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7 Rudimentary Contraceptive Methods and the American Transition to Marital Fertility Control, 1855–1915

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7.1 Overview: Historical Issues, Evidence, and Argument

The economic and social history of the American nation in the nineteenth century was distinguished by the fact that the fertility of its people underwent one of the most dramatic declines recorded in the

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In the course of this monograph's long history, we have accumulated intellectual and other debts too numerous to acknowledge fully. Some of these have been noted at appropriate places in the text and footnotes, and in notes to tables, but others deserve mention here.

Carl Degler was encouraging and generous with comments and suggestions from the very first point at which we expressed interest in his archival find. Dr. Paul Gebhard, former director of the Institute for Sex Research at Bloomington, Indiana, kindly undertook to provide us with a special research tape based on the Kinsey data. William Nye and Edward Steinmueller carried out the initial coding of the Mosher Survey. Michel Matel recorded, devised additional questions, and painstakingly applied her insight and ingenuity to the task of deducing missing dates of vital events from the internal evidence of the survey responses. With Nilifur Cagatay, Matel also performed much of the actual computational work underlying successive editions of the present tables. Thomas Mroz programmed calculations made from the Kinsey tape (only some of which are presented here).

Presentation of some of this material in preliminary form to the Newberry Center Conference on Women and Quantitative History, July 5–8, 1979, in Chicago, brought insightful criticisms from Sheila R. Johansson on that occasion and subsequently, as well as suggestions from Maris Vinovskis and Daniel Scott Smith. For many other comments and references that have found their way into the present version, we thank Tony Wrigley, Peter Laslett, and members of the Cambridge Group for Population and Social Structure Seminar (1978); John Hajnal, Charles Rosenberg, Karen Paige, Dudley Kirk, John Whiting; Matilda W. Riley, and members of the Seminar on the Life Cycle and Aging at the Center for Advanced Studies in Behavioral Sciences (1979); and Michael Haines and participants at the NBER Williamsburg Conference on Long-Term Factors in American Economic Growth (1984). The research was sustained by grants to the Stanford Project on the History of Fertility Control from the National Science Foundation (Economics) and the National Institute of Child Health and Human Development.

whole of the Western world. Only the French preceded the white population of the United States in initiating a sustained decline in birthrates and total fertility which owed more to the reduction of total marital fertility rates than to a secular rise in marriage age and increases in the proportion of women who remained celibate. Moreover, the reduction of total fertility in America had commenced from levels that were among the highest achieved anywhere in the West when the nineteenth century opened. White women who entered marriage about 1800 and remained fecund to the normal age of menopause, in their later forties, would have given birth to 8 children on the average, whereas the comparable total fertility rate had fallen to the neighborhood of 3.3 by the second decade of the present century (Coale and Zelnik 1963, pp. 34–35; Sanderson 1979).

The magnitude and importance of the fertility decline in the United States, once virtually ignored by economic and social historians, increasingly has come to be recognized as a central factor in the nineteenth-century transformation of American society, one whose ramifications are to be discerned in almost every aspect of the evolving economy and culture of the world's first modern republic. As the descendants of the European settlers became less prolific, the entailed alterations in demographic structure touched many aspects of individual lives and social organization, ranging from savings behavior and labor force participation to popular education and the "status" of women (Easterlin 1972; David 1977; Guttentag and Secord 1984).

Given the perceived importance of this demographic revolution, is it not remarkable that only lately there has been something like a concerted effort to understand how it came about? Although the quantitative importance of enhanced control over marital fertility is now generally accepted, particularly by demographic historians who have analyzed the aggregate statistics pertaining to the native white population in the period 1860–1920, we are just beginning to be able quantitatively to describe the complex patterns in the adoption of family limitation goals and strategies that lie beneath the smooth downward progression of the aggregate fertility indexes. The purpose of this paper is to explore the morphology of the transition to low average levels of completed marital fertility, and the manner in which this was achieved among the native white segment of the population; not why it happened, but how it was managed by successive cohorts of couples who first entered marriage in the period stretching from the eve of the Civil War to the turn of the century.

Aggregate demographic measures tell us what needs explanation but are not inherently informative as to the best explanatory approaches. This is particularly so when the intent is ultimately to understand the

motivations and constraints that shaped the behaviors of the individuals involved. In fashioning an account of the American fertility transition, no less than in the case of such transitions elsewhere, it will make a difference whether the decline of marital fertility can be portrayed as reflecting a gradual reduction of completed fertility by some representative couples, or as the consequence of a rise in the proportion of the population which had managed to achieve a reduced but essentially unchanging level of marital fertility. These are, of course, the polar alternatives. In the latter case, one would be justified in approaching the fertility decline purely as a form of "diffusion phenomenon," and seeking to account for it in congruent terms.

It should not be supposed, however, that identifying the fertility decline in postbellum America as "the diffusion of family limitation" would be sufficient to dispose of the problem of explanation. The term "diffusion" means different things to different people.[1] Contrary to the dichotomy suggested by Carlsson (1966), one may conceptualize diffusion as an equilibrium process in which at every point in time family limitation is the dominant, utility-maximizing strategy for just those couples in the population who have adopted it, or, as an "equilibrating" adjustment process (for the population as a whole) between uncontrolled marital fertility and some state of "controlled" fertility. The adjustment process often is portrayed in the latter vision as a disequilibrium phenomenon akin to the spread of an epidemic. Indeed, there is an abundant literature which would have us understand the adoption of family limitation in terms of the propagation of information about the benefits and methods of birth control, emphasizing the diffusion of (costless?) information through education and other media as the mechanism by which the new mode of behavior was extended throughout the society (see, e.g., Rogers 1973; Zei and Cavalli-Sforza 1977). We do not hope on this occasion to resolve the issues raised by the juxtaposition of these alternative interpretations. Indeed, until a better description of the proximate sources of the American marital fertility decline can be provided, in terms of the extent and effectiveness of the use of fertility control strategies, one cannot even make a sensible start toward understanding it.

7.1.1 Macrodemographic Outlines of the Postbellum Fertility Transition

To outline briefly the quantitative dimensions of the transition to lower marital fertility levels among the United States' native white population in the postbellum era, we may draw upon preliminary findings obtained by a new method of demographic analysis, applied to the age- and marital duration–specific parity distributions from the censuses of 1900, 1910, and 1940.[2] What these reveal is that the nineteenth

century witnessed not one continuous process of transition to effective limitation of family size, but at least two chronologically and geographically distinct phases of movements among the native white population.

The earlier of these had its origins in the Northeastern region of the country during the antebellum era and was already well advanced there by the early 1870s. Over 26% of couples among the marriage cohort of 1855–59 in the United States had managed successfully to avert some births during their completed reproductive life span. The corresponding proportion for the resident population of the Northeast was over 41%. And typically they had averted many births. The later-marrying members of the birth cohort of 1840–44 (to which those women belonged), specifically, those who had been brides at ages 20–29, were particularly effective in restricting their completed family size. We estimate that their completed fertility rate was 4.07, compared with a rate of 7.41 for earlier-marrying women from the same (1840–44) birth cohort in the United States as a whole. Even among women who bore at least one child, the average number of children ever born to those who were active (effectual) controllers at some point in their completed reproductive span, was as low as 3.1 in the Northeast.

This was a standard not to be matched by the whole of the nation's native white urban-dwelling population for another two decades, that is to say, not until the later-marrying (ages 20–29) women among the marriage cohort of 1885–89. By then, as it appears from an analysis of the distribution of births among those effective controllers who did have children, the "two-child family" norm which had for some while been established in the Northeast was emerging ubiquitously among the native white urban population. Furthermore, the pattern was being carried thither to other parts of the country, most notably the states of the Far West.

The foregoing, essentially northern urban and rural nonfarm pattern in the extent and effectiveness of fertility control diverged starkly from the situation that prevailed among native-born whites in Southern states. The latter, largely rural population showed scant indication of any effective marital fertility control, right up to and including the marriage cohorts of the late 1850s.

In this respect, as in so many others, the antebellum South differentiated itself from the predominantly rural North Central region of the country. There, more than one-fourth of the native white residents who had married during the 1850s were active controllers, whereas among Southern native whites marrying during the 1870s fewer than one-fifth ever controlled effectively. Indeed, it was not until the late 1880s and the early 1890s that recently married couples in the South were swept up in a sudden and widespread transformation of fertility behavior. This movement was sufficiently rapid to be able to bring the later-marrying,

and presumably the urban, segments of the white Southern population into substantial conformity with the standards of marital fertility control that prevailed in the rest of the nation by the 1920s.

Between the two phases we have discerned in the postbellum American fertility transition, there was a clear morphological change that reflected itself in the proximate sources of the decline recorded in the total marital fertility rate of the native white population. Among the segment of the married population that were actively controlling, average completed fertility (number of children ever born to a woman aged 45–49) decreased by one-fifth from the marriage cohort of 1860–64 to the marriage cohort of 1885–89. This change accounted for about 55% of the aggregate reduction in average completed fertility, leaving the smaller part attributable to the growth in the proportion of active controllers within the native white population.

The remainder, rather less than half of the decline, can be attributed to the expansion of the proportion of the population that was engaged in some form or other of effective control. This share had risen at a rate approaching 2% per annum, from 0.346 of the 1860–64 marriage cohort to 0.566 of the 1885–86 marriage cohort. Over the following quarter-century the pace of diffusion slowed appreciably, as was perhaps to be expected since the main arena for new recruitment to the ranks of the family limitation movement was largely confined to the South and the rural sections of the North Central region. Among the marriage cohort of 1910–14 nationwide, the proportion of active controllers stood at 0.756, with the South itself no longer far behind at the 0.70 level.

Nevertheless, the diffusion of active control constituted the proximate source of the 1.2 births per woman reduction in the total marital fertility rate for the United States native white population which took place during the second 25-year phase of the postbellum transition. All but 6% of that change is attributable to the more widely extended implementation of essentially the same standards of effective control as had been established among the actively controlling portion of the population during the 1880s. Looking at the comparison between the marriage cohorts of 1885–89 and 1910–14 in greater detail, one finds that while the number of children ever born to all active controllers was, on average, virtually stable, this stabilization was the result of two opposing tendencies. Higher mean levels of completed fertility typical of active controllers within the segments of the population (especially in the farm South) among whom family limitation was diffusing most rapidly, served largely to offset a slowed but continuing downward adjustment of mean family size among the social strata in which marital fertility control had been widely accepted for at least a generation, if not longer.

The impressive degree of family limitation achieved by the end of the first phase of the postbellum transition, and its uniformity throughout the ranks of active controllers, are worth remarking upon. Once-married women who reached the altar during their twenties in the years 1885–89, and who subsequently managed to avert at least one birth before reaching the end of their reproductive span (at ages 45–49), are estimated to have borne 3.18 children on the average. This figure pertains to the native white population of the United States at large, and stands a good bit above the average of 2.80 that prevailed among the residents of the Northeast. Leaving aside the active controllers who remained childless, the corresponding mean level of completed fertility was 3.35 nationwide, and 3.09 in the Northeast. Just as the geographical differentials were less pronounced within the ranks of the childbearing active controllers, urban-rural differences in completed fertility also were comparatively small. For comparable couples belonging to the same (1885–89) marriage cohort, the deviations of the urban, nonfarm rural, and farm-dwelling subpopulations from the 3.35 national average rate just cited were only −0.20, +0.03, and +0.38 births per woman, respectively.

It should be noticed, too, that the urban-Northeastern levels of completed fertility were so low even among childbearing active controllers that these couples could barely have been expected to replace themselves in the population. Based on the mortality experience of the period 1870–85, only 0.734 of the children born to women in the 1885–89 marriage cohort could have been expected to survive to ages 20–24, implying that no more than 2.3 mature offspring would have been on hand to take their parents' place. Still more remarkable is the fact that the same situation obtained in the Northeast as early as the marriage cohort of 1860–64, in which childbearing active controllers could have expected to see no more than 2.2 of their children survive to ages 20–24.[3]

To summarize these preliminary findings: from the beginning of the postbellum era, if not before, among those strata of the native white population of the Northeast in which women characteristically deferred marriage until their mid-twenties, even fertile couples were managing to hold their expected completed fertility remarkably close to the replacement level. The closing decade of the century saw this impressive standard approached by active controllers in other regions, and throughout the urban segment of American society, and the maintenance of the same degree of effective control as the ranks of birth controllers were swelled by new converts. Thus, it may be said that the approximate halving of the native white population's completed marital fertility rate, which occurred between the birth cohorts of 1840–44 and 1890–94, reflected the popular extension—or, to use Himes's

(1936, 1970 ed.) phrase, the "democratization"—of a pattern of successful reproductive control that was already being achieved at the outset among a substantial minority.

7.1.2 Toward Understanding the Microdemography of the Transition

The preceding quantitative overview directs our immediate attention to the task of understanding how such low levels of marital fertility were achieved and maintained in the latter part of the Victorian era. Thus motivated to probe further beneath the surface of the macrodemographic trends, we shall turn in section 7.2 to examine an important set of microdemographic clues provided by the remarkable body of information that has become known as the Mosher Survey. On the basis of this evidence we are led to suggest that during the last quarter of the nineteenth century, and quite possibly earlier still, the key to the success of the native-born urban fertility controllers lay in combining the application of rudimentary contraceptive methods with a very considerable measure of sexual restraint within marriage. If these Victorian pioneers of successful family limitation resembled us to a surprising degree in their fertility goals and their acceptance of the latest in available contraceptive technologies, their sexual life-style will be seen to have been, by choice and necessity, very "unmodern."

To lend a measure of credence to the relevance of the testimony concerning sexual, contraceptive, and reproductive experiences provided by the small group of married women who responded to the remarkably thorough and candid questions posed by Clelia Mosher starting in the early 1890s, we first go to some lengths to show that in their fertility experience these women were representative of the larger social and economic stratum from which they had been drawn. This is to say our historical "informants" testified to a pattern of reproductive experience that matched the urban wives of men in professional occupations. The latter group, in turn, closely resembled the entire contemporaneous segment formed by the effective fertility-controlling couples among the urban native white population.

A second line of support for the hypothesis advanced in section 7.2 is provided by the results obtained in section 7.3 with a simple microdemographic simulation model, using historically relevant parameters. This serves to establish the consistency between the range of contraceptive methods reported by the Mosher Survey interviewees, the low level of marital coitus to which they testified, and their actual fertility. It further demonstrates the possibility of effective use of rudimentary contraceptive methods, if one were prepared to bear the costs in terms of the sacrifice of what today would be judged a normal regime of marital sexual intercourse. The findings of this section (7.3) also lend

some additional support to the proposition that "spacing behaviors" played an integral role in the nineteenth-century United States fertility transition. Recognition of the inherent unreliability of the available means of contraception, and the hazards entailed in effectual efforts to induce abortions, led couples in this era not only greatly to reduce the frequency of coitus but also to initiate positive measures of control at a very early stage of marriage (see David and Sanderson 1984).

The concluding discussion in section 7.4 addresses broader themes briefly, considering the significance of Victorian culture and sexual ideology among the formative elements of the strategies of fertility regulation which appear to have become most typical of American urban middle-class couples during the postbellum era. Rather than treat the Respectable Victorian ideology of sexual restraint as a wholly exogenous cultural phenomenon affecting the "supply side" of fertility control, its emergence and persistence into the early twentieth century may be explained in part by reference to the contraceptive objectives and the technological constraints relevant to the situation of many middle-class couples. We suggest that the role models, or prescriptive behavioral stereotypes, which this ideology projected had acquired a positive functional value for individual couples who were seeking effectively to utilize the rudimentary, inherently unreliable contraceptive technologies which became available during the nineteenth century. The acceptance within the society's educated middle classes of the lifestyle of marital sexual continence, in varying degrees, at both the individual attitudinal and behavioral levels, was, on this reading, promoted by the emergence of a transitional technological context that made the indicated course of sexual behavior consonant with their family-limiting goals.

7.2 How Did They Do It? Family Limitation Strategies among the Urban Middle Class

Exactly how near-replacement levels of marital fertility were achieved during the postbellum era by the vanguard of birth controllers among the urban, native-born population in the Northeast has remained something of a mystery. It is widely supposed that the spread of contraceptive practices during the latter part of the nineteenth century somehow played a key role in enabling individual couples to regulate their fertility, but the direct evidence for this presumption is meager, to say the least. Little is known quantitatively about the extent to which the various methods and devices available for the "the prevention of pregnancy" actually were employed by different socioeconomic groups in the American population before the 1920s. Still less may be ventured with any confidence as to the temporal and geographical patterns of adoption

of specific methods. Indeed, the lack of close attention to the technological, physiological, and pharmacological aspects of historical methods of fertility control has given rise to something of a puzzle: How could an assortment of rudimentary contraceptive methods, which by today's standards appears both cumbersome and disastrously unreliable, have come to be so extensively and effectively employed?

No longer is it possible to attribute the persisting vagueness of discussions of the means of family limitation in nineteenth-century America to the delicacy or inhibitions of historians in addressing matters inextricably related to the subject of human sexuality. Modern scholars, such as Linda Gordon (1976), James C. Mohr (1978), James Reed (1978), Carl N. Degler (1980), and, most recently, Peter Gay (1983), are frank enough. But they have found it hard to cast off legacies of the tradition through which social historians became reconciled to discussing these questions despite the difficulties of furnishing documentary evidence about the fertility-regulating behaviors of populations in the past.

Insofar as a traditional speculative consensus can be said to have emerged on these matters, it maintained that low marital fertility could be achieved by premodern populations (and where such are observed, were most probably achieved) through a combination of abstinence, abortion, and coitus interruptus. Since these three methods of family limitation are often presumed to have been generally known and understood in America from colonial times onward—if not necessarily put into practice—most of the attention among social, economic, and demographic historians concerned to understand the nineteenth-century fertility decline has become focused upon the forces creating a demand for smaller families (see, e.g., Easterlin 1976; Lindert 1978; Haines 1979; Vinovskis 1981; Tolnay and Guest 1982, 1983; continuing an older tradition from Yasuba 1962; and Forster and Tucker 1972).

We hold no brief against this important line of inquiry, and seek here only to point out that there may be a value to attempting to redress the balance between the "demand side" and the "supply side" of the determination of effective family-limiting behavior. After all, the "why" of the story cannot properly be explained in abstraction from the question: How did they do it? One is not likely to be successful either in accounting for the diffusion of family limitation, or in understanding the emerging patterns of fertility among the effective controllers, without considering the full range of circumstances and attitudes that motivated the people involved. In addition to learning what prompted married couples to wish to inhibit their reproductive power, we must try to understand more about the means that were available to them for that purpose, and the behaviors entailed in implementing those methods successfully. Desired family size is not determined without reference to the pecuniary and psychic costs of control, as economists

are ready to point out. (See Easterlin 1978 and David and Sanderson 1978a for theoretical formulations.) If this insight is to be fruitful, it should lead to fuller considerations of the factors determining the costs of marital fertility regulation. These costs must be gauged in terms of the behavioral demands of maintaining an effectual contraceptive regime, as well as pecuniary outlays for contraceptive appliances. The differing abilities of various groups within the society to sustain them may well have played an important role in generating the patterns of differential fertility that emerged among the native white population of the United States during the postbellum era (Rainwater 1960).

The key to the differential success of the contraceptive efforts of educated, native-born couples in the Northeastern states, and particularly the members of the professional classes who belonged to the marriage cohorts of the 1870s and 1880s, most probably was sexual restraint within marriage. The rudimentary state of development of the broadening array of contraceptive methods and devices which they sought to employ required that, for success, sexual "continence" had to be practiced to a degree which, by the standard of more recent times, can only be described as extreme.

Our reasons for advancing this hypothesis, and for believing that coital frequencies within marriage were exceptionally low among this particular segment of the population, derive from an analysis of material contained in the Mosher Survey, which is now widely accepted by American social historians as the earliest extant set of detailed and quantifiable responses to explicit questions concerning sexual and contraceptive behavior (MaHood and Wenburg 1980). The historical significance of the Mosher Survey and its broader relevance for the social history of sex and reproduction has been considered elsewhere (Degler 1974, 1980; Rosenberg 1982, esp. pp. 98–99, 180–87; Gay 1983, pp. 135–44, 258). Here, in section 7.2, we shall discuss the characteristics and import of this small but illuminating body of information as it applies to the study of the historical interrelationship between sexual and contraceptive behavior.

The group of women whose interview responses are recorded in the questionnaire forms of the Mosher Survey were mothers; all had borne at least one child. Despite the smallness of the sample and the serendipitous way in which it was collected, we show that the fertility experience of the respondents closely matched that of all childbearing wives of urban professional men in the United States who belonged, as they did, to the marriage cohorts of 1870–94. Considering just the urban "professionals" marrying in 1885–89 and taking brides in the 20–29 age group, the average completed fertility of those who bore children is found to have been 3.20. This is essentially the same as the figure (3.15) for the entire group of fertile (i.e., childbearing) but actively

controlling couples among the contemporary native white urban population. What has previously been referred to as the "urban standard of effective control" for the marriage cohort of 1885–89 was thus reflected in the marital fertility of the Mosher Survey women. We therefore may hope to derive from the confidences of these candid few some pertinent hints to understanding the reproductive behavior of the reticent many, that multitude of successful birth controllers who at the time composed upward of 60% of the country's native white urban-dwelling couples.[4]

7.2.1 The Mosher Survey and Its Representativeness

Previous efforts to fashion an account of nineteenth-century sexual and reproductive behavior have proceeded largely on the basis of inferences drawn from diaries, letters, novels, marriage manuals, and other literary evidence. What follows takes the alternative tack of formulating a historical account of these matters largely on the basis of quantifiable information about the lives and behavior of a small sample of couples married during the late nineteenth and early twentieth centuries. At this stage tentative hypotheses rather than firm conclusions are in order. But our hypotheses, hedged and qualified as it is appropriate for them to be, do derive directly and indirectly from the microdemographic clues that we have extracted systematically from data which, until a decade ago, lay unnoticed in the Stanford University Archives.

Carl Degler first brought to our attention the presence in the Archives of the papers of Clelia Duel Mosher, and the existence among them of the responses to a questionnaire she had developed and administered in the period from 1892 to 1920.[5] The Mosher Survey, as Degler (1974) first called it, dealt with the sexual and reproductive experience of 44 married women, virtually all of whom were wedded to members of the professional classes and many of whom were the wives of university professors.

Clelia Mosher herself was neither wife nor mother. The early interest she displayed in these subjects derived from what would become for her a lifelong professional concern with issues relating to women's health. An exceptional woman in her time, she made a place for herself first as a physician and later among the Stanford professoriate. A dutiful daughter, she had remained in the family home following her secondary schooling, occupying herself in a little greenhouse business as her father wished. But in that capacity she unexpectedly accumulated enough money to strike out on an independent course, commencing her undergraduate education at the age of 25 by enrolling in Wellesley College (Jacob 1979). In her junior year, Mosher transferred to the University of Wisconsin at Madison to major in biology. It was there during 1892,

when prompted by a request from the Mothers' Club of the University to speak on the "marriage relation," that Mosher designed and administered the first six of the existing questionnaires to which we have referred.

The following academic year, Mosher moved again, this time to Stanford University where she received her B.Sc. (in biology) in 1893. After completing her baccalaureate studies Mosher stayed on at Stanford as a graduate student in biology, and working also as an assistant in hygiene. She received her M.Sc. in 1894, and in the autumn of 1896 left Stanford to join the first cohort of women students admitted to study medicine at The Johns Hopkins University in Baltimore. During her initial sojourn at Stanford, Mosher collected sixteen questionnaires, and in the course of her medical student career at Johns Hopkins she administered four interviews. After she received her M.D. degree in 1900 and served an additional year at the Hopkins Hospital, Mosher returned to Palo Alto, California, where she engaged in private practice. No questionnaires were completed during this period. It was only after Mosher gave up her practice to become an assistant professor of personal hygiene at Stanford in 1910 that she resumed collecting the data analyzed below. In 1913, fifteen more questionnaires were added, and in 1920 the final five forms were completed.[6]

The respondents to her questionnaire were, in a literal sense, daughters of the early Victorian era: virtually all were drawn from the birth cohorts between 1835–39 and 1870–74. Fourteen of these women were born before the beginning of the Civil War, two as early as the decade of the 1830s. The largest birth cohort among the sample, numbering 19 to be precise, belonged to the decade 1860–69 in which Clelia Mosher herself was born. Nine of the women she interviewed were her juniors, seven having been born in the 1870s. But only one among the interviewees was born during each of the two closing decades of the century.[7]

Although the survey respondents as a group did not match Clelia Mosher's educational and professional attainments, they were nonetheless a highly educated group of women for the time. All those about whom educational information is available had completed high school, and roughly three-quarters of them continued their education beyond that point. About half the Mosher Survey women received at least one college degree. Their husbands were highly educated too: at the time of the survey, most were teachers and college professors, but a few businessmen and engineers appear among them.

The remarkable character of this data set, however, resides not in the fact that it pertains mostly to educated middle-class women born before 1870, but in the range and nature of the information elicited by the interviews.[8] Although we have but 44 usable sets of responses,

there is an extraordinary wealth of detail about each individual's life and that of the household in which she resided. These afford glimpses of patterns of covariation among physiological, situational, attitudinal, and behavioral characteristics, some of which are only infrequently revealed in modern surveys dealing with reproductive behavior. Family backgrounds, educational careers (of both the respondent and her spouse), work experience, health history and status, attitudes, experience and habits in sexual matters—all these are inventoried. In addition, and most crucial for our purposes here, the responses provide records of marriage, conceptions, miscarriages, births, infant deaths, lactation period, as well as collateral information concerning knowledge and use of contraceptive methods.

The first point which must be established here about such a small and serendipitously collected sample concerns its usefulness for the purpose of suggesting hypotheses about the sexual and reproductive behavior of a broader segment of the American population. Deriving from the origins of Clelia Mosher's inquiries, the Survey respondents all were mothers, but conditional upon that fact that their fertility experience was quite representative of the social and occupational class of native white American's from which they were drawn.

Table 7.1 presents a comparison of the fertility of mothers in the Mosher Survey sample classified by age and marital duration with the fertility in 1910 of similarly classified native white, once-married mothers living in urban areas, whose husbands had a professional or semi-professional occupation. The cell means derived from 1910 census data are based on large numbers of observations, whereas the Mosher Survey cell means are based on very small numbers of cases. To take into account the greater biological and behavioral heterogeneity of the national sample, the figures obtained from the 1910 census source have been suitably adjusted to render them comparable with the Mosher Survey observations.[9]

Visual comparison of the fertility of the paired entries in table 7.1 conveys the correct impression that in their fertility, if in nothing else, the Mosher Survey respondents were quite representative of the larger group. This can be confirmed by more formal statistical tests. Consider the following regression model:

$$B_M(i,j) = \alpha + \beta\,[B_C(i,j)] + e(i,j),$$

where $B_M(i,j)$ is the mean number of births to mothers in the Mosher Survey who were of age i and of marital duration j; $B_C(i,j)$ is the comparable figure in table 7.1 derived from the census data; α and β are parameters; and $e(i,j)$ is a random variable with mean zero. Were the Mosher Survey responses truly an unbiased reflection of the un-

Table 7.1 **Representativeness of Fertility Experience of Mothers in the Mosher Survey Sample: Average Numbers of Children Born to Mosher Sample Mothers in Specified Age and Marital Duration Groups, Compared with Corrected Averages for White Mothers Married to Urban Men in Professional Occupations in the United States in 1910**

		Duration of Marriage (years)									
Age		Under 3	3–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	Unweighted Average[a]
	Total Number of Mosher Observations	(4)	(3)	(6)	(4)	(2)	(4)	(4)	(3)	(2)	Total Number of Mosher Observations
25–29		1.0	1.0	2.0							(4) 1.3
		1.26	*1.60*	*2.17*							*1.68*
30–34		1.0	1.0	2.4	2.0						(11) 1.6
		1.26	*1.60*	*2.29*	*2.86*						*2.00*
35–39					4.0	4.0					(2) 4.0
					2.86	*3.43*					*3.14*
40–44				1.0	2.0	2.5					(4) 1.8
				1.94	*2.86*	*3.43*					*2.74*
45–49					3.0		3.0	5.0			(3) 3.7
					2.29		*2.66*	*4.11*			*3.35*
50–54							4.5	5.0	4.0		(5) 4.5
							3.31	*3.89*	*4.69*		*3.96*
55–59								4.0	2.5		(3) 3.3
								3.43	*4.23*		*3.83*
60–64										5.5	(2) 5.5
										4.23	*4.23*
	Unweighted Average[a]	1.0	1.0	1.8	2.7	3.2	3.7	4.7	3.3	5.5	(34) Mosher
		1.26	*1.60*	*2.13*	*2.91*	*3.43*	*3.48*	*3.81*	*4.46*	*4.23*	*Census*

Note: Roman figures show means computed from Mosher Survey women reporting one or more live births. Italic figures show means computed from United States census of 1910 data, after correction for heterogeneity.

[a]Unweighted averages of cell means appearing in this table; these are not arithmetic averages of underlying individual observations.

Technical notes and sources:

Mosher Survey Mothers, 1892–1920: The average numbers of children ever born (live) to women in the indicated age and marital duration groups who had one or more live births have been computed from the unpublished source: "The Mosher Survey, an Edited, Machine-readable Version," prepared by Paul A. David and Warren C. Sanderson, with Michelle Matel, May 1979. (This source is referred to hereafter as the "Mosher Survey Tape.")

United States White Mothers Married to Urban Men in Professional Occupations, 1910: See United States Bureau of the Census (1947), table 19, pp. 116–41, for underlying 1910 census data (Sample W) from which were computed age- and marital duration–specific means of the number of children ever born to wives (of men classified by the 1910 United States Census as having a professional occupation) who reported at least one birth.

For comparisons with the age- and marital duration–specific means for the Mosher Survey (mothers), it is necessary to adjust the census sample means to allow for the much greater degree of heterogeneity in the effective fecundity of the population(s) to which these refer. As may be seen from the next to the rightmost column in table 7.1, there are very few Mosher sample observations in each cell; in addition, the geographical location, nativity, religious, and occupational composition of the Mosher Survey respondents render it a virtually homogeneous sample for purposes of comparison with the census sample of white women married to urban professionals. Cf. Bongaarts (1976), pp. 234–35, for derivation of the correction factor (1.143) which has been used to multiply the published census cell means.

derlying census data, we would expect that the parameter α would be insignificantly different from zero and that the parameter β would be insignificantly different from unity.

The regression results are as follows, where the numbers in parentheses are standard errors of the coefficients:

$$B_M(i,j) = \underset{(0.589)}{-0.507} + \underset{(0.190)}{1.157}\,[B_C(i,j)]\ ,\ \bar{R}^2 = .660.$$

(standard error of the regression = .887)

The expected results clearly obtain at the conventional 95% confidence level: the intercept is insignificantly different from zero and the slope coefficient is insignificantly different from unity. To confirm that the slope coefficient remains insignificantly different from unity when the intercept term of the regression equation is constrained to be zero, examine the following regression equation:

$$B_M(i,j) = \underset{(0.062)}{1.002}\,[B_C(i,j)] \quad \text{(standard error of the regression = .881)}$$

An F-test ($F = .73$) indicates that constraining $\alpha = 0$ does not significantly reduce the explanatory power of the model—at any reasonable level of statistical significance that one might care to name. These results support the view that the Mosher Survey observations on fertility by age and marital duration are an unbiased sample of the relevant national subpopulation from which Clelia Mosher's informants were drawn, as reflected in the United States census data for 1910.

This fortuitous coincidence, taken altogether with the scope of the personal information inventoried, makes the Mosher Survey a veritable Rosetta Stone for the study of the demographic and social history of a significant segment of the American population—namely, the social, occupational, and residential stratum that appears to have formed the vanguard of the American family limitation movement during the postbellum era. It is not, of course, a suitable statistical testing-block for old and new theories concerning fertility behavior. The dangers of overanalysis, or of "overfitting" in the process of seeking internal regularities within this data set can scarcely be ignored. In view of the small number of respondents involved, it seems most appropriate to utilize their testimony in the way that social anthropologists make use of informants who belong to a culture other than their own. As such, this trove of information legitimately may serve as the inspiration for hypotheses that can eventually be subjected to rigorous statistical tests by indirect means, employing other bodies of historical data that are less comprehensive in scope yet offer wide coverage of a few important dimensions of fertility behavior.[10]

7.2.2 Extent and Methods of Contraception—From Mosher to Kinsey

In table 7.2 are assembled clues which have been gleaned from three historical sources concerning the quantitative extent of contraception and the distribution of methods used. To the Mosher sample we have added information from two better-known, twentieth-century surveys: the Terman sample and the Kinsey sample. All of these data sets refer to educated middle-class women.[11] The reproductive experiences spanned in this table extend from 1856, when the earliest marriage among the Mosher Survey women was celebrated, to the mid-1930s when the Terman survey was conducted. By the latter date most of the women in the Kinsey sample of those marrying before 1915 would have completed their reproductive spans.

The questions concerning contraceptive practice in the Mosher and Kinsey surveys were essentially inquiries into the array of contraceptive methods ever used by respondents, whereas the question in the Terman Survey (see table 7.2, n. 3) was apparently designed to elicit information on current use. The responses, however, led Terman to believe that many people were answering this question as if it referred to methods ever used (see Terman 1938, pp. 347–48). With this in mind, it is interesting to glance at the figures on the proportion of noncontraceptors among respondents shown on the second line from the bottom. One may see that only 12.5% of the Mosher respondents interviewed in the nineteenth century reported that they never used contraceptive methods, whereas only 5.9% of those interviewed in the twentieth century reported no contraceptive use.

The former of these figures fits in nicely with the preliminary estimates we have obtained, using the cohort parity analysis methods referred to in section 7.1. Those findings, based on ample census samples, confirm the relatively small dimensions of the "noncontrolling remnant" left among the native white women of the Northeast, whence many of the Mosher survey respondents originally had come. For women who married in their twenties during 1885–89, the CPA estimate of the proportion of dedicated noncontrollers, based upon completed reproductive lives, is found to be 14.6%. We also can report a close match with the subsequent, still lower estimate of the fraction of noncontraceptors among the women interviewed by Mosher after 1900. Most of the latter were married in the late 1890s, and for that marriage cohort the "noncontrolling remnant" in the population of native white women who wed in their twenties has been estimated at 7.0% in the case of couples remaining in the Northeast, and at 4.5% in the case of those residing in the West at the end of their reproductive lives. The Mosher survey respondents interviewed in Palo Alto after 1900 obviously be-

Table 7.2 **Contraceptive Use Experience among Married Upper Middle-Class American Women: From the 1850s to the 1930s (Frequency Distributions of Methods Reported as Ever Used)**

	Mosher Survey Sample,[1] 1892–1920				Kinsey Survey:[2] Wives of College Men, Married before 1915		Terman Sample[3]	
	Full Sample		1892–97	1913–30	1938–50		1935	
Methods Ever Used	Number	Percent	Percent	Percent	Number	Percent	Number	Percent
Positive methods								
Douche	18	32.2	41.4	25.0	23	27.4	242	197
Safe period/rhythm	12	21.4	25.0	18.8	0	0.0	74	6.0
Withdrawal	8	14.3	16.7	12.5	21	25.0	233	18.9
Condom	11	19.6	12.5	25.0	22	26.2	259	21.1
Pessary, diaphragm	4	7.1	0.0	12.5	9	10.7	137	11.1
Suppository, jelly (and foam powder)	2	3.6	0.0	6.2	9	10.7	233	18.9
Other	1	1.8	4.1	0.0	0	0.0	53	4.3
Total positive usage (above)	56	100.0	100.0	100.0	84	100.0	1231	100.0
Abstinence	4	6.2	10.0	3.0	0	0.0	n.a.	n.a.
No method used	4	6.2	10.0	3.0	7	7.7	19	1.5
Total instances reported	64	100.0	100.0	100.0	91	100.0	1250	100.0
Number of respondents	41	100.0	(24) 100.0	(17) 100.0	41	100.0	792	100.0
Noncontraceptors among respondents	4	9.8	(3) 12.5	(1) 5.9	7	17.1	10	2.4
Positive usage per user	1.51		1.14	2.00	2.47		1.59	

Note: The observations presented in the upper and middle sections of this table are "instances of use" (or nonuse) of the indicated methods of contraception. More than one method may be reported by a given user. Observations pertaining to the survey respondents (contraceptors and noncontraceptors) are presented in the lower panel.

Technical notes and sources:

1. **Mosher Survey Sample:** Observations from coded responses to Mosher's question, "Have you ever used any means to prevent conception? If so, what?" as tabulated from David and Sanderson, with Matel, "Mosher Survey Tape" (May 1979). The data here pertain to the subsample of women currently married (at time of interview) who responded positively or negatively to this question.

Notes: (a) The "other" method mentioned, one instance, among the 1892–97 interviews, was coitus reservatus. (b) The exact questionnaire date cannot be determined in one case: Form 27 has been assigned to the 1892–97 period.

2. **Kinsey Survey Sample:** From the unpublished Kinsey Data Tape: Married Women (ISR Compilation, December 1978), kindly made available to the authors by Dr. Paul H. Gebhard. A subsample was created consisting of those once-married women who were married before 1915 to men who had attended at least one year of college. Within that subsample, tabulations were made of the responses of those 41 women who reported having ever used or never used the contraceptive methods listed in the table. See Gebhard and Johnson (1979), tables 309–14, for the form of the original Kinsey interview questions and marginal tabulations of the responses for the whole sample.

3. **Terman Sample:** Computations based on data in Terman (1938), table 130, p. 347, derived from responses to the question (asked of both husband and wife in each couple: "What method of contraception (birth control) do you use? (check) condom_____, pessary_____, jelly_____, powder _____, douche_____, withdrawal_____, 'safe period'_____, other methods."

longed to the second of the two groups: 5.9% of them reported themselves innocent of experience with contraception.

Only 2.4% of the California married couples interviewed by Louis Terman in the early 1930s labeled themselves as noncontracepting. This figure in table 7.2 also fits into the pattern of CPA-based estimates showing a steady shrinkage in the noncontrolling remnant in the West, until that proportion reached 2.5% among women belonging to the 1915–19 marriage cohort who were married at ages 20–29. These points of agreement with measures obtained by entirely independent methods from extensive census samples, offer a modicum of reassurance that small sample bias and self-selection biases in these early surveys are not leading us seriously astray regarding the pattern of contraceptive use among this stratum of middle-class American society.[12]

The indications from table 7.2, however, are strikingly at variance with Oscar Handlin's (1957) impression that the dire warnings issued by some Victorian authors of medical and marriage manuals must have persuaded educated middle-class couples to put aside all positive contraceptive methods as undesirable or ineffectual. As far as actual behavior is concerned, it seems quite incorrect to suppose that the combination of such individual exhortations with late-nineteenth-century legislation (inhibiting the distribution of contraceptive information and materials) had succeeded in making abstinence "the law" for those concerned to limit family size. Instead, the Mosher Survey evidence, in conjunction with the more broadly based indirect measures reviewed in section 7.1, suggest that, among native-born urban dwellers toward the upper end of the American socioeconomic hierarchy, the process of "quiet percolation" of contraceptive knowledge described by Norman Himes (1970 ed.) was already far advanced toward completion when the nineteenth century drew to its close. In the same vein it may also be remarked that, despite the influential role of nineteenth-century religious perfectionism, which Linda Gordon (1976) recently has discerned in tracing the development of feminist birth control thought in America, the perfectionists' "rejection of mechanical or chemical contraception in favor of changes in the nature of sexual intercourse itself" would appear to have exerted no decisive influence upon the modes of contraception adopted by women such as those interviewed by Clelia Mosher.[13]

Still more revealing is the distribution of contraceptive methods shown in table 7.2. In the full Mosher sample, the traditional "male-implemented" forms of contraception (withdrawal and condom) accounted for only one-third of all mentions of contraceptive use. Among the Mosher respondents who completed their questionnaires in the nineteenth century, douche was clearly the most prevalent form of contraceptive, followed by safe-period methods, withdrawal, and condom, in

that order. The extent of use of safe-period methods may come as something of a surprise, especially since the timing of ovulation in the human menstrual cycle was not generally understood by the medical profession during the nineteenth century, indeed before the work of Knaus and Ogino in the 1930s. Nonetheless, widespread use of various primitive safe-period methods is quite consistent with much of the medical advice literature of the day (David and Sanderson 1979; Degler 1980, ch. 9). The possibility that safe-period methods may have played a role in the nineteenth-century United States fertility decline is one of those tantalizing suggestions which abound in the Mosher Survey data, to which we shall return briefly in section 7.3.

Starting with the nineteenth-century Mosher Survey responses in table 7.2, and reading across to the right, gives us several clues as to the changing patterns of contraceptive use. These trends may be followed up to the middle of the present century by consulting table 7.A.1. Douche and safe-period methods decline in popularity over time and are replaced with the more effective, female-implemented techniques of diaphragm, suppositories, and foams. The prevalence of male-implemented methods, particularly the condom, increases from the early to the late period in the Mosher responses but then remains roughly constant.

These observations lend further weight to the emerging consensus that middle-class couples were actively experimenting during the post-bellum decade with a variety of contraceptive techniques, among which female-implemented methods of comparatively recent origins figured prominently. The latter included not only the new-fangled vulcanized rubber cervical caps and diaphragms of the 1870s and 1880s, but post-coital vaginal douching using syringes, as first advocated during the 1830s and 1840s by the western Massachusetts physician, Charles Knowlton; and systems of periodic continence, based upon the idea of a "safe period," that had been introduced into America from France during the 1850s (Himes 1970 ed.; La Sorte 1976; David and Sanderson 1979).

As far as educated, middle-class Americans were concerned, then, there is simply no foundation for continuing to suppose that couples desiring to avert pregnancies had been relying mainly upon the traditional "tried and true" methods of coitus interruptus and abstinence until 1915, when supposedly they were liberated to employ a better contraceptive technology by the political movement which coalesced around Margaret Sanger's catchy slogan—"birth control."[14] Few couples in the reproductive age range appear to have resorted to total abstinence from sexual intercourse for any prolonged duration, and the Mosher respondents mentioned using either douche or safe-period methods far more frequently than they mentioned the use of withdrawal.

Although it is clearly unwarranted to imagine that the contemporary medical and marriage manuals generally dissuaded readers from experimenting with the various methods of contraception described critically therein, perhaps their unanimously dire warnings against the use of coitus interruptus actually were heeded by substantial number of educated, middle-class couples who were inclined to suspect the worst of anything "old-fashioned." Surely, it appears unfounded for historians to venture the sophisticated interpretation, namely, that the great frequency of admonitory references concerning the damage done to mind and body by "pullbacks" (withdrawal) confirms an almost universal reliance upon this method by contracepting couples. Whether or not the virtually universal denunciations of coitus interruptus by writers of marriage manuals and tracts during the postbellum era in America is properly to be held responsible for a shift to other means of contraception among educated middle-class couples, must remain a matter for conjecture.

The Mosher Survey data do serve, however, to underscore the dubious nature of the argument that because coitus interruptus was the method of contraception most widely denounced, it must therefore have been "the most common method in actual practice."[15] On the same point, the evidence drawn from clinical surveys and retrospective investigations conducted in the 1920s (and later) appear to be no less treacherous as a basis for quantitative conclusions about nineteenth-century contraceptive practice, at least that among the professional classes. Wrigley (1969) and other students of British population history have been inclined to view the findings of Lewis-Fanning (1949) as providing corroboration for the view that withdrawal, having become a widespread practice among the French population as early as the eighteenth century, remained the dominant method of marital fertility control among the English—abortion aside—right up until the modern era.[16] This may yet be found to be true as a statement about the nineteenth-century American population as a whole, but the Mosher Survey evidence raises serious doubts that the generalization holds when applied specifically to the Victorian middle classes.

Further, since withdrawal is the male-implemented method of contraception par excellence, there have been those who have taken its putatively dominant position among the techniques actually in use as grounds for arguing that male motivation to control fertility held the key to successful contraception during the nineteenth century and before.[17] It is necessary now to reconsider this position, not only in light of the evidence we will present as to the effectiveness with which methods such as postcoital douching and the safe period could be used, but in view of the foregoing indications of the importance of these female-implemented methods among middle-class strategies of fertility regulation.

7.2.3 The Question of Abortion

What of abortion? The problem we face here is that the women interviewed by Clelia Mosher were asked no direct questions concerning induced abortion, nor did any of them volunteer explicit information on the subject. Quite apart from legal considerations and attitudes prevailing in respectable middle-class society at the end of the nineteenth century, the question of abortion doubtlessly would have been a matter of particular delicacy even in confidential communications between a regular medical practitioner and her patients (see Mohr 1978, chaps. 4, 6, 7). Fortunately, however, in the Mosher questionnaires the number of conceptions was reported separately from the number of children ever born, and so it is possible to examine the frequency and distribution of miscarriages within a subsample of the population.

The relevant data on conceptions and intrauterine mortality are summarized by table 7.3. Considering only the 40 women who had at least one recognized conception (missed menstruation) and for whom complete information is available as to the outcome of every pregnancy, the average rate of miscarriage was 0.185 in a total of 128 conceptions. From this, and from the fact that slightly under one-third of the subsample of these fertile women had ever aborted a recognized pregnancy (spontaneously or otherwise), it is evident that *successful* recourse to induced abortion among this group of middle-class wives was not at all the ubiquitous phenomenon decried by antiabortion campaigners within the American medical profession.[18] The Mosher Survey women belonged to another world than the real or imaginary one described by the Chicago physician Edwin M. Hale, who, in his work *On the Homeopathic Treatment of Abortion* (1860), held that it could be "safely asserted that there is not one married female in ten who has not had an [induced] abortion or at least attempted one!" (quoted in Mohr 1978, p. 90).

Unsuccessful efforts to induce abortions were probably widespread, fostering suspicions (or misplaced confidence) regarding the cause of miscarriages which in fact were of spontaneous origin. Such indications of a widespread willingness among women to attempt to terminate pregnancies, even by means so emotionally and physiologically "costly" as the techniques of abortion then available, are not without significance for our understanding of the strength of the desire to control fertility. Modern authorities have noted that interest in abortion and the actual incidence of induced abortion may sometimes increase with the initial diffusion of contraception, because couples become committed to the goals of family limitation before contraceptive control techniques are adequate to the task (Omran 1972, p. 100). But this is quite different

Table 7.3 **Total (Spontaneous or Induced) Abortion Rates among Fertile Women in the Mosher Survey Sample, 1892–1920**

Mosher Survey Women Reporting One or More Pregnancies, the Outcome of Each of Which Is Known

1. Aggregate Average Rates of Occurrence

	Total Sample	Women Ever Aborting
Conceptions per woman	2.98	5.33
Abortions per woman	0.55	1.83
Abortions per conception	0.185	0.343
Number of women	40	12

2. Probability of Pregnancy Terminating in Abortion (for Specified Individuals)

Woman's contraceptive use experience (groups of methods ever used)	N. Obs. (Women)	Mean	S.D.	N. Obs. (Women)	Mean	S.D.
I. Diaphragm, condom included:	12	0.091	0.142	4	0.271	0.095
II. Withdrawal included, but not in (I)	7	0.119	0.209	2	0.417	0.118
III. Douche, safe period, other, but not in (I) or (II):	17	0.127	0.191	6	0.361	0.125
IV. No contraception:	4	0.000	0.000	0	n.a.	n.a.
Totals	40	0.102	0.170	12	0.340	0.118

Technical notes and sources:

1. **Aggregate Average Rates of Occurrence:** Each pregnancy (among those having a known outcome) that did not terminate in a live birth or a stillbirth was classified as having been "aborted." Tabulations were made for all qualified pregnancies (119 conceptions) recorded on the Mosher Survey Tape (May 1979). In four cases respondent was pregnant at time of interview; for the purposes of this table these conceptions are treated as if they had not occurred. The average rates presented for abortions per woman implicitly weights each woman's experience by her number of conceptions. The average abortion rate presented under (1) is thus a per conception rate, treating each *conception* as an independent observation.

2. **Probability of Pregnancy Terminating in Abortion:** From the Mosher Survey Tape (May 1979), an average frequency of abortions (as defined above) per conception was computed for each of the women who reported one or more pregnancies, the outcome of each of which is known. The mean and standard deviation of abortion probabilities presented in this portion of the table are calculated by treating each woman's average abortion rate as a single observation—rather than weighting by the number of conceptions she reported.

The women in the subsample for whom the foregoing abortion frequencies could be computed were then classified into one or another of the four, mutually exclusive contraceptive experience categories defined in detail in the stub of table 7.6.

from saying that successful abortion was quantitatively important among the factors responsible for the high degree of fertility control actually achieved by urban professional couples in postbellum America.

When one takes into account the prevailing standards of prenatal care and the age structure of the Mosher sample population (most of

these women not having begun to bear children before they were 25), it would not be implausible to suppose that the observed average rate of miscarriage was wholly a reflection of spontaneous abortions. The findings of Leridon (1973), for example, indicate 0.19 as an overall average rate of *spontaneous* abortion.[19]

Another indirect approach to detecting significant reliance upon abortions is to compute individual average rates of induced or spontaneous abortion for groups of women who differed in regard to their reported experience in the use of contraceptive method. On the hypothesis that all abortions were spontaneous, we should expect to find abortion rates which did not differ significantly across contraceptive-experience groups. That is indeed the result that appears in the lower panel of table 7.3. Taken by itself, this last unfortunately falls short of being a conclusive test, because data for a sample in which there was a uniform rate of induced abortion also could have satisfied the "no relation" criterion. Although it may be concluded that the pattern in these quantitative data do not suggest the presence of a substantial number of induced abortions, the latter possibility cannot be completely dismissed. This residual element of ambiguity notwithstanding, it should be observed that the idea that induced abortion provided an important *alternative* to the strategy of contraception for successful controllers receives no support whatsoever. None of the handful of noncontraceptors among the women in table 7.3 had experienced abortions—induced or spontaneous.

Consideration of the available qualitative information in the Mosher Survey similarly tends to weigh against the impression that "criminal abortion" was especially rampant among the married middle classes in the postbellum era (Gordon 1976, pp. 51–60; Mohr 1978; Degler 1980; Gay 1983, pp. 253–54). Whatever the propaganda of the "regulars" in the American medical profession may have claimed, a reading of the individual medical histories contained in the Mosher Survey materials fails to disclose any indication immediately contradicting a bold surmise that the miscarriages experienced among this group of women were virtually all spontaneous in origin. None of the interviewees reported uterine infections, punctures, rupture, or other gynecological complications that would support suspicions that an abortion had been instrumentally induced or obtained by reflex methods. On the other hand, it is possible that these women were less than completely candid in divulging such aspects of their gynecological histories to Dr. Mosher. Had they been aborted by competent physicians—to which their income and social position would have helped give them access—there need not have been the sort of telltale injuries that often marked the work of the "quack" abortionists who ministered to the needs of less well-situated members of society. Further, the use of

chemical abortifacients would not be expected to have left obvious physiological indications of this sort.

The matter simply resists closure on the basis of the available evidence. While one cannot justifiably assert that none among the 17.2% of pregnancies terminated represented induced abortions, the Mosher data remain consistent with the surmise that successful inducement of abortion was far from a commonplace experience in the lives of educated, urban, middle-class, married women during the closing decades of the nineteenth century.

If we are even approximately correct holding to the latter position, how is one to account for the "expert" testimony of contemporary physicians regarding the prevalence of induced abortions among the "well-to-do" and "so-called respectable classes," and their assignment of responsibility for the declining fertility of married middle-class American women to this supposed "slaughter of innocents"? (See e.g., Gay 1983, p. 254.) Perhaps mid-nineteenth-century American physicians, like Horatio Robinson Storer, for want of any hard evidence as to the actual extent of the midcentury "wave" of abortion against which they inveighed, were merely giving rein to their suspicions that essentially all miscarriages that came to their notice had somehow been produced by "criminal" interventions. It appears that it was indeed Storer's view that most miscarriages were intentionally produced. (See, e.g., Storer and Heard 1868, 1974 ed., p. 27, pp. 82–83.) Were such the case, and were the Mosher Survey women's miscarriage rates more generally typical of the frequency of spontaneous and induced abortion combined, then one could understand how these "expert contemporary observers" could have arrived at the erroneous consensus accepted by modern social historians, namely, that one pregnancy in five was being intentionally terminated by abortion (Mohr 1978, pp. 74–82; Degler 1980, pp. 231–32).

Some historians of the American fertility transition who have ventured beyond the evidence proffered by such "interested parties" as Storer and Heard have perpetuated the tradition of confounding observations on spontaneous and induced abortions. Reed (1978), for example, makes the following statement: "A 1917 study by a physician of 464 indigent women who received care in the dispensaries of New York's Department of Health revealed the stark reality of the frequency of *resort to abortion* among the poor. Of the 192 of these women who never used contraceptives 104 had a history of abortions. There were 202 abortions, or an average of almost two apiece" (p. 82, emphasis added).

A reexamination of the source of Reed's information (Kahn 1917, pp. 790–91), which we present as table 7.A.2, reveals three points. First, the 202 abortions mentioned by Reed were "miscarriages or abortions"—that is, both spontaneous and induced abortions in our

terminology. Second, the ratio of spontaneous and/or induced abortions to conceptions among the 192 women who never used contraceptives is found to have been 0.135—a figure quite consistent with the hypothesis that the group members had not induced any abortions. Third, the women who did contracept had a ratio of (spontaneous and/or induced) abortions to conceptions of 0.132—almost identical to the rate of noncontraceptors. Thus, Reed's inference about the quantitative "resort to abortion" is contradicted by the very source he cited.

Reed is not the only social historian who has been misled by data which are often treacherous and at best difficult to interpret. In at least one passage of an otherwise generally informative study, James Mohr (1978, p. 79) was similarly carried astray: "Storer and Heard reach their most important single conclusion: 'The reported early abortions of which the greater number of course escape registry, bear the ratio to living births of 1 to 4.04 [in New York (Mohr's interpolation)], while elsewhere [in the world (Mohr's interpolation)] they are only 1 in 78.5.' In other words, on the basis of officially recorded figures alone, it appeared that fully 20 percent of all pregnancies in New York were being aborted."

Although Mohr's quotation from Storer and Heard's 1868 volume ([1974 ed.], p. 34) is technically accurate, there are two very serious flaws. One lies in the quotation itself, and the other in the interpretation placed upon it.

First, the sentence as it appears in Storer and Heard contains a serious typographical error. To show what it is we quote from Storer and Heard's detailed discussion of the underlying statistics elsewhere in the same volume: "In 41,699 cases registered by Collins, Beatty, La Chapelle, Churchill, and others, there were 530 abortions and miscarriages. Here all abortions were known: their proportion was 1 to 78.5. In New York from 1854 to 1857, there were 58,323 births at full time reported, and 1,196 premature. Here all the abortions were not known, probably but a very small fraction of them: the proportion was 1 to 40.4" (Storer and Heard 1974 ed., p. 27).

Thus the 4.04 figure quoted by Mohr, and cited by so many others who refer to his book, is the product of a nineteenth-century typographical error which misplaced the decimal point one digit too far to the left! Moreover, when the underlying statistics assembled for New York by Storer and Heard are correctly divided, the correct proportion turns out to be 1 to 48.77. This tells us that one pregnancy in 49.8 had ended either in a miscarriage or in an induced abortion, whereas we now know that about one pregnancy in five or six ends in a *spontaneous* miscarriage (Leridon 1976, p. 322). It is obvious that Storer and Heard examined data which suffered from a substantial undercount of miscarriages, as anyone familiar with the deficiencies of even twentieth-

century public health statistics on the subject would suspect. Indeed, the undercount is so great that they can shed no light whatsoever on the frequency of induced abortion in nineteenth-century America.

Some of the most widely noted quantitative pronouncements made by modern social historians with regard to the frequency of induced abortion among married women in nineteenth-century America have thus been found to be essentially baseless. We suspect that a more throughgoing reexamination of the original sources than we have been able to undertake on this occasion would further deflate the legacy of exaggeration bequeathed to us by the anti-abortion campaigns of the 1860s and 1870s; in so doing it would corroborate the indirect testimony of the Mosher Survey, concerning the limited role of induced abortions as a means of family limitation among educated, urban middle-class couples.

In comparison with contraception, abortion as a regular method of fertility control imposes much heavier costs both in emotional and pecuniary terms and still entails far greater physical risks. It is perhaps not so surprising after all to find that educated upper-class women during the latter part of the nineteenth century resorted only infrequently to such effectual abortion techniques as were then available. We shall see, in section 7.3 below, that the existing array of contraceptive methods rendered fertility control aspirations largely attainable for this segment of the population, thereby greatly reducing their need to employ abortion except occasionally as an ancillary, "back-up" method.

Thus, to recapitulate the argument on this point, we have found several good reasons to doubt that abortion was utilized comparatively more intensively by the married women of the upper occupational and educational strata of American society during the final quarter of the nineteenth century. In the absence of empirical foundations such a view seems to rest largely upon the idea that, from the 1860s on, anti-abortion legislation and self-policing by the new masters of organized medicine "drove up the price of abortions and thus increasingly reserved them for the prosperous and enterprising" (Gay 1983, p. 254). Yet there were at least two distinct markets for abortions, and surely it was the artificial restriction of supply in the market for therapeutic abortions performed by socially respectable, "qualified" physicians which constituted the shift most relevant for potential upper-middle-class customers. The supply of self-performed, informal, and illicit abortions of undetermined but appreciable risk was far more elastic. Furthermore, the greater availability of contraception as an alternative form of effective fertility control meant that the middle classes' demand for "qualified medical" abortions was the more elastic, and so the quantity sought by them would fall more sharply in response to an increase in the

relevant price. On both counts, then, we should expect that the negative quantitative impact of criminalization upon the frequency of abortions was most pronounced in respectable, higher-income circles.

Of course, married women belonging to the lower occupational and educational strata of American society were not the more fortunate for being left to the ministrations of "unqualified" abortionists. Lack of access to safe and dependable procedures—of the sort that have only recently come into widespread use in the United States—undoubtedly was responsible for much anguish and hardship in the lives of individual women. Estimates made by Sanderson (1979, table 5) indicate that for the entire United States population of ever-married white women born around the middle of the nineteenth century, induced abortion could have been quite significant as a means of control in comparison with contraception; even so Sanderson (1979) concludes that induced abortions in all likelihood accounted for less than half of all births averted by ever-married white women. Higher rates of induced abortion may indeed have prevailed among lower-income groups, the foreign born, and particularly among unmarried women, as a reflection there of less widespread diffusion of contraceptive knowledge and less effective contraceptive practice. This is but another respect in which the nineteenth-century American fertility decline was marked by divergent experiences rather than social and geographical uniformity.

7.2.3 The Frequency of Marital Coitus in the Era of "Careful Love"

The Mosher Survey data summarized in table 7.4 provide the first quantitative evidence, or at least the first of which we are aware, that the Respectable Victorian ideology of sexual continence had a definite counterpart in the marital sexual behavior of middle-class couples.[20] Age-specific frequencies of marital coitus computed from this source have been compared with those calculated for the Terman sample and the Kinsey sample. The frequencies of the respondents to the Mosher Survey were almost uniformly lower than those reported by either the 1935 Terman study sample or the Kinsey survey. As may be seen from table 7.A.3, the Mosher Survey observations also fall considerably below the coital frequency rates found by the 1965 and 1970 National Fertility Surveys. The one exception to this general rule is itself suggestive: among the Mosher Survey respondents who were interviewed at ages 45–59, the reported level of coital frequency was the same as, if not higher than, the rates found by the studies in the 1930s and 1940s.

How seriously ought one to take the contrast that appears in table 7.4? The observations available from the Mosher Survey are, after all, pitifully few in number. Might the apparent differences have arisen merely from random sampling variations? Such severe doubts as to the

Table 7.4 **Trends in Monthly Frequency of Marital Coitus Reported by Upper-Middle-Class Married Women in the United States, 1892–1950**

	Mosher Survey Sample:[1] Currently Married Women			Terman Sample:[2] "Active" Married Women	Kinsey Survey Sample:[3] "Active" Women Married to College Men	
Interview Dates	1892–97	1913–20	Total 1892–1920	1935	1938–43	1944–50
Ages 25–34						
Mean	4.12	3.50	4.05	6.52	7.67	7.90
SD	2.48	0.00	2.33	3.99	4.77	4.56
N	15	2	17	332	28	424
Ages 35–44						
Mean	2.66	4.07	3.60	4.99	6.11	5.43
SD	1.26	2.48	2.17	3.36	4.61	3.99
N	3	6	9	277	15	298
Ages 45–59						
Mean	3.44	5.86	4.98	3.92	6.18	4.89
SD	2.61	4.77	4.15	2.80	4.45	4.93
N	4	7	11	108	3	114

Technical notes and sources:

1. **Mosher Survey Sample:** Computed from coded responses to Mosher's question, "Habit of intercourse, average number of times per week? per month? per year?" as tabulated from the Mosher Survey Tape (1979). The data here pertain to the subsample of women currently married (at time of interview) who reported their sexual relations with their present spouse. All such respondents reported some positive frequency of intercourse on this question.

For women reporting a range of coital frequencies as most did, e.g., "2–3 times per month," the midpoint of the range has been taken as the rate. Where an upper- or lower-bound rate was reported alone, e.g., "3 times or less," an estimate was interpolated for the other, missing end of the range, and the midpoint then calculated. Interpolations were made using the mean of ratios of individual maxima to minima among those women in the same age group who reported both explicitly. Of the 3 cases where such interpolations have been made, 2 occur among the 45–59 age group, and 1 among the 25–34 age group.

Coital frequencies originally reported as weekly rates have been converted to a monthly equivalent at the rate of 3.5 weeks per month. The latter figure was used to obtain comparability with the practice followed in the case of the Kinsey interview data. See n. 3, below.

2. **Terman Sample:** Computed from underlying data in Terman (1938), table 83, p. 270. Terman's questionnaires explicitly asked about the monthly frequency of marital intercourse. The published distributions of monthly frequency for (married) women of specified ages actually refer to a measure of the couple's sexual activity: the mean of the frequencies of marital intercourse reported separately by each of the spouses. To achieve comparability with the Mosher Survey Sample data, means and variances were computed for women (couples) who were sexually active—i.e., reporting some positive frequency of marital intercourse. A further adjustment was indicated, to achieve greater comparability with the *female*-reported frequencies secured from the Mosher and Kinsey Survey's for this table. Terman (1938, p. 269) noted that as a group, the women in his sample reported marital intercourse rates that exceeded those reported by their husbands. From tables 82 and 83 of Terman (1938, p. 270) we calculate that the mean monthly frequency as reported among the sexually active wives of all ages was 5.735, whereas the corresponding mean of their (self-reportedly "active") husbands was 5.435. (The differential is virtually the same cited by Terman as pertaining to the active and inactive couples as a group.) To adjust Terman's published age-specific measures to a female-report basis, we have multiplied them by the uniform factor of 1.027, that being the ratio of 5.735 to the midpoint (5.585) between the female- and male-report means. The unadjusted age-specific means corresponding to those presented in the table are: 6.35 for women 25–34, 4.86 for women 35–44, and 3.82 for women 45 or over (87% of women were in the 45–54 age group).

The uniform adjustment just described has the effect of raising the coital frequencies for women 25–44 somewhat less than is appropriate, while raising the rates for women 45 and over rather more than is appropriate. It has been found by Wallin and Clark (1958) that reporting discrepancies between spouses are correlated with the relationship between "preferred" and actual (mean of reports) frequencies of the partners. When one partner's preferred rate exceeds the "actual," that partner's reported rate is lower than the actual; the opposite holds when the preferred rate is below the "actual." In the Terman sample the mean age-specific rates "preferred" among husbands exceed the mean of the spouses' pooled reports at all ages, but especially below 45. The age-specific rates preferred among wives exceed the mean of the spouses' pooled reports among women in the under-45 age group, but the reverse is the case among older women (cf. Terman 1938, table 85, p. 272). Thus the presumption of a downward bias in the husbands' reports may be thought to be offset by the opposing upward bias in wives' reports, leaving the pooled estimate for the couple below the wife's reported frequency among women in the age group under 45. On the other hand, among older women there would be some (slight) underreporting bias by both partners, and the female-reported rate cannot be presumed to exceed the pooled rate to the same extent that is the case among the under-45s. Hence a uniform adjustment factor calculated from the Terman sample means across all ages—such as the 1.027 figure we have applied—tends to yield estimates of female reported frequencies of marital coitus which exhibit an insufficiently strong negative age gradient over the range above age 35.

3. **Kinsey Survey Sample:** Computed from current weekly frequencies of marital coitus reported by sexually active, currently married women, whose husbands had attended one or more years of college, as tabulated from the Kinsey Data Tape: Married Women, ISR Compilation, December 1978.

Our analysis of the coded current (and retrospective) observations on the frequency of marital coitus prepared by the staff of the Institute from the original interview records indicates that frequencies reported on a monthly basis were converted to a weekly basis by applying a factor of 0.29, which, allowing for rounding, corresponds to taking one month as the equivalent of 3.5 weeks. The latter figure has been used here to convert all the observations back into monthly frequencies.

Although interviewing by the staff of the Institute for Sex Research continued into the period 1951–63, the number of cases thus added to the basic sample of married women used here was negligible. We thus date the observations as referring to the period 1938–50, although those reported under the 1944–50 heading refer to all interviews conducted after 1943. Cf. Gebhard and Johnson (1979), pp. 31–35, for a description of the timing and location of the interviews conducted by Kinsey and his co-workers.

meaningfulness of the contrasts can be laid to rest. Consider for a moment the comparison between the coital frequencies of sexually active women married to college-educated males who were interviewed by the Kinsey team between 1944 and 1950, and the coital frequencies of the Mosher respondents. For 24–34-year-olds the difference appears quite large. The probability that 17 observations whose mean was 4.05 or lower would be chosen at random from the Kinsey subpopulation is less than one-half of one percent. Clearly in the case of women aged 25–34, by the usual standards of statistical significance, a test of the Mosher Survey respondents' average coital frequency against the sample mean for the corresponding Kinsey Survey women (interviewed in 1938–43 when married to men who had attended college) would require us to reject the null hypothesis that the coital frequencies of the two groups were identical.[21] For 35–44-year-olds, the probability that 9 observations having a mean of 3.26 or lower would be chosen at random from the 35–44-year-olds in the Kinsey subpopulation interviewed in 1944–50 is about 8%. It is possible also to reject the null hypothesis that the Mosher mean coital frequency among survey respondents age 35–44 *exceeded* that among the small sample of wives of college men interviewed by Kinsey and his colleagues during 1938–43, although the null hypothesis here can be rejected only at the 90% level. For 45–59-year-old women, as already noted, the coital frequencies reported in the Mosher Survey and the Kinsey 1944–50 interview data hardly differ, and the excess of the Mosher mean above that reported for the same age group in the Terman sample is not statistically significant.

We are thus led to conclude that during the years of exposure to reproductive risks the average frequency of marital coitus among the portion of the postbellum population represented by the Mosher Survey women was significantly lower than the norms that became established among more or less the same social strata of the American population in the second quarter of the twentieth century.

7.2.4 Covariation of Coital Frequencies with Contraceptive Methods

Some aspects of the relationship between contraceptive practice and coital frequencies among the Mosher Survey sample are presented in table 7.5, along with comparative data from the 1965 and 1970 National Fertility Surveys of the United States. One may note that the coital frequency levels are uniformly much lower in the Mosher Survey sample, within each of the comparable categories of contraceptive experience. As for the within-sample patterns of association, both the NFS and the Mosher Survey indicate that those who used "safe period" methods of contraception had relatively low coital frequencies. In the National Fertility Survey data, however, women using douche have the

next lowest coital frequencies, while in the Mosher survey data they had the highest coital frequencies among the women who ever contracepted. Table 7.5 thus gives no clear hint that the Mosher Survey respondents resembled the respondents to the National Fertility Surveys in displaying positive covariation of the frequency of marital coitus with the inherent reliability of the contraceptive methods employed.

Nevertheless, variations in the frequency of marital coitus observed among couples in the Mosher Survey population were not unrelated to differences in their reported use of contraceptive methods. Beneath the surface of the summary figures in table 7.5 there existed a pronounced pattern of positive covariation between the current "habit of intercourse" and the (past and present) employment of methods of contraception whose characteristics belonged to the following set: (a) comparatively high inherent reliability, as indicated by modern demographic findings, and/or (b) involvement of an appliance-device during copulation, and/or (c) male implementation of the practice.

The vertical stub of table 7.6 lists the reported methods in the lexicographical ordering we have formed by reference to the three characteristics just cited. By this means we have been better able to accommodate the varied patterns of individual contraceptive experience that are described in the Mosher Survey responses. The contraceptive experience subset containing "diaphragm, condom, withdrawal, and douche" is placed at the top, as it involves—in order of listing—the two methods which entail use of an appliance-device, and two practices that are male implemented.

Although the five principal groupings of methods are set out in general conformity with modern notions of the inherent reliability of the methods denoted with capital letters, the arrangement as a whole does not guarantee a strict descending ordering of submethods with respect to this single dimension. "Condom only," prior to the introduction of liquid latex, and Federal Drug Administration testing in the late 1930s, is usually rated roughly on a par with "withdrawal only," but as the former member of this pair of male-implemented methods involves an appliance-device, it occupies a higher position in our ordering. "Withdrawal only" is generally held to be inherently more reliable than the nonappliance female-implemented techniques, and within the latter group "douche only" is likewise thought to dominate "rhythm only"—here taken to refer to all methods based upon the safe period.[22] A briefer explication suffices for the horizontal stub of the table: here the observations are arrayed according to four classes of coital frequency, and within each of those classes by the duration of the woman's exposure. The period of "exposure" for this purpose has been measured as the interval between marriage and the first of either the questionnaire date or the woman's fortieth birthday.[23]

Table 7.5 **Patterns of Variation in the Mean Monthly Frequency of Marital Coitus with Contraceptive Methods Used: Mosher Survey and National Fertility Survey Findings Compared**

Category Code Numbers	Methods Ever Used	Number of Women	Mosher Survey, 1892–1920: Mean "Habitual" Frequency		National Fertility Survey: Age-Standardized Frequency[a]				
			Unstandardized	Age-Standardized	Current Method Used	1965	(Obs.)	1970	(Obs.)
					Pill	8.4	(690)	9.2	(1211)
					IUD	9.6	(41)	8.9	(267)
a, b, b′, c, d, e, f	Diaphragm and/or condom, included	11	3.88	3.89	Diaphragm or condom	7.2	(900)	8.6	(679)
g, h, i	Withdrawal included but not a–f	5	3.34	3.14	Withdrawal	7.5	(112)	8.6	(74)
j, k, l	Douche included but not a–i	12	4.86	4.87	Douche	7.1	(196)	7.6	(126)
m, n	Safe period, but not a–l	4	1.84	1.80	Rhythm	5.9	(285)	7.6	(206)
o	None	3			None[b]	6.7	(1244)	7.9	(1462)

[a]Marital coitus during 4-week period prior to interview; "contraceptive method used" refers to same time interval.

[b]Noncontraceptors other than women currently pregnant or lactating.

Note: Category numbers (letters) correspond to those in table 7.6 for Mosher Survey data.

Technical notes and sources:

1. **Mosher Survey:** Monthly Frequency of Marital Coitus, for Women, Classified by Contraceptive Use-Experience: The unstandardized and "age-standardized" means were computed from a tabulation of the Mosher Survey Tape (May 1979) coital frequency observations, described in note 1 of table 7.4. The underlying observations are the midpoints of the ranges reported by currently married women.

The contraceptive experience categories are formed by simple aggregation of the detailed categories which appear on the stub of table 7.6. See discussion in note 1 of table 7.2 for the definition of contraceptive use experience adopted in analyzing the Mosher Survey data.

To adjust the mean method-specific coital frequency estimates to remove the influence of intermethod differences in the age distribution of the respondents, the ($\bar{x}^s$) "age-standardized" measure has been computed as follows: $\bar{x}^s = (\bar{x})\ [\bar{x}_{.j}/\bar{x}^s_{.j}]$, where $\bar{x}$ is the grand mean ($\bar{x} = \Sigma_i \Sigma_j x_{ij}\ (N_{ij}/N)$), i being an index of the age groups 25–29, 30–34, 35–44, 45–59, and j being an index of the five "experience" categories identified in the table. $\bar{x}_{.j} = \Sigma_i (x_{ij})\ [N_{ij}/N_j]$ is the unstandardized mean, reported in the second column of the table, N_j being the number of women in the jth category. $\bar{x}^s_{.j} = \Sigma_i \bar{x}_i\ [N_{ij}/N_j]$ is an "experience" category-weighted average of the age-specific mean coital frequencies, where the latter are computed for the sample as a whole as follows: $\bar{x}_i = \Sigma_j x_{ij}\ [N_{ij}/N_i]$. When the age distribution of women in each experience category is identical $\bar{x}^s_j = 1$ and the age standardization employed here has no effect.

The foregoing standardization is designed to improve the internal comparability of the method-specific mean frequencies, not to render the levels of the Mosher Survey rates strictly comparable with the NFS rates presented in the table. See further discussion, below.

2. **National Fertility Survey:** Age-standardized mean frequency of marital coitus among women using specified contraceptive methods during the 4 weeks prior to interview, in 1965 and 1970.

See Westoff (1974), table 3, p. 138, for underlying data, rearranged here. In describing the mean age–standardized rates, Westoff reports that the 1970 NFS age distribution was used "to eliminate effects of different age distributions associated with different exposure (contraceptive use) categories and changes in age distribution from 1965 to 1970."

The age standardization renders the NFS figures for these two dates comparable, but of course they are not fully comparable with the Mosher Survey mean method-specific rates, since the effects of differences between the 1970 NFS age distribution and the Mosher Survey sample age distribution have not been eliminated.

Table 7.6 **Distribution of Mosher Survey Respondents by Contraceptive Experience, Typical Frequency of Marital Coitus, and Duration of Marriage at Date of Interview**

Contraceptive Experience Category Code Numbers		Methods Ever Used	Years:	Monthly Frequency of Marital Coitus: Reported "Habit of Intercourse"											
				Married over 10.5			Married 10.5–7			Married 6.99–3.5			Married under 3.5		
				13+	5–12	< 5	13+	5–12	< 5	13+	5–12	< 5	13+	5–12	< 5
		Diaphragm (pessary)													
	a	& condom & c.i.[a] & douche								4					
	b	& condom & c.i. & safe period		7											
	b′	& condom & douche						4							
	c	Only					8								
I		Condom													
	d	& safe period & "jelly or douche"								5			5		
	e	& safe period													1
	f	Only								5.2			4	0	0
		Withdrawal (c.i.)													
	g	& abstinence									3				
II	h	& only					3			3.12	3				
	i	coitus reservatus only													1
		Douche													
	j	& suppository & safe period									2		6		
	k	& safe period								2		2			
III	l	Only		6			6		2	0	2	3	4	2	
		Safe period													
	m	& abstinence											3	2	
	n	Only												1.3	
IV	o	None							1.1						0

Source: Tabulated from the Mosher Survey Tape (May 1979), prepared by David and Sanderson, with Matel. Exact marital durations are unknown in two cases: form 8 and form 44 have been assigned to the "13+" category.

Note: Each entry in the cells of the array records the number of conceptions reported by an individual woman

[a]c.i. = coitus interruptus.

Each number entered in the body of table 7.6 represents an observation on the experience of one couple, and indicates the number of recognized *conceptions* reported by the wife. In all, there were 37 women for whom these four pieces of information—contraceptive experience, coital frequency, marriage duration, and number of conceptions—were available jointly. Other than the tendency for the number of conceptions to vary positively with coital frequency, no significant pattern of variation is immediately discernible in the *magnitudes* of these entries. Yet there is a statistically significant relationship between coital frequency and contraceptive experience within the cross-section. The latter stands out graphically from the location of the entries themselves, which will be seen to be concentrated in the cells forming the principal diagonal of the array. The comparative emptiness of the off-diagonal cells is strikingly illustrated by the next-to-lowest row of the table: every one of the (4) women who reported having relied exclusively upon the safe-period methods also reported that her modal frequency of marital coitus was less than 3.5 times in the month—and this was the case among older and younger women alike. The usual chi-square test for statistical independence—in this case, of coital frequency and contraceptive method-type—is immediately obtained from table 7.6 by converting the latter into a 4×5 contingency table. We simply count the frequency with which the sample of 34 observations *of women* are distributed among the main cells of the array, deleting the entries in the (bottom) row relating to noncontraceptions. At the 0.01 significance level, with $df = (5 - 1)(4 - 1) = 12$, the critical value $\chi_0^2 = 32.91$. The actual value of χ^2 calculated from the array is 34.0, allowing us to reject the null hypothesis of statistical independence with a very high measure of confidence.

Focusing on the observed positive covariation of the Mosher Survey respondents' coital frequencies with the inherent reliability of the contraceptive methods they had employed, at least two explanatory hypotheses present themselves immediately for consideration. The first lays emphasis upon behavior in a stochastic environment, and would have us interpret the cross-section association between these intermediate fertility variables as reflecting the operation of a selection process. Those couples who fortuitously experienced low fertility when employing douche or safe-period methods, on this argument, would have been more likely to persist in those practices—rather than switching to other methods and so being led toward methods farther up the scale of reliability. At low coital frequency levels there would be a reduction in the probability of couples unluckily exceeding some prespecified fertility norms, and a reduction, therefore, in the likelihood of their receiving a stimulus strong enough to induce a change in their mode of contraception. Thus it is quite possible that the observed

covariation may have been generated by differentially higher continuation rates on the part of those couples who had begun to practice contraception by using douche and safe period, but who happened also to have established a regimen of infrequent sexual intercourse.

The second hypothesis is more straightforward: contraceptive methods such as postcoital douching and the premodern safe-period method may actually have proved much more effective in use than modern discussions of contraceptive reliability would intimate, especially when these supposedly ineffectual techniques were applied by couples who did not have intercourse with anything like the frequency observed among modern populations. In this vein, the conjunction of the evidence just examined with the observations reviewed above might be taken to suggest the existence of hitherto unrecognized interactions between low coital frequency and the "technologically inherent" reliability of contraceptive methods. If such interactions materially enhanced the use-effectiveness of what today appear to be extremely rudimentary techniques of fertility control, this could account for the remarkable large proportion among the Mosher Survey respondents who, though they reported having used only douche or the safe-period method, nevertheless as a group experienced low average conception rates for women of their ages and marital durations.[24] Among this subgroup the range of coital frequencies appears to have been low not only by modern standards but in relation to the other practitioners of contraception in the Mosher Survey population.

Was the fertility-regulating behavior of Victorian couples affected by an awareness of the existence of such interaction effects? Although suggestive, the evidence provided by the Mosher Survey itself is not at all conclusive on this point. Nor does it furnish a suitable statistical basis for evaluating the effects of coital frequency upon contraceptive effectiveness in order to establish that there is indeed a valid "technological" premise for this hypothesis. Fortunately, the latter task is one that may be approached by other means—and carried through to an affirmative conclusion, as shall be shown in section 7.3. For the moment, however, it is sufficient to notice that the hypothesis just proposed would complement the previously formulated "selection process" explanation. It would suggest a reason why couples at the lower end of the coital frequency distribution might tend (more than others) to begin to practice contraception using the less inherently reliable methods among those that were available.

At the core of the foregoing interpretation lie two notions: that a readiness to employ contraceptive means of family limitation already was widely established among the segment of the population represented in the Mosher Survey, and that persisting efforts to hold individual fertility below some generally accepted norm, or target level,

caused these couples' choices among methods to become systematically adapted to their habitual frequencies of sexual intercourse.

But rather than implicitly regarding each couple's characteristic range of coital frequency as having been essentially predetermined, and therefore envisaging processes whereby the usage of contraceptive methods of different inherent reliabilities could come to be adjusted to accord with the goal of fertility control, the story could be turned around. Notice that our lexicographic ordering of contraceptive methods also arrays the latter in the "appliance/nonappliance-device" dimension, and according to the sex of the partner implementing the technique. Thus it is equally possible to suppose that for a given couple the selection of particular subsets of methods would be more or less determined by limitations in their knowledge of available techniques, their access to the necessary appliances, and/or the dominant preference of one or the other partners with regard to convenience, "naturalness," and still other considerations. Among the latter, concerns about the psychological and physiological side effects of regularly employing one or another particular method—whether or not these were scientifically justified—may have played a role. This has been suggested in the case of attitudes regarding the practice of coitus interruptus. In circumstances where selections of methods were thus constrained, there could well be a tendency for frequency of sexual intercourse to be adjusted in consonance with the couples' desire to achieve a target level of fertility.

The two microdemographic processes for the selection of contraceptive strategies that we have just set out are merely polar cases, and not competing or mutually exclusive alternatives. Thus it is not really necessary to take up the problem of deciding which of them is the more nearly correct, a determination that in any case could hardly be made simply on the basis of cross-section observations such as those culled from the Mosher Survey. Instead, it will be far more sensible to entertain the still broader view that in the experience of a representative population of late Victorian middle-class couples, family limitation efforts resulted in some degree of mutual adaptation between the methods of contraception employed and the "habitual" frequency of marital coitus. The resulting pattern of behavior would necessarily have reflected the profound influence of underlying technological (and biological) constraints that defined the set of possible fertility-regulating strategies.

7.2.5 Toward Interpretation

Two styles of possible explanation may be suggested for the temporal trends, and the pattern of cross-sectional variation suggested by table 7.6. The first is behavioral, whereas the second involves the nature of

the questions in the two surveys. A behavioral story would go something like this: the Mosher women and their husbands had available to them contraceptive techniques which were perceptibly less reliable and more cumbersome than those at the disposal of the Terman and Kinsey survey couples. To lower their fertility without recourse to abortion with all its hazards, the Mosher women had learned to combine low coital frequencies with the relatively rudimentary methods which they employed. As they grew older, however, two changes occurred. Some of these women may have become infecund, "suffering" secondary sterility as a normal physiological development. For others, their experience with contraception may have been sufficiently successful so that it was no longer necessary to reduce coital frequency to the extent that they had done earlier in marriage. Finally, when they reached menopause and no longer faced any reproductive risks warranting the continued imposition of sexual self-restraints, their coital frequency rose and essentially matched that which the Kinsey study found among sexually active women married to college-educated men.

A different style of explanation threatens the foregoing plausible story. It focuses upon possible biases arising from the nature of the several survey questions regarding coital frequency. The Kinsey data presented in table 7.4 are coital frequencies at the date of interview.[25] The Mosher data, on the other hand, are not exactly comparable: they are responses to a question concerning the woman's "habit of intercourse," and it is possible that this elicited answers in terms of some marital lifetime average, rather than an average cast over the previous year. Were that the case, the true current coital frequencies of 35–44-year-old and 45–59-year-old Mosher respondents would actually have been lower than those appearing in table 7.4, augmenting the contrast with the chronologically later surveys but conforming to a more normal, "modern" pattern of gradual decrease with (male) age and marital duration.

This latter possibility raises further suspicions that the low reported frequencies of marital intercourse could somehow be artifactual or, alternatively, caused by circumstances other than purposive sexual restraint linked to the desire to avert pregnancies. Such circumstances would have obtained were the husbands of the Mosher Survey women much older, for it is observed in modern populations that coital frequency decreases with male age, and especially beyond age 45 (Kinsey et al. 1948; p. 252; Kinsey et al. 1953, pp. 353–55, 394; James 1973).

Examination of the actual distribution of the age differences between the spouses represented in the Mosher Survey, however, allows us to put aside this particular worry. The women in the age range from 25 to 45, virtually all of whom had been interviewed in the period 1892–97, belonged by and large to the marriage cohorts of the later 1870s

and the 1880s. As one might have expected, postponement of marriage on the part of professional men was still very much the norm. The husbands of women who were 25–34 at the time of the interview had married at an average age of 28.5 (± 6.8) years, much like the husbands of the older interview group, who were 29.5 (± 8.0) years old, on the average, at the time of their espousal. But neither had their brides hastened to the altar, and so the interspousal age differences were quite small.[26] The mean age difference between husband and wife was 2.8 (± 6.6) years for Mosher's 25–34-year-old interviewees, −1.6 (± 6.9) for those who were 35–44, and 6.6 (± 13.9) for those aged 45–59. While that latter differential would suggest, if anything, that the women of postreproductive age should have reported relatively lower coital frequencies, just the reverse was the case.

A different source of doubt remains to be considered: a potential reporting bias other than the one initially examined. Quite conceivably, even married women of the *fin du siècle*, having grown up in the shadow of the higher Victorian era, were more prone to understate their true frequencies of marital intercourse than were the daughters of the early twentieth century's "sexual revolution" (Burnham 1973; Smith 1973). There is no direct way to evaluate this suspicion, but several considerations weigh against supposing this kind of reporting bias was responsible for the very low rates recorded among interviewees in the reproductive age range. The Mosher Survey questionnaires gave respondents the opportunity to distinguish between their desired ("ideal") frequency of marital coitus and their actual frequencies, and these women, as a group, indicated the latter to be significantly higher than the former. In a study of reporting biases in coital frequency information, however, Wallin and Clark (1958), found that spouses whose actual frequency exceeds their desired frequency tend to *overstate* the actual levels, as the theory of cognitive dissonance suggests they might (see n. 2 to table 7.4 for further discussion).

Hence we cannot find compelling reasons in the psychology of the situation to suppose that the low coital frequencies of reproductive-age women in the Mosher Survey population are an artifact of reporting biases. Moreover, as the analysis of section 7.3 will serve to establish, the coital frequency rates and the reported methods of contraception are entirely consistent with the degree of control over fertility which the Mosher Survey respondents had in fact achieved.

7.3 Possibilities of Effective Birth Control with Rudimentary Contraceptive Methods

As fascinating and suggestive as the microdemographic clues contained in the Mosher Survey materials are, the number of observations

remains worrisomely small. Small-sample biases, not to mention the biases inherent in personal interview information on sexual and contraceptive behavior collected in the Victoran era, may be substantial. How much credence can be placed in generalizations based on such a source? How plausible is it that the large population of professional men and their wives, from which the Mosher Survey sample was constituted, managed effectively to control fertility by following similar strategies—combining the use of postcoital douching, or coitus interruptus, or the so-called safe-period methods, with a regime of comparatively infrequent sexual intercourse?

One style of answer to these questions would be that of the conventional empirical researcher and the traditional historian: gather additional historical information from similar sources and see whether it is consistent with the Mosher Survey indications. And indeed, this is sound advice. Without further direct corroborative material one must be extremely cautious in extrapolating from the behavioral patterns revealed by the Mosher Survey. Of course, the best sort of supporting evidence to be obtained would be a larger set of observations similarly detailing coital frequencies, contraceptive practices, and the reproductive histories of other such couples. But such advice, while sound, is not terribly encouraging. To date the Mosher Survey remains unique as a repository of information about these questions, as far as concerns couples who lived during the latter half of the nineteenth century. Researchers in American archives may turn up more fragmentary data pertaining to these and related aspects of fertility history, but it is doubtful that such finds will substantially enlarge the direct evidentiary base available at comparable levels of completeness and integration. Were we to come into possession of several additional sets of data just like the Mosher Survey, the same fundamental issues would be raised by seeking directly to extrapolate from the behavioral patterns in these small samples to conclusions about the population at large.

Fortunately, another approach is available: combining the analytic methods of mathematical demography with fragmentary historical evidence. Use of such techniques, and the still more complex business of microdemographic simulation in a stochastic framework, will allow researchers to proceed in a more immediate fashion to assess the plausibility of hypotheses suggested by the Mosher Survey and other small but potentially illuminating sources.[27]

Here we confine ourselves to reporting the outcome of a first and fairly obvious step in the direction of full-scale simulation experiments: to check the consistency between the average fertility experience of the larger population of couples belonging to the urban professional classes, on the one hand, and the pattern of contraceptive and marital

sexual practices indicated by the sample of respondents to the Mosher Survey, on the other hand. Given the inherent unreliability of the methods being employed, was their use at reduced levels of coital frequency an effectual strategy of fertility regulation for a normally fecund, well-nourished population that did not rely significantly upon induced abortion as a "back-up method"? Some of the basic modeling techniques of analytical demography can be applied to answer such a question; to ascertain, in effect, the consequences of alternative patterns (including the Mosher Survey respondents' pattern) of fertility-regulating behavior within the framework of a general mathematical model of the reproductive process.

The outcome of such an exercise is of considerable intrinsic interest in exploring the way key intermediate fertility variables entered into the determination of completed marital fertility during the American fertility transition. Further, although it can amount to nothing more than a consistency check of the proposition that middle-class couples at large achieved comparably low fertility by adhering to patterns of sexual and contraceptive behavior resembling those of the Mosher Survey respondents, even obtaining this limited measure of confirmation is of value.

To see this one need only consider the implications of various conceivable results of the analysis. For example, it is imaginable that given the coital frequencies they reported, the Mosher Survey women's fertility could be accounted for only on the assumption that no *effective* contraceptive means were being employed. Were this the case, then we should have to conclude either that the reported methods of contraception were not really used, or were virtually ineffective, or that the Mosher Survey respondents as a group were of above average fecundity. Any of these inferences certainly would cast doubt on our general thesis. A different conceivable outcome of the exercise might be a finding that the range of contraceptive methods used by the couples in the Mosher sample were, after all, sufficiently reliable to make low fertility levels attainable even when marital coitus was as frequent as is observed in the modern American population. This result would be surprising and would undermine the argument that the ideology of sexual continence and its behavioral concomitants played an important role in the nineteenth-century diffusion of family limitation through contraception. There are in principle many other outcomes possible when comparisons are made between fertility predicted by a micro-demographic model with broadly representative biological parameters and the level of marital fertility observed among a historical population such as the professional classes in postbellum America. Any gross inconsistency between the two would suggest that the specification of

a pattern of contraceptive and sexual behavior based upon the Mosher Survey finding is not likely to be generally valid as an indication of behavior in the corresponding social stratum at large.[28]

7.3.1 The Model

To carry out this test we shall start with a quite general microdemographic model of human reproduction viewed as a Markov renewal process, and proceed to adapt it so as to make explicit the relationship between expected fertility, on the one hand, and average coital frequency and contraceptive practice, on the other.[29] For a homogeneous group of fecund women the average level of completed fertility over an extended reproductive span may be closely approximated by

$$B = \frac{M}{\left(\frac{1}{1-a}\right)\frac{1}{\Pi} + \left(\frac{a}{1-a}\right)I_a + I_g + I_p}. \tag{1}$$

In this expression B is the expected number of live births during a reproductive life span of M months. The probability that a recognized conception will terminate in a spontaneous or induced abortion is represented by a. Π is the monthly probability of a recognized conception (a missed menstruation). I_a is the mean length of the entire period of nonsusceptibility associated with miscarriages, that is, the sum of the lengths of the mean interval of terminated gestation and the mean duration of post-abortum nonsusceptibility. I_g is the mean gestation interval in the case of a live birth, and I_p is the mean length of the period of nonsusceptibility following a live birth.

The monthly probability of a recognized conception, Π, depends upon the biological effects of the pattern and frequency of marital intercourse over the menstrual cycle, and their interactions with the technical and behavioral determinants of contraceptive effectiveness. Treating time as a discrete variable, measured by the "days" of a standard "month," a suitable quantitative specification for this biological-technological relationship is given by

$$\Pi = \theta \sum_{c=1}^{\nu} \left[\binom{\nu}{c} n^c (1-n)^{\nu-c}\right] \cdot \left[1 - (1-f)^c\right], \tag{2}$$

where

$$f = \mu + (1-\mu)\,\alpha_m. \tag{3}$$

Here θ is a parameter of inherent biological fecundity, denoting the probability of a fertile menstruating woman conceiving as a result of unprotected coitus during the fertile interval. The latter interval is ν, representing the number of days within each menstrual cycle when

unprotected intercourse may result in pregnancy. The summation index c indicates the number of such susceptible days in the cycle on which intercourse does occur.[30] Finally, completing the ingredients of equation (2), n is the probability that intercourse will occur on any given day and f is the probability that (as a result of contraceptive failure) any given act of coitus will be rendered "unprotected" and therefore capable of leading to pregnancy.

As equation (3) indicates, the per-trial probability of contraceptive failure (f) depends on behavioral as well as essentially technological factors. μ is the per-trial probability that contraception will be omitted when intercourse occurs, whereas α_m is the mth method's inherent accident rate—the probability that the contraceptive method on any given trial will fail to eliminate possibility of a conception.

A number of assumptions are embedded in equations (2) and (3). These need not be labored over here, but it is necessary to state them explicitly and note some of their implications before proceeding to the stage of empirical implementation. In equation (2) the actual frequency and temporal pattern of marital coitus within the menstrual cycle are treated as stochastic variables whose distribution is governed by a single parameter n, the daily probability of intercourse. In effect, we assume a Bernoulli process—in which the probability of intercourse on a given day is constant and independent of the occurrence or nonoccurrence of coitus between spouses on any preceding day.[31]

The specification based on the assumption of randomly timed coitus—a conventional assumption in mathematical studies of fertility determination—may be taken as a reasonable representation of the behavior of randomly chosen couples who do not practice contraception or who do contracept using such methods as douche, coitus interruptus, vaginal suppositories, condom, or diaphragm. On the other hand, it is obviously inappropriate as a representation of the behavior of couples who employ modern rhythm methods, or who follow an adaptive regime of contraception based on primitive safe-period methods. Theoretical investigations of fertility determination within such contraceptive regimes require other, rather more complex modeling approaches which need not be described here.[32] Salient findings of some of our exploratory work along these lines, however, will be mentioned below.

Insofar as the average frequency of marital coitus has been found to decline systematically with increases in the age of the male, the specification of a constant value of n for any appreciable portion of the reproductive life span is unlikely to provide a close approximation to reality. But if the average daily probability of coitus over the reproductive span is used in equation (2) in place of the true age-dependent average frequencies, the average monthly probability of a conception

indicated by this expression will be biased upward.[33] Since biases in this direction are unfavorable to the argument that we are advancing here, our case will be strengthened by accepting equation (2) and interpreting n as the average daily probability of marital coitus over the reproductive life of a representative couple.

An analogous point can be made concerning the formal representation of methods and modes of contraception. The per-trial rate of contraceptive failure, denoted by the parameter f is expressed in equation (3) as a sum of two constant probabilities: the probability (μ) of omission of all contraceptive protection, and the probability $(1 - \mu) \cdot (\alpha_m)$, of the mth method being employed but failing on any given trial.[34] It is quite appropriate to thus characterize contraceptive methods by a constant, technologically determined rate of per-trial failure (α_m) which we shall refer to as the "inherent accident" rate. On the other hand, there is modern evidence indicating that among contracepting couples the average omission rate is parity dependent and tends to decline as the couples approach some "target" level of fertility.[35] The combined probability of failure due to accidents and omission, f, is thus likely to decline during the course of a continuously contracepting couple's reproductive span. But if the parameter f is interpreted as the average per-trial failure rate applicable over that period, we may be assured that the corresponding average monthly probability of a conception indicated by equation (2) will be biased upward on this account.[36]

A third set of remarks is in order, concerning our assumptions about the way biological and physiological factors enter into the determination of the monthly probability of a conception. In form, equation (2) is the sum of products of two terms. The first term in brackets represents the probability that coitus occurs exactly c times within the fertile interval v. The second term in brackets represents the probability that at least one contraceptive accident or omission occurs on those occasions.

Two assumptions are implicit in this specification. The first is that intercourse occurs at most once per day during the fertile period. This is not a wholly unrealistic assumption with regard to couples whose coital frequencies are as low as those reported in the Mosher Survey. Moreover, relaxation of this restriction poses no particular formal difficulties and would yield results which are insignificantly different from those reported here.[37] The second, and the more significant assumption is that the monthly probability of a conception depends upon the probabililty of one or more contraceptive failures occurring during the fertile interval but is independent of the precise number of such instances.

We have two reasons for assuming that the likelihood of conception is not raised by the occurrence of multiple contraceptive failures within the brief period of susceptibility of impregnation. The first is essentially

one of mathematical and computational convenience: although the specification undoubtedly is not precisely accurate, it leads to tractable expressions whose properties do mimic the quasi-concave functional relationship (between coital frequency and the probability of conception) that has been observed in detailed physiological and statistical studies of human fertility.[38] Second, when compared with other possible specifications that would more closely represent the complex dependence of the monthly conception probability upon the frequency of unprotected coitus during and immediately preceding the fertile interval, equation (2) yields results that least favor the empirical propositions we seek to establish.[39]

7.3.2 Historically Relevant Parameter Values

To implement our model it is necessary first to specify historically appropriate values of the parameters a, I_a, I_g, I_p in equation (1) and to fix corresponding values for the biological parameters ν, and θ in equation (2). Table 7.7 presents the numerical estimates we shall employ, and the notes appended thereto briefly describe the sources and procedures used in their derivation. The important point to notice is that, in keeping with our purpose of evaluating the general applicability of the particular array of fertility control strategies revealed by the Mosher Survey, we have employed values for the primarily biological parameters (θ, ν, I_a, and I_g) that are appropriate for the larger population of married fecund women belonging to the American professional classes during the nineteenth century. Equivalent care has been taken to employ values for the probability of spontaneous and induced abortion (a), and the mean duration of the interval of postpartum nonsusceptibility (I_p), that accord with observations derived from the Mosher Survey data. In principle the latter parameters could reflect significant fertility-regulating behavior. From the discussion in section 7.2 it should be recalled, however, that internal evidence from the Mosher Survey, and comparisons with data for larger historical populations, suggest that this (.184) rate of recognized miscarriage largely reflected spontaneous abortions. Further, we may note that our estimate of 7 months for I_p, based on the Mosher Survey's information about the mean length of the interval from birth to resumption of menstruation and the average duration of lactation, is somewhat shorter than estimates usually employed in simulation studies of historical noncontracepting populations.[40]

We now possess a suitably parameterized mathematical structure which predicts average completed fertility in a reproductive lifetime of M months, given the corresponding average frequency of marital coitus (n) and the per-trial rate of contraceptive failure (f).[41] But, to be able to translate the results into statements about the efficacy of various historical strategies of fertility control one additional step is necessary.

Table 7.7 Parameter Values for Equations (1) and (2)

Parameter	Symbol	Numerical Value
Probability of abortion	a	0.184
Postabortum interval of nonsusceptibility	I_a	4 months
Gestation interval	I_g	9 months
Postpartum interval of nonsusceptibility	I_p	7 months
Fertile period	v	3 days
Mean inherent fecundity	θ	0.2461

Notes and sources:

a: The value of a is taken from the Mosher Survey data but accords quite well with modern estimates of the spontaneous miscarriage rate. See our discussion of this point in Sec. 7.4 above.

I_a: Two studies referring to populations during the first half of the present twentieth century, one for the United Kingdom and one for Indianapolis, show mean durations of pregnancies terminated before the seventh month as 3.25 and 2.78 months, respectively. The underlying data for these computations appears in United Nations (1954), table 3, p. 16. A recent, but also more careful study by French and Bierman (1962), p. 835, puts the mean duration of a spontaneously aborted pregnancy at approximately 2 months. Adding one month for postabortum nonsusceptibility we have a choice of setting I_a either at 3 or 4 months. Since the studies referring to periods when maternal medical care was less preventive of miscarriage suggest that the 4-month estimate is more appropriate, and since a choice of the larger value would bias the computation reported in table 7.7 against our argument, we have chosen to set I_a equal to 4 months rather than 3.

I_p: The Mosher Survey provides two sorts of information concerning the length of the period of postpartum nonsusceptibility. There are 48 direct observations on the interval between a birth and the first subsequent menstruation. The average duration of that interval is 5.17 months. The second source of data relates to lactation. The mean lactation period for 44 observations is 7.48 months. Both sorts of data are available in 25 cases and in this subset the mean interval from a birth to the first menstruation is 6.36 months and the mean lactation period is 6.76 months. Given these data and the fact that susceptibility may resume only after one or two menstrual periods (see Tietze 1961, p. 132, and Perez et al. 1971, p. 499–503), we have taken the mean period of postpartum nonsusceptibility to be 7 months. We may have as easily chosen 6 months as the mean period of postpartum nonsusceptibility. Given our procedure for determining θ described below, an I_p value of 7 is less favorable to the thrust of our argument than is an I_p value of 6.

v: An excellent survey on the length of the susceptible period can be found in Nag (1972). The literature reviewed there suggests that the susceptible period is about 2 days long. An identical conclusion is reached by Bongaarts (1976), pp. 236–37, although by a somewhat different route. Physiological evidence, on the other hand, suggests that the susceptible period may be as long as 3 days (cf., e.g., Hartman 1962, chap. 9, esp. 74). The latter value has been employed by Tietze and Potter (1962) in theoretical investigations of the modern rhythm method's effectiveness. We have chosen to set v equal to 3 instead of 2, because given the procedure followed here in determining θ, this choice is less favorable to our argument.

θ: The value we have used for θ takes into account all the other parameters in table 7.6. It was set so that a population of noncontracepting women whose average daily probability of marital coitus was $n = .333$ (over their reproductive lives) would bear, on the average, the same number of children over a 20-year reproductive life span as would a group of married women between the ages of 20 and 39 who had the age-specific marital fertility rates which Coale and Trussell (1974) have associated with natural fertility. Age-specific marital fertility rates which occur in the absence of volitional contraception tend

Table 7.7 (continued)

to vary in level across times and places but not in any systematic pattern. Sanderson (1979) shows that the level of the age-specific marital fertility rates associated with natural fertility in Coale and Trussell (1974) is appropriate for nineteenth-century America. The value selected for $n(=.333)$ is consistent with modern coital frequencies reported in sec. 7.3 (table 7.3) above, and with the data analyzed in James (1971, p. 159). Bongaarts (1976, pp. 236–237) accepts the same average frequency as appropriate for historical populations displaying natural fertility.

In the process of computing θ (but not in table 7.7) a sterility rate of 8.2% was assumed. Our treatment of sterility here is a simple one. Sterility varies with age, but for ease of computation we have used the sterility rate of 25–29-year-old women in Tourouvre au Perche (1665–1765), as estimated by Charbonneaux (1970).

A correspondence must be established between f and specified contraceptive methods employed with specified degrees of "regularity"—that is, omission probabilities. Since methods may be characterized by their inherent probability of failure when used with perfect regularity, it is natural to seek to determine the values of α_m associated with the relevant historical methods, using for this purpose observations of the "use-effectiveness" of contraceptives in situations where the omission rate is exactly known. The principal difficulty that stands in the way is the unavailability of such observations, even for periods more recent than the late nineteenth century.

As an alternative approach, we have utilized historical information pertaining to the use-effectiveness of various contraceptives under conditions in which it is reasonable for us to assume that the average per-trial frequency of contraceptive omission was negligibly low. The use-effectiveness measures in question derive from data gathered in the early 1930s and related to the experiences of a large sample of women during the period shortly following their having contacted a family planning clinic in the Bronx.[42] The technical appendix summarizes the procedures we have derived for retrieving estimates of the parameter α_m from conventional measures of postclinic use-effectiveness, and discussion of these complexities need not further detain us here.[43] For the three methods most relevant to the present discussion, douche, coitus interruptus, and condom, our computations produced the following values of α_m: 0.118, 0.047, and 0.016, respectively. As satisfactory as these values may be in characterizing the state of contraceptive technology circa 1935, we shall find it necessary to consider the possibility that around the turn of the century the average inherent unreliability of the douche solutions and condoms in use may have been substantially greater than this.

7.3.3 Simulation Results

Our findings on the quantitative relationship between average completed fertility over a 240-month reproductive span, on the one hand,

and coital frequency, contraceptive method, and the regularity of contraceptive practice, on the other, are summarized in table 7.8. Since the latter two variables exert their influence by jointly determining the per-trial rate of contraceptive failure (f), it is best to begin by considering the general properties of the function $B(n,f)$ exhibited in this table. As one would expect, $B(n,f)$ is a positive and concave function of each of its arguments—holding the other constant.[44] For the values of f greater than 0.125, the concavity of $B(n|f)$ appears here as being most pronounced when the coital frequency rate varies within the range below 0.250, that is, when intercourse occurs on fewer than 6 days of a 28-day "month" ($\tau < 6$). But as f is parametrically reduced below .125, the $B(n|f)$ function becomes progressively more linear over the entire domain of n and slopes upward less steeply.

Greater marital sexual continence, therefore, turns out to be quite ineffective as a means of averting births when the per-trial probability of contraceptive success ($1 - f$) is as high as or higher than 0.97, which is essentially the range attainable by regular use of *modern* contraceptive methods. One may see that when $f = .03125$, drastically reducing the average monthly frequency of coitus from 12 to 4 only averts an additional 1.21 expected births over the reproductive span, thereby lowering completed fertility from 1.92 to 0.71. Nor is greater continence any more effective as a means of averting births in the absence of positive contraception, unless the average frequency of marital coitus is reduced to extremely low levels. When $f = 1$ it is possible to avert 1.21 births, on the average, by decreasing the monthly frequency of (unprotected) coitus from 12 to 6; but the proportional change in B, from 10.62 to 9.41, is a small one. Even when the average frequency of unprotected intercourse is held to as low a rate as twice in 3 months ($n = .0625$), 5.31 births would be expected over the course of the 20-year reproductive span. Near abstinence by itself could not account for the low average levels of completed marital fertility attained by couples belonging to the professional classes in Victorian America, even if it were plausible to suppose such a practice was ubiquitous among this segment of the population.

The foregoing observations pertain to the extreme situations of populations that either are using highly effective, modern contraceptives, or are not contracepting at all. They turn out to be quite misleading as guides to the quantitative significance of coital frequency variations in situations where rudimentary contraceptives are being employed—or where inherently quite reliable methods are applied only irregularly. Indeed, the interaction between reduced coital frequency and the application of rudimentary contraceptives is the most notable, and perhaps most surprising general feature of the relationships summarized in table 7.8. Whereas a reduction in τ from 12 to 4 averts 1.21 expected

Table 7.8 **Expected Number of Births (B) to Completed Unions: Homogeneous Populations Following Specified Contraceptive Strategies throughout a Reproductive Life Span of 240 Months**

Per-Trial Probability of Contraceptive Failure (f)	Equivalent Contraceptive Practice[a]		Average Daily Frequency of Random Coition (n); Frequency in 24-Day Period (τ)					
	Method (m)	Per-Trial Probability of Omission (μ)	$\tau = 12$ $n = .5000$	$\tau = 8$ $n = .3333$	$\tau = 6$ $n = .2500$	$\tau = 5$ $n = .2083$	$\tau = 4$ $n = .1667$	$\tau = 3$ $n = .1250$
1	No contraception		10.62	10.01	9.41	8.96	8.36	7.50
0.5	Douche	0.43	9.41	8.36	7.50	6.93	6.22	5.31
	Withdrawal	0.48						
	Condom	0.49						
0.25	Douche	0.15	7.50	6.22	5.31	4.75	4.11	3.35
	Withdrawal	0.20						
	Condom	0.24						
0.125	*Douche*	0.01	5.31	4.11	3.35	2.91	2.44	1.92
	Withdrawal	0.08						
	Condom	0.11						
0.0625	*Withdrawal*	0.02	3.35	2.44	1.92	1.64	1.35	1.04
	Condom	0.05						
0.03125	*Condom*	0.02	1.92	1.35	1.04	0.88	0.71	0.54

Source: Equations (1) and (2), and parameter values summarized in table 7.7, with $M = 240$, generate the estimates shown for B.

[a]The standards of reference for inherent reliability and "perfect regularity" of use correspond to postclinic experience with the indicated methods during the early 1930s, as observed by Stix and Notestein (1940). See text for discussion of the procedures followed in establishing correspondences between (f) and indicated contraceptive practices. In eq. (3) the α_m estimates used are: douche (0.1186); withdrawal (0.0471); condom (0.0158).

births when $f = .03125$, the same drop in average coital frequency may be seen to avert 3.19 expected births when $f = .50$, 3.39 expected births when $f = .25$, and 2.87 when $f = .125$. Thus, in place of the 10% decrease in B which the drop in τ from 12 to 4 yields in the absence of any contraception, with f at these intermediate reliability levels we find the completed fertility rate is decreased by roughly 33%, 45%, and 54%, respectively.

What does the information in table 7.8 tell us about the effectiveness of the contraceptive methods which the Mosher Survey respondents reported having employed? It has long been maintained that the method of withdrawal can be quite effectual, if it is practiced with complete regularity and care to avoid postejaculatory reintromission. This is confirmed by the figures in the second row from the bottom of the table, which indicate an equivalence between the postclinic practice of withdrawal with 90% regularity, and the use of 1930s-standard condoms with 95% regularity. Either technique would yield a per-trial failure rate of $f = .0625$, easily sufficient to hold completed fertility below 2.5 children with the average frequency of marital coitus as high as 8 times per month.[45] Very regular postcoital douching, using solutions whose spermicidal effectiveness matched those employed by the New York birth control clinics' clients in the 1930s, is found to yield a per-trial failure rate twice as great ($f = .125$), and therefore would provide the same expected measure of lifetime fertility control for couples whose average coital frequency was only half as high.

Of course, one cannot assume that the condoms or douche solutions in use during the latter part of the nineteenth century typically were as reliable as those available to the clients of birth control clinics 40 or 50 years later. The historically relevant per-trial probability of failure with these methods, at any specified omission rate, may well have been substantially larger than is indicated by the equivalences established in table 7.8. Suppose, for example, that in 48% of the cases the inherent reliability of the douche solution and its method of application was on a par with the 1930s postclinic standard, and that for the remainder of the users the action of douching was subject to an inherent probability of failure three times greater than that standard. The representative user of "douche" would thus have been subject to a per-trial probability of contraceptive accident as high as $\alpha = .2424$, and the corresponding per-trial failure rate for very regular postcoital douching (i.e., with .01 probability of omission) would be $f = .25$ rather than .125. Similarly, whereas 1930s-standard condoms applied with probability of $(1 - \mu) = .89$ are shown as giving rise to a per-trial failure rate of $f = .125$, one may readily calculate that if 14% of the condoms were certain to be defective and the rest subject to the 1930s standard of inherent reliability, the historically relevant rate of per-trial contraceptive failure

among common users (assuming the same .11 omission rate), again, would be as high as $f = .25$.[46]

Although the foregoing seem to us to be rather generous allowances for the inferiority of nineteenth-century contraceptive technology, to make them serves further to reinforce the general point that at low coital frequencies these rudimentary methods could afford couples a surprising measure of control over their expected fertility. The significance of the popularization of douche among middle-class women from the mid–nineteenth century onward, and the indications of the method's prominence which the Mosher Survey data provide, deserves particular notice in this regard. As may be seen from the following illustrative calculations, the introduction of even so unreliable a method as this provided women—or at least women who could purchase a syringe and conveniently prepare a douche solution—a means to reduce their fertility rather substantially.

To begin, let us suppose that the husband were to practice coitus interruptus only irregularly, say, with a probability of .52 on any given occasion of intercourse. The corresponding per-trial failure rate is found, from table 7.8 (withdrawal: $\mu = .48$), to be $f_h = .5$. Now assume that, independent of his actions, the wife were to adopt extremely regular postcoital douching using *inferior* solutions which alone as in the previous example would give rise to a typical per-trial rate of contraceptive failure of $f_w = .25$. The per-trial probability of failure for the couple's *combined* contraceptive practice would therefore be $f_h f_w = .125$, which is equivalent to regular postcoital douching practice matching 1930s postclinic standards of effectiveness. Such a contraceptive regime, when maintained with an average monthly coital frequency of 4, would give the couple an expectation of substantially fewer than 2 births over a 15-year period: (180/240)(2.44) = 1.83 births, to be precise. Let us suppose, then, that the woman in question was 25 years old when she married, and, without having undertaken any positive contraceptive action on her own part, had borne two children and resumed menstruation by the time she reached age 30. Under the foregoing assumptions, having her take up the secondary, female-implemented regime of regular postcoital douching from that point onward would make the difference between the couple's completed fertility being 3.83, on average, rather than the 5.91 births that could be expected were they to rely solely upon continuation of the husband's irregular practice of coitus interruptus.[47]

7.3.4 No Safety in Numbers—Simulation Findings on Primitive "Rhythm" Methods

Among the means of preventing conception that had been used by the women whom Clelia Mosher interviewed during the 1890s, only

the douche was cited more frequently than was the safe-period method. Prompted by this finding, and by the observation (from tables 7.5 and 7.6) that the women who had relied solely upon the safe-period method also reported extremely low frequencies of marital coitus, we have elsewhere undertaken to investigate the potential effectiveness of an adaptive strategy of contraception based on the primitive principle of the rhythm method.[48] By this we refer simply to the notion that susceptibility to impregnation is a periodic occurrence in the menstrual cycle, and that there must consequently exist some interval of absolute or comparative "safety." Premodern "safe-period" recommendations came in many forms, frequently conflicting, often treacherous, and generally lacking in any scientifically accurate physiological foundations.

Nevertheless, there scarcely can be any doubt as to the contraceptive success experienced by those women who adopted one specific formulation of safe-period advice current from the 1850s onward, and rigorously avoided intercourse during the fortnight following the cessation of their menses.[49] Such an antinatal regime would certainly be easier to maintain if intercourse occurred more often than three times a month. But infrequent coitus may equally accommodate a perversely pronatal regime of periodic continence. There is scant doubt that contraceptive failure must have awaited those women who accepted the advice, no less current in supposedly informed medical circles, to avoid intercourse through the week immediately before menstruation, during the menses, and in the week immediately following.[50]

Thus, in considering the subject, it is essential to distinguish between the principle of seeking the woman's period of minimal (or maximal) susceptibility to impregnation, and the various specific recommendations that have been made, down through the ages, as to where within the menstrual cycle one should first look. Historians of fertility control have generally failed to draw this distinction, and in so doing they have overlooked the possibility that the informal practice of *searching* for the elusive safe period could in itself constitute an effective means of limiting individual fertility. Not for every individual involved, alas, but at least for the representative couple of such a population.

Authorities on the modern rhythm methods (e.g., Tietze and Potter 1962) would be predisposed to dismiss such an adaptive strategy of fertility control as utterly hopeless. According to Christopher Tietze: "Self-taught rhythm, haphazardly practiced is a very ineffectual method of contraception and deserves its facetious designation, 'Vatican roulette' " (Tietze 1965, reprinted in Nam 1968, pp. 449–500). But just how ineffectual is "very ineffectual"? In the preceding statement the standard of comparison implied clearly is the array of far more dependable methods at the disposal of modern couples who seek to space pregnancies or terminate childbearing completely, methods whose ap-

pearance derives precisely from the fact that their proper application does not entail a process of trial and error. That is hardly the level of expectation appropriate in a discussion of nineteenth-century contraceptive efforts. Moreover, modern coital frequency norms apparently are higher than those relevant to the historical context of the present discussion, and it is only to be expected that antinatal "learning" would prove considerably more difficult when a regime of frequent intercourse was being maintained. Quite apart from the lower probability of chance avoidance of the susceptible interval, in the event of a recognized pregnancy there would be a larger number of days (on which coitus had occurred) during the preceding month to which the "responsibility" for the conception could be assigned.

We have made computer simulation experiments with simple, behaviorally plausible algorithms of heuristic information processing, and these confirm the importance of the coital frequency level as a determinant of the efficacy of adaptive safe-period strategies. When the frequency is maintained at a constant level in the modern range of 8 times per month, and above, average completed fertility is found not to differ significantly from that expected with a regime of purely randomly timed coitus at the same average monthly frequency. But the simulations also reveal that the contraceptive effectiveness of the same adaptive strategy is dramatically enhanced when coital frequency is (parametrically) reduced. With the latter rate (τ) continuously maintained at 4 times per month it seems quite feasible to adaptively modify the timing of intercourse so as to hold the average level of completed fertility over a 240-month span in the range below 2 births.

In other words, referring back to table 7.8, it appears that at these low coital frequencies the effectiveness of a consistently maintained adaptive safe-period method rivaled that of coitus interruptus practiced with a fairly high ($1 - \mu = .92$ to $.98$) degree of regularity throughout the same reproductive life span. It is therefore understandable why one finds, in table 7.6, that the Mosher Survey respondents who reported having employed no method of contraception other than "the safe period" all belonged to the lowest coital frequency class in the sample—those having marital intercourse at an average rate below 3.5 times per month.

7.3.5 Further Implications

The final implications of the information summarized in table 7.8 can be brought out by drawing some comparisons with the average age- and marital-duration-specific fertility figures for the wives of men in the professional occupations at the time of the 1910 census. In table 7.1 the completed fertility rates for women aged 45–49 and married 20–24 years, or aged 50–54 married 25–29 years, are those most im-

mediately comparable with our predictions of expected completed fertility over a 240-month (fertile) time span. Note that it is appropriate to restrict attention to the fertility of women who were mothers, as is done in the table, because our simulation model assumes a homogeneous *nonsterile* population. It is also proper to make allowance, as has been done in the entries in table 7.1, for the fact that the completed fertility of the homogeneous analogue would be greater than that for the heterogeneous population of couples in the professional classes that was actually censused. From table 7.1, one may see that the figures for the 1910 census population range from 3.66 to 3.89 births per fertile woman centering on 3.77 births. As one would be led to expect from the discussion in section 7.2, there is a remarkably close coincidence between this and the 240-month completed fertility average (3.86) that can be obtained from the handful of comparable observations provided by the Mosher Survey sample.[51]

Returning now to table 7.8, it is seen that the same level of completed fertility could be expected by couples practicing withdrawal continuously, and with fairly high regularity ($1 - \mu = .92$), at coital frequencies that averaged between 6 and 8 times per month over the course of a 20-year reproductive span. The midpoint between the predicted completed fertilities of 4.11 and 3.35 is 3.73 births. But what of those educated, middle-class couples who had taken to heart the warnings of dire physiological and psychological consequences that attended the practice of coitus interruptus? We have also seen that those like the Mosher Survey respondents—who were having marital intercourse only 3–4 times per month on average—would have found it equally feasible to keep their completed fertility close to 3.77 births by adopting other contraceptive practices involving the more recently popularized methods of douche and condom (even in forms substantially inferior to the standards of the 1930s) that were characterized by per-trial failure rates as high as $f = .25$; alternatively, they could have been following an adaptive practice of period continence based on the safe-period principle.

To suggest that the observed levels of marital fertility among the professional classes could be accounted for in this fashion might appear to require the implicit assumption that the adoption of positive contraceptive measures had become universal in this segment of the American population by the close of the nineteenth century. Such an assumption does strike us as too extreme: even though virtually all of the women interviewed by Clelia Mosher during the 1900–1914 period reported having used some contraceptive method(s), table 7.2 revealed that a somewhat larger group (12.5%) of those interviewed prior to 1900 claimed to have had no contraceptive experience. But the assumption of universal adoption of contraception is not really called for by our argument. We have previously noted that several sources of

bias in the specification of our model that almost guarantee that the figures for completed fertility predicted in table 7.8 (for values of n below .333, equivalent to $\tau \leq 8$ times per month) overstate the true levels of fertility that are to be expected when coital frequency and the per-trial probability of contraceptive failure have the indicated values as an average over the entire reproductive period. The presence of this margin of error means that we can make allowance for the adoption of contraception having been considerably less than universal, and still account for the observed population averages of completed marital fertility on the hypothesis that those who were contracepting adhered to a pattern of practice resembling that revealed by the Mosher Survey.[52]

A second point which had been left implicit in the foregoing discussion must now be brought out. We have supposed here that all of the various contraceptive regimes examined would have been maintained continuously from the initiation of the marriage, or at very least from the first birth. By implication this would seem to tell us that the use of unreliable contraceptive methods obliged would-be controllers to become "spacers," inhibiting fertility early in their marriage rather than permitting themselves a period of unregulated fertility followed by attempts to terminate childbearing completely.

Although some recent students of the American fertility transition have subscribed to the opposing view, which holds that spacing behavior was not important (Tolnay and Guest 1984), others have found indications that "spacing" of births played a role in the transition to controlled fertility, at least among the Mormons of Utah (Anderton and Bean 1985). There is a good bit to be said for the latter conclusion on a priori economic grounds: considerations of risk aversion would tend to militate against a strategy of unregulated fertility followed by efforts to stop when "target fertility" had been attained—unless the costs of falling short of the target level were smaller than those associated with bearing additional, unplanned children (David et al. 1985). Moreover, the available evidence for the nineteenth century suggests that the age-specific marital fertility rates for women in their early twenties did not remain undiminished in the course of the American white populations' transition to lower total marital fertility rates.[53]

Finally, we may mention in this connection that our preliminary estimates, derived from comparisons of the parity distributions for 1900 and 1910 relating to those couples who belonged to the same marriage cohort (1875–79) and can be classified as having controlled fertility effectively prior to those census data, indicate that deferral of the first birth and "spacing behavior" in the interval preceding the second birth remained a widespread practice among those native white women who were effectively controlling marital fertility at the very end of the nineteenth century (see David and Sanderson 1984). There is reason to

conjecture that this sort of "spacing" was still more extensive among earlier cohorts of controllers. Of course, whether the motives for this truly derived from concerns to achieve some optimal separation between live births, or whether these couples were attempting—with nonnegligible probabilities of failure—to terminate childbearing very early in their marriage, cannot be clarified from the indirect information at our disposal.

7.4 Technology and Ideology in the Middle-Class Transition to Family Limitation

The Mosher Survey findings have been seen to characterize a set of fertility-regulating strategies that could have been in use much more widely throughout the urban middle-class married population in the late Victorian era. One cannot suppose that in such matters there was complete uniformity; the very absence of open, public discussion must itself have tended to foster the persistence of a wide variety of quite different sexual and contraceptive strategies. Some couples may have rejected positive contraception in favor of prolonged abstinence, in accord with the precepts of the radical feminist ideology of "voluntary motherhood." Indeed, there may even have been some groups in the population who made extensive use of esoteric techniques such as coitus obstructus and coitus reservatus or "karezza" (prolonged intromission without ejaculation), and others who, by employing the more popular contraceptive methods in multiple combinations, managed to curtail their family size while maintaining the frequency of marital intercourse at essentially modern levels. Almost surely there were some married middle-class women who relied upon induced abortions to a degree far beyond the apparent experience of the Mosher Survey respondents. On balance, however, it remains most probable to conclude that the pattern of contraceptive usage at reduced coital frequencies—which has been preserved for our study like a fossil in the matrix of the Mosher Survey questionnaire forms—was widespread among low-fertility married couples in late nineteenth- and early twentieth-century urban America.

There is ample reason to conclude that the comparatively low frequency of marital coitus revealed by the Mosher Survey was a cultural phenomenon, and not simply a biologically determined consequence of the age distribution of the marital partners represented in this sample. Such Victorian sexual restraint, if we permit ourselves to call it that, can be held to have been entirely consonant with the evident concerns of these middle-class couples to limit their fertility. Whether it should be seen, further, to have been an outcome of individual choices ra-

tionally directed toward the goal of family limitation—rather than as a pattern of behavior that was in some more general context "socially learned," or consciously directed toward goals having little connection with fertility control—remains a more problematic issue.

The systematic positive covariation found within the Mosher Survey cross-section observations on coital frequency and contraceptive usage (table 7.6) certainly is consistent with the interpretation that a commonly held set of low fertility goals was playing a powerful role in shaping these dimensions of individuals' reproductive behavior. But the pattern of coital frequency variations in question constituted a distribution whose mean lay distinctly below that found in comparable modern populations, and quite probably below the norms prevailing earlier in the nineteenth century and among other contemporaneous socioeconomic strata. And at the same time, the suppositions of Oscar Handlin (1957) and Linda Gordon (1976) to the contrary notwithstanding, it appears that these "sexually restrained" representatives of the late Victorian middle classes were quite advanced in their acceptance and extensive employment of positive contraceptive methods.

These observations pose an intriguing historical paradox. While reduced coital frequency and resort to positive contraceptive methods would appear from the microdemographic cross-section observations in the relationship of substitutes, when viewed from the dynamic and societal perspective these two aspects of middle-class reproductive behavior appear to have gone hand in hand during the Gilded Age. As it seems likely that the style of marital relations characterized by sexual continence had become more widely established among upper-middle-class households than elsewhere in postbellum American society, one is left with the rather pardoxical implication that the life-style of sexual restraint was embraced most firmly by the very same groups that were taking the lead in the initial phases of the movement toward the control of fertility by more effective contraception. Indeed, this feature of nineteenth-century middle-class culture now appears quite instrumental in the successful practice of contraception using the rudimentary methods available, and therefore integral to the emerging socioeconomic differentials in the diffusion of family limitation and the level of marital fertility.

Putting the matter this way invites the immediate comment that these two historical developments, although confluent, need not have been causally interrelated. Perhaps conjugal relations among middle-class Victorians were governed more by the dominantly repressive tone of late nineteenth-century public attitudes and social policies pertaining to sexual conduct and less by individual considerations of the possible fertility consequences that would flow from marital indulgence of the

sexual appetites. But as plausible as it may seem to invoke the influence of respectable Victorian sexual mores, this simple explanatory gambit remains less than entirely satisfying.

How certain and immediate was the nexus between individuals' views (and behavior patterns) in sexual matters and the respectable Victorian belief system? The ideology which enjoined "considerate" husbands and wives to accept a regime of sexual intercourse once per month as the "ideal" had been introduced in America, beginning in the 1830s, by exhortations both spiritual and physiological on behalf of the continent life; it was propagated subsequently, from the 1870s onward, through more organized efforts "to enforce chastity upon the unwilling," such as were personified in the career of Anthony Comstock.[54] Were such prescriptions and proscriptions effective?

Carl Degler (1974, 1980) has questioned the presupposition that personal beliefs mirrored contemporary sexual ideologies, pointing out that during the late Victorian era the attitudes of middle-class men and women were not thoroughly permeated with the repressive doctrines regarding female sexuality that pervaded so much of the medical and marriage advice literature of the times. His argument, documented in considerable part by references to the attitudinal evidence contained in the Mosher Survey, offers a caution that is well taken. On the other hand, the behavioral evidence reviewed here must occasion, at very least, some skepticism of a portrayal of educated middle-class Victorians as having remained quite untouched by the prescriptions and proscriptions of their cultural milieu, and really rather modern in their notions about the proper objectives and conduct of sexual relations within marriage.

It is true that only a few of the women interviewed by Clelia Mosher were products of mid-nineteenth-century Victorian culture. Most of them had been raised and entered marriage in an era of growing interest and candor regarding sexual matters. Still, the authorities of their day continued to urge a rather Spartan sexual regime as the basis for an ideal life both prior to and after entering the marital state, and even those who encouraged married couples to enjoy the sexual aspects of their relationship were agreed that in a choice between extremes, too little was certainly better, healthier, and even emotionally more satisfactory than too much. Even if the public moral climate of the era of Anthony Comstock had not militated against developing a relaxed and positive attitude toward sexual expression within the privacy of marriage, the risk of pregnancy and childbirth remained substantial, and there was little objective basis for confidence in the protection afforded by contraceptive methods or the safety of remedial abortion. A couple immune to such influences, and able to sustain confidence in their ability to have sex freely and utilize existing methods of contraception

without repeated failures, would have to have been far more atypical then the men and women whose intimate lives the Mosher Survey has allowed us to characterize.

Even a clear resolution of this point in social psychology would not fully dispose of the larger problem. In the end it seems just too facile to invoke an ideological explanation while leaving the emergence of the ideology itself unexplained. The real issue that has been broached is thus seen to run deeper, and to involve greater subtleties, requiring recognition of the interrelationships between two complex and contemporaneous society developments: the crystallization of respectable Victorian standards for sexual conduct, and the growing acceptance of family limitation as a proper middle-class objective to be pursued by contraceptive means. While the intellectual origins and psychological sources of the formalized system of beliefs were largely independent of fertility control considerations, insofar as individuals' behavior was influenced by the sex-role models thus defined,[55] the emergence of Victorian sexual ideology has to be reckoned among the forces that shaped the historical diffusion of effective contraceptive practice. At the same time, it may be argued, an awareness on the part of contracepting couples of the antinatal effects of reducing coital frequency could have promoted tacit acceptance of the accompanying ideological rationale.

The ideological framework into which individuals fitted their sexual attitudes, combined with the difficulties and uncertainties connected with using the available modes of control, both reinforced the effects of middle-class worries about producing too many offspring. It may ultimately have led some husbands to have recourse to mistresses and prostitutes. But it also encouraged many to opt for a sexually rather restricted home life as part of the cost of protecting their wives from the hazards of pregnancy and childbirth, of allowing their offspring more time and care before the arrival of the next sibling, and of ultimately keeping the number of their surviving children not far in excess of the emerging two-child norm.

Technical Appendix

1. Estimation of Per-Trial Failure Rates (f) from Stix-Notestein Measures of Contraceptive Use-Effectiveness

Stix and Notestein (1940) measured use-effectiveness ($\bar{e}$) as the ratio of pregnancies per month of exposure, defining the latter as the months

of observation (M) less "months in puerperium plus one" for each pregnancy. No reduction of exposure was made for the interval of postpartum amenorrhea (I_p). Thus, for the jth method,

$$\text{(A1)} \qquad \bar{e}_j = 1 - \frac{\dfrac{C_j}{M_j - [(1 - a)(I_g + 1) + aI_a]\, C_j}}{\dfrac{C_o}{M_o - [(1 - a)(I_g + 1) + aI_a]\, C_o}},$$

where C_j is number of pregnancies with the jth contraceptive method; $j = 0$ denotes no contraceptive; M_j is number of months of observation of subjects using jth method.

The modern conventional definition of (monthly) use-effectiveness is

$$\text{(A2)} \qquad \hat{e}_j = \frac{\pi_o - \pi_j}{\pi_o} = \frac{M_j - M_o}{M_j},$$

where π and M are defined as in section 7.3 above and are interpreted as population means.

Assuming $M_j = M_o$, it may be shown that the two measures are related as follows:

$$\text{(A3)} \qquad \hat{e}_j = \bar{e}_j[1 + (1 - a)(I_p - 1)\pi_j] .$$

2. The Relationship between $\bar{e}$ and f

For a heterogeneous population, if the homogeneous $\pi -$ function is given the continuous time analogue of equation (2) in the text at section 7.3, namely,

$$\text{(A4)} \qquad \pi = \theta(1 - e^{-vnf}) ,$$

the mean monthly probability of conception may be approximated from

$$\text{(A5)} \qquad \bar{\pi} = \theta\,[1 - (1 + \frac{(cnv)^2}{2} f_j^2) e^{-nvf_j}],$$

where $c = \sigma_n/n$, the coefficient of variation of coital frequency, n being interpreted as the mean (population) frequency of intercourse.

From equations (A2) and (A3) we can derive a relationship between $\bar{e}$ and the mean monthly probabilities of conception, $\bar{\pi}_o$ and π_j ; solving for $\bar{\pi}_j$ we have

$$\text{(A6)} \qquad \bar{\pi}_j = \frac{1 - \bar{e}_j}{\dfrac{1}{\bar{\pi}_o} + \bar{e}_j(1 - a)(I_p - 1)} .$$

Substituting (6) into (5), the following implicit function is obtained

$$\text{(A7)}\quad e^{nvf_j}\left(1 - \frac{(1 - \bar{e}_j)}{\{1 - [1 + \frac{(cnv)^2}{2}]e^{-nv}\} + \bar{e}_j(1 - a)(I_p - 1)\theta}\right) - f_j^2\frac{(cnv)^2}{2} - 1 = 0.$$

Given estimates of the parameters based on table 7.6, and using $c = .62$ from Barrett (1964) as suggested by Bongaarts (1976), we have

$$B_o = nv$$

$$B_1 = \theta(1 - a)(I_p - 1) = 1.2049$$

$$B_2 = \frac{(cnv)^2}{2} = 0.4258.$$

$$\text{With } B_3 = [1 - (1 - \bar{e}_j)/(B_o + \bar{e}_j B_1)]\ ,$$

we can solve the following formulation of equation (A7),

$$\text{(A8)}\qquad e^{B_o f_j} B_3 - f_j^2\, B_2 - 1 = 0\ ,$$

for f_j corresponding to $\bar{e}_j$ at a constant n. Solutions are readily obtained by iteration using Newton's method.

Table 7.A.1 **Contraceptive Use-Experience among Predominantly Urban Population Samples of American Married Women: From the 1920s to the 1950s (Frequency Distributions of Methods Reported as Ever Used)**

	Pearl[1] (Urban U.S., 1932–33)		Kopp[2] (New York City, 1933)		Kinsey Women Married after 1914[3] (1938–50)				Growth of American Families[4] (1955)		
					All Husbands,		College Husbands,		GAF Weights		Kinsey Weights[b]
Methods Ever Used	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Percent
Positive methods reported											
Douche	1350	42.2	1225	8.0	475	11.8	276	10.3	533	16.7	14.5
Safe period/rhythm	102	3.2	303	2.0	142	3.5	102	3.6	645	20.2	14.8
Withdrawal	612	19.1	5894	38.5	753	18.6	498	17.4	284	8.9	8.0
Condom	813	25.4	4759	31.1	1256	31.1	883	30.8	818	25.6	30.8
Diaphragm, pessary	83	2.6	748	4.9	1136	28.1	900	31.4	684	21.4	25.0
Suppository, jelly	199	6.2	1751	11.4	278	6.9	188	6.6	192	6.0	5.7
Other	41	1.3	697	4.1					38	1.2	1.2
Total positive usage (above)	3202	100.0	15,317	100.0	4040	100.0	2867	100.0	3194	100.0	100.0
Abstinence[a]	2849	47.1	1121	6.5					38	0.9	1.2
No method used			666	3.9	143	3.4	60	2.0	815	20.1	26.9
Total instances reported	6051	100.0	17,164	100.0	4183	100.0	2927	100.0	4047	100.0	100.0
Number of respondents	4932	100.0	9916	100.0	1903	100.0	1301	100.0	2716	100.0	100.0
Noncontraceptors among respondents	2849	57.8	1787	18.0	143	7.5	60	4.6	815	30.0	25.7
Positive usage per user	1.54		1.65		2.29		2.31		1.68		1.70

Note: The observations presented in the upper and middle panels of this table are "instances of use" (or non-use) of the indicated methods of contraception. More than one method may be reported by a given user. Observations pertaining to the survey respondents (contraceptors and noncontraceptors) are presented in the bottom section.

[a]Lactation is included with abstinence in the Pearl (1934) and Kopp (1934) data.

[b]GAF contraceptive use-experience rates within religious groups reweighted using religious distribution of Kinsey sample of married women. Figures in this column may be compared with those for Kinsey Survey married women.

Technical notes and sources:

1. **Pearl, 1932–33:** See Pearl (1934, table 13, p. 383) for original data (rearranged here) on women interviewed in urban hospitals.

2. **Kopp, 1933:** See Kopp (1934, p. 134) for original data (rearranged here) on women interviewed in New York City hospitals and clinics.

3. **Kinsey Survey Sample, 1938–50:** Once-married women, married after 1914, who responded to interview questions regarding contraceptive use or non-use, as tabulated from the unpublished Kinsey Data Tape: I.S.R. compilation, December 1978. See n. 2 to table 7.2. The heading "All Husbands" refers to the total sample described above. "College Husbands" refers to the subsample of women married to men who reportedly attended at least one year of college.

4. **Growth of American Families, 1955:** See Whelpton et al. (1966, table 156, p. 278) for original data on frequency of use of positive methods and abstinence and (table 128, p. 218) for the proportion ever using contraceptives in the national sample of married couples conducted by the Michigan Survey Research Center in 1955. The same source also provides data separately for the three principal religious affiliation groups: Protestant, Catholic, and Jewish. The latter were presented in the 1955 GAF sample in the proportions 0.73, 0.24, and .03, respectively. In the column headed "Kinsey Weights" we present the result of reweighting the three religious-specific distributions of contraceptive use experience according to the relative representation of Protestant, Catholic, and Jewish women in the Kinsey Survey sample. The latter proportions are found from Gebhard and Johnson (1979, table 8) to be 0.64, 0.10, and 0.26, respectively.

Table 7.A.2 **Estimates of "Miscarriage or Abortion" Rates Recorded among New York City Department of Health Dispensary Patients (Married Women) Interviewed about 1917**

	All Married Women Interviewed		Married Women Ever Aborting or Miscarrying	
	Knowledgeable about Contraceptives (N = 272)	Ignorant of Contraceptives (N = 192)	Knowledgeable about Contraceptives (N = 72)	Ignorant of Contraceptives (N = 104)
	Aggregate Average Rates of Occurrence			
"Miscarriages or abortions" per woman	0.45	1.05	1.69	1.94
Reported conceptions per woman	3.28	7.84	n.a.	n.a.
"Miscarriages or abortions" per conception	0.137	0.134	n.a.	n.a.

Technical notes and sources:

Aggregate Average Rates of Abortion and Conception: Data published by Kahn (1917, pp. 790–91) permit reconstruction of the aggregate number of births to the total sample of patients and to each of the two groupings of women based on previous contraceptive knowledge, when supplemented by the following two assumptions.

1. Among married women having 9 or more births, 69% had 10 or more births. This figure is based on the experience of the (natural fertility) population of rural Ireland in 1911, whose relevance here is justified by Kahn's (1971, p. 791) report that among the (44) women reaching parity 9 all were "ignorant of contraceptives."

2. The married women having 10 or more births averaged 11.56 births apiece. The latter estimate is derived from data on United States white women married for 30–34 years in 1940, having married at ages 22–24. The fertility of such women, belonging to the marriage cohort of ca. 1906–10, probably approximates closely the fertility of the high-parity women in the Kahn (1971) sample, who had first married, on average, in 1901. Cf. David and Sanderson (March 1979, table 3) for further discussion of the sources of the two estimates used.

From the estimated births to women knowledgeable about (771) and ignorant of (1,303) contraceptives, and the respective numbers (122 and 202) of "abortions or miscarriages" reported for these two groups by Kahn (1917, p. 790), the number of conceptions and the total abortion rates (per conception) can be computed for each.

The numbers of "miscarriages or abortions" per woman can be computed directly from Kahn's published figures for each contraceptive-experience group, whence the average conception rate for the two groups can be derived.

Table 7.A.3 **Monthly Frequency of Marital Coitus Reported by Married Women in the United States, 1938–70**

	Kinsey Survey, 1938–50[1]				National Fertility Survey[2]	
	Married Women: Current Observaions					
	College Husbands		All Husbands		Married Women: Current Observations	
	Active Sample	Total Sample	Active Sample	Total Sample	1965	1970
Ages 25–34						
Mean	7.9	7.3	8.1	7.5	7.1	8.5
SD	4.6	4.8	5.1	5.4	n.a.	n.a.
N	452	488	637	685	1741	2240
Ages 35–44						
Mean	5.5	5.3	5.5	5.3	5.5	6.4
SD	4.0	4.0	4.1	4.2	n.a.	n.a.
N	313	321	409	424	1824	1842
Ages 45 and over						
Mean	4.9	4.4	4.6	4.0		
SD	4.9	4.9	4.8	4.8		
N	117	131	171	194		

Technical notes and sources:

1. **Kinsey Survey Samples, 1938–50**: Computed from current (monthly equivalent) frequencies of marital coitus for individuals in the indicated age groups, as tabulated from the unpublished Kinsey Data Tape: Married Women, I.S.R. Compilation, December 1978, described in n. 3 to table 7.4. The same procedure for converting weekly to monthly rates, at the rate of 3.5 weeks per month, was followed. "College Husbands" refers to the subgroup of women whose spouses reportedly attended one or more years of college. "Active Sample" refers to the subset of women who reported some positive frequency of marital coitus, whereas "Total Sample" refers to all women (in the age and spouse's education category) from whom an interview response to the question was obtained.

2. **National Fertility Survey Samples, 1965 and 1970**: Westoff (1974, table 2, p. 137) provides comparable mean coital frequencies, pertaining to the 4-week period prior to interview, for 5-year age groups. We have presented unweighted averages for age groups 25–29 and 30–34, and for the age groups 35–39 and 40–44. Aggregation of the respective 5-year age group means for each survey date, using uniform weights derived from the 1970 survey sample, yield 10-year age group means identical to the unweighted rates shown here—within the margin of rounding errors. Similarly, a reweighting of the 1965 NFS 5-year group means using weights corresponding to the age distribution of the Kinsey Survey Sample of Married Women (Total Sample), yields the following means: 7.13 for women 25–35, 5.55 for women 35–44.

Westoff (1974) does not contain standard deviations corresponding to the mean age-specific coital frequencies.

Notes

1. On the contrast between sociopsychological and economic models of diffusion, and the "equilibrium" vs. "disequilibrium" process distinction, see David (1969), Stoneman (1983), and references therein. Cavalli-Sforza and Feldman (1981, esp. pp. 180–89), suggest the applicability of various cultural transmission models—resembling those developed for population genetics—to the historical spread of behaviors consistent with the "small family ideal."

2. The methodology referred to as Cohort Parity Analysis (CPA) has been developed with this purpose in mind by the Stanford Project on the History of Fertility Control, an undertaking in which the present authors have had numerous collaborators, most notably Thomas Mroz, Kenneth Wachter, and David Weir. See David and Sanderson (1980) and David et al. (1983) for descriptions of the measures on which we report here.

3. These estimates are based on the survival rates to ages 20–24 for white males and white females (weighted at 0.514 and 0.486, respectively) computed as averages from the quinquennial life tables covering the periods 1845–60 and 1870–85 in Kunze (1979), table 14. The survival rates are .702 and .734, respectively.

4. Whether the small size, and more to the point, the self-selected nature of the sample casts more serious doubts upon the representativeness of the sexual *attitudes* expressed by the respondents, seems to us to be a valid issue which some critics of Degler's (1974) interpretation have raised (see, e.g., Faderman 1981, p. 440). But this is an issue quite separable from the questions of *behavioral* representativeness addressed here.

5. See Mosher (n.d.), Stanford University Archives. The descriptive title affixed to the set of questionnaires by Mosher was: "Statistical Study of the Marriage of Forty-seven Women." This is inaccurate as to the true number of individuals involved (44) and the number of separate questionnaires completed (48). See MaHood and Wenburg (1980) for a typed transcription of the handwritten responses; it is more accessible than the original, and is reasonably free of errors, although its subtitle errs in supposing that 45 individual women's sexual attitudes are represented.

6. There is one questionnaire whose date of completion (although most probably prior to 1900) cannot be ascertained precisely. There are a total of 48 questionnaires which refer to 44 women, since one woman reported two marriages, and several were interviewed more than once in the same marriage.

7. There are two questionnaires for which the respondent's precise date of birth and exact marital duration remain undetermined: form 8 has been assigned to the 20–24-year marital duration interval, and form 44 to the 10–14-year interval, for purposes of analysis in table 7.1.

8. The edited, "machine-readable" version of the Mosher Survey (David and Sanderson, with Matel 1979) codes 415 items to each questionnaire form; on many items there are no responses, however, and about half are repeated questions dealing separately with each conception, pregnancy, miscarriage, parturition, and so forth, for the respondent.

9. A correction factor of 1.143, derived from Bongaarts (1976) was used to multiply the census means, as noted in table 7.1. The need for a differential heterogeneity adjustment arises because of our concern with demonstrating that the behavior observed in the Mosher Survey could have produced the pattern of fertility outcomes observed in the 1910 census data. Average fertility rates depend not only on the average fertility-related behavior of group members but on the variability of that behavior as well. Therefore, in order to show that the behavior of the Mosher Survey respondents is consistent with the observed census figures, the average fertility rates for both groups must be measured in such a manner that group differences in the degree of behavioral heterogeneity are removed.

10. See David and Sanderson (1976) for various proposals along these lines.

11. See Terman (1938), table 6, for socioeconomic status and educational attainment of the couples surveyed; Gebhard and Johnson (1979) on the background of the Kinsey Data Tape from which subsamples used here have been constructed.

12. The 17.1% noncontracepting reported among the wives of college graduates—in the pre-1915 marriage cohorts—interviewed by Kinsey and his colleagues starting in 1938 is rather more problematic. It should be noted that the bulk of these early interviews involved Indiana couples and drew upon the marriage cohorts of 1895–1914. (See Geb-

hard and Johnson 1979.) From our CPA estimates we find the mean proportion of noncontrollers among the later-marrying native white women belonging to those marriage cohorts, and resident in the North Central states in 1940, was about 11%. The latter population was undoubtedly much more urbanized than the one Kinsey encountered in the environs of Bloomington, Indiana. Nevertheless, since the corresponding CPA estimate of the dedicated noncontrolling remnant was 20% among all native white Southern residents, the 17.1% figure obtained from this Kinsey survey subsample must still be regarded as being anomalously high.

13. These conclusions are in agreement with the surmise which Degler (1980, pp. 196–99) offers, apparently on grounds of sheer implausibility, that the increasing practice of abstinence alone could not have brought about the decline in the total fertility rate observed during the nineteenth century.

14. This view was suggested by Himes's (1970, ed.) classic work, and continued to be echoed in the contributions of economic demographers, e.g., Easterlin (1972) and Lindert (1978). The latter, being primarily concerned to identify demand-side factors underlying the nineteenth-century American fertility decline, therefore tended to gloss over the possible role of changes in the state of the available contraceptive technologies. For the more recent consensus, especially as it is reflected in the writings of social historians of the middle class in America and Europe, see Degler (1980, chap. 9) and Gay (1983, chap. 3). Degler makes use of our preliminary findings from the Mosher Survey on these points.

15. See Smith (1973b), p. 50. Smith himself went on to recognize the possibility that the genre of literary evidence he cites might prove misleading as a guide to actual behavior, however sophisticated the interpretations placed upon it. He remarked, anticipating Degler (1974): "[e]ven among the urban middle classes (presumably the consumers of these manuals and tracts) reality and ideology probably diverged considerably."

16. See Grebenik and Glass 1965, pp. 113–18; Wrigley 1966, pp. 104–5, 1969, pp. 124–88. There is some circularity here, since the English nationwide survey findings reported by Lewis-Fanning (1949), esp. pp. 8–9 and table 91, have not been without influence in sustaining historical demographers suppositions as to the importance of coitus interruptus as a method of contraception among the population of France during the eighteenth century (see also Bergues et al. 1960). In turn, the writers of England cite those on France to bolster their argument that withdrawal as a regular technique was imported from France where it was the dominant method.

17. See Wrigley (1969), pp. 124–200, and citations therein. See Degler (1980), chap. 9, for the opposing view.

18. As one would expect, the average frequency of miscarriage among the 12 fertile women in the Mosher sample who reported one or more such events was much higher than the mean rate for the group as a whole: it was 0.343, more than twice the average. Assuming the subsample was homogeneous with respect to the probability of abortion, and assuming that probability was a constant, a, independent of previous occurrences of abortion for any cause, then the probability of having at least one abortion in c conceptions could be reckoned as $P(A) = 1 - (1 - a)^c$. These assumptions, however, are not fulfilled even when all abortions are spontaneous, and it is to be expected that the actual proportion recording one or more abortions would be lower than the proportion $P(A)$ indicated by the formula. This is in fact the case, since with $a = 0.185$ and $c = 2.98$ (the mean number of conceptions) per fertile woman in the subsample of 40, we can calculate that $P(A) = 0.46$, whereas the actual proportion is 0.343 in table 7.3.

19. This estimate has been accepted recently by Bongaarts (1976, p. 234) as appropriate for use in simulating the fertility behavior of historical populations not engaged in fertility control. In a still more recent study of data obtained from a clinic near Paris, Leridon (1976, p. 322) reports the following age-specific rates of spontaneous abortion: age 20–24 = 0.127, age 25–29 = 0.155, age 30–34 = 0.182, age 35–39 = 0.216.

20. On the ideology of sexual continence and the realities of marital sexuality in England and America, see Cominos (1963); Nissenbaum (1968), to whom we are indebted for "Careful Love"; Burnham (1973); Rosenberg (1976); Degler (1980), chap. 11; Rothman (1982); Gay (1983), chap. 1.

21. Where the comparison samples are much larger, a fortiori there will be an increase in the confidence with which the Mosher Survey mean coital frequency can be said to fall below the other populations represented in table 7.4. For procedures in carrying out

these tests based upon the *t*-distribution of student's ratio, see e.g, Burington and May (1953, pp. 157–58).

22. See, e.g, Tietze (1965) for modern evidence on the reliability of the intermediate contraceptive methods. Measured use-effectiveness, however, depends on the regularity of use and coital frequency, as is pointed out in greater detail in sec. 7.3.

23. Some such measure of "exposure" would be required were one to read the table for information about contraceptive effectiveness. A warning is in order, however, against placing much weight on the data in the latter connection: the information about contraceptive use is retrospective and does not in general disclose the durations of use of the various methods. Since we do not attempt to ascertain contraceptive use-effectiveness directly from the Mosher Survey data, the "duration of exposure" information conveyed by the table serves mainly as a rough indication of the ages of the women and the duration of experience on which they were reporting.

24. The fact that the users of douche, safe period, and vaginal suppositories constituted half the subsample of contraceptors, as may be seen from the bottom two major-row entries in table 7.6, makes it rather unlikely that couples in this group represented a subfecund fringe *within* the Mosher Survey population. This view is further supported by the finding that among this group the average number of conceptions per woman was not significantly different (even at a 0.20 error level) from that among the remainder of the sample of contraceptors—holding constant the "exposure duration" classes indicated in table 7.6.

25. These differ, incidentally, from the published frequencies of marital coitus, e.g., Kinsey et al. (1953, table 93, p. 394), which mix retrospective and current report data.

26. The prevalence of such comparatively minor differences between the ages of once-married spouses appears to have been a relatively recent development. It represented a sharp departure from urban middle-class marriage customs of the pre-1870 era, and a transition to the nuptiality patterns established among the more educated strata during the interwar period of the present century. In a study of middle-class households in Union Park (Chicago) based upon the 1880 Manuscript Census, Sennett (1970, pp. 105–7) found that in a majority of all married couples the husband was at least 5–10 years senior to the wife. These data, however, were not analyzed by marriage cohort and so fail to shed light on the precise timing of the suspected shift in middle-class nuptiality patterns—a subject that clearly deserves further study.

27. See, e.g., Wachter et al. (1978) for recent applications of microdemographic simulation to historical questions.

28. The preceding illustrative statements are premised on the biological parameters of the model having been chosen to be representative of the larger population, with the behaviorally determined parameters set to correspond to the (Mosher) sample population levels. We pursue this approach, with suitable modifications designed to strengthen the power of the test.

29. The basic (Markov) renewal model of the stochastic birth process has been extensively analyzed by mathematical demographers. See Sheps and Mencken (1973), and references therein. For a nontechnical exposition of the approach, see Keyfitz (1971). Bongaarts (1976) neatly exemplifies the empirical implementation of a formal model resembling the one we present.

30. The combinatorial expression $\binom{\nu}{c} = \nu!/(\nu - c)!c!$ denotes the number of different ways in which c (daily) occurrences can take place within ν days.

31. Strictly, we need only to assume that the frequency and pattern of marital coitus within the period of susceptibility (ν) can be closely approximated by a Bernoulli process—in which, in effect, a coin with a constant loading is tossed to determine whether intercourse will occur on the given day. If other factors governing sexual activity, such as a taboo against intercourse during menstruation (see Paige and Paige 1981, chap. 6), merely affect the time pattern of coition outside the brief fertile period, our specification remains valid. See James (1971) for findings that individual distributions of coitus within the intermenstruum do not follow such random processes. But one must consider the effect of averaging over many individuals with different nonrandom patterns. In the subsequent implementation we do suppose that couples abstain from coitus during 4

menstrual days of an average 28-day menstrual "month." The average frequency of intercourse in the month (τ) is therefore given by $\tau = 24n$.

32. See Tietze and Potter (1962) on the modern rhythm method; David and Sanderson (1976, sec. 2.2.4; 1979) treat adaptive safe-period methods.

33. This follows immediately from the fact that (when ν exceeds one day, as in the case under normal biological conditions) the monthly probability Π is represented (properly) by eq. (2) as a concave function of n.

34. Since contraceptive failure is also represented as a Bernoulli process, the remarks in n. 31 apply correspondingly in this connection: we need, strictly speaking, only to assume the validity of the Bernoulli process as an approximation for contraceptive failures during the brief fertile period of each month.

35. For discussion of the relevant empirical evidence and its interpretation in the demographic literature dealing with "motivation effects," see David and Sanderson (1980).

36. This may be seen by expanding eq. (2), taking ν as any value equal to or exceeding one, and noticing that in the resulting expression n and f appear everywhere as multiplicative factors. From the preceding statement regarding the concavity of the Π-function in n (when ν exceeds one), it follows that under the relevant biological conditions Π must also be a concave function of f.

37. See Bongaarts (1976) for a continuous-time version of eq. (2), in which the distribution of marital coitus is assumed to be generated by a Poisson process. The technical appendix makes use of the latter specification in a distinct but related connection.

38. See the discussion and references in Hartman (1962), and MacLeod and Gold (1952, 1953a, 1953b), as the work of Lachenbruch (1967) and Tietze and Potter (1962). Two sorts of effects are at work. First, the probability of conception depends not only on intercourse occurring during the susceptible period, but also on the interval of male continence preceding coitus. Frequent intercourse decreases the concentration of sperm within the ejaculate and reduces the probability of a conception. Multiple acts of coitus within a 3-day period, then, may not cause the monthly probability of a conception to rise much above what it would be if coitus occurred only once during the susceptible period. The second effect relates to the level of the conception probability in a propitious menstrual cycle. Suppose for a moment that if intercourse occurred once in the susceptible period of a menstrual cycle the probability of a fertilized ovum would be as high as 0.8 (the probability of a *recognized* conception may be much lower due to early implantation failure and fetal loss), then there is little scope for multiple acts of intercourse to increase the probability of conception.

39. In eq. (2), as already noted, Π is a positive concave function of n. The degree of concavity depends on the assumption that the probability of a conception is identical for one, two, or three acts of coition within the susceptible period. Relaxing this assumption, and allowing multiple occurrences to have some positive effect on the likelihood of conception, will render the relationship less concave. (See, e.g., David and Sanderson (1976, table 2.3.4:1, and accompanying discussion.) Given the manner in which we proceeded in setting the level of the parameter θ, as briefly described in the notes and sources to table 7.7, the more concave the relationship between Π and n, the higher are the monthly probabilities of a conception when $n < .333$. This raises fertility levels at low relative coital frequencies, biasing the results of our computations against the assertion that low fertility could be attained through the use of rudimentary contraceptive methods at relatively low coital frequencies.

40. See Henry and Gautier (1958) and Charbonneaux (1970) for estimates placing the mean interval of postpartum amenorrhoea at 7.1 and 9.1 months, respectively. Bongaarts (1976, p. 223), employs 8.1 as an estimate for I_ν.

41. The period M must be a fairly extended one if the birthrates predicted from the renewal model are to be taken as closely approximating their equilibrium values. With no contraception and low rates of pregnancy wastage, the oscillatory deviations of the birthrate from its equilibrium are found to become negligibly small (less than 1%) after roughly 120 months, given an interval of postpartum nonsusceptibility in the neighborhood of 15 months. Convergence occurs much more quickly when the monthly probability of conception is reduced or the pregnancy wastage rate is as high as 0.3. See Sheps and Menken (1973, pp. 213–18) for theoretical discussion and numerical examples. The

estimates of expected total fertility are less sensitive to such deviations, and may be regarded as highly accurate if M exceeds 60 months. In table 7.8, M is taken as 240 months and the estimates of B cited in the text, below, all refer to reproductive spans exceeding 120 months.

42. See Dickinson (1938, p. 10) for postclinic use-effectiveness measures based on work of Stix and Notestein (1935). It has been possible to support the general assumption of negligible postclinic omission rates by analysis of other data presented by Stix and Notestein (1940, pp. 109, 122) on the causes of postclinic contraceptive failure among users of the diaphragm method prescribed by the same clinic.

43. See technical appendix. The conventional measures of use-effectiveness from which we started are as follows: douche, 69%; withdrawal, 86%; condom, 95%.

44. In fact, because n and f appear symmetrically in eq. (2) when $\nu = 3$, and enter eq. (1) only via the variable Π, all statements about the relationships $B(n|f)$ must hold equally for the relationships $B(f|n)$. We may therefore confine the text discussion to describing the former family of functions.

45. On the other hand, it may seem that with coital frequencies around $n = .333$ and omission rates in the range between .08 and .20, coitus interruptus would avert only something like five births within the course of a 20-year reproductive span. These figures seem quite consistent with the report of Lella Secor Florence (1930, p. 19) on the experience of the first 300, predominantly working-class clients of the first birth control clinic established in Cambridge, England, by the Cambridge Women's Welfare Association in 1925: "In our own clinic, for instance, we have many cases of parents employing *coitus interruptus* throughout all or part of their married life, despite the fact that it had failed on four or five occasions. The assumption that there might have been ten children instead of five if these efforts at limitation had not been made seems perfectly justified."

46. The illustrative calculations are made by applying eq. (3). For the case of douche, we set $f = .25$, $\mu = .01$, $\alpha^* = .1185$ (the estimate based on postclinic 1930s data), and solve for $x = .477$ (or approximately 48%) from the following equation:

$$0.25 = .01 + (1 - .01)[.1185)x + 3(.1185)(1 - x)] .$$

The term in the square brackets $= \bar{\alpha} = .2424$, the "average" inherent accident rate, is more than twice the level of α^* for douche.

For the case of condom, we set $f = .25$, $\mu = .11$, $\alpha^* = .0158$ (the estimate based on postclinic 1930s data), and solve for $x = .856$ (or approximately 86%) in the following equation:

$$0.25 = .11 + (1 - .11)[(.0158)x + 1(1 - x)] .$$

The term in the square brackets $= \bar{\alpha} = .1573$, the "average" inherent accident rate, is almost 10 times the magnitude of α^* for condom. It should be noted that the 1930s standard for condoms still represented the state of affairs prior to government regulation and inspection under the 1930 Pure Food and Drug Act.

47. The assumption that the wife has had 2 births and returned to the state of susceptibility 5 years after her marriage is entirely plausible for our hypothetical late Victorian middle-class couple. Consider the following scenario: since their average coital frequency up to the time of first conception was $n = .250$ (i.e., 6 times per month), and no contraception was practiced during this period, the mean date of resumption of menstruation following the first live birth would be 18.5 months ([240/9.41)] − 7) after the woman's marriage. At that point, out of concern to space the next birth, the couple's average frequency of coitus was reduced to 4 times per month and the husband commenced the practice of coitus interruptus—but only slightly more often than not, i.e., with omission probability $\mu = .48$. From tables 7.8 and 7.7 it may be found that the next conception leading to a live birth would be expected in 22.58 months ([240/6.22] − 16), and the woman could be expected to resume menstruating after her second live birth in the 58th month (18.5 + 22.58 + 16) of her marriage. From table 7.1 it may be seen, further, that among women age 25–29 who did not suffer primary sterility, and who were married to professional men for 4 years or longer, the average level of fertility was close to 2. This figure is quite consistent with both our assumptions and the foregoing scenario.

48. A more detailed, technical account of this line of research will be available in our forthcoming paper, "Contraception through Stochastic Learning: An Analysis of Adaptive Rhythm Methods."

49. Among American writers on birth prevention, see, e.g., American Physician (1855, pp. 59–61), Lewis (1874, pp. 94–98), and Trall (1881, pp. 205–9). See also the earlier influential work of the Frenchman Pouchet (1847). Drysdale (1854, p. 348), who was quite unorthodox in describing the *sterile* period as commencing two or three days before the menses and ending on the eighth day following, continued to claim some adherents among influential purveyors of birth prevention advice in England. See Himes (1970 ed., pp. 234–35) on Drysdale (1887) and Albutt (1887). If one pressed to the latter end of Drysdale's "sterile" interval, however, there was a nonnegligible probability of having coitus close enough to the time of ovulation for the sperm to survive to fertilize the ovum.

50. In addition to the prescriptions of Hollick (1850) and Gardner (1856), see Ashton (1865, pp. 14–15) and the more influential writings of Stockham (1887, pp. 29, 324–26) for examples of nineteenth-century American contraceptive advice in this perverse vein.

51. One may roughly approximate the average fertility of the Mosher Survey women (mothers) who had experienced 20 years of marriage within the reproductive span, by averaging the entries along the subdiagonal cells in table 7.1, starting with women aged 45–59 and married 20–24, and proceeding downward to the women in the age group 60–64 who were married 35–39 years. From the data underlying the table it is found that the women involved had an average completed fertility of 3.86. Note that allowing for the effect of greater heterogeneity in the United States census population—compared with the Mosher sample—tends to eliminate the large (positive) discrepancies between the boldface and italicized entries, which appear among the older, higher-fertility women in table 7.1.

52. For example, start with a calculated figure for contraceptors (following practices yielding $f = .25$, with $\tau = 3$–4) of 3.8 births over 240 months, as suggested in table 7.8. Then, assume that 20% of the population did not control fertility by any contraceptive means and had an average completed fertility as high as 7.5. (the latter figure would be lower if the noncontraceptors were less fecund or resorted to abortion). If the true level of expected fertility for low coital frequency, contracepting couples were 0.79 of the level represented in table 7.8, one could account for the average fertility of the entire population being approximately 3.9.

53. Sanderson's (1979) findings for the white population are the most comprehensive, but the conclusion emerges also in other studies of extensive samples based on reconstitution and genealogical data, most notably Kunze (1979, chap. 5).

54. The phrase has been borrowed from Rosenberg (1976, p. 73). On the influence of Sylvester Graham and his followers in the antebellum period, see Nissenbaum (1968). For an account of Comstock's career and the "social purity" crusade as a moral reform movement, see Pivar (1973). Howe (1976) contains a number of illuminating essays on late Victorian attitudes regarding public and private sexual morality.

55. See Rosenberg (1976, chap. 3) for a view of Victorian sexual ideology as affecting individual behavior by delineating particular sexual stereotypes and influencing choices among alternative sex-role models.

Comment

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This paper summarizes rather lengthily some of the recent and ongoing research of the co-authors on the nature of the fertility transition in

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the United States in the nineteenth and early twentieth centuries. Earlier work by Warren Sanderson (1979) established that the dramatic decline in the American total fertility rate (from over 8 in about 1800 to about 3.3 by 1910) was more due to declines in marital fertility than to adjustments in nuptiality (rising female age at first marriage and increasing proportions of women never marrying). Both, however played an important role. Given the paucity of adequate vital statistics in the nineteenth century and the heavy reliance on census child/woman ratios to measure fertility, Paul David and Warren Sanderson turned to other techniques and sources to illuminate the problem.

The major sources that underlie this paper are (1) the published results of the censuses of 1910 and 1940 on children ever born by age, marital duration, race, and nativity of women; (2) similar data from a sample of the 1900 United States census; and (3) the remarkable information collected by Clelia Mosher between 1892 and 1920 on the reproductive behavior of 44 middle-class white women with professional husbands. The latter is so unusual because it constitutes the earliest instance of detailed survey data (albeit a small and unsystematic sample) on the sexual behavior of American women. Since that time there has been a rapid increase in survey research in this area, but the Mosher survey is unique in its period of coverage.

The initial issue was to establish some of the dimensions of the nineteenth-century fertility decline. This was done by Sanderson, who estimated total marital fertility rates and proportions of women married in the nineteenth century and assigned a precise role to declines in marital fertility (a neo-Malthusian transition) and to adjustments in nuptiality (a Malthusian transition) (Coale 1974). Then, using some new methodological developments, which David and Sanderson refer to as Cohort Parity Analysis (CPA), parity data from the censuses of 1900 (a sample of the manuscripts) and 1910 and 1940 (published data) were exploited to gain a more detailed picture. These results are summarized in section 7.1, but the reader is given no explanation of the methodology used in deriving them. While this is perhaps understandable, and forgivable, in a paper already over long, the result is to deprive readers of a basis for evaluating the statements made about the timing and pattern of diffusion of fertility control in the American native white population.

In consequence, the authors' methodological advances in connection with CPA deserve some mention, because they are very useful and important in their own right. I will therefore devote the bulk of my comments to this aspect of their work. First, it was necessary to correct the calculated mean parity data for older women for selectivity due to mortality and marital dissolution ("differential postreproductive attrition"). This has been done using a group of models for correcting

censored distributions, where the censoring is not independent of the attributes which are to be estimated—in this case the status of having been a "controller" or a "noncontroller." Second, it was then necessary to exploit parity data using a model population of noncontrollers as a basis for estimating the proportion of controllers (both "active" and "passive," i.e., those who would control if it were necessary). One of the unique features of this method was the incorporation of the observation by Page (1977) that model marital fertility schedules which incorporate only age (such as those of Coale and Trussell [1974] and Brass [1975]) can produce seriously misleading results if marital duration is not considered. Pursuant to this, the authors develop, using parity data by age and marital duration from the 1911 census of Ireland, a model distribution of natural fertility (fertility not subject to deliberate control) to be applied to the American data.

Without going too much into detail, the authors then are able to estimate the full distribution of completed marital parity, the proportion of American marriage cohorts 1855–59 to 1915–19 ever controlling actively during completed reproductive lifetimes, aggregate effectiveness of control (the ratio of active controllers to couples desiring control), and the mean completed parity of controlling women. Their methods yield standard errors for these estimated population parameters, although these are not reported by the discussion in section 7.1 of the present paper. While the robustness of these methods has yet to be demonstrated (to me, at least), I believe that this methodology is very imaginative. (One possibility for verification would be some application to the English data on parity and marital duration from censuses of 1911 onward in conjunction with published and other vital and census data generating standard reproductive measures.)

Among the principal findings are that, from at least the middle of the nineteenth century onward, native white women in urban areas of the northern states (and especially the Northeast), as well as, increasingly, in northern rural areas, were able to exercise increasingly effective control of marital fertility. This was combined with a rising age at marriage. This pattern did not begin to characterize the South until rather late in the nineteenth century (approximately 1880). In the Northeast, for example, the marriage cohort of 1855–59 (with women married at ages 15–24) had over 40% "effective" controllers (defined as those who had managed over the course of their reproductive lives to avert one or more births). They achieved a mean parity of 3.78 children. The cohort of women in the Northeast married during 1865–69 at ages 20–29 achieved a parity of only 3.07 children. This pattern spread to other parts of the country, first the North Central region and the West, and finally the South. I would suggest the authors develop a single parameter from their age-duration model (analogous

to Coale and Trussell's "m") that could be used to describe the degree of departure from natural fertility over time and by region. I wondered, however, how the earlier (pre-1850s) decline in total fertility rate (from over 8) was achieved with such a low proportion of women controlling (26% for the marriage cohort of 1855–59). Perhaps the simulation model in section 7.3 could be used to investigate this issue. An additional important finding is that both the spread of desire for fertility control and the reduction in average births to those who were successful in the application of contraception were about equally important. This is quite significant because it sheds light on supply-side constraints in family limitation. Much previous work on nineteenth-century American fertility, including my own, has focused on demand factors, assuming that traditional contraceptive measures were sufficient. Much of section 7.3 consists of the development of the supply side.

The basis for the hypothesis presented in the paper is the Mosher survey, which is characterized as "a veritable Rosetta Stone for the study of demographic and social history of a significant segment of the Amerian population." (I will not comment on the extensive comparisons of the Mosher data with other results (e.g., Kinsey and Terman). Suffice it to say that the authors have convinced me that the survey gives a reasonable picture of the reproductive lives of this particular socioeconomic stratum in this era. A description of Mosher and her survey, for the curious, may be found at the beginning of sec. 7.2.) The main conclusion is that in the regime of *inefficient* contraceptive technology (both in application and effectiveness) which characterized the late nineteenth and early twentieth centuries (douche, rhythm, condoms, and withdrawal were apparently the major methods), couples who desired to limit family size had to make love *very* carefully. Evidently abortion or "farming out" of unwanted children, which was widely practiced in France and which greatly increased child mortality, were not desirable options. However, abortion, though not common in the Mosher survey, may well have been important in the nineteenth century. The paper takes note of this and in the end concludes that induced abortion may well have accounted for somewhat less than half of births averted in the mid–nineteenth century, especially among lower-income groups and the foreign born. More investigation of this possibility is definitely an item for future research. In addition, the role of changes in infant and child mortality is not dealt with. With high mortality, neither contraception nor abortion assumes as much importance. In any event, the consequences of this inefficient technology were low coital frequency, delayed marriage, and apparent practice of contraception from the outset of marriage.

All these points are quite fascinating. The hypothesis (and that is what it is) of the "era of careful love" is consistent with the data and has a great deal of intuitive appeal. It is, moreover, a challenge to the use of Coale-Trussell types of model fertility schedules, which assume a lack of controlling behavior early in the marriage. I would note, however, that the new data presented in this paper did not confirm the notion that fertility control behavior in the nineteenth-century United States was largely spacing rather than stopping. The authors cite other work, some of it their own, in defense of this view, and point out that the simulation model presented in section 7.3 is certainly consistent with the argument that contraception would have had to have been consistently practiced with a low frequency of intercourse in order to have achieved the actual outcome. A recent paper by Anderton and Bean (1985) is cited. It uses the extensive database of genealogies in the Mormon Historical Demography Project to reconstruct fertility patterns in the nineteenth century and finds that spacing as well as stopping was characteristic of the fertility decline in this sample. But more work, such as the comparison of parities of the same young cohorts from the 1900 and 1910 censuses with the natural fertility model, seems to be a promising direction of inquiry. The authors have made a start in this direction already (David and Sanderson 1984). Overall, the present paper is imaginative and challenging, and opens a number of prospects for future work.

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