Online appendix for "Is High-Tech Care in a Middle Income Country Worth It? Evidence from Perinatal Centers in Russia"

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I. Obstetrics Care in Russia

In 2005-2006 the Russian government divided the nation's hospitals into three levels: level I (obstetrics divisions of sub-provincial district (rayon) hospitals with less than 30 beds, with 14.6 percent of all deliveries taking place in these hospitals in 2012), level II (cross-rayon and city hospitals, maternity units in large city hospitals and rayon perinatal centers, together accounting for 62.5 percent of all births in 2012), and level III (regional maternity houses, maternity centers linked to university medical facilities, and perinatal centers, making up 5.2 percent of all maternity hospitals and hosting 22.9 percent of all births in 2012).[1] The level of a maternity hospital is determined according to the capacity to provide care under various levels of health risks to mother and infant. Perinatal centers can be in both groups II and III, and hospitals other than perinatal centers can be in groups II and III. Thus, group III does not exclusively contain all perinatal centers. However, the 24 centers that were built in 2009-2012 are exclusively in the 3rd group. The level of the maternity hospital is determined according to the capacity to provide care under various levels of health risks to mother and infant.

Most measures in the obstetrics reform within National Health Project targeted level III hospitals and concurrently reduced obstetrics beds elsewhere owing to the gradual closure of level I obstetrics units (Starodubov and Sukhanova, 2013), which has given rise to a debate as to which structure of obstetrics care is best. The change in the role of remaining hospitals of levels I and II in emergency care is increasingly focused on re-routing patients to level III hospitals (Sychenkov and Sukhanova, 2012), and this practice may reduce the ability of such hospitals to provide emergency care in the most urgent situations.

On the one hand, given the climactic and geographic features of the Russian Federation, which can mean sometimes having the distance to a 3rd level hospital exceed 500 kilometers and taking three hours in travel time (Starchenko, 2010), it is risky to shift the weight of obstetric care from a local smaller units to perinatal centers in the capital cities, as Sychenkov and Sukhanova (2012) argue. In a detailed study of Obninsk maternal hospital, the authors argue that sufficient reductions in maternal and infant mortality can

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[1] Starodubov and Sukhanova (2013); Filippov and Guseva (2010)

be achieved with a shared emergency unit between obstetrics and neonatology within a level II hospital.

Conversely, Filippov and Guseva (2010) argue that targeting resources to the central perinatal hospitals is key to improving the mother and infant health outcomes, and provide evidence of a strong negative correlation between mother's mortality and the share of the births in maternal hospitals of level I. Specifically, the average level of maternal mortality in the regions with more than 30 percent of births in level I units exceeded that of those regions that had less than 30 percent of births in level I hospitals on average during 2005-2007. Strikingly, maternal mortality is 2.6 times more likely in a level I unit than in any other unit. However, the authors do not consider the effects of removing such units all else equal; these might increase the risk of maternal mortality and infant death to a much higher degree because of reduced accessibility to basic obstetrics care.

A. Birth Accounting in Russia

Not only has recorded Russian infant mortality been higher than most of the EU countries, but a more narrow definition of a life births and stillbirths meant that Russia historically has reported lower infant death numbers. Moreover, the high thresholds for a live birth made it convenient to transfer some marginal delivery cases into categories that were not 'target indicators' for national statistics (stillbirths) or not counted at all as part of national vital statistics records (late abortions). Consequently, the true picture until very recently almost certainly is worse than that officially reported.

WHO (from its *Health for All* database) defines live births and stillbirths as events occurring irrespective of duration of pregnancy and with the difference between a live birth and stillbirth being the certain signs of life that the fetus shows after exiting its mother's body.[2]. The permitted lower bound for recording a fetal death is a death during the perinatal period. 'The perinatal period commences at 22 completed weeks (154 days) of gestation (the time when birth weight is normally 500 g), and ends seven completed days after birth.' (WHO, *Health for All database* definitions). Whatever happens before 22 weeks of pregnancy is designated a miscarriage or abortion.

As defined by WHO, infant mortality, neonatal and early neonatal mortality are the deaths per 1000 live births within the first year, month and week, respectively. Perinatal mortality accounts for all fetal losses in the gestational period between 22 weeks from conception and up to the end of the first week after birth, per 1000 still- and live born infants.

[2]According to WHO, a live birth is 'the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - for example, beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached'. Each product of such a birth is considered live born: a fetal death, which we synonymously term *stillbirth*, is 'death prior to the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy and which is not an induced termination of pregnancy. The death is indicated by the fact that after such expulsion or extraction, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.'

The definitions of birth events in pre-2012 Russia were: live born (or stillborn) infants are the infants with the mass of 1000 grams or more, or, if weight is unknown, 35 cm or more in length, or with duration of pregnancy of 28 weeks or more, or those weighing 500 grams or more in the case of multiple fetuses. In addition, infants weighing 500-1000 grams were recorded as live births only if they survived for more than 168 hours (Ministry of Healthcare of the Russian Federation, 1992). Thus, for infants meeting these criteria and who did not survive, the only official difference between a live birth and a stillbirth was whether or not the infant showed any of the signs of life listed in the WHO definition. However, in pre-2012 Russia, the two necessary conditions for officially recording any birth were: 1) its weight exceeds 1000 grams 2) its gestation period exceeds 28 weeks; the only case in which they did not have to be met was if infant survived 168 hours. If an infant was born either on the 27th week of gestation, or weighed 999 grams dead or alive and did not survive for 168 hours, it was not included into the official statistics and was signed off as a miscarriage. Importantly, the complications of the mother due to such a birth outcome were also, as a result, omitted in the health statistics, as they no longer were associated with *birth* (Starodubov and Sukhanova, 2013). Since infant mortality has always been a target indicator for Russia by which healthcare performance is measured, as opposed to stillbirths, healthcare providers and officials had an obvious motivation to move marginal live births to less noticed stillbirths (Kvasha and Khar'kova, 2012), and since there was an additional opportunity to completely omit the cases (usually with unfavorable complications for mother and deaths of an infant due to the limited definition of a birth) this created a temptation to undercount the marginal birth cases in two ways.

1) Recording a live birth as a stillbirth;

2) Failure to record in official statistics an infant born (alive or still) weighing not much more than 1000 grams or born slightly after the 27-week boundary.

3) Possibly aborting a fetus late-term if the pregnancy is likely to be of high risk for either mother or infant.

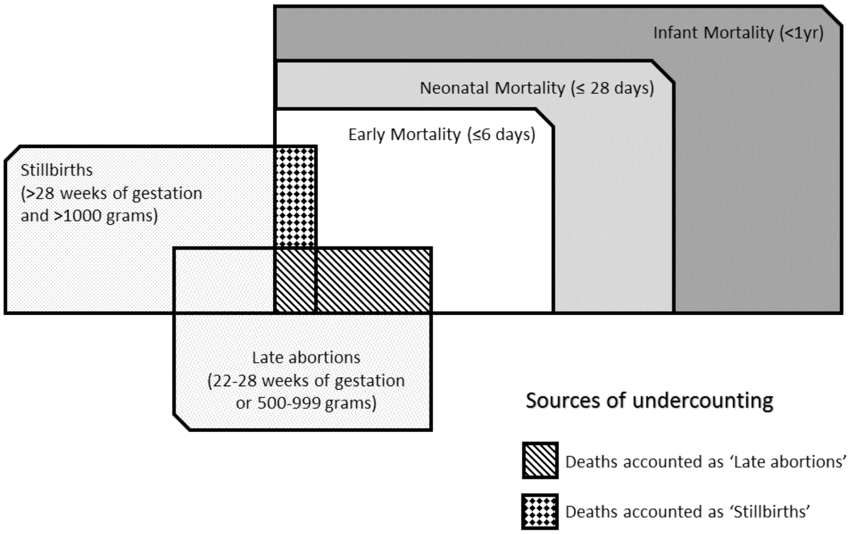
Figure 1 above displays the channels of undercounting.

Fortunately, for internal purposes, the Russian healthcare system tracks of all products of pregnancy born weighing 500-1000 grams and also those with the gestational periods of 22-27 weeks (with the two groups almost fully overlapping). Late abortion data also are available; we obtained access to some of these data and utilize them in our analysis.

B. New Rules and New Undercounting

One other significant event has coincided with the commissioning of new Perinatal Centers in the 24 regions. In April 2012, the Russian Healthcare Ministry has ordered new criteria for registering live births that are much closer to the WHO standard definition: a fetal discharge is considered a live birth if the fetus' weight is above 500 grams (as opposed to the earlier threshold of 1000 grams); in addition, termination of pregnancy that occurs

Figure 1. Sources of Undercounting of Mortality on Russia



from 22-27 weeks of pregnancy is now considered a live birth (while it was called a *late abortion* before 2012).[3]

As a result, in line with the previous hypotheses, in 2012 the official statistics reported a few interesting changes (as demonstrated in Starodubov and Sukhanova (2013)):

1) 17.6 percent increase in infant mortality in 2012, of which only 71.8 percent were accounted for by 500-1000 g infants. Noting that the overall infant mortality trend of the preceding years was declining, the remaining 28.2 percent increase in infant mortality is surprising;

2) A simultaneous sharp drop in late abortions at 22-27 weeks and a sharp increase in abortions at 12-22 weeks of pregnancy (the share of 22-27 week abortions in total pregnancies dropped from 0.60 percent to 0.34 percent, and the respective share of 12-22 weeks' abortions increased from 3.28 percent to 4.20 percent, both changes abruptly departed from the preceding smoothly declining trend;

3) A decline in the number of Extremely Low Birth Weight Infants (ELBW: 500-1000 grams) (from 15,692 in 2011 to 10,021 in 2012 and a decline of their share in live and stillbirths from 0.88 to 0.53 percent);

[3] Order of Ministry of Healthcare of Russia N1687 27.12.2011, as cited in Starodubov and Sukhanova, 2013.

4) An increase in the number of Very Low Birth Weight Infants (VLBW: 1000-1500 grams) from 11,347 to 13,676 and in their share in live- and stillbirths from 0.64 percent to 0.73 percent. This is the first time in recorded Russian history that the number of the VLBW has been larger than the number of ELBW infants.

C. *Behavioral response*

We believe the dynamics above, almost surely caused by the law change, have revealed certain practices, all under the plausible assumption that there were no other severe shocks to obstetric practices in 2012. Starting from observations (3) and (4), it is a standard biological pattern that the number of fetuses by weight follows a normal distribution (Salomon, Bernard and Ville, 2007; Starodubov and Sukhanova, 2013) and the fact that they followed an inverse relationship before 2012 can be explained by undercounting. Hospitals did not record terminations of pregnancy with the fetus weighing marginally more than 1000g as real children, but as fetuses, and, presumably, assigned a (false) weight of less than 1000g, preventing the case from entering official statistics as a live birth followed by early neonatal infant death.

Prior to 2012, the live birth criterion used to state that an artificial end to a pregnancy is called an abortion, before the viability of an infant was confirmed. Thus, the procedure for women who delivered infants who were not viable and had a mass close to 1000 grams was likely to be recorded as a *late abortion*. Moreover, in observation (1) it seems likely that much or all of the 28.2 percent of the increase in infant mortality in Russia after ELBW infants are netted out reflects more accurate childbirth registration, as argued in Starodubov and Sukhanova (2013). With the evidence from (1), (3) and (4), we infer that the average undercounting of infant deaths in Russia before 2012 was at least 28.2 percent based on old definitions.

From observation (2) we can conclude that re-shifting of marginal cases to the new *late abortions* (at 12-22 weeks) caused the reported reduction in pregnancy termination at 22-27 weeks. 72.4 percent of the increase in these new *late abortions* category were recorded as due to fetus birth defects and 15.5 percent due to maternal health reasons. Although the diagnosis of birth defects is constantly improving, such an abrupt shortening of termination of pregnancy terms is unlikely to be due to sharp improvements in diagnosis, even after many advanced perinatal centers have opened. As for stilbirths, the effect is inconclusive as shown in Figure 1: on the one hand, it may be overreported due to marginal neonatal deaths, and from another side underreported, if some stillbirths are placed into *products of late abortions* section.

A number of articles have addressed the problem of undercounting in Russia (Sukhanova (2011); Anderson and Silver (1986); Kvasha and Khar'kova (2012); Andreyev and Kvasha (2002)), and other countries (Gonzalez (2013); Anthopolos and Becker (2010); Penina, Meslé and Vallin (2011)). The authors propose different methods to correct the undercounting or estimate the mortality according to the WHO definition. Gonzalez (2013) adjusts the ratio of early neonatal mortality to fetal deaths. Andreyev and Kvasha (2002) identify unusual proportions of early neonatal deaths conditional on close-to-average perinatal mortality and an indicator for larger undercounting, and correct for it by including births with weights below 1000 grams. Penina, Meslé and Vallin (2011) project the absolute and proportional change of one-week and one-month mortality in 1973 when statistical guidelines in Moldova changed. Anderson and Silver (1986) also utilize the change in reporting rules in 1974 in the Soviet Union to adjust for undercounting.

II. Measurement error

We now analyze the possibility of differences in measurement by treatment. It is both a curse and a blessing that perinatal centers' opening have coincided with the statistics criteria change. On the one hand, the shifts in all mortality indicators in 2012 offer a clue as to the degree of underreporting in each region in the past as outlined in Appendix section I.B. On the other hand, it is possible that a new type of underreporting started taking place due to the new rules, just around the new threshold of 500 grams birth weight and 22 weeks of gestation, which is impossible to measure. The issue of undercounting is only a threat to the validity if it is systematically different in treated regions. It is reasonable that local authorities would encourage hospitals to demonstrate that the federal investment of about 2 billion rb per center was not in vain. At the same time, better statistical standards and more careful observation might be enforced inside the center itself, improving the reporting overall. In this case the bias is towards zero.

The occurrence of infants of a particular mass range is generally determined by biological characteristics of the mother. Hospitals themselves cannot immediately influence the distribution of infant and fetus weight. However, the way accounting is done in the hospital can affect the way these occurrences *are reported*. Before 2012 and after 2013 a region will be undercounting differently. Before 2012 the category of 1000-1500 g (VLBW) will be smaller relative to 500-999g (ELBW) and bunching will occur at 500-999g, because this "bin" would not have gone into the official statistics. In contrast, after 2012 the undercounting will happen around the new threshhold of 500g (arguably to a smaller degree, since there are fewer marginal cases at 500g). After 2012 the 1000-1500 category is expected to return to "normal", whereas the ELBW category would experience a proportional decline (both because new undercounting could potentially take place at 500g threshold and because previously marginal cases at 1000g would now be assigned a correct weight). The analogous logic applies to late abortions (22-28 weeks of gestation before 2012). Keeping the above in mind, we would like to determine whether the degree of undercounting is ever affected by the introduction of the center. We use three variables that can signal the undercounting and first test this for a subsample of perinatal center introductions before 2012. Equations 2 and 3 test whether the late abortions ($LateAbort_{r,t}$) or the share of 1000-1500g infants ($VLBW_{r,t}$) were affected by the introduction of the center in 2011. All regions that did not experience a change in perinatal center status in 2011 become part of the control group.

$$(1)\quad \begin{aligned} LateAbort_{r,t} =& \beta_0 + \beta_1 d2011 + \beta_2 Treat_{cohort_{11}} + \beta_3 Treat_{cohort_{11}} d2011 \\ &+ \beta_4 Z_{r,t} + \varepsilon_{r,t} \end{aligned}$$

$$(2)\quad \begin{aligned} VLBW_{r,t} =& \beta_0 + \beta_1 d2011 + \beta_2 Treat_{cohort_{11}} + \beta_3 Treat_{cohort_{11}} d2011 \\ &+ \beta_4 Z_{r,t} + \varepsilon_{r,t} \end{aligned}$$

$Treat_{cohort_{11}}$ stands for all the 11 centers that opened in early 2011 (or late 2010) and d2011 is the dummy for year 2011. The regression is run with all the controls and oblast fixed effects from the baseline model ($Z_{r,t}$). We find neither differential change of late abortions nor of the VLBW infants' share, and the results are reported in the Appendix (Table 2).

We then investigate changes in Extremely Low Birth Weight (ELBW) proportion for years 2010 and 2012 (the only two years we were able to obtain) and run an analogous specification for the cohort of nine regions that opened in 2012 ($Treat_{cohort_{12}}$), compared to all other regions as controls.

$$(3)\quad \begin{aligned} ELBW_{r,t} =& \gamma_0 + \gamma_1 d2012 + \gamma_2 Treat_{cohort_{12}} + \gamma_3 Treat_{cohort_{12}} d2012 \\ &+ \gamma_4 Z_{r,t} + \nu_{r,t} \end{aligned}$$

Assuming a normal true distribution of birth weights (Starodubov and Sukhanova, 2013), the share of 1000-1500 g births would increase and the share of 500-1000 g births would decrease, because bunching no longer happens at 1000g. Surprisingly, in Table 1, columns 1 and 3 illustrate that although 1000-1500g births increased as expected, the proportion of 500-750g births has increased to some extent as well. This suggests that undercounting in Russia had been even more severe prior to 2012, and many cases below 1000g were not accounted for even in the unofficial hospital statistics before 2012. The change in the policy has induced more accurate accounting of the lightest infants. In any case, the shares of birth weights for any birth weight group are not differentially affected by perinatal center opening.

Table 1—Test for Endogenous Undercounting, Birth Weights

	(1) % Births 500-749g	(2) % Births 750-999g	(3) % Births 1000-1499g	(4) % Births 1500-1999g	(5) % Births 2000-2499g	(6) % Births 2500-2999g	(7) ELBW share	(8) ELBWshare/LBWshare
PC Opening in 2012	0.0391	0.0176	0.0782	-0.0695	0.0191	0.0663	0.0567	0.0314
	(0.0247)	(0.0307)	(0.0479)	(0.0806)	(0.161)	(0.334)	(0.0465)	(0.0297)
Treated PC in 2012	0.105**	-0.0138	-0.0791	-0.235	-0.635*	-3.128***	0.0917	0.0730
	(0.0509)	(0.0634)	(0.0989)	(0.166)	(0.333)	(0.689)	(0.0959)	(0.0613)
Year Dummy 2012	0.0465***	0.00351	0.0841***	0.0384	0.00649	-0.232**	0.0500***	0.0145
	(0.00813)	(0.0101)	(0.0158)	(0.0265)	(0.0531)	(0.110)	(0.0153)	(0.00977)
Constant	0.0368	0.243***	0.668***	1.516***	4.307***	16.83***	0.280***	0.126***
	(0.0352)	(0.0438)	(0.0683)	(0.115)	(0.230)	(0.476)	(0.0663)	(0.0423)
Observations	166	166	166	166	166	166	166	166
R^2	0.642	0.644	0.796	0.806	0.875	0.930	0.623	0.545
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OblastFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

Table 2—Test for Endogenous Undercounting, Late Abortions

	(1) Delivery at 22-27 weeks	(2) % Born Dead at 22-27 Weeks	(3) LBW share (1000-2000g)	(4) VLBW share (1000-1500g)
PC Opening in 2011	5.168	7.851*	0.0354	-0.0311
	(9.070)	(4.160)	(0.118)	(0.0465)
Treated PC in 2011	380.4***	-21.63**	0.532*	0.266**
	(21.04)	(9.651)	(0.274)	(0.108)
Year Dummy 2011	9.915***	1.007	0.0479	0.0394**
	(3.449)	(1.582)	(0.0449)	(0.0177)
Constant	72.04***	69.05***	1.426***	0.430***
	(14.63)	(6.711)	(0.190)	(0.0750)
Observations	166	166	166	166
R^2	0.993	0.709	0.687	0.722
Controls	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

Table 3—Controlling for Lead1

	(1) 0-1 yr Mortality	(2) 0-28 days Mortality	(3) 0-6 days Mortality	(4) Perinatal Losses	(5) Stillbirths	(6) 28-365 days Mortality
Perinatal Center	-0.238	-0.311*	-0.215	-0.454*	-0.228	0.0725
	(0.200)	(0.162)	(0.132)	(0.266)	(0.209)	(0.0939)
Policy Lead 1	-0.244	-0.144	-0.115	0.0392	0.141	-0.0995
	(0.259)	(0.207)	(0.133)	(0.227)	(0.174)	(0.139)
Observations	378	378	378	378	378	378
R^2	0.445	0.374	0.319	0.449	0.434	0.305
OblastFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes
OblastTimetrend	No	No	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

Errors clustered at oblast level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Lead1 and Lead2 are variables in dicate the policy status on and two years ahead of the policy.

Table 4—Controlling for Lead2

	(1) 0-1 yr Mortality	(2) 0-28 days Mortality	(3) 0-6 days Mortality	(4) Perinatal Losses	(5) Stillbirths	(6) 28-365 days Mortality
Perinatal Center	-0.230	-0.301*	-0.206	-0.440	-0.223	0.0709
	(0.201)	(0.163)	(0.133)	(0.267)	(0.209)	(0.0936)
Policy Lead 1	-0.105	0.0208	0.0355	0.275	0.221	-0.126
	(0.236)	(0.179)	(0.103)	(0.210)	(0.167)	(0.136)
Policy Lead 2	-0.254	-0.303	-0.278	-0.433*	-0.149	0.0490
	(0.280)	(0.231)	(0.180)	(0.258)	(0.174)	(0.139)
Observations	378	378	378	378	378	378
R^2	0.447	0.378	0.324	0.452	0.435	0.305
OblastFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes
OblastTimetrend	No	No	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

Errors clustered at oblast level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Lead1 and Lead2 are variables in dicate the policy status on and two years ahead of the policy.

Table 5—Birth Rates in Treated and Neighboring Regions

	(1) Births per 1000 people	(2) Births per 1000 people	(3) Births per 1000 people	(4) Births per 1000 people
Perinatal Center	0.0728		0.0929	
	(0.108)		(0.125)	
Perinatal Center in Neighboring Oblast		-0.167		-0.145
		(0.173)		(0.207)
PC X Close to Border			-0.0619	
			(0.155)	
PC in Neighb. Oblast X Close to Border				0.0954
				(0.180)
Observations	378	210	378	174
R^2	0.567	0.468	0.567	0.469
OblastFE	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes
OblastTimetrend	No	No	No	No
Controls	Yes	Yes	Yes	Yes

Standard errors in parentheses

Errors clustered at oblast level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6—Sbstitution Effect Regression

	(1) Maternity Units	(2) Maternity Hospital, count	(3) Neonatologists per 1000 infants	(4) Midwives per 10000 wmn in fert age
Perinatal Center	9.004	-0.273*	0.547	0.0636
	(21.11)	(0.154)	(0.865)	(0.146)
Observations	378	378	378	378
R^2	0.250	0.151	0.186	0.199
OblastFE	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes
OblastTimetrend	No	No	No	No
Controls	Yes	Yes	Yes	Yes

Standard errors in parentheses

Errors clustered at oblast level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7—Perinatal Centers and Maternity Hospitals Interaction

	(1) 0-1 yr Mortality	(2) 0-28 days Mortality	(3) 0-6 days Mortality	(4) Perinatal Losses	(5) Stillbirths	(6) 28-365 days Mortality
Perinatal Center	-0.455	-0.543*	-0.243	-0.369	-0.121	0.0881
	(0.328)	(0.302)	(0.225)	(0.336)	(0.307)	(0.136)
Maternity Hospital, count	0.00623	0.0616	-0.00213	-0.0769	-0.0843	-0.0553
	(0.0740)	(0.0676)	(0.0567)	(0.115)	(0.0861)	(0.0356)
Mat. Hosp X Perinatal Center	0.0413	0.0553	-0.0119	-0.0149	-0.00226	-0.0140
	(0.0855)	(0.0758)	(0.0536)	(0.0670)	(0.0709)	(0.0315)
Observations	378	378	378	378	378	378
R^2	0.445	0.376	0.318	0.450	0.436	0.312
OblastFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes
OblastTimetrend	No	No	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

Errors clustered at oblast level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8—Change in Different Types of Doctors After Treatment

	(1) Ob Gyn per 10000 wmn in fert age	(2) Neonatologists, Count	(3) Midwives, Count	(4) Ob Gyn Doctors, Count
Perinatal Center	-0.0892	1.016	1.595	-7.915
	(0.0770)	(4.513)	(14.01)	(13.92)
Observations	378	378	378	378
R^2	0.103	0.074	0.246	0.022
OblastFE	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes
OblastTimetrend	No	No	No	No
Controls	Yes	Yes	Yes	Yes

Standard errors in parentheses

Errors clustered at oblast level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9—Perinatal Centers and Change in Neonatologists in the First Year of Treatment

	(1) 0-1 yr Mortality	(2) 0-28 days Mortality	(3) 0-6 days Mortality	(4) Perinatal Losses	(5) Stillbirths	(6) 28-365 days Mortality
Perinatal Center	-0.425*	-0.478**	-0.322*	-0.425	-0.0902	0.0523
	(0.212)	(0.196)	(0.166)	(0.289)	(0.207)	(0.109)
Change in Neonatologists in 1st yr of Treatment X PC	0.0220*	0.0185*	0.0127	0.00981	-0.00384	0.00348
	(0.0116)	(0.0110)	(0.00870)	(0.0147)	(0.0118)	(0.00496)
Observations	378	378	378	378	378	378
R^2	0.448	0.377	0.321	0.450	0.435	0.310
OblastFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes	Yes	Yes
OblastTimetrend	No	No	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

Errors clustered at oblast level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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