Outcomes of 17 137 Pregnancies in 2 Urban Areas of Ukraine

Ruth E. Little, ScD, Susan C. Monaghan, DrPH, Beth C. Gladen, PhD, Zoreslava A. Shkyryak-Nyzhnyk, MD, and Allen J. Wilcox, MD, PhD

ABSTRACT

Objectives. Frequent terminations of pregnancy and high rates of fetal loss have been reported, but not confirmed, in the former eastern bloc. A census of pregnancies in Ukraine, a former eastern bloc country, was conducted to determine the rates of these events.

Methods. All pregnancies registered in 2 urban areas were enumerated. During a 19-month period between 1992 and 1994, 17 137 pregnancies and their outcomes were recorded.

Results. Sixty percent of the pregnancies were voluntarily terminated, generally before the 13th week. In pregnancies delivered at 20+ weeks, fetal mortality was 29 per 1000, nearly 5 times the rate among Whites in the United States. There was a greater proportion of very early deliveries (20–27 weeks) in Ukraine, as well as higher death rates at all gestational ages. Perinatal mortality was estimated to be 35 per 1000, about 3 times the US rate.

Conclusions. This is believed to be the first study in the former eastern bloc to ascertain all of the clinically recognized pregnancies in a specified period and to determine their outcomes. The data document elevated reproductive risks in a former Soviet state. (*Am J Public Health.* 1999;89: 1832–1836)

There is evidence of a decline in public health in the countries of central and eastern Europe since the dissolution of the Soviet Union.[1] Maternal and infant health are reportedly compromised by frequent, repeated terminations of pregnancy; high rates of fetal loss; and increased infant morbidity and mortality.[2] This information is drawn largely from official and unofficial statistics that may be incomplete or biased; the true extent of risk is difficult to assess.

To explore the state of reproductive health in this region, we conducted a study in 2 urban areas of Ukraine, a newly independent country that was part of the former Soviet Union. There have been anecdotal reports of higher rates of reproductive problems and infant mortality in Ukraine, but there has been no systematic investigation of them to our knowledge. Here we describe the results of a population-based investigation of clinically recognized pregnancies and their outcomes.

Methods

We conducted a census of all pregnancies diagnosed in 2 study sites during a 19-month period. The study sites were the Left Bank (Dniprovski) region, one of 14 districts in the capital city of Kyiv (Kiev), and the city of Dniprodzerzhinsk, approximately 400 km southeast of Kyiv. Both sites had about a quarter of a million inhabitants in 1993.[3,4] They vary in demographic, economic, and ecological conditions, but both are highly industrialized urban areas.

These sites were chosen for the census because they are part of the area where the European Longitudinal Study of Pregnancy and Childhood[5] ("Longitudinal Study") is being conducted in Ukraine. This ongoing study attempts to enroll every woman who is seen for prenatal care in a targeted geographic area and who is expected to deliver during a specified time period. However, in Ukraine, women who did not plan to continue their pregnancy or who did not meet other criteria, primarily related to permanent residence in the area, were excluded. Our census defined a 19-month eligibility period that was the same as the Longitudinal Study cohort eligibility range (most recent menstrual period occurring between February 25, 1992, and July 23, 1994) to provide a population-based description of pregnancy outcomes at the 2 sites.

Enumeration Procedures

The clinically diagnosed pregnancies in the sites were divided into those that were ended by elective termination and those that were not ("continuing pregnancies"). The centralized nature of the Ukrainian health care system facilitated ascertainment of these pregnancies. All public medical care in Ukraine was provided at no charge during the study period, and there was virtually no private medical care. Women were assigned to a health care facility on the basis of their residence; services included prenatal care at the local polyclinic and delivery at the local hospital unless the case was complicated.

Ruth E. Little, Beth C. Gladen, and Allen J. Wilcox are with the National Institute of Environmental Health Sciences, Research Triangle Park, NC. Susan C. Monaghan is with the School of Public Health, University of Illinois, Chicago. Zoreslava A. Shkyryak-Nyzhnyk is with the Institute of Pediatrics, Obstetrics, and Gynecology, Kyiv, Ukraine.

Requests for reprints should be sent to Ruth E. Little, ScD, Epidemiology Branch, A3-05, National Institute of Environmental Health Sciences, PO Box 12233, Research Triangle Park, NC 27709 (e-mail: little1@niehs.nih.gov).

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Elective termination was legal, free, and accessible through 12 weeks' gestation. Terminations after this point were allowed for medical reasons or for social reasons, such as divorce or partner's death during the pregnancy, if a senior obstetrician-gynecologist approved. If a woman sought termination at another facility, she was required to obtain special documents from the local clinic and to undergo tests so that a record of the termination existed there. Illegal terminations were probably uncommon since early termination was readily available.

Several steps were taken to maximize ascertainment. At both sites, lists of eligible pregnancies were prepared by a single physician from clinic termination logs and medical records. We checked within and across lists to detect duplicates and serial pregnancies of the same woman by matching last name, date of birth, and date of delivery. We searched manually and by computer for other similar names. We stratified both termination and continuing pregnancy lists by month of most recent menstrual period to check for omission of records and to confirm that women on the lists fell within the period of study.

Difficulty in locating delivery records is the most likely source of error in the enumeration. The archives of the hospitals were difficult to access. There is no microfilm in Ukraine, nor is the location of records computerized, so locating original documents was an arduous process. Floods occurred in the archives of both sites during the study period. One archive was relocated, and another was closed. Because of these difficulties, we compiled 2 separate and independent inventories of all available hospital records, several months apart.

Variables

The following information was collected for the pregnancies at the 2 sites: study site, mother's name and date of birth, most recent menstrual period or estimated date of conception, pregnancy outcome, date of termination–delivery, and gestational age at termination–delivery (for some terminations, date or gestational age, but not both, was listed). Pregnancy outcome and gestational age at which it occurred were the primary variables in this study.

Outcome of pregnancy. For continuing pregnancies, a live birth was defined, according to World Health Organization (WHO) criteria, as one in which "the fetus is expelled or extracted from the mother, regardless of the duration of pregnancy, after which the child breathes or shows any other sign of life, such as heartbeat, pulsation of the umbilical cord, or voluntary muscular movement."[6] Because this was not the customary definition of live birth in Ukraine, we monitored adherence to the WHO definitions by clinicians and record abstractors throughout the duration of the study.

Several checks were made to increase the accuracy of the outcome data. When the woman was not a Longitudinal Study participant, we attempted to determine the missing outcome by returning to the medical records and contacting the woman. If the woman was a Longitudinal Study participant, additional information was available from the study records. In every case of a reported adverse outcome, the medical record was reviewed to confirm the loss and the gestational age at which it occurred and to verify that the loss was spontaneous.

Gestational age. In continuing pregnancies, gestational length was calculated as number of completed weeks from most recent menstrual period to date of delivery. Most recent menstrual period was determined by the woman's report during her first visit to the Women's Consultation Clinic. If no data on most recent menstrual period were available in the record, estimates were made according to a systematic protocol that incorporated gestational information from all available sources. Date of delivery and a clinical gestational age estimate made after the birth were derived from an abstract of the pregnancy outcome that was sent to the antenatal clinic by the hospital. For terminations before 13 weeks, gestational age was taken from the clinic records or from estimated date of conception established by physical examination.

There was concern that some of the women might have misstated the timing of their most recent menstrual period to gain pregnancy benefits, which are increased with longer gestation. Therefore, in continuing pregnancies, gestational age estimates based on most recent menstrual period were checked against the hospital's clinical estimates; we expected that clinical estimates of gestations would be shorter than estimates based on most recent menstrual period if this bias were present. We compared these 2 values in women who were Longitudinal Study participants, because there were multiple sources of information available that could help to resolve discrepancies.

Gestational age was grouped into 7 categories. Ninety percent of the Longitudinal Study subjects had a category of clinical gestation that was closer to term (38–42 weeks) than the category based on the most recent menstrual period estimate. Among women who were not Longitudinal Study participants, the same tendency of the clinic estimate of gestation to be closer to term than the most recent menstrual period estimate was seen; this tendency has been reported by others.[7] Fewer than 3% of clinical estimates of gestational age were more than one category removed from the most recent menstrual period estimate. There was no evidence that women routinely reported a most recent menstrual period that was earlier than its actual date; therefore, this estimate was the basis for gestational age in the present study. Gestational age data based on most recent menstrual period were available for 96% of continued pregnancies.

Substudy on Complete Ascertainment of Outcome

After delivery of all registered pregnancies, outcome data were still missing for 353 potential cases. While this represents only 2% of all clinically diagnosed pregnancies, mortality rates are based on relatively few numbers of deaths and thus can change sharply with the omission of just a few subjects. We were concerned that women with missing outcomes might have had high-risk pregnancies with an increased probability of death. Therefore, we conducted a substudy to determine the reasons for missing outcomes.

In 145 cases, we found that the women had moved or obtained prenatal care in another area. The move was the probable reason for the missing outcome, because the distance between facilities limited communication. It was unlikely that these pregnancies were particularly high risk. From the remaining 208 pregnancies, we chose a sample of 48 women stratified by most recent menstrual period. These 48 women were the focus of intensive follow-up efforts, while routine efforts to determine outcomes for the remaining cases continued. The intensive follow-up revealed that 19 of the 48 missing outcomes were due to duplicate identity, an error usually caused by hyphenated or changed names or by misspelling. This finding led us to search for and eliminate other possible cases of double counting in the larger study.

Another 13 women either had never been pregnant or had most recent menstrual period estimates outside the boundaries of the study. Thus, the 48 missing outcomes yielded only 16 eligible pregnancies. In 4 of these 16 cases, the women had moved out of the area, 7 had delivered live births, one had had a spontaneous abortion at 17 weeks, and another had had a spontaneous abortion at an unknown gestation. The remaining 3 women could not be located, even via personal visit to their home. We infer from these results that the missing outcomes in this population are not necessarily those of high-risk women whose pregnancies would

involve substantially increased probabilities of fetal death.

Results

During the period under study, 17137 pregnancies were registered in the target area: 5189 in Kyiv and 11948 in Dniprodzerzhinsk. Sixty percent (n = 10363) ended in induced abortion; all but 102 of these terminations occurred during the first 12 weeks of gestation. Terminations were more frequent in Dniprodzerzhinsk (63%) than in Kyiv (54%).

Among the remaining 6774 ongoing pregnancies, maternal age at most recent menstrual period ranged from 13 to 45 years; nearly one fifth of the women were 18 years or younger (Table 1). Half of the women with known gestation at their first visit began prenatal care in the first trimester, and an additional 41% were seen by the end of the second trimester. Only 1% of the women had their first visit for prenatal care after 36 weeks (Table 1).

Data on gestational age, plurality, and vital status at birth are shown in Table 2. After completion of all follow-up efforts, gestational age was unknown for 264 deliveries, and outcome was unknown for 253. (Among the 253 pregnancies with missing outcomes, 165 mothers had moved or received care elsewhere; records of the remaining 88 cases could not be located.) Twins were reported in 32 of the births with known outcome; no other multiple births were reported. Two percent of the pregnancies in Kyiv and 6% of the pregnancies in Dniprodzerzhinsk ended between the first prenatal visit and 20 weeks; these pregnancies are not included in further analyses, nor are cases with unknown outcome or gestation.

There were 6172 pregnancies of at least 20 weeks with known gestation and outcome (Table 2). These pregnancies produced 6199 infants; 9.1% of them were born before 37 weeks (Table 3). The fetal mortality rate at 20 weeks and beyond was 29 per 1000; this rate was nearly twice as high in Dniprodzerzhinsk as in Kyiv. Among pregnancies of 28 weeks or more, the fetal mortality rates were 10 and 9 per 1000 births, respectively.

The US Bureau of the Census defines perinatal mortality using either all births of at least 20 weeks or all births of at least 28 weeks as the denominator and stillbirths combined with deaths in the first 7 days of life as the numerator. We calculated perinatal mortality using the 20-week denominator. Discharge records indicated that 47 live-born infants of at least 20 weeks' gestation died before leaving the hospital. Exact age at death was known for 24 of them, and 20 died within the first 7 days of life. Age at death was unknown for the remaining 23, all of whom were nonparticipants in the Longitudinal Study. If we extrapolate the known results to these 23 infants, 39 infants are estimated to have died in the first week of life. Combining the 39 postnatal deaths with the 179 fetal deaths of at least 20 weeks' gestation (Table 3) yields 218 perinatal deaths, with an estimated perinatal mortality rate of 35.2 per 1000 births of at least 20 weeks. If none of the cases of unknown age at death involved death in the perinatal period, the perinatal mortality rate would be 32.1 per 1000; if all of them did, the

TABLE 1—Age of Mother at Most Recent Menstrual Period and Gestational Age at First Prenatal Visit, by City: Ukraine, 1992–1994

	Dniprodzerzhinsk, No. (%)	Kyiv, No. (%)	Total, No. (%)
Mother's age, y			
13–18	883 (21)	363 (15)	1246 (19)
19–30	2939 (69)	1689 (72)	4628 (70)
31–35	335 (8)	210 (9)	545 (8)
36+	115 (3)	86 (4)	201 (3)
Unknown	126	28	154
Gestation at first visit, wk			
2–12	2213 (55)	956 (41)	3169 (50)
13–27	1519 (38)	1079 (47)	2598 (41)
28–36	242 (6)	236 (10)	478 (8)
37+	35 (1)	36 (2)	71 (1)
Unknown	389	69	458
Total	4398	2376	6774

Note. Data represent continuing pregnancies only.

TABLE 2—Reported Outcomes of Continuing Pregnancies, by Gestational Age and City: Ukraine, 1992–1994

	Singleton, Alive	Singleton, Dead	Twins, Both Alive[a]	Twins, Both Dead[a]	Unknown Status	Total
Dniprodzerzhinsk						
Gestation, wk						
<20	0	263	0	0	3	266
20–27	6	95	0	1	0	102
28–36	254	18	7	0	6	285
37–42	3383	20	10	0	8	3421
43+	179	1	0	0	2	182
Unknown	8	8	3	1	122	142
Total	3830	405	20	2	141	4398
Kyiv						
Gestation, wk						
<20	0	55	0	0	0	55
20–27	5	23	0	0	0	28
28–36	129	13	4	0	0	146
37–42	1901	7	5	0	1	1914
43+	111	0	0	0	0	111
Unknown	6	4	1	0	111	122
Total	2152	102	10	0	112	2376
Total						
Gestation, wk						
<20	0	318	0	0	3	321
20–27	11	118	0	1	0	130
28–36	383	31	11	0	6	431
37–42	5284	27	15	0	9	5335
43+	290	1	0	0	2	293
Unknown	14	12	4	1	233	264
Total	5982	507	30	2	253	6774

[a]No set of twins involved one stillborn.

TABLE 3—Infant Vital Status and Fetal Mortality Rates, by Gestational Age Category and City: Ukraine, 1992–1994

	Alive at Birth	Dead at Birth	Total	Fetal Mortality Rate[a]
Dniprodzerzhinsk				
Gestational age, wk				
20–24	0	72	72	1.000
25–27	6	25	31	0.806
28–31	36	5	41	0.122
32–36	232	13	245	0.053
37–42	3403	20	3423	0.006
43+	179	1	180	0.006
Total				
≥20 weeks	3856	136	3992	0.034
≥28 weeks	3850	39	3889	0.010
Kyiv				
Gestational age, wk				
20–24	4	16	20	0.800
25–27	1	7	8	0.875
28–31	22	4	26	0.154
32–36	115	9	124	0.073
37–42	1911	7	1918	0.004
43+	111	0	111	0.000
Total				
≥20 weeks	2164	43	2207	0.019
≥28 weeks	2159	20	2179	0.009
Total				
Gestational age, wk				
20–24	4	88	92	0.957
25–27	7	32	39	0.821
28–31	58	9	67	0.134
32–36	347	22	367	0.060
37–42	5314	27	5341	0.005
43+	290	1	291	0.003
Total				
≥20 weeks	6020	179	6199	0.029
≥28 weeks	6009	59	6068	0.100

Note. Data represent only continuing pregnancies with known gestation and vital status.
[a]Number of deaths divided by total births in category.

rate would be 35.8 per 1000. With the 28-week restriction, the perinatal mortality rate is 16.0 per 1000 births when the extrapolated rate for unknown deaths is used. The rate decreases to 12.7 if we assume that none of the deaths involving an unknown date occurred in the first 7 days of life.

Discussion

We conducted a census of all pregnancies diagnosed in 2 urban areas of Ukraine during a 19-month period between 1992 and 1994. A total of 17 137 women were seen at their local clinics and diagnosed as pregnant. Sixty percent of the women chose to terminate their pregnancy. Among the pregnancies that continued to 20 weeks for which vital status at delivery was known, the fetal mortality rate was 29 per 1000 infants. When deaths occurring in the first week of life were included, estimated perinatal mortality was between 32 and 36 per 1000 infants.

These results are not directly comparable to official Ukrainian statistics in the study period. WHO definitions of live birth and fetal death were not employed in Ukraine until 1996. Before this time, Soviet vital statistics classified a delivery at less than 28 weeks, at less than 1000 g, or with a length of less than 35 cm as an "abortion" unless the infant survived 7 days.[8] Our results can be compared with vital statistics from the United States, however, because both involved WHO definitions; the most recent available year is 1992. The US comparison group was White women, because the Ukrainian study population was almost exclusively White.

The most notable difference in the US and Ukrainian birth outcomes is the 5-fold greater frequency of fetal deaths in Ukraine (Table 4). This differential reflects not only the higher rate of fetal deaths in every gestational age category but the higher proportion of deliveries before 28 weeks, when only 8% of Ukrainian infants were born alive. This is consistent with official Ukrainian statistics. When Ukraine is compared with 15 other former eastern bloc countries that use similar definitions, only Russia routinely exceeds Ukrainian fetal death rates.[3]

The perinatal mortality rate for infants of 20+ weeks' gestation is at least 32.1 per 1000 births in Ukraine, in comparison with 9.7 per 1000 for White US births. The high fetal death rate at lower gestations drives this differential. Our inability to ascertain a precise number of postpartum infant deaths makes it difficult to determine how the later deaths contribute to the rate; in any case, the extent of this contribution is small relative to fetal mortality. Inadequate resources for handling complications of delivery and limited facilities for high-risk newborn care may contribute to mortality. Limited resources and facilities are especially prevalent in Dniprodzerzhinsk, which is far from the capital city of Kyiv and has less advanced technology and fewer resources in general.

In a study of 142 US infants born at 22 to 25 weeks of gestation, 92% were live born (vs 8% of Ukrainian infants born at these weeks of gestation), and 39% survived for at least 6 months.[9] The high perinatal death rate in Ukraine is consistent with standards of practice from the Ministry of Health, which does not mandate attempts to resuscitate before 28 weeks.[4] Failure to resuscitate cannot explain the higher fetal death rates, however, because intervention would be successful only if the death occurred in the minutes before birth.

We cannot say why the perinatal mortality rate in the Ukrainian study population is so high. Prenatal care was available early and without cost, but this has not been a significant contributor to better pregnancy outcomes in the United States.[10] Maternal age may be a factor; the Ukrainian study population contained a large proportion of women younger than 19 years. Of the countries of the former eastern bloc, only Bulgaria has a larger proportion of teenaged mothers.[2] In this study, the fetal mortality rate among Ukrainian women younger than 19 years was 41 per 1000. However, fetal mortality was 25 per 1000 even among women aged 19 to 35 years, so young mothers account for a small part of the total mortality of 29 per 1000. The difference in fetal mortality between the 2 census sites partially reflects the greater proportion of young women in Dniprodzerzhinsk, but the mortality disparity exists even if they are excluded.

The twin rate in the census is less than half of published rates in comparable populations. A review of earlier international twin studies indicates that twinning rates in the former eastern bloc European countries have

TABLE 4—Gestational Age Distribution and Fetal Mortality Rates for Deliveries in 2 Urban Areas of Ukraine and for Deliveries to White Mothers in the United States, 1992

	Ukraine		United States, 1992	
Gestational Period, Wk	Infants in Category, %	Fetal Mortality Rate[a]	Infants in Category, %	Fetal Mortality Rate[a]
20–27	2.1	0.916	0.7	0.339
28–36	7.0	0.071	8.8	0.021
≥37	90.9	0.005	90.5	0.002
All births	100.0	0.029	100.0	0.006

Note. Data represent continuing pregnancies. US computations are based on data for Whites from *Vital Statistics of the U.S. 1992.* For Ukraine, percentages are based on all deliveries with known gestation of 20+ weeks and known vital status.
[a]Number of deaths divided by total births in category.

historically been between 1% and 3%.[11] There is a time trend toward lower proportions of twins, but the figure in the Ukrainian census is so low that other factors are probably at work.

To check on the possibility of missed twins, we looked at data on the Longitudinal Study participants. Study staff conducted periodic audits of hospital records to identify their subjects who had delivered, and medical records were abstracted for them; thus, it was unlikely that many Longitudinal Study twin deliveries at local hospitals were missing from the census. The twin rate for Longitudinal Study women was 0.0072. This is nearly triple the rate for women not involved in the study (0.0025). The Longitudinal Study rate is closer to published rates but is still low. The discrepancy between expected and observed twin rates is probably due to other influences in addition to underreporting, such as the high proportion of younger mothers in the census and their lower observed rate of twinning.[11]

Finally, the termination rate in the Ukrainian census mirrors the use of voluntary abortion as the major method of birth control in the former eastern bloc.[12] In the census study sites, the rate was 172 per 100 live births, which is slightly higher than the official Ukrainian rate of 154 per 100. This national rate was in the upper third of the rates of all former eastern bloc countries in 1993.[3] In the United States, the termination rate among Whites was estimated at 30 per 100 live births in 1992.[13]

To our knowledge, the present study is the first to use WHO definitions and rigorous research procedures to enumerate and report pregnancy outcomes in an area of the former eastern bloc. The study involves some limitations, however. We could not enumerate pregnancies that were not clinically recorded, such as early spontaneous abortions and late illegal terminations. The difficulty in accessing records probably led to other pregnancies being missed. None of these omissions appeared to be a major source of bias, but they should be kept in mind.

Furthermore, the urban areas where the study was conducted are not necessarily representative of the country or of the other European countries formerly in the eastern bloc. The women residing in these areas, however, face the same problems as others who are in a period of transition from a centralized system. Poverty, stress, high crime rates, pollution, and an underfunded health care system are characteristic of this transition, and these are some of the factors that may interfere with reproduction.[14] The present study provides information on fetal health in these difficult circumstances. □

Contributors

R. E. Little planned and supervised the study, analyzed the data, and wrote the paper. S. C. Monaghan supervised the Ukrainian fieldwork. She and Z. A. Shkyryak-Nyzhnyk supervised the European Longitudinal Study of Pregnancy and Childhood in Ukraine, which involved subjects in the population described in this paper; both assisted in writing the paper. B. C. Gladen assisted in designing the study, analyzing the data, and writing the paper. A. J. Wilcox assisted in the study design and contributed to writing the paper.

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