	0.644	15281	-0.067***
		(0.008)		(0.004)		
Mother's Age	3703	27.825	11578	29.999	15281	-2.175***
		(0.099)		(0.058)		
Age at First Birth	3703	19.960	11578	19.695	15281	0.265***
		(0.057)		(0.030)		
Number of Union (Mother)	3703	0.032	11576	0.042	15279	-0.010***
		(0.003)		(0.002)		
Number of Union (Father)	955	0.085	2836	0.093	3791	-0.009
		(0.009)		(0.005)		
Father Working	970	0.904	2865	0.925	3835	-0.020**
		(0.009)		(0.005)		
Father's Age	970	31.943	2865	33.913	3835	-1.969***
		(0.212)		(0.124)		
Age at Death(in months)	151	3.556	537	6.047	688	-2.490*
		(0.776)		(0.679)		
Father away from home(Days)	369	5.875	1526	6.554	1895	-0.679
		(0.398)		(0.248)		
Age at First Birth (Father)	967	23.720	2859	23.460	3826	0.260
		(0.139)		(0.080)		

Significance: ***=.01, **=.05, *=.1

Table 7

Mean Differences between Treatment and Control Districts

	(1)		(2)		(1)-(2)	
	Earthquake Affected		Control		Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean difference
Infant Death	1666	0.035	13615	0.040	15281	-0.006
		(0.004)		(0.002)		
Infant Death(Female)	1666	0.015	13615	0.019	15281	-0.004
		(0.003)		(0.001)		
Infant Death(Male)	1666	0.020	13615	0.021	15281	-0.001
		(0.003)		(0.001)		
Sex	1666	0.478	13615	0.478	15281	0.001
		(0.012)		(0.004)		
Working Mother	1666	0.742	13615	0.614	15281	0.128***
		(0.011)		(0.004)		
Mother's Age	1666	30.465	13615	29.351	15281	1.114***
		(0.159)		(0.054)		
Age at First Birth	1666	20.671	13615	19.647	15281	1.024***
		(0.092)		(0.027)		
Number of Union (Mother)	1665	0.038	13614	0.039	15279	-0.002
		(0.005)		(0.002)		
Number of Union (Father)	467	0.111	3324	0.088	3791	0.023
		(0.015)		(0.005)		
Father Working	475	0.924	3360	0.919	3835	0.005
		(0.012)		(0.005)		
Father's Age	475	34.282	3360	33.292	3835	0.990***
		(0.304)		(0.115)		
Age at Death (in months)	67	4.433	621	5.615	688	-1.182
		(1.393)		(0.599)		
Father away from home (Days)	199	6.392	1696	6.426	1895	-0.034
		(0.740)		(0.223)		
Age at First Birth (Father)	474	24.114	3352	23.442	3826	0.672***
		(0.207)		(0.074)		

Significance: ***=.01, **=.05, *=.1

Table 8

Impact of the 2015 Earthquake on Female Infant Death

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Post 2015 x Treatment District x Female	-0.0484*	-0.0517**	-0.0527**	-0.0515**	-0.0784**
	(0.0252)	(0.0258)	(0.0260)	(0.0256)	(0.0360)
Post 2015 x Female	-0.00197	-0.00258	-0.00191	-0.00241	0.00192
	(0.00754)	(0.00750)	(0.00752)	(0.00751)	(0.0109)
Treatment District x Female	0.00723	0.00993	0.0101	0.0106	0.0197
	(0.0125)	(0.0125)	(0.0126)	(0.0124)	(0.0165)
Post 2015 x Treatment District	0.0347*	0.0406**	0.0404*	0.0399*	0.0663**
	(0.0204)	(0.0206)	(0.0207)	(0.0205)	(0.0289)
Sex	0.000190	0.0000925	-0.000340	-0.0000716	-0.00824
	(0.00436)	(0.00434)	(0.00435)	(0.00433)	(0.00630)
Post Earthquake	-0.00471	-0.00467	-0.0201**	-0.0197**	-0.0356***
	(0.00563)	(0.00559)	(0.00830)	(0.00832)	(0.0111)
Earthquake-Affected Districts	-0.0122	0.0243	0.0251	0.0269	0.0450
	(0.00757)	(0.0238)	(0.0232)	(0.0229)	(0.0367)
Observations	15281	15281	15281	15281	6773
Controls	NO	NO	NO	NO	YES
District FE	NO	YES	YES	YES	YES
Year FE	NO	NO	YES	YES	YES
Mother's Age FE	NO	NO	NO	YES	YES

Standard errors in parentheses
p* < 0.1, **p < 0.05, **p*** < 0.01

Table 9

Impact of the 2015 Earthquake on Female Infant Death (Severely Hit Districts)

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Post 2015 x Severe Treatment District x Female	-0.0515	-0.0521	-0.0532	-0.0510	-0.122**
	(0.0431)	(0.0437)	(0.0440)	(0.0443)	(0.0583)
Post 2015 x Female	-0.00197	-0.00258	-0.00201	-0.00267	0.000853
	(0.00754)	(0.00750)	(0.00752)	(0.00753)	(0.0109)
Severe Treatment District x Female	0.00173	0.00302	0.00278	0.00243	0.0288
	(0.0179)	(0.0179)	(0.0178)	(0.0176)	(0.0224)
Post 2015 x Severe Treatment District	0.0475	0.0499	0.0501	0.0477	0.108**
	(0.0352)	(0.0351)	(0.0353)	(0.0357)	(0.0461)
Sex	0.000190	0.0000925	-0.000259	0.000116	-0.00768
	(0.00436)	(0.00434)	(0.00435)	(0.00433)	(0.00631)
Post Earthquake	-0.00471	-0.00467	-0.0205**	-0.0204**	-0.0371***
	(0.00563)	(0.00559)	(0.00852)	(0.00855)	(0.0113)
Severely Affected Districts	-0.00819	0.0251	0.0265	0.0289	0.0379
	(0.0108)	(0.0236)	(0.0230)	(0.0227)	(0.0337)
Observations	14351	14351	14351	14351	6287
Controls	NO	NO	NO	NO	YES
District FE	NO	YES	YES	YES	YES
Year FE	NO	NO	YES	YES	YES
Mother's Age FE	NO	NO	NO	YES	YES

Standard errors in parentheses
*p < 0.1, *p* < 0.05, *p**< 0.01

Figure 1

Mean Infant Death by Birth Year for Treatment and Control Groups

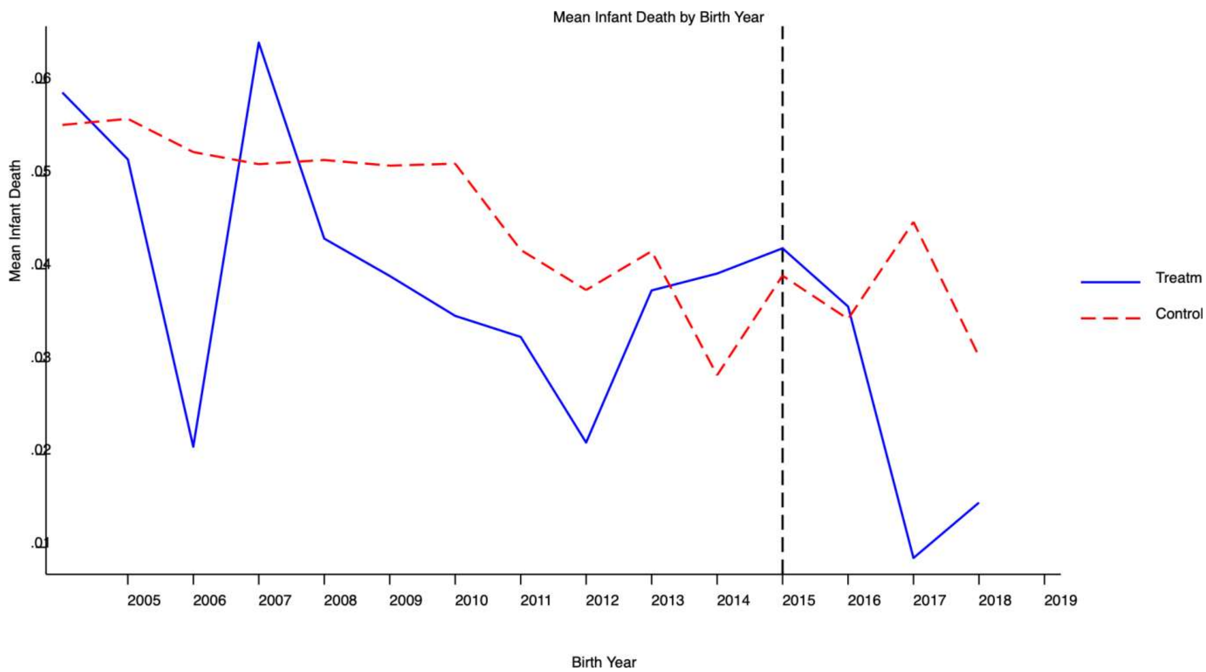

Figure 2

Detrended Infant Death by Birth Year for Treatment and Control Groups

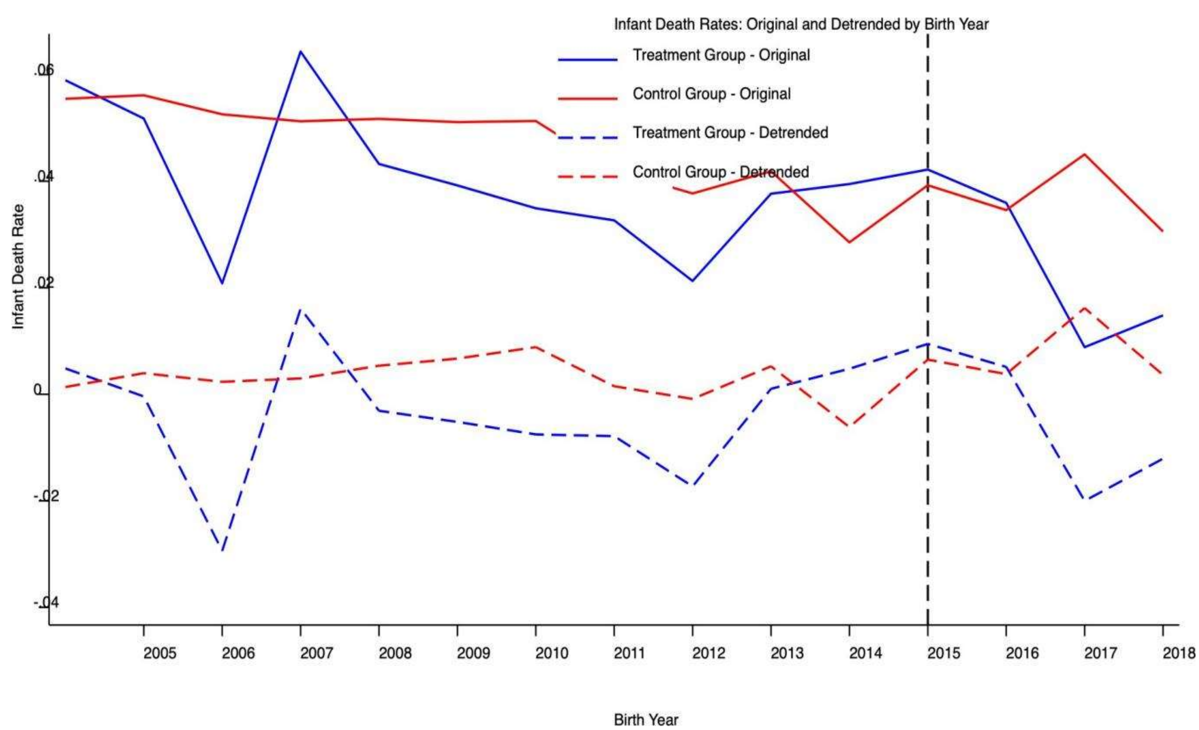

Figure 3

Female Infant Death by Birth Year for Treatment and Control Groups

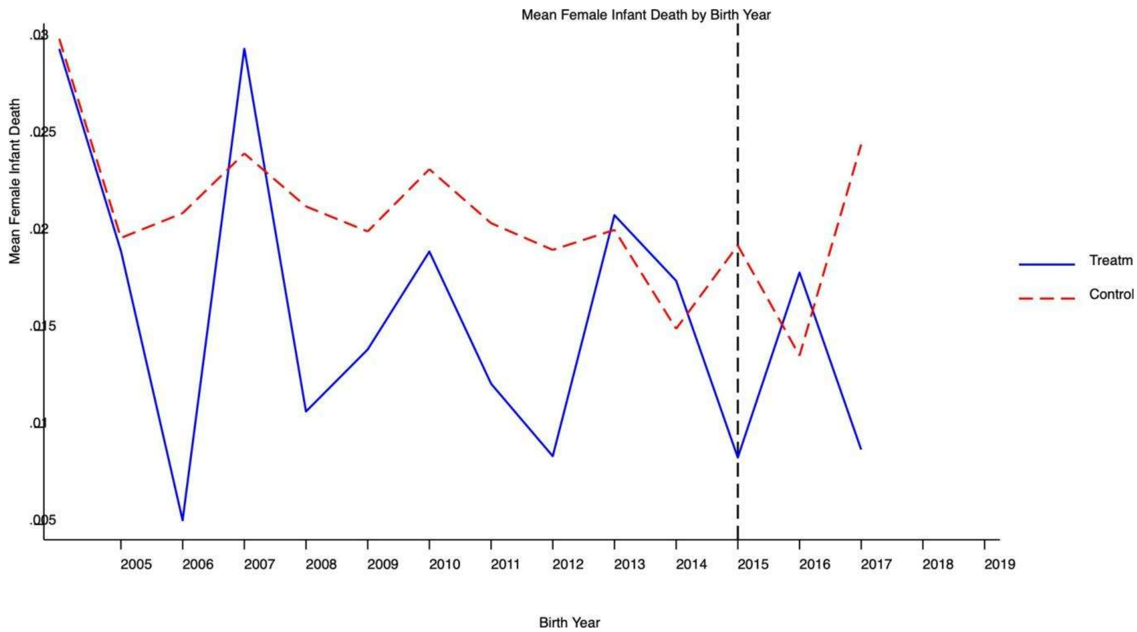

Figure 4

Male Infant Death for Treatment and Control Groups

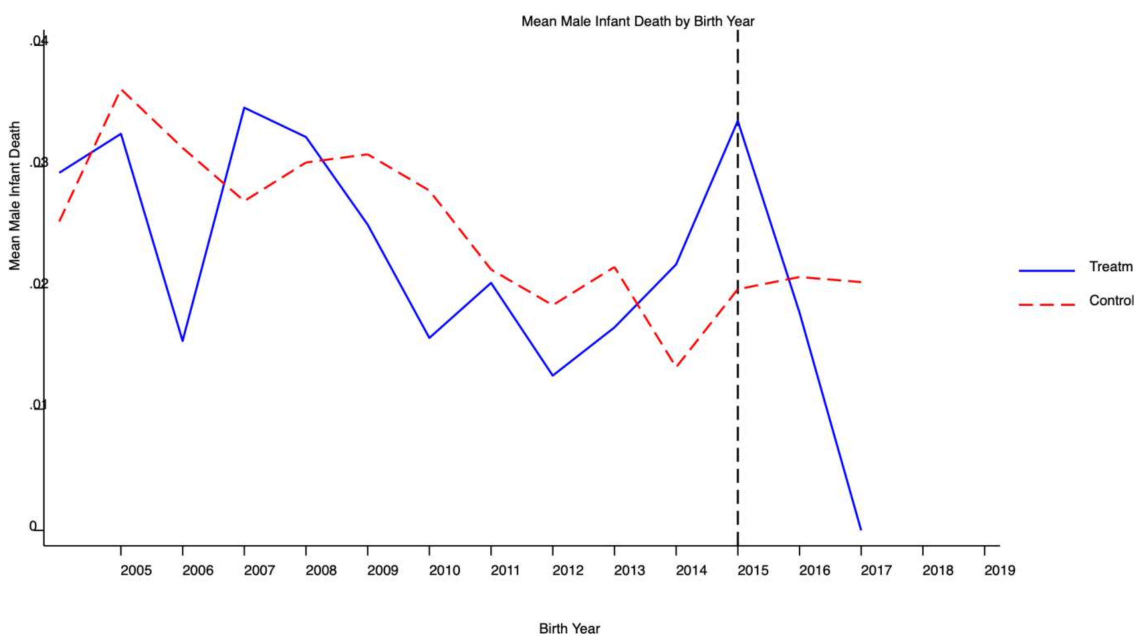

Figure 5

Female-Male Ratio at Birth Year for Treatment and Control Groups