

Fetal Death Ratios in a Prospective Study Compared to State Fetal Death Certificate Reporting

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Abstract: A cohort of 6,254 pregnancies surviving at least 20 weeks of gestation was identified through pregnancy testing and follow-up at three Kaiser Permanente medical offices in northern California in 1981–82. Fetal death ratios per 1,000 live births were 12.1 for all fetal deaths versus 5.0 for the subset of fetal deaths reported to the California state registrar. Only fetal deaths resulting in overnight hospitalization of the mother were reported. Seventy-nine percent of fetal deaths over 28 completed weeks since the last menstrual period (LMP) were reported versus only 10 percent between 20 and 28 completed weeks since the LMP. Ninety-three

percent of fetuses over 400 grams were reported. The unreported fetal deaths were mainly those perceived by attending physicians as spontaneous abortion, especially missed or incomplete spontaneous abortion. Physicians apparently preferred the label of spontaneous abortion over stillbirth or fetal death whenever fetal maturity could not be substantiated, regardless of prior estimates of the date of the LMP. Fetuses as large and developed as potentially viable infants were the most likely to be reported. (*Am J Public Health* 1989; 79: 1268–1270.)

Introduction

State fetal death certificate reporting has been the primary source for determining the risk of stillbirth, or late fetal death, in the United States for more than 60 years.¹ While the legal definition of reportable fetal death has varied somewhat by time and state, reasonably consistent trends in fetal death ratios (the number of fetal deaths per 1,000 live births) have been observed across the country and over the years. Nevertheless, underreporting of fetal deaths is a well-recognized and pervasive problem^{2–4} whose magnitude is unknown.

Most states now require that a fetal death certificate be filed for spontaneous fetal deaths over 20 weeks of gestation. Eight states also require filing certificates for earlier fetal deaths, and four states specify fetal delivery weight over 350–500 grams as an alternative reporting criterion to 20 weeks gestational age.* As recently demonstrated by Harter, *et al*,⁴ and others in the past,^{2,3} states with reporting requirements based on gestational ages less than 20 weeks or based on fetal delivery weight have consistently higher ascertainment of fetal deaths between 20 and 28 weeks. After 28 weeks of gestation, reporting of fetal deaths appears to be fairly complete.

Harter, *et al*, imply that reasons for underreporting may be related to the condition of the fetus upon expulsion. If it is macerated, malformed, or very small, its chances of being reported are diminished. If the fetus dies in utero before 20 weeks of gestation but is carried for days or even weeks afterward, as in the case of "missed abortion," whether or not it should be reported may be unclear to physicians.

The same medical personnel responsible for reporting fetal deaths often use the International Classification of Disease (ICD) index to code hospital discharge summaries. A late fetal death (ICD-9 code 656.4) is defined in the ICD-9 Tabular List as having more than 22 completed weeks of gestation while spontaneous abortion appears with a separate

code (634) presumably for earlier fetal deaths occurring prior to 22 weeks. This may also cause confusion.

In California, Section 10175 of the California Health and Safety Code, first prepared in 1955, states, "Each fetal death in which the fetus has advanced to or beyond the twentieth week of uterogestation shall be registered." An advisory was later circulated to county health departments in 1978 stating that if the gestational age cannot be determined, a weight of over 400 grams and a crown-heel length of over 28 centimeters may be used as alternative reporting criteria. While this advisory is still in effect, existing copies are difficult to find. I was unable to locate written documentation from the state vital registration office, the county offices, or Kaiser hospitals.

To see which fetal deaths are likely to be reported and which are not, I used data from the Kaiser Permanente Medical Care Program in northern California collected for a large prospective study of pregnancy outcome. In this study there were 75 fetal deaths of 20 or more weeks of gestation within a cohort of 6,254 pregnancies surviving at least 20 completed weeks from the last menstrual period (LMP). Gestation was counted from the first day of the LMP until expulsion from the womb. Days 0–6 constitute the 0th week so that days 140–146 constitute the 20th week (this convention was established in prior prospective studies of pregnancy outcome).^{5–8}

Methods

The Kaiser program in northern California is one of the oldest health maintenance organizations in the country, now providing prepaid medical coverage to about 2 million members. Ninety percent of the membership join through employee organizations and 10 percent as individuals. Kaiser members tend to report early for medical care, including pregnancy diagnosis; they also tend to stay with the program for long periods of time.

In early 1983, researchers attempted to identify all women having positive pregnancy tests or pregnancy confirmation at three Kaiser clinics in the south San Francisco Bay Area, September 15, 1981 through June 30, 1982. The purpose was to establish a cohort of women in early stages of pregnancy during the nearly one-year period that the pesticide, malathion, had been sprayed in the area by the State of California Department of Agriculture. A case-control study was then embedded within the cohort to study the effects of

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the spraying and of other environmental exposures during pregnancy.⁹⁻¹¹

An original cohort of 9,564 pregnancies was identified by scanning logs of urine pregnancy tests and pregnancy confirmation visits at the three clinics (Table 1). Pregnancy outcomes were determined from computer linkage to hospital discharge summaries, California birth certificate files, and Kaiser abortion clinic data. For outcomes not obtained from these three sources, individual medical records were reviewed. Records were then re-reviewed for confirmation of all outcomes other than live birth indicated in Table 1. Particular attention was given to determining as accurately as possible the gestation period for each pregnancy.

Of the 9,564 pregnancies, 6,254 survived at least 20 completed weeks and remained under care at one of the three clinics through the time of delivery. Of these, 75 ended in spontaneous fetal death and 6,179 ended in live birth. These form the basis of this study on reporting practices for fetal deaths. Descriptions of the pregnancies ending in fetal death were derived both from medical records at the three clinics and from the program's computerized hospital discharge summaries.

An extensive search was made of state fetal death certificate files to determine whether the fetal deaths had been reported to the state registrar. The search was conducted by manually matching the study subjects to four separate lists of fetal death certificate files sorted by hospital, by mother's last name, by mother's first name, and by date, respectively.

Results

Forty-one of the 75 fetal deaths occurred before 28 completed weeks of gestation (between day 140 and day 195, inclusive) and 34 occurred after 28 completed weeks (day 196 and beyond). Most (37/41) of the 20-27 week fetal deaths were not reported, while most (27/34) of the 28-41 week fetal deaths were reported. Only about half (21/41) of the 20-27 week fetal deaths resulted in an overnight hospitalization of the mother, while most (30/34) of the 28-41 week fetal deaths resulted in overnight hospitalization of the mother. For the 24 fetal deaths not requiring overnight hospitalization all were attended by physicians: nine in the emergency rooms and 15

only in the clinics. Dilation and curettage procedures were performed on 16 of the 24.

Table 2 shows the diagnosis codes for fetal outcome on the mother's computerized hospital discharge summary by fetal death certificate reporting status. Three of the 31 mothers with reported fetal death showed no code for fetal death, or for abortion—only miscellaneous conditions of the delivery such as preeclampsia or premature rupture of membranes. A search for fetal deaths using hospital discharge diagnoses only would miss these cases. For the 20 mothers whose fetal deaths were not reported even though hospitalization had occurred, most had codes for some kind of abortion (spontaneous, missed, elective, molar pregnancy or abortion type unspecified). Four had the appropriate ICD-9 code 656.4 for intrauterine death, three of whom delivered fetuses under 400 grams. Of the 24 other women who were not hospitalized, none of their fetal deaths were reported to the state.

The 31 reported fetal deaths fell into several categories: cord problems, placental problems, abnormal presentation, twin pregnancy, sepsis, complications of toxemia, congenital anomaly, and unknown cause of death. (In only four cases was the cause of death unknown by the attending physician.) None of the reported fetal deaths were described in the medical chart as missed abortion. Birthweights were generally considerably over 400 grams although three were less than or equal to 400 grams. Four of the reported fetal deaths were less than 28 weeks gestation (three at 26 and one at 24 weeks); the remainder were all over 28 completed weeks.

Of the 37 unreported fetal deaths occurring during the 20th through 27th weeks, 28 (76 percent) were referred to in the medical chart as missed or incomplete abortion, one was a molar pregnancy, and the remaining eight were described as complete spontaneous abortions. Delivery weights were generally unknown or not recorded. Two delivery weights, however, were over 400 grams. Both resulted in hospitalization of the mother but with a spontaneous abortion code rather than the intrauterine death code on the hospital discharge summary. Of the seven unreported fetal deaths over 28 completed weeks of gestation, only one was over 400 grams. All were under 34 weeks at the time of expulsion. Five of the seven were referred to in the medical chart as missed abortions with the fetus described as autolyzed, mummified, or macerated. Causes of death were unknown or unspecified in over half of the unreported fetal deaths. Known causes of death, however, were similar to the reported fetal deaths.

TABLE 1—Fetal Outcomes in Cohort and in Fetal Death Study among 9,564 Pregnancies Identified at Three Kaiser Medical Offices, September 15, 1981–June 30, 1982

Fetal Outcome	Number In Cohort	Number in Fetal Death Study ^c
Live Birth	6,759	6,179
Fetal Death ≥20 Weeks	80	75
Fetal Death <20 Weeks	538	—
Induced Abortion for Malformation	5	—
Voluntary Induced Abortion	1,802	—
Ectopic Pregnancy	48	—
Unknown	391 ^a	—
Total	9623 ^b	6,254

^aUnknowns were largely due to terminated membership in the Kaiser program.

^bIncludes 114 co-twins and three co-triplets.

^cIncludes all that survived at least 20 weeks and remained under care at one of the three Kaiser facilities.

TABLE 2—Diagnosis of Fetal Outcome on Mother's Hospital Discharge Summary by Fetal Death Certificate Reporting Status

Diagnosis	ICD-9 Code	Reported	Not Reported
Intrauterine death ≥22 weeks	656.4	28	4
Abortion			
Spontaneous	634	—	2
Missed	632	—	8
Elective	635	—	2
Molar pregnancy	630	—	1
Unspecified	637	—	2
Miscellaneous condition of delivery ^a	—	3	1
Not hospitalized	—	0	24
Total	—	31	44

^aNo mention of fetal outcome.

Fetal death ratios (the number of fetal deaths divided by the number of live births per 1,000) were calculated for reported fetal deaths, for hospitalized fetal deaths, and for all fetal deaths (Table 3). For fetal deaths at greater than 28 completed weeks of gestation, there were only small differences between the three nested categories. For fetal deaths defined from the 20th week, the fetal death ratio for all fetal deaths was more than double that for only reported fetal deaths; the ratio for hospitalized fetal deaths was midway between the other two categories.

Discussion

These findings are consistent with other prospective investigations conducted in the United States with follow-up through full term⁵⁻⁷: fetal death ratios for fetal deaths beyond 20 weeks of gestation were 40-80 percent higher than the respective state averages. In another study in which follow-up was only through the end of the 27th week,⁸ fetal death rates for weeks 20-27 were consistent with the present study.

While death in utero after 20 weeks of gestation seems a simple definition, persons responsible for reporting fetal deaths are either confused by the definition or ignore the requirement. Factors other than time since LMP appear to play important roles in reporting fetal deaths. In the Kaiser data, overnight hospitalization must have occurred for a fetal death to be reported. But even with hospitalization, only 68 percent of fetal deaths over 20 completed weeks of gestation were reported to the state. In contrast, 89 percent of hospitalized fetal deaths over 28 completed weeks were reported. The best predictor of reporting was birthweight, with 93 percent of weighed fetuses delivered over 400 grams being reported.

Reporting practices found in the Kaiser program may be representative of reporting practices elsewhere. Fetal death ratios at Kaiser hospitals based on reported fetal deaths are about average in the state of California.¹² Although guidelines¹³ exist to help clarify the difference between fetal death and neonatal death there are no routinely distributed guidelines from the states and counties to help distinguish reportable fetal death from other fetal deaths.

Perhaps physicians may rely more on their obstetric training than on state regulations to determine reportability. *Williams Obstetrics*,¹⁴ a major textbook for obstetric training in this country, emphasizes birthweight as the main criterion for reportability, stating "... fetuses weighing less than 500 grams usually are not considered as births, but rather as abortions, for purposes of perinatal statistics." Gestational age is then referred to in terms of equivalency to birthweight.

It is routine practice at Kaiser to offer a woman options for disposition of the body of the fetus if it weighs over 500

grams. Such options are not routinely offered for smaller fetuses.

If the trends in this study are representative of widespread practices, the majority of underreporting of fetal deaths may be due not to negligence or random omissions, but rather to systematic perception of which fetal deaths are reportable. Fetuses under 500 grams may seldomly get reported regardless of time since LMP.

This practice in fetal death reporting may account for the consistently lower rates of fetal death found in studies based on state vital statistics compared to prospective studies based on follow-up of pregnancy cohorts. In the prospective studies, gestational age at outcome is based on time between LMP and expulsion, not on birthweight equivalencies.

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TABLE 3—Fetal Death Ratios per 1,000 Live Births

	≥20 Completed Weeks of Gestation	≥28 Completed Weeks of Gestation
Fetal death certificate	5.0	4.4
Hospitalized	8.3	4.9
All fetal deaths	12.1	5.5