Proposed Standard Measure of Recurrence of Out-of-Wedlock Births to Adolescents

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ILLEGITIMACY has long commanded considerable space in the professional and nonprofessional literature. The subsubject of illegitimate births to adolescent girls also has been an interesting and challenging subject in its own right. Reports on recurring out-of-wedlock births—more than one child born to the girl—have been the exception. Awareness of the magnitude of this phenomenon is of recent vintage and, since it is often referred to as recidivism, it tends to be associated with welfare abuses, moral degradation, and the attitudes generally directed toward second offenders and three-time losers.

The recidivistic event, or repeated illegitimate births, is destined to be among the most troublesome problems besetting adolescents in the decade ahead. Its mushrooming "popularity" is attributable to the number of health, education, and welfare programs serving adolescents during the experience of out-of-wedlock pregnancy—usually a first out-of-wedlock pregnancy. The pioneers of these programs who have taken the time to follow up their service populations have found without exception an alarmingly high recurrence rate. Accordingly, an increasingly popular index of a program's success or failure is the degree to which such recurrent events can be reduced. In addition to this internal evaluation, interest is growing in comparative evaluation to assess the relative magnitude of repeated illegitimate births in the variable populations served by similar or disparate intervention systems.

The basic focus of this paper, therefore, is the need of administrators of programs to follow up their service populations beyond a period of service to determine the extent of repeated births within those populations. The basic question is: How can administrators express the magnitude of recurrence within their service populations in a standard and, therefore, comparable way? A proposed answer to this question is outlined in the following three steps. First, the basic unit of measure, as adapted to recurrence, is discussed briefly. Second, the literature on recurrence is discussed in terms of the comparability of measures that have been used. And, third, a standard rate is recommended and defended.

Unit of Measure of Recurrence

The basic question, as stated previously, fundamentally concerns measuring the incidence of an event; the somewhat obvious initial answer is the construction of an incidence rate.

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The basic appeal of an incidence rate is its simplicity since it consists of only three components: the numerator, the denominator, and the unit of time, expressed as

$$\frac{\text{Number of events}}{\text{number at risk of event}} \text{ per unit of time}$$

The infant mortality rate, for example, is an incidence rate, expressed as the number of events of death over the first year of life in a specified at-risk population of live-born infants. Accordingly, the adolescent illegitimacy recurrence rate becomes

$$\frac{\text{Number of repeated events of illegitimacy}}{\text{number who are at risk of repeating}} \text{ per unit of time}$$

Unfortunately, nothing is simple when the possibility of complications exists, and examination of the literature reveals that such repetition has an unusually rich potential for complication and confusion.

Studies of Recurrent Illegitimate Births

The literature was searched for followup studies of repeated illegitimate births within an adolescent service population. Only five usable studies were found, and all had been published in the past few years. The researchers worked independently and without precedent; consequently, their pioneering work was most appropriately described as exploratory. Interest in recurrence ranged from minor or incidental to major or dominant. Although the populations studied tended to be uniformly of the lower class and predominantly nonwhite, the administrative auspices of the service programs ran the gamut of health, education, and welfare agencies.

Following is a brief description of the five usable studies; they are alluded to specifically only occasionally hereafter:

1. Barglow: Published July 1968; followup of 78 adolescents, primarily from a psychiatric point of view, with major emphasis on recurrence (*1*).

2. Crumidy: Published August 1966; followup of 100 adolescents, with only incidental interest in recurrence (*2*).

3. Howard: Published 1968; followup of 487 adolescents, with major and detailed interest in recurrence (*3*).

4. Sarrel I: Published July 1966; followup of 123 adolescents, with major interest in recurrence (*4*).

5. Sarrel II: Published August 1967; followup of 50 adolescents, with undetailed interest in recurrence (*5*).

For these five studies, the denominator, the numerator, and the unit of time of the adolescent illegitimacy recurrence rate are considered.

Denominator. The denominator consists of adolescents in a service program who are at risk of repeating illegitimate births. The index event in the literature that qualifies a person for being at risk is consistently an out-of-wedlock delivery—for the most part in the literature, the first out-of-wedlock delivery. Therefore, the at-risk population is one of primiparas. At least one program, however, also contained multiparas; thus the at-risk population now becomes those who have delivered at least once out of wedlock, and the incidence rates can be made specific for parity if the population does not uniformly consist of primiparas.

Numerator. The numerator, or number of recurrent events among those at risk, is much more complicated. The first, and probably the major, difficulty lies in deciding whether the event is an out-of-wedlock conception or pregnancy or an out-of-wedlock delivery. (Needless to say, not all out-of-wedlock pregnancies end in out-of-wedlock delivery because abortions, stillbirths, or marriages change the event.) In the literature no investigator clearly, specifically, or consistently defined the repeated event as an out-of-wedlock pregnancy or as an out-of-wedlock delivery. Although the word "pregnancy" was used more frequently, it seemed to be used often as a synonym for delivery.

Marriage complicates both the denominator and the numerator. If a girl marries after the index event but before the repeated event, is she considered at risk and therefore enumerated in the denominator? This issue generally received minor or no consideration from the authors, except Howard (*3*). Another type of situation reinforces the need to define the repeated event clearly. If a primipara conceives out of wedlock a second time and marries before the delivery, she could or could not be considered a repeater, depending on whether the event had been defined as an out-of-wedlock pregnancy or an out-

of-wedlock delivery. Although stillbirths are infrequent and abortions are usually concealed, marriage is neither infrequent nor concealed and therefore should and can be considered quantitatively.

Unit of time. This factor is very important. How long after the index event, the out-of-wedlock delivery, should each person be followed to determine whether another illegitimate birth has occurred? As with the numerator and the denominator, the literature reflects no convention. The length of followup ranges from 1 to 5 years and, in some studies, the length of followup is not uniform for all members of the at-risk population nor is it clearly specified.

The denominator, numerator, and unit of time for each study are defined in the table. Other readers of these studies may very well define the denominators, numerators, and units of time differently. The authors did not specifically define their rates, and the definitions I have used are my best estimates of the intention of the authors. The obvious lack of uniformity produced widely disparate incidence rates.

That varied definitions are found among independent pioneering investigators is not surprising. Several studies are excellent pieces of research, but despite their individual excellence, little collective, comparative value resulted from the studies because the basic units of measure were not even remotely comparable. Curiously, one collective value of these followup studies is the suggestion that some convention be developed promptly so that current researchers can express comparable findings.

Proposed Rate

The current need is for a basic, flexible, conventional recurrence rate. Rather than reason to a rate, I propose the following one and will defend it.

$$\frac{\text{Number of repeat out-of-wedlock deliveries}}{\text{total number of out-of-wedlock deliveries}} \text{ per 24 months after the index delivery}$$

The proposed rate, conceptually optimized according to the following grossly stated specifications, must fulfill these requirements:

1. A simple and generally useful single rate that is defined clearly enough to be accepted as a convention and, consequently, to generate comparable data among independent researchers.
2. Practical in the sense that the collection of data is not a Herculean task and that the data are useful to the program administrator.
3. Flexible enough to be separated into component parts and to be specific for selected variables. The infant mortality rate, for instance, can be broken down into the components of neonatal and post neonatal mortality, and the total rate or either component can be made specific for variables such as birth weight, mother's age, and so on.
4. Relevant to the intention of service, which will be discussed.

Definitions of denominator, numerator, and unit of time used by investigators in constructing adolescent illegitimacy recurrence rates from followup studies

Author	Denominator	Numerator	Unit of time	Proportion of repeaters
Barglow	Number of 1st out-of-wedlock deliveries by adolescents remaining single at least up to the 2d conception.	Number of 2d out-of-wedlock pregnancies.	Not clear	26 of 78.
Crumidy	Number of out-of-wedlock deliveries.	"Unwed mothers"	18 months	19 of 100.
Howard	Number of out-of-wedlock deliveries.	Not clear whether delivery or pregnancy. Legitimate 2d births apparently were included.	Varies, but is clear.	Rates for 487 expressed in various ways.
Sarrel I	Number of out-of-wedlock deliveries not lost to followup.	Deliveries, apparently including legitimate.	5 years	95 of 100.
Sarrel II	Number of out-of-wedlock deliveries.	"Pregnancy"	Not stated	1 of 50.

5. Adaptable to conventional evaluation designs. Devising a recurrence rate for a service group in a way that defies measurement in a control group makes little sense. Attempts to conform to these specifications should be evident in the following consideration of the denominator, the numerator, and the unit of time for the proposed rate.

The denominator consists of all out-of-wedlock deliveries in the original service population. The at-risk population could be defined as those with an index out-of-wedlock pregnancy since most programs are initially in contact with the adolescents during the prenatal period. However, a few would marry before the delivery and therefore be dropped from the denominator.

Losing part of the population to followup presents a dilemma; dropping them from the denominator is an unpleasant necessity. I am assuming that the experience of recurrence for those found and those lost is the same—probably an invalid assumption but one an investigator must live with until the nature and extent of bias can be specified. (A study now in progress should yield information on such a bias.)

Adolescents who marry before the recurrent event should also be dropped from the denominator. This statement does not imply that the event of marriage is of no interest to the programs. On the contrary, it is so important that it warrants measurement as a subject unto itself. Separate treatment of the subject removes this group from consideration of a recurrent event, of which they are not immediately at risk. Cohort analysis, whenever feasible, is the method of choice because it allows expression of the incidence of many events in addition to recurrent ones.

The denominator, then, consists of all out-of-wedlock deliveries in the original service population minus those lost to followup and those marrying before the recurrent event.

The numerator consists of all out-of-wedlock deliveries among the population enumerated as at risk in the denominator, as stated before. For the following three reasons, I decided to define the recurrent event as an out-of-wedlock delivery rather than as an out-of-wedlock pregnancy.

1. A delivery is a discrete event and allows more precise measurements than a pregnancy; it occurs at one point of time rather than over a period of many months.

2. Illegitimacy refers to both the mother and the infant and is better described by the delivery than by the pregnancy, which only describes the mother's potential contribution to illegitimacy.

3. In evaluative research, it is conventional to identify a control group and to measure recurrent events within that group as well as within the service group. The author can conceptualize many good, bad, and indifferent evaluative designs requiring the use of birth records for information on the control group. Birth records provide information on delivery but not on pregnancy, and in 35 States the legitimacy of delivery is reported on the birth certificate (*6*).

Whenever possible, all sequences to all outcomes should be identifiable from service records. The sequence of delivery→marriage→conception→delivery is not the same as the sequence of delivery→conception→marriage→delivery, although the outcome in both sequences is legitimate delivery; and neither these sequences nor the outcome resembles the sequence of delivery→no marriage→no conception. In the last sequence the adolescent is not a repeater although she was at risk because of an index out-of-wedlock delivery and a continuing single marital status.

The unit of time presents more conceptual and methodological problems than either the denominator or the numerator. Just how long does one follow a service population to determine the extent of recurrence? One can err in the direction of too short or too long a followup. A followup of less than 1 year, for instance, would identify only those few who deliver twice within 12 months. At the other extreme, one could follow each girl for 20 or 30 years or for the duration of her reproductive years—an obvious impracticality. Even with the more practical followup of 2, 3, 4, and 5 years, one has to weigh gains and losses carefully.

The major gain as length of followup increases is a more complete picture of the recurrence experience. But three major losses result from lengthy followup. First, a greater and greater proportion of the service population is lost to followup as time increases, which intro-

duces a bias of unknown type and magnitude. Second, the major purpose of evaluation is to help the administrator build a better program, and if there is a 5-year wait for evaluative data, progress is very slow indeed. Third, the preventive benefit of a program decreases over time. Realistically, can a program be given either the credit or the blame for a low or high recurrence rate except during the period of service and shortly thereafter?

The objective, then, is to choose the shortest possible followup time that supplies "adequate" knowledge about "recidivism" among the at-risk population.

To select an appropriate cutoff point, it would be helpful to know the frequency distribution of repeated deliveries by length of time between the index and the repeated deliveries. To this end the records of a municipal hospital were searched, and it was found that both mode and median of the distribution were encountered before 21 months following the first delivery. The curve steeply ascended to the mode soon after 1 year, with a gradual decline and a final leveling off at low frequency. The same type of curve was found in Howard's work (*3*).

Followup at least to 21 months, then, benefits the program by including most "early" repeaters. Fortuitously, two additional benefits are derived. A relatively minor benefit is that two out-of-wedlock deliveries following the index delivery within 21 months are virtually impossible; thereby the thorny issue of double events is avoided. Of major importance, however, is the relevance of 21 months to the intention of service. With 9 months of gestation, conceptions in the year after the index delivery will reach the outcome of delivery before 21 months. That is, a girl who conceives 12 months after her index delivery, with 9 months of gestation, will deliver at 21 months. Girls who conceive before 12 months will deliver before 21 months. Thus followup to 21 months is really a measure of those who conceive within 1 year after the index delivery. Since most service programs can be expected to follow the adolescents for at least 6 to 12 months after the index delivery, it is reasonable that conceptions occurring during this period may be counted as a measure of the success or effectiveness of such programs. Followup at least to 21 months, therefore, will include most early repeaters and will conform to a minimum and logical period of accountability by the service programs.

To enhance the acceptability of this proposed rate, I recommend that the standard unit of time be changed to 24 months. Not much is lost by extending the unit to 24 months, and more than acceptability is gained. With 24-month data, a 21-month rate can still be expressed for those who appreciate its logic. A 24-month rate includes a multiple of calendar years, which is a convention unto itself, and allows easier comparisons with routine tabulations, such as vital statistics. It is farther from the mode than 21 months, which reduces the magnitude of bias from differential prematurity (defined by gestation time rather than by birth weight) in two or more populations. It also has the benefit of reducing the chance of bias from a shifting curve—a phenomenon described later.

Discussion

There is no such thing as an all-occasion rate. One rate can serve only as a starting point for describing recurrences in a service population, and the rate that I have proposed is a conventional starting point.

Several points that I have not considered deserve mention. There are practical considerations such as whether the entire at-risk population should be included in followup or whether some sampling scheme should be used. Perhaps even more basic is deciding for which of the infinite number of possible variables the basic rate should be made specific. The rule of thumb is to make it specific for variables associated with higher or lower than "normal" rates. For instance, neonatal mortality rates are generally made specific for birth weight, a variable predictive of chances for survival. This procedure is especially important in comparative analysis since an apparent difference in recurrence rates between two programs may be attributable to differences in the populations served, differences in effectiveness of service, or both.

More time also should be devoted to the dangers of inferring to recurrences beyond 24 months. For instance, since the causes of death in the neonatal period are different from the

causes of death in the post neonatal period, inferences to causes of post neonatal mortality from observed causes of neonatal mortality are invalid. Similarly, variables that are predictive of "early" recurrence may or may not be predictive of "delayed" recurrence. And since we have little information on which variables are predictive of recurrences, the basic rate should probably be made specific for at least the conventional variables of age, race, parity, and socioeconomic status.

This proposed conventionalized rate becomes a convention only if it is widely used, and many investigators probably will not choose to use it. Most people never become aware of a proposed convention; of those who do, many are not interested and more than we care to admit arbitrarily reject the proposal. There are also those who have good reason not to conform to the proposed convention, and most of the reasons seem to be related to the unit of time. In this period when program funding has more up's and down's than a manic depressive, many program administrators simply have insufficient resources to follow up study groups at all, much less for 24 months.

Other program administrators may have evidence that in their populations the distribution of repeated events over time shows a mode and median beyond 21 months, requiring a longer followup for an adequate study. An increasingly intensive service intervention possibly may have no impact but to delay the repeated event a few months, which would shove the graph curve to the right without changing its shape. If such a phenomenon occurred, following a service population and an unaffected control group to 24 months would show a spuriously lower recurrence rate for the service group.

Some programs may assign a higher priority to objectives other than recidivism. A school program, for instance, with the primary interest of keeping girls in school may require a 3-year followup program.

For those who cannot or will not follow up for as long as 24 months, there can be limited contribution to a literature that could become so conventionalized. For those who must or choose to follow up for a longer period, recurrence rates can be expressed in 24-, 30-, or 36-month rates.

No conclusion is appropriate for a paper such as this, but much is lost if no convention is adopted by independent investigators.

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Tearsheet Requests

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