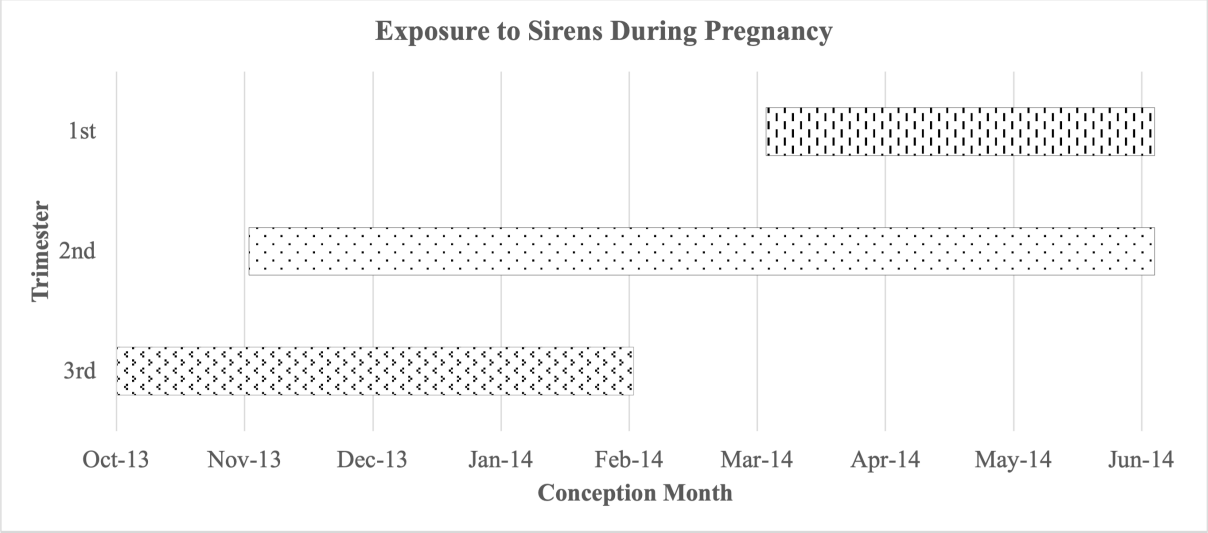
Figure 4: Potential Siren Exposure by Conception Month



Notes: This figure plots the potential exposure to sirens during each of the pregnancy trimesters by month of conception. This exposure is conditional on experiencing sirens during one's town of residence during the relevant dates.

Appendix

A Siren Exposure by Conception Month

B Migration Balance following Operation Protective Edge

As discussed in Section 3, our data has the limitation of observing maternal locality only during birth, as opposed to when OPE actually occurred. To verify that this does not bias our results due to potential migration across localities in the aftermath of OPE, we test whether locality migration balances following OPE - during 2015 - were correlated with the number of sirens experienced in each locality. Table 8 presents regression results for a sample of localities with the migration balance per 1000 residents in 2015 as the dependent variable and the number of sirens during OPE as the explanatory variable. The first column presents results for all Jewish localities and the second column presents results for localities that had non-zero sirens during OPE.

The source for migration balance data is from the Israel CBS. We note that the CBS migration balance data was only available for towns and cities and not smaller localities in Israel, which represent a large fraction of the localities in our data for southern Israel. As such, we tested for the correlation across all towns in Israel, rather than just towns from southern Israel, as this would have reduced the sample to solely 12 towns and cities. We only used Jewish towns and localities because of the large amount of Arab towns and cities in northern Israel that both experienced no sirens during OPE and have extremely low

Table 8: Migration Balances following Operation Protective Edge and Sirens

	Dependent Variable: Locality Migration Balance per 1000 Residents	
	All Localities	Localities with Non-Zero Sirens
Number of Sirens During Operation Protective Edge	0.096	0.047
	(0.076)	(0.053)
Observations	123	89
Mean of Dependent Variable	2.455	4.826

Notes: Migration balance data is from the Israel CBS for the year 2015. The sample of localities is all Jewish localities with 2015 migration balance data available in all of Israel. The coefficient estimates are from OLS regressions.

migration balances due to the Arab population being largely immobile in terms of migration in Israel.

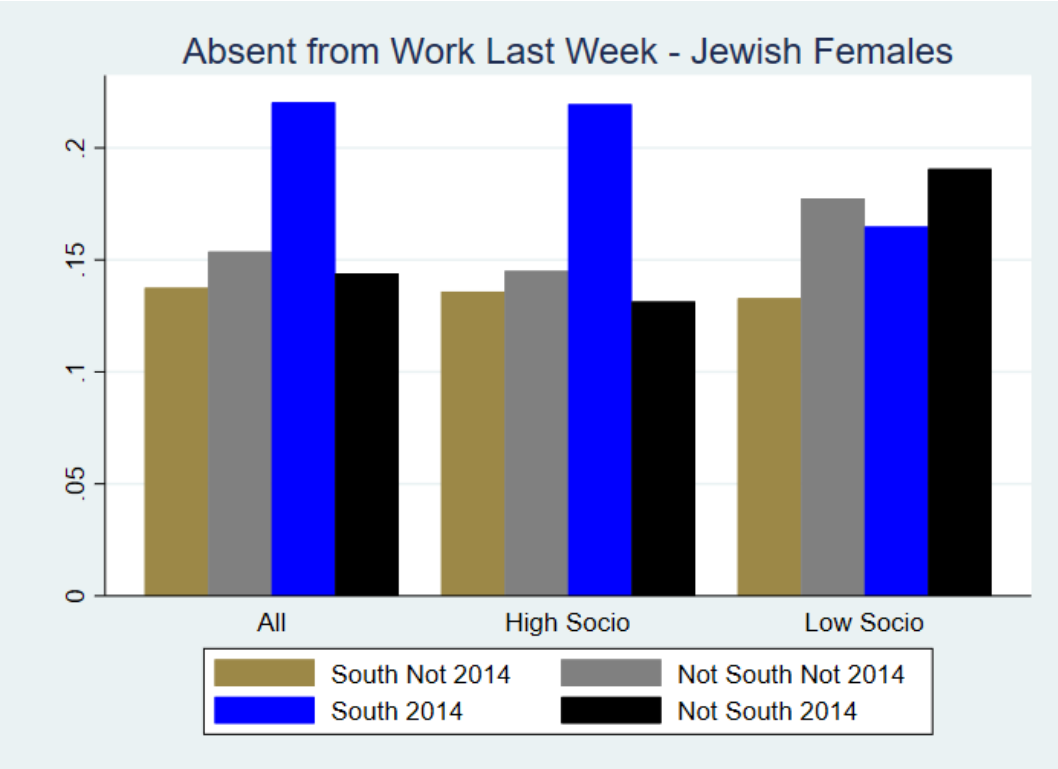
The results in Table 8 do not show a statistically significant relationship between locality migration balances during 2015 and the number of sirens during OPE. The p-value for the coefficient estimates are 0.21 and 0.38 for the first and second columns of Table 8, respectively.

C Absence from Work during OPE

As discussed in Section 2, absence from work increased during OPE, as outdoor activities - including reaching one's work - involved a risk and child care services were suspended. The existent literature on the effects of absence from work during pregnancy on birth outcomes is not concise. Nevertheless, in Figure 5, we use data from the Israel Labor Force Survey (LFS) to demonstrate large changes in female absence from work during OPE, and that these changes appear to have been more pronounced among mothers ranked higher socioeconomically. If absence from work during pregnancy improves birth outcomes, then this could also be an underlying mechanism driving improvements in birth outcomes among mothers ranked higher socioeconomically.

We note that this is merely speculative, and a more thorough analysis would examine pregnant women's responses in terms of absence from work to sirens in their locality. However, the number of identified pregnant women in the LFS is very small, and an analysis we performed to evaluate changes in absence from work specifically among pregnant women in response to OPE sirens in their localities was inconclusive.

Figure 5: Female Absence from Work during OPE



Notes: Data is from the Israeli Labor Force Survey restricted-use data files for the years 2012-2015, responses from July through early September. The sample consists of females and males ages 20-45. The sample includes all survey respondents, including those who do not participate in the labor market. The sample is limited to individuals in the following districts: South, Jerusalem, Haifa and North, but excludes individuals residing in the Gaza Envelope. High Socio implies individuals residing in localities with a socioeconomic ranking of 5 or greater (from a scale of 1-10). Number of observations is 14,700, 8,316, and 4,838 for females All, High Socio, and Low Socio, respectively.

D Siren Distribution based on Maternal Locality Socioeconomic Ranking

Figure 6 is the same as Figure 1, only separate for low and high socioeconomically ranked maternal locality. The figure demonstrates that the distribution of exposure to sirens during each trimester does not vary substantially across socioeconomic ranking.

E Response to Sirens - Additional Dependent Variables

We lend support to our results regarding differential effects of sirens based on socioeconomic status by presenting results for other birth outcomes available in our data: the probabilities of a c-section, the child being born with a birth defect, early water breaking prior to delivery, and being born small for gestational age (SGA),[24] as well as the Apgar score given to the newborn 5 minutes after birth. Table 9 exhibits both beneficial and adverse effects of sirens on birth outcomes. However, all improved birth outcomes in response to sirens are among mothers from localities ranked high socioeconomically and in response to sirens during the first and second trimester - the probabilities for c-sections and birth defects decrease. This is consistent with the results in Table 3 that also demonstrate improved birth outcomes primarily among mothers from localities ranked high socioeconomically and in response to sirens during the first and second trimesters.

There is also evidence of adverse effects among mothers from localities ranked high socioeconomically in terms of the probability of birth defects, the Apgar 5 score, and the probability for SGA. Mothers from localities ranked low socioeconomically also had a greater probability of a birth defect and lower Apgar 5 scores in response to sirens during the third trimester and a higher probability of being SGA in response to sirens during the first trimester.

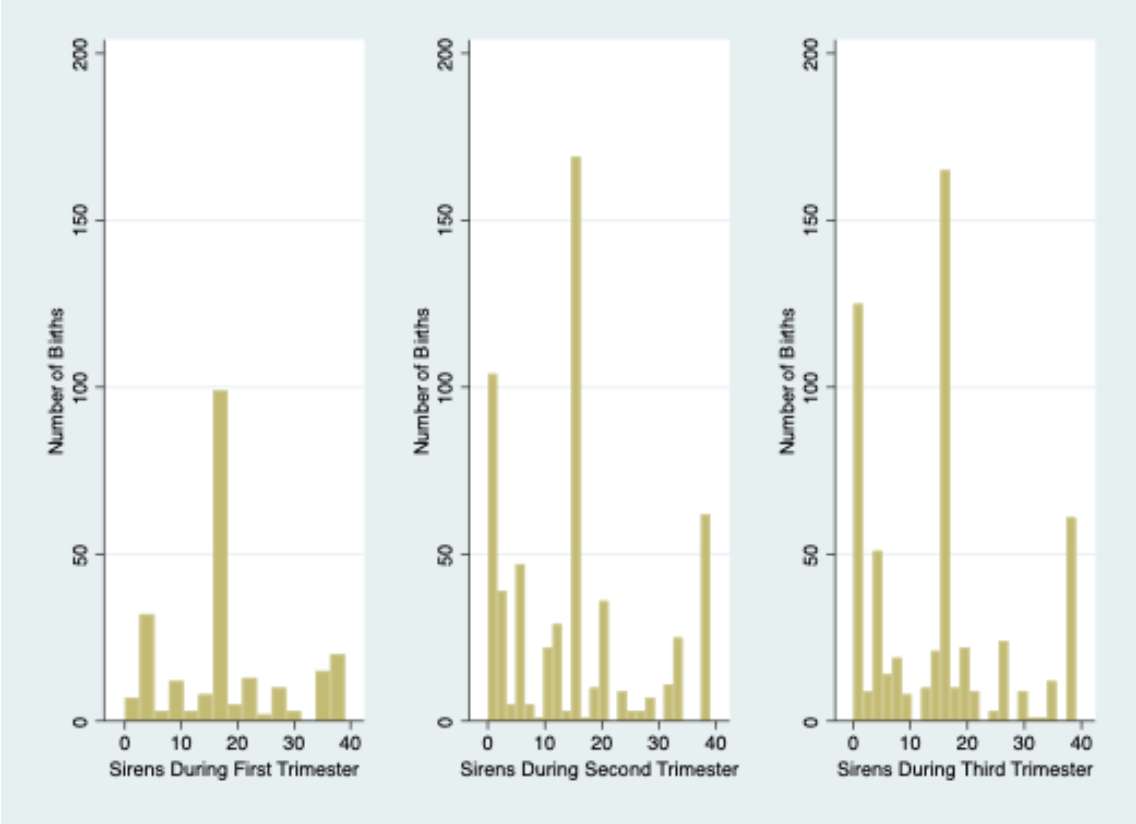
F Regressions with Maternal Fixed Effects

As stated in Section 5, our data enable us to run regressions with maternal fixed effects. Maternal fixed effects are advantageous in terms of alleviating concern for maternal selection for pregnancies during OPE. However, the decreased variation through which the coefficients are estimated can inflate the standard errors such that the results become non-informative. Unfortunately, the maternal fixed effects regression results presented in Table 10 do not allow us to conclude meaningfully concerning the effect of sirens on birth outcomes, and much of this is due to large standard errors. Of the 24 coefficient estimates for the four variables of interest in Table 10, four are statistically significant at the 10 percent level. However, only two of these are consistent with the results in Table 3. There are several additional point estimates in Table 10 that are very similar to those in Table 3 - low socio first trimester birth weight response, high socio first

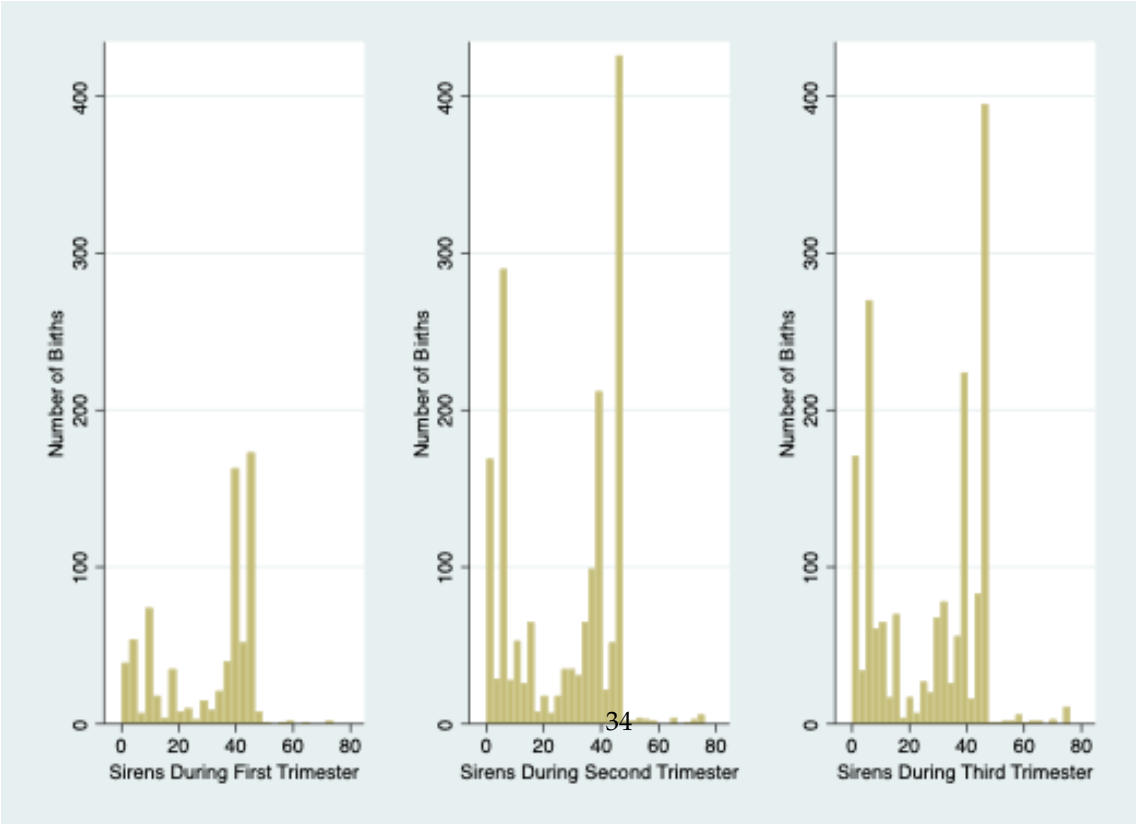
[24] Being born small for gestational age is a clinical term used for births that have a low weight - below the 10^{th} percentile - relative to their pregnancy length.

Figure 6: Siren Distribution based on Maternal Locality Socioeconomic Ranking

(a) Maternal Localities Ranked Low Socioeconomically



(b) Maternal Localities Ranked High Socioeconomically



Notes: Notes: The sample is limited to all Jewish births in Soroka Hospital conceived during 2013 and through the first half of 2014 with gestation length of at least 180 days and residents of localities in Southern Israel. Each histogram is limited to births that were exposed to OPE during the relevant trimester. The number of births is smaller for first trimester exposure to OPE due to the exclusion

Table 9: Siren Exposure and Additional Birth Outcomes

	C-Section	Birth Defects	Early Water	Apgar5	SGA
Sirens - Trimester 1 - Low Socio	0.002	0.001	0.000	-0.001	0.002**
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Sirens - Trimester 2 - Low Socio	-0.001	-0.001	0.002	-0.000	-0.000
	(0.001)	(0.002)	(0.001)	(0.004)	(0.000)
Sirens - Trimester 3 - Low Socio	-0.001	0.001***	0.001	-0.004**	0.001
	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)
Sirens - Trimester 1 - High Socio	-0.001**	-0.001*	0.001**	-0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Sirens - Trimester 2 - High Socio	-0.001**	-0.001***	0.001***	-0.000	0.001*
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Sirens - Trimester 3 - High Socio	-0.000	0.000	-0.000	-0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,467	13,467	13,467	13,335	13,467
Mean Dependent Variable - Low Socio	0.194	0.0713	0.117	9.933	0.124
Mean Dependent Variable - High Socio	0.166	0.0684	0.128	9.922	0.116
Conception Month Fixed Effects	✓	✓	✓	✓	✓
Birth-Specific Controls	✓	✓	✓	✓	✓
Conception Year-Locality FE's	✓	✓	✓	✓	✓

Notes: The number of localities is 84. Low (High) Socio indicates that the siren count variable for each trimester is interacted with an indicator variable for the mother's residence being ranked 5 or less (6 or more) in the CBS official socioeconomic ranking of towns. Based on this, 17 towns are ranked low socioeconomically, representing 3,317 of the total number of observations. See Section 3 for information on the sample. The coefficient estimates presented are from a variation of equation (1), as discussed in Section 4. Birth-specific controls are: mother's age at birth (categorical), mother's age (categorical), child sex, maternal abortion history, birth parity (categorical), high fertility, past cesarean delivery, late pregnancy loss in the past, and infertility treatment. Mean of Dependent Variable is the mean for non-OPE births in the sample. Standard errors are clustered at the locality level. *** p<0.01, ** p<0.05, * p<0.1

trimester gestation length response, and first trimester low birth weight response - only the standard errors are substantially larger, and as such, they are not statistically significant.

An additional concern with our maternal fixed effects specification is that all pregnancies experiencing OPE sirens have each mother's highest birth order, as the latest conception month in the sample is June 2014. This could bias the effect of sirens upwards, as it has been shown that higher birth order is associated with better birth outcomes (Brenøe and Molitor (2018)).

Table 10: Birth Outcomes and Sirens Exposure - Including Maternal Fixed Effects

	Birth Weight	Gestation Length	LBW	Preterm
Sirens - Trimester 1 - Low Socio	-4.901	-0.179	0.002	0.006**
	(4.370)	(0.147)	(0.002)	(0.003)
Sirens - Trimester 2 - Low Socio	2.465*	-0.031	-0.002	0.001
	(1.368)	(0.043)	(0.001)	(0.001)
Sirens - Trimester 3 - Low Socio	0.360	-0.025	0.000	-0.001
	(1.374)	(0.037)	(0.002)	(0.002)
Sirens - Trimester 1 - High Socio	2.132**	0.040	-0.000	0.001
	(1.068)	(0.024)	(0.001)	(0.001)
Sirens - Trimester 2 - High Socio	0.870	-0.039*	0.000	0.001
	(0.841)	(0.023)	(0.001)	(0.001)
Sirens - Trimester 3 - High Socio	-0.682	0.013	-0.000	-0.000
	(0.910)	(0.030)	(0.001)	(0.001)
Observations	8,179	8,179	8,179	8,179
R-squared	0.74	0.65	0.58	0.61
Mean Dependent Variable - High Socio	3212	273.3	0.0755	0.129
Mean Dependent Variable - Low Socio	3224	273.1	0.0573	0.122
Conception Year Fixed Effects	✓	✓	✓	✓
Conception Month Fixed Effects	✓	✓	✓	✓
Birth-Specific Controls	✓	✓	✓	✓
Locality Fixed Effects	✓	✓	✓	✓
Mother Fixed Effects	✓	✓	✓	✓

Notes: Number of localities is 79. Number of mothers is 3,896. Sample is births conceived during 2007, 2010, 2011, 2013, and 2014 through June with gestation length of at least 180 days and residents of localities in Southern Israel. All regressions exclude mothers with single births during the sample period. The coefficient estimates are from a variation of equation (1), as discussed in Section 4. Birth-specific control include: mother's age at birth (categorical), mother's age (categorical), child sex, maternal abortion history, birth parity (categorical), high fertility, past cesarean delivery, late pregnancy loss in the past, and infertility treatment. Mean of Dependent Variable is the mean for non-OPE births in the sample. Standard errors are clustered at the locality level. *** p<0.01, ** p<0.05, * p<0.1