Birth Statistics in Maternal and Child Health Programs

By WILLIAM HAENSZEL, M.A.

MANY convincing reasons can be advanced for processing all data from birth certificates as a single integrated operation. The data cannot, for example, be segregated into two watertight compartments—legal and medical. Such items as race, place of delivery, and previous child-bearing history of the mother are all part of the legal certificate, which is handled by the bureau of vital statistics, but they must also be taken into account in tabulating and interpreting the medical data, which in some places is handled by maternal and child health personnel. Processing a single punch card eliminates some duplication of work and simplifies scheduling of coding, punching, and tabulating procedures. Furthermore, the bureau of vital statistics is best equipped to conduct follow-up inquiries to complete information and routinely match infant death certificates with birth records. Desired birth tabulations can be furnished to maternal and child health administrators.

This paper deals primarily with problems of collection and analysis of material usually found on the medical supplement of the birth certificate, including data on fetal and neonatal deaths. Recapitulating and summarizing developments in this field since 1940 has been greatly simplified by activities undertaken by the Public Health Conference on Records and Statistics, the Association of Maternal and Child Health and Crippled Children Directors, the National Office of Vital Statistics, and the Children's Bureau. Where opinion has crystallized, these organizations have made recommendations on definitions and tabulations for birth weight and related characteristics (*1*, *2*).

Mr. Haenszel is chief of the biometrics section, National Cancer Institute, National Institutes of Health, Public Health Service. This paper was presented at the 2d Conference on Public Health Statistics, School of Public Health of the University of Michigan, Ann Arbor, on June 17, when Mr. Haenszel was director of the bureau of vital statistics, Connecticut Department of Health, Hartford.

Definitions and Grouping of Items

The need for and importance of standard definitions and procedures cannot be overemphasized. Comparisons—between hospitals and local areas within the State as well as on the interstate and international levels—are the heart of this enterprise. Each maternal and child health administrator has a stake in having tabulations for his jurisdiction which can be compared with experience elsewhere.

For death certificate terminology, there is the standard medical certification form and the elaborate machinery of the International Statistical Classification of Diseases, Injuries, and Causes of Death, and ancillary instruction manuals. For birth certificates, the phrasing and presentation of certain medical supplement items is still under study. The International List is not completely suitable for classifying complications of pregnancy and labor or operative procedures.

Lack of standard groupings for birth weights has been a deterrent to interarea comparisons of the proportion of immature births and weight-specific mortality rates. The distribution curves according to birth weight for live births and neonatal deaths exhibit steep gradients, at the smaller weights particularly. Differences of only a few ounces in class limits render the data virtually incomparable.

A detailed grouping of birth weights in intervals of 250 grams, with corresponding avoirdupois weights, has been published (*1*). The intervals have been so arranged that one division point, 2,500 grams (5½ pounds), coincides with the weight criterion for an immature birth in the International Statistical Classification.

The importance of hospitals following standard procedures for recording birth weight is obvious (*1*). They should report in the units of measurement appearing on their scales (metric or avoirdupois) and not attempt to convert birth weights. Failure to report birth weight on the birth certificate for even a small proportion of births can distort data on incidence of immaturity and mortality in low weight groups. The residual group of unweighed babies will consist almost entirely of immature infants, because of the tendency to leave very small babies unweighed, and can be sizeable in relation to the number of babies actually reported in the smaller weight groups. Routine checks should be maintained on the completeness of birth weight reporting for individual hospitals.

Length of pregnancy is used principally for the adjustment and distribution of unknown or not stated birth weights. Improvement in reporting on this item will eventually make possible the joint use of birth weight and gestational age data for indicating maturity of the newborn child.

Tabulations for individual hospitals should refer to the hospital where delivery occurred, unless clearly specified otherwise. This is important in areas maintaining special premature nursery facilities, to which babies are transferred from other hospitals. Separate tabulations will usually be maintained for "transferred babies."

Pregnancy and Labor

The International Statistical Classification cannot be considered an entirely suitable framework for classifying complications of pregnancy and labor. To date classifications have been constructed from terms actually reported on the birth certificate. Complications fall into three major groups—labor, pregnancy, and nonpuerperal. It is not difficult to develop a list of titles within each of these groups. Trouble arises when specific terms are collected under each title. Such categories as "dystocia" or "disproportion of fetus" can cover a wide variety of conditions. Differences in incidence and mortality for certain complications can often be traced to noncomparability in conditions covered. In the absence of a standard classification system, it is of great importance that the kinds of complications under each title be clearly specified in publications (preferably in an appended glossary of inclusions).

An investigation of hospital records for a birth certificate sample in upstate New York revealed extensive under-reporting of complications (*3*). Reporting was more complete for deliveries involving fetal or neonatal death, or cesarean sections. Under-reporting could be confirmed anywhere by tabulating the proportion of certificates with reported complications by hospital. In Connecticut (1948) this proportion ranged from 3.3 to 26.3 percent for individual hospitals (*4*); reporting was better in the larger hospitals with well-organized obstetrical departments.

A check-list format for the medical supplement has been recently introduced in New York State and, according to a preliminary study, increased the incidence of total complications reported from 14.4 to 17.3 per 100 births (*5*). Anemia, premature separation of placenta, postpartum hemorrhage, breech and other malpresentations, heart disease, and syphilis were among the complications for which better reporting was noticeable. The design of the medical supplement should call attention to reporting of operative indications as complications or physicians may omit reporting complications obviated by resort to surgery (*4*).

Comparison of unpublished data collected by the Connecticut and New York State Departments of Health has revealed close correspondence in rates for certain complications for which there was substantive agreement in conditions covered. The two areas resemble each other closely in many vital statistics indexes, and these comparisons enhance the confidence to be placed in the stability of the data. They indicate that the birth registration system can deliver descriptive results, even though subject to some distorting biases.

The code for delivery procedures in the International Statistical Classification needs some modification. No serious objection can be raised to the grouping of mid and high forceps, in view of their infrequency and the difficulty of distinguishing between them from birth certificate reports. However, the combination of breech extraction and of version and extraction under "manipulation without instruments" seems unwise. The two procedures have different characteristics when analyzed with respect to complications and mortality.

Connecticut data have demonstrated marked disparity between hospitals in the proportion of low-forceps deliveries, which could be traced to disagreement as to whether terminal or prophylactic forceps constituted an operative procedure and were to be so reported on the birth certificate (*4*). Current Connecticut practice has been to code prophylactic forceps as low forceps. There is no pressing need to distinguish between low-forceps and spontaneous deliveries. In many areas, mortality rates (both fetal and neonatal) have been reported without exception as lower for low-forceps deliveries. This held true even when the rates were adjusted in Connecticut to take account of the smaller birth weights among babies delivered spontaneously (*4*).

The check-list approach, discussed for complications, could readily be extended to cover delivery procedures.

Malformations and Birth Injuries

The Sixth International List provides a suitable scheme for classifying congenital malformations. The classification for birth injuries appears unduly condensed, segregating only intracranial and spinal injuries from other birth injuries. Separate categories for fractures, facial paralysis, and brachial plexus injuries could be provided.

Congenital malformations and birth injuries are not always apparent when the birth certificate is made out. Consequently, reporting on the medical supplement must be regarded as incomplete. The degree of under-reporting can be approximated by comparing neonatal death certificates mentioning malformations or birth injuries with the corresponding birth certificate. Reporting of birth injuries is definitely poorer than for congenital malformations, only one-third of the birth injuries having been reported, according to the New York State data (*6*).

Neonatal deaths

A neonatal death is defined as one occurring less than 28 days subsequent to birth. The following groupings of ages of death (*1*) should suffice for most purposes: under 1 hour; 1 to 23 hours; single days to the end of the first week; 7 to 13 days; 14 to 20 days; 21 to 27 days.

Causes of death may be grouped for tabular presentation. Reference 2 gives a list of 45 selected causes.

Handling Neonatal Death Data

Three specialized procedures necessary for the handling of birth and neonatal death data deserve comment.

1. Matching birth and death records is without doubt the most important single step to be taken in the development of adequate birth statistics. Provisions for matching should always include neonatal deaths and, if possible, deaths under one year of age.

2. Combining data from matching birth and death records on a single punch card is a prerequisite for the efficient handling of neonatal death tabulations. At least the following information should be available (*1*):

From the birth certificate: Certificate number; place of birth, including identity of hospital; place of residence; attendant; sex; plurality; month and year of birth; race; age of mother; order of birth; birth weight; length of pregnancy; and any other medical and health items that are usually punched.

From the death certificate: Certificate number; age at death; cause of death; place of death.

3. Adjustments to take account of the "not stated" birth weights are necessary. Reports of birth weight are more likely to be omitted for grossly underweight babies, including those

Table 1. Weight-specific neonatal death rates per 100 live births, New York City, 1949

Birth weight (Grams)	Birth weight (Pounds)	White: For known birth weights	White: Adjusted for unreported birth weights	Nonwhite: For known birth weights	Nonwhite: Adjusted for unreported birth weights
Total		1. 5	1. 8	2. 2	2. 8
Under 2,500	5 pounds 8 ounces or less	11. 7	14. 1	11. 2	14. 4
2,500 and over	Over 5 pounds 8 ounces	. 6	. 7	. 9	1. 0
Under 1,000	2 pounds 3 ounces or less	93. 4	97. 4	82. 4	88. 5
1,000 to 1,499	2 pounds 4 ounces to 3 pounds 4 ounces	43. 3	47. 0	39. 0	40. 7
1,500 to 1,999	3 pounds 5 ounces to 4 pounds 6 ounces	14. 6	16. 9	12. 5	14. 8
2,000 to 2,499	4 pounds 7 ounces to 5 pounds 8 ounces	3. 1	3. 5	3. 0	3. 6
2,500 to 2,999	5 pounds 9 ounces to 6 pounds 9 ounces	. 9	1. 0	1. 1	1. 3
3,000 to 3,499	6 pounds 10 ounces to 7 pounds 11 ounces	. 5	. 6	. 8	. 8
3,500 to 3,999	7 pounds 12 ounces to 8 pounds 13 ounces	. 5	. 5	1. 0	1. 0
4,000 to 4,499	8 pounds 14 ounces to 9 pounds 14 ounces	. 7	. 7	. 5	. 5
4,500 to 4,999	9 pounds 15 ounces to 11 pounds	1. 2	1. 4	1. 0	1. 0
5,000 and over	11 pounds 1 ounce or more	4. 5	6. 2	0	0

NOTE.—Adapted from a table published by the Bureau of Records and Statistics, New York City Department of Health. The class intervals in grams are not precisely those recommended by reference 2. The avoirdupois limits have been inserted to illustrate presentation format and may not represent exactly the weight groupings used.

born dead or with poor prospects for survival. Mortality rates, based only on known birth weights, understate seriously the true rates. The size of the correction in mortality will usually be greater for fetal deaths than for neonatal deaths. Allocation of unknown birth weights can be handled through a number of procedures now in effect (*2*).

Table 1 illustrates the effect of adjustment on weight-specific neonatal mortality rates. The correction is greatest for the under 1,000 grams group, becomes negligible in the 2,500- to 4,500-gram range, and then reappears at higher weights.

Tabulation of Data

Tabulations of medical supplement data have a wider audience than maternal and child health administrators. The needs of medical society committees, hospital superintendents and staffs, and of interested physicians must also be kept in mind.

Reference 2 outlines suggested tabulations for birth weight and related characteristics. Reduced to skeleton form, the suggested tabulations are:

1. Live births (and neonatal deaths) classified by birth weight, race, and county of residence (with subtabulations for cities of over 50,000 population).
2. Live births (and neonatal deaths), classified by birth weight and individual hospitals (also group hospitals according to size).
3. Single live births (and corresponding neonatal deaths), classified by birth weight, race, and person in attendance.
4. Single live births (and corresponding neonatal deaths), classified by birth weight, race, and sex; neonatal deaths further subdivided by age at death and by cause of death.
5. Plural live births (and corresponding neonatal deaths), classified by birth weight, race, and sex; neonatal deaths further subdivided by age at death and by cause of death.
6. Live births (and neonatal deaths), classified by birth weight, race, period of gestation.

Note: This report does not cover such topics as complications of pregnancy and labor, operative procedure, birth injuries, or congenital malformation.

The cross-tabulation "Birth weight by area of residence" may throw light on possible relationships between environmental factors and incidence of immaturity. It will delineate the geographical pattern for incidence of immaturity and help determine those areas needing added special facilities for care of immature babies. Where nearly all deliveries occur in hospitals, maternal and child health administrators would probably rely on hospital rather than area-of-residence tabulations for pinpointing the need for special facilities.

Data on birth weight for individual hospitals is usually more informative than data for hospitals grouped according to size. They enable an investigator to pick out hospitals diverging from the usual pattern. Published analyses should refer to the distribution pattern by individual hospitals, identifying individual hospitals by code number, if necessary, as well as presenting figures for hospital groups by size of hospital.

Only one hospital was found in Connecticut (1948) where the distribution of immature birth weights deviated significantly from the State average. Where such differences are found, they should not be accepted at face value. Scales and weighing procedures in an individual hospital may have been at fault and may have biased the results. One must assess the hospital practice and the type of people it serves in interpreting the findings. In the Connecticut hospital, later developments suggested that weighing procedures were at fault.

The question has been raised whether adjusted mortality rates based on weight-specific rates should be computed for individual hospitals. In my opinion, this should not be done routinely. Where differences in birth weight distributions are small, the changes produced by adjustment are negligible. If the deviations are major, the question as to whether they are real or classification artifacts must first be answered. If the weight differences are real, use of adjusted mortality rates could be justified. Inaccurate recording of weights rewards the hospital with a lower adjusted rate than warranted (when the bias is toward lower weights) or penalizes it with a higher rate if the bias runs in the opposite direction.

Interhospital mortality comparisons are clouded in many States because of complications caused by the presence of small maternity homes, and municipal and proprietary hospitals. Maternity homes may handle mainly uncomplicated deliveries; proprietary hospitals may draw patients from a well-to-do clientele who constitute better risks; municipal hospitals usually treat medical indigents, who may be poorer risks, and may draw the emergency cases with poorer prognosis. Under these conditions, the factor of treatment and its effects cannot readily be disentangled from selection of cases.

These selection elements are minimized in Connecticut, where no more than two hospitals were engaged in large-scale obstetrics in any community, no municipal or proprietary hospitals were involved, and maternity homes were not permitted to operate. All general hospitals in the larger cities have active staffs, and outward appearances would indicate no significant differences in types of patients admitted. For these reasons the accompanying abstract of Connecticut data (1948–50) on neonatal mortality per 1,000 live births (unadjusted) by hospital may prove interesting (table 2). Deaths are tabulated by hospitals where birth occurred, grouped according to size of hospital.

The mortality differences between hospitals

Table 2. Neonatal deaths per 1,000 live births, by hospital where birth occurred, Connecticut, 1948–50 (partial listing)

Place of birth	Rate per 1,000 live births
Total deaths in State	19.5
Deaths in hospitals:	
Total, all hospitals	19.1
Hospitals with 2,000 or more births yearly	18.0
No. 1	15.2
No. 2	16.3
No. 5	21.5
No. 6	21.7
Hospitals with 1,000–1,999 births yearly	20.5
No. 1	16.5
No. 2	18.2
No. 8	21.9
No. 9	25.8
Hospitals with 500–999 births yearly	19.3
No. 1	16.0
No. 2	16.8
No. 8	22.3
No. 9	27.2
Hospitals with less than 500 births yearly	18.4

cannot be attributed to chance factors. Assuming that the neonatal mortality rate for the entire State represented the true risk in each hospital, the differences between the observed and the expected number of deaths could have occurred by chance much less frequently than once in 100 trials (chi-square=52.6, d. f. 24). This hypothesis must be rejected. Differences between hospital size groups were unimportant, compared to those between individual hospitals. The same results would have held if reported fetal deaths had been combined with neonatal deaths to compute combined loss ratios.

Mortality rates by individual hospitals provide a powerful tool for maternal and child health administrators. They not only point out places for improvement, but, when distributed to the hospitals concerned, stimulate the staffs to examine and take steps to improve conditions.

A standard table of major importance, useful for interarea and time series comparisons, is mortality by birth weight (table 1). The administrator will probably be most interested in following the time trends in his area for mortality in the various weight groups to see what results his program is producing. Where space permits, both unadjusted and adjusted (for unreported birth weights) weight-specific rates should be shown, so the reader can gauge the size of the correction involved. Separate presentation of neonatal mortality and fetal mortality is imperative. With differences in legal requirements for reporting fetal deaths, present interarea comparisons of fetal mortality are greatly restricted.

It is well known that sex and race influence birth weight distributions; male and white babies weigh more, on the average, than female and Negro babies (*7,8*). Since female and nonwhite babies are generally more mature than male or white babies of equal weight, other things being equal, the former tend to exhibit smaller weight-specific mortality rates under 2,500 grams. The New York City data for nonwhites bear this out.

Complications of Pregnancy and Labor

Tabular presentation should distinguish between the total births registered and the number of reports with answers to questions on complications. A count of deliveries exhibiting one or more complications should be presented, permitting comparison with the total number of complications reported. In Connecticut, the ratio of reported "complications" to "women with complications" has run between 1.10 and 1.15.

For clarity in presentation, grouping of individual complications under three major headings—complications of pregnancy, of labor, and nonpuerperal—seems desirable. The arrangement must be somewhat arbitrary because the line of demarcation between complications of pregnancy and of labor is not always distinct; for example, premature separation of the placenta could be associated either with the antepartum stage or with labor. Standard usage in the arrangement and grouping of complications can undoubtedly be developed.

The distribution of complications for plural deliveries departs noticeably from that for single deliveries and should be presented separately.

For single deliveries, complications affecting birth weights of babies weighing 2,500 grams or less should be distinguished from those for full-term babies. Further subdivision of birth weights expands the tables greatly, tends to obscure the results in a mass of detail, and should not be attempted as a routine measure. Plural deliveries are so few that the study of association between complications and birth weight can advantageously be confined to single deliveries. Data for plural deliveries could be accumulated and made the subject of a special report.

Tabulations of reports of complications by hospitals are of interest, primarily as a check on the quality of reporting from individual hospitals, taking into account any selectivity factor among patients. These reports offer the maternal and child health administrator some clues as to completeness of records maintained in various obstetrical departments. The maternal and child health administrator can use these tables as a springboard for making specific inquiries about record-keeping systems in individual hospitals. It is difficult to generalize as to where such inquiries may lead. Depending on the interest and cooperation of the hospital staff, results might include revision of hospital forms and more frequent review of case records by chiefs of services.

In Connecticut (1948) the proportion of live births with complications reported ranged, by hospital, from 3.3 to 26.3 percent. In addition to such complications as dystocia, disproportion, and malpresentations other than breech (for which lack of precision in definition contributes to variability), reporting varied markedly for toxemias (other than eclampsia), placenta previa and other antepartum hemorrhage, erythroblastosis, and breech presentation.

Presentation of mortality data requires separate tabulation of complications for neonatal and fetal deaths. The general breakdowns for single full-term, single immature, and plural deliveries should be maintained. Preceding comments concerning separate presentation of fetal death and neonatal mortality apply here also. When the numbers observed are relatively few, consolidation of certain complications for the computation and publication of rates may be indicated. At best, such tables are voluminous and the reader's task may be eased by arranging the complications in descending order of mortality.

Table 3 is an abstract of material on mortality according to complications. For convenience in reproducing the results, only the rates are shown. Antepartum hemorrhage was the complication of pregnancy with the highest combined mortality; hemorrhage, for complications of labor; diabetes was the leading nonpuerperal complication. The variable relationship between fetal and neonatal mortality and the mortality pattern for full-term and immature deliveries should be noted. Because of variation in reporting complications by hospitals, routine analysis of mortality by complications for individual hospitals would not be feasible.

Medical society committees and hospital staffs, as well as health departments, have always expressed keen interest in tabulations of delivery procedures for individual hospitals. In Connecticut, such data have been released, with the hospital identity concealed by code.

Table 3. Fetal loss per 1,000 births,[1] by complications of pregnancy and labor, Connecticut, 1948

Complications of pregnancy and labor	Total			Single, full-term			Single, immature		
	Combined fetal loss	Deaths under 1 month	Fetal deaths	Combined fetal loss	Deaths under 1 month	Fetal deaths	Combined fetal loss	Deaths under 1 month	Fetal deaths
Questions on complications answered	31.0	18.1	13.2	13.9	7.2	6.7	268	180	108
No complications	16.0	12.2	3.8	7.3	5.6	1.7	178	137	47.4
One or more complications	113	51.9	64.0	55.7	18.1	38.3	441	280	224
Complications of pregnancy	195	92	113	89	27	64	473	298	249
Antepartum hemorrhage (including placenta previa and premature separation of placenta)	263	146	137	107	40	70	541	377	264
Toxemias (including eclampsia and hypertension)	125	33	95	64	10	55	395	171	271
Infections of pregnancy	55	16	39	19	-------	19	214	153	71
Complications of labor	92	31	63	62	17	46	432	233	259
Hemorrhage	495	56	466	418	20	406	862	500	724
Breech presentation	129	69	64	69	30	39	515	377	222
Malpresentation other than breech	62	21	42	48	16	33	333	111	250
Dystocia	46	22	24	34	12	23	128	89	43
Previous cesarean section	29	26	4	21	21	-------	77	40	39
Nonpuerperal complications	122	62	73	71	20	53	500	357	222
Diabetes	455	268	255	340	143	234	1,000	1,000	333

[1] Rates for "combined fetal loss" and "fetal deaths" are per 1,000 total births (i. e., live births plus fetal deaths). Rates for "deaths under 1 month" are per 1,000 live births. "Fetal deaths" refer to fetuses of not less than 28 weeks gestation.

Table 4. Percentage of live births by cesarean section in Connecticut hospitals, 1948

Size of hospital (number of births)	Average (group)	Individual hospitals
Total, State	5. 6	
2,000 or more	6. 4	12.1, 7.8, 5.4, 4.8, 3.2, 1.4.
1,000 to 1,999	4. 3	8.2, 6.9, 5.4, 5.2, 4.5, 4.2, 3.0, 2.2, 1.4.
500 to 999	6. 3	12.5, 10.9, 8.3, 6.7, 5.2, 5.1, 4.9, 2.6, 1.9.
Less than 500	3. 0	10.0, 6.0, 4.1, 3.8, 2.8, 2.4, 2.4, 1.6, 1.3, 0.9.

These data have indicated little variation by hospital for version and extraction; the tabulations pinpoint a few hospitals with high rates for this complication. The variation has been more pronounced for mid- and high-forceps deliveries, but, again, the tabulations picked out a few hospitals with rates markedly above average.

The great difference between Connecticut hospitals has been in the proportion of babies delivered by cesarean section. The figures do not appear directly related to hospital size (table 4), although the lowest proportion of cesarean sections is found in the smallest hospitals. Differences of the magnitude observed must represent differences in concepts and procedures rather than differences in problems encountered.

The concepts underlying Lembcke's recent study (*9*) and investigations of delivery procedures would seem to be essentially the same. Increasing attention in the future will probably be devoted to vital statistics studies dealing with interhospital variation.

The proportion of deliveries by cesarean section has increased steadily in Connecticut during recent years. A similar trend has been evident in New York City and upstate New York. Mid- or high-forceps delivery, breech extraction, and version and extraction have declined (table 5).

Because of the great interhospital variation in proportion of cesarean sections, marked changes in the trend for cesarean sections are potentially possible. Repeated tabulations on delivery procedures at regular intervals seem desirable.

Not much demand has developed for detailed cross tabulations of delivery procedures by complications, since the selection of delivery procedure is generally dictated by the complication. Physicians have been satisfied with tabulations of operative procedures by broad groupings of complications.

Neonatal and Fetal Deaths

Studies made by Yerushalmy (*10*) several years ago demonstrated a relationship between neonatal and fetal mortality and birth order and age of mother. In view of the declining neonatal and fetal mortality rates, presentation of current data on these points should be encouraged. Where differences in mortality by birth order and age of mother still exist, some special tabulations of complications and birth weight by these factors might be undertaken to see if they could account for all or part of the differences in mortality.

Gardiner and Yerushalmy (*11*) demonstrated that the risk of neonatal and fetal mortality was much higher for mothers whose child-bearing history showed previous loss of children. This line of investigation could profitably be extended to consider complications reported for such women in a current delivery and the birth weights of the babies, as well as resultant mortality.

Medical certifications for neonatal deaths rarely allude to conditions present in the mother in the sequence leading up to the underlying cause of death of the infant. This is one reason why it is difficult to reconcile cause-of-death distributions for early neonatal and late fetal deaths, which theoretically should closely resemble each other. The situation might be accounted for in part by lack of information

Table 5. Change in percentage of live births by procedures specified, Connecticut, 1948 and 1941

Delivery procedure	Year		Percent change
	1948	1941	
Cesarean section	5. 6	3. 2	+75
Mid or high forceps	3. 6	4. 2	−14
Breech extraction	1. 6	2. 1	−24
Version and extraction	. 3	. 5	−40

available to the certifying physician concerning the obstetrical history of the mother. Neonatal death certifications could be reviewed in connection with complication data reported on the matching birth certificate to see if further inferences could be drawn concerning cause of death. This might lead to improvement of medical certifications for neonatal deaths.

The last revision of the standard stillbirth certificate removed the question on time of death—before or during delivery. Some people hold that this item helps in the interpretation of fetal death statistics and that causes of fetal death should routinely be cross-tabulated with time of death. States which have retained time of fetal death on their certificates should incorporate this element into their tabulations of causes of fetal deaths.

Drawing Samples for More Intensive Study

The assessment of preventability of fetal and neonatal deaths is a project which excites the interest of maternal and child health directors. The success which has attended the investigation of individual maternal deaths to determine preventability and the subsequent confirmation, as indicated by the decline in maternal mortality rates, of the findings that many of the deaths were preventable, has led many people to believe that the same methods of inquiry should be applied to fetal and neonatal deaths. A sampling approach would be indicated since there would be too many fetal and neonatal deaths for each to be investigated.

In Connecticut, a State Medical Society Committee to Study Stillbirth and Neonatal Mortality has recently been organized with both pediatricians and obstetricians represented in its membership. Members have been drawn from a large number of hospital staffs to secure a broad base of representation.

The committee is just beginning to study a sample of neonatal deaths. Standard sampling techniques are being used to select cases for study, so that inferences from the sample can be extended to the total neonatal deaths in the State. In Connecticut the decision has been made to draw the sample in the State office. The health department physicians doing the field work find that assembling of information through review of hospital records and interviewing physicians is progressing satisfactorily. As yet, the committee has not fixed a procedural pattern for reviewing and evaluating the material collected.

Complete work-up of individual deaths calls, of course, for microscopic examination of tissues. This, too, could be fitted into the sampling scheme. Tissues could be stored in the hospitals temporarily until after the sample is drawn and specimens then discarded for deaths not included in the sample, if the specimens are not wanted for other purposes.

Statistical Program Operations

Tabulation of the birth statistics considered in this paper consumes a great amount of personnel and machine time. Many projects await study by public health statisticians, and the allocation of statistical resources to work demanding attention is a major responsibility confronting statistical administrators. This pressure automatically raises certain questions concerning such a major activity as the medical supplement program: Must the data be processed completely every year? If not, is continuous sampling the answer? Is a cyclical approach satisfactory? Can a complete analysis be done one year, dropped, and picked up in a later year? Would a 2- or 3-year cycle of operations be needed, using the initial year of the cycle to improve the quality of responses on the medical supplement?

The problems of State offices with respect to coding, tabulating, and other handling of records make the complete processing of records in selected years the most attractive approach. Many offices would have no difficulty in building up a cycle of operations in which medical supplements alternate with such projects as multiple cause-of-death tabulations, and with special tables and rate computations for census years.

Conclusion

Many studies have been stillborn when the prospective investigators have concluded the data were too unreliable to bear analysis. No one working with the birth certificate medical supplements has ever believed that this material was a model of statistical precision and accuracy, but this did not deter the pioneers in this field, and some benefits can now be reaped from their work.

Much has been printed recently concerning computing machines and servomechanisms which have so-called feed-back facilities. The feed-back principle should be borne in mind in essaying the analysis of medical supplement data. Material is salvaged from the initial investigations, not only for its immediate interest, but as a means of stimulating the sources of information—the physicians—and encouraging them to improve their reporting practices. With repetition of the interaction cycle between physicians and statisticians, the quality of the data can gradually be improved. The handling of the medical supplement data on birth certificates, a generally accepted health department activity, may provide useful experience to statisticians in the problems and mechanics of handling medical care data. These statisticians will later attack problems concerning the collection and improvement in quality of medical data in other fields of interest to public health administrators.

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The complete text of this paper may be obtained by writing to the Bureau of Vital Statistics, Connecticut State Department of Health, Hartford.