

Surgical Fertility Regulation among Women on the Navajo Indian Reservation, 1972-1978

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Abstract: Changes in the rates of induced abortions, bilateral tubal ligations, and hysterectomies on the Navajo Indian Reservation have been examined for the years 1972-1978. While the incidence of abortions and tubal sterilizations is still considerably lower among Navajo women than among the total United States population of women, it has risen, especially among those in the prime of the reproductive cycle, i.e., ages 20-34. The rate of hysterectomy has not changed substantially. Regression analyses performed

on the data indicate that the utilization of surgery for fertility regulation in women on the Navajo Reservation, unlike other surgical procedures, is not affected by access to hospitals which provide surgery. Rather measures of involvement in the wage work economy are of primary importance. Those areas of the Reservation having the highest levels of such involvement exhibit the highest rates of such surgery. (*Am J Public Health* 1981; 71:403-407.)

Introduction

Previous studies of Navajo Indians have shown that economically and demographically they are similar to many populations in less developed countries.¹⁻⁶ Per capita income is low and unemployment high; kin networks are important in redistributing income from multiple fluctuating sources; fertility has been high but has declined slowly over the past 30 years (from about 40/1,000 to 25-30/1,000); there has been a substantial decline in infant mortality over the years, but the present rate is still twice that of the larger United States population; however, crude mortality has been relatively low since at least the mid-1950s (6-8/1,000). The result has been a high rate of population growth and a young population, now numbering approximately 150,000 living on a reservation of 25,000 square miles in Arizona, New Mexico, and Utah.

Traditionally, Navajos have attempted fertility control only to protect the health of the mother,⁷ but this may now be changing. Since the early 1960s, family planning services have been increasingly available without charge from the Indian Health Service of the US Public Health Service.⁸⁻⁹ In general, contraception has not been effectively used by Navajo women and has been the source of occasional conflict within families. The use of surgery to prevent childbearing has also been relatively infrequent among Navajos when

compared both to the neighboring Hopis and to the larger US population.¹⁰

It is reasonable to suppose that the low rates of surgery by women to prevent childbearing are in part the result of the inaccessibility of hospitals. A previous study has shown that hospitalization rates as well as rates of several types of surgery decrease as distance from the nearest hospital increases.¹¹ At the same time, there is considerable evidence from many populations that characteristics of women and their families are related to the use of various types of surgery for fertility regulation. The purpose of this study is therefore two-fold: 1) to describe changes in the utilization of various forms of surgery for preventing childbearing among Navajo women in comparison to changes in the larger US population; and 2) to examine the degree to which access to hospitals and socioeconomic characteristics of the population explain variations in rates of different types of such surgery from one part of the Reservation to another.

Methods

Three sources of data have been used in this research:

- hospital discharge records of Navajo patients residing on the Reservation who have been seen in Indian Service and contract hospitals in the Navajo, Phoenix, and Albuquerque areas of the Indian Health Service (IHS) from fiscal years 1972 through 1978
- population estimates of Navajos residing in the 18 land management districts of the Reservation in 1975¹²
- economic data gathered in a 1974 survey by the Survey Research Center of Brigham Young University.¹³

The hospital discharge records have been computerized and provide data on age, sex, tribe, community of residence,

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TABLE 1—Mean Values of the Variables Used in the Regression Analyses

Variables	Mean	Std. Deviation
Dependent:		
Induced abortion ratio	53.4	23.14
Age-specific abortion ratio; ≤ 19 yrs	66.2	44.60
Age-specific abortion ratio; 20-34 yrs	52.9	21.59
Age-specific abortion ratio; 35-49 yrs	39.1	27.42
Ratio of bilateral tubal ligations	48.1	12.54
Age-specific ratio of bilateral tubal ligations; 20-34 yrs	43.4	14.95
Age-specific ratio of bilateral tubal ligations; 35-49 yrs	155.0	59.07
Ratio of hysterectomies	23.1	7.26
Age-specific ratio of hysterectomies; 20-34 yrs	10.1	6.81
Age-specific ratio of hysterectomies; 35-49 yrs	142.9	55.37
Independent:		
Distance from nearest hospital	44.8	19.84
Distance from nearest surgery	66.0	32.18
Per cent of income from welfare	18.3	11.70
Education of women	8.4	1.15
Per cent living in hogans	16.8	8.02
Mean household size	6.4	1.17
Per cent of fulltime female employment	10.5	6.31
Per cent of fulltime male employment	38.7	14.43
Mean age of female household head	42.9	2.26
Mean age of male household head	45.5	1.87

primary, secondary, and tertiary diagnoses, types of surgical procedures done, dates of admission and discharge, as well as some additional information. Unfortunately, these records do not include such information as marital status or parity of hospitalized women. Because the IHS is the major provider of health care to Navajos on the Reservation, and because most of the care not provided directly is paid for by contract funds, reporting of hospitalizations is virtually complete.*

Population estimates for land management districts are based upon tribal enrollment data and school censuses and include only total population and no information on age structure. Land management districts, of which there are 18 on Reservation, were established in the 1930s. Over the years much economic and social data have been collected using them as enumeration districts. An analysis of much of the material has been published previously as well.¹⁴

The 1974 economic survey used land management districts as sampling frames. The samples were small, however, and the lists from which they were drawn may have been inaccurate to varying degrees. Nonetheless, it is the only existing source of socioeconomic data covering the entire Reservation. Except for average distance to the nearest hospital providing surgery or simply general services, the independent variables are drawn from this source. These variables and their mean values are listed in Table 1.

Hogans are the traditional Navajo circular or hexagonal dwelling. The proportion of families in a land management

district living in such homes is a rough measure of the quality of housing and availability of plumbing and electricity.

A correlation analysis of these data shows that the proportion of families living in hogans is positively related to distance from the nearest hospital providing surgery and proportion of income derived from welfare, and inversely related to the average educational level of female household heads and the proportion of women employed full-time. The proportion of income from welfare is positively correlated with distance from hospitals, and inversely correlated with the proportion of women and men employed full-time. Employment of men and women is positively related to educational levels and inversely related to the age of household heads (both men and women).

In general we may say that those districts which have populations heavily dependent upon welfare: have a high proportion of families living in hogans; have high rates of unemployment; tend to be far from hospitals; but do not necessarily have the oldest male and female household heads.

Regression analysis was employed in an attempt to explain the observed rates of gynecological surgery. In each case the dependent variable is an average annual ratio for the period 1972-1976. This time span was selected in order to use 1974, for which the socioeconomic data are available, as a mid-point, and because in July 1977 the Winslow IHS hospital was closed, thus changing the access to care in those land management districts previously served by that facility.

The regression employed is the stepwise procedure with maximum R² improvement (MAXR). This technique is considered superior to a simple stepwise procedure because it does not settle on a single model. MAXR begins by finding the one variable model producing the highest R². Then, another variable expected to yield the greatest increase in R² is added. Once the two variable model is obtained the variable

*The one important exception appears to be workmen's compensation cases which are often cared for in non-IHS facilities and paid for by a third party that does not report to the IHS. In the present instance, the loss of cases is thought to be minimal.

in the model is compared to all those not in the model, and MAXR considers the improvement in the R² that each potential switch offers. The difference between the stepwise technique and the maximum R² improvement method is that MAXR evaluates all possibilities before a final choice is made.¹⁵

All of the analyses are performed at the ecological level. That is, population characteristics of land management districts are the unit of analysis.

Results

Births by Age, 1972–1978

Due to the lack of reliable population statistics, it is not possible at this time to develop a meaningful analysis of the Navajo fertility profile during the 1970s. Nevertheless, when the distribution of deliveries among Navajo women is examined by age, an interesting trend emerges (Table 2). The youngest age class of women (those under age 20) appears to have been responsible for an increasingly large percentage of deliveries, from 13.7 percent in 1972 to 21.9 percent in 1978. This observation is consistent with the concern about the alarming rate of teenage pregnancies expressed recently in the *Navajo Times*.¹⁶ The 20-34 year age group, which in most societies bears the bulk of childbearing, exhibits a steady proportion of deliveries throughout the time period. However, the oldest age class, women 35 years and older, shows a continuing decline in the proportion of all deliveries—from 12.5 percent in 1972 to 8.6 percent in 1978. It is not likely that the age structure of the population has, in the last 10 years, undergone a change significant enough to account for the observed trend. To the extent that the changing age pattern of deliveries reflects new attitudes toward childbearing, an examination of the utilization of means which prevent childbearing becomes of considerable interest.

Induced Abortions

Although the frequency of induced abortions among Navajo Indian women who reside on the Reservation has remained well below the national average, Navajo women

have not remained unresponsive to the new general trend of the 1970s. From 1972 to 1978 we observe a 130 per cent increase in the number of induced abortions performed. During this time the ratio of abortions per 1,000 deliveries has increased from approximately 34 to 77 (an increase of 126 per cent). In the first two years of observation the rate of this increase was very high (59 per cent and 38 per cent respectively) and may have been indicative of the need for this type of service. In subsequent years the rate has stabilized at the present level. The mean and median ages of women seeking abortion have declined by 1.5 and 1.0 years respectively. This decline is consistent with our observation of the declining mean age of women at delivery, and the substantial increase of deliveries attributed to teenagers. The age-specific pattern of abortion ratios indicates that it is primarily the younger women, those under 34 years of age, who are responsible for the upward trend in abortion ratio (Table 2).

At the national level it appears that access to abortion providers is a crucial factor in explaining both the observed increase in the rates as well as the rate differentials.¹⁷⁻¹⁹ A regression analysis** was performed to examine the variability in the frequency of abortion ratios among the 18 land management districts on the Reservation. When the dependent variable is represented by a ratio of abortions per 1,000 deliveries, the best single variable model includes dependence on welfare—the higher the proportion of income derived from welfare, the lower the ratio of induced abortions. The two variable model adds mean age of female head of household, this variable being positively correlated with the dependent variable. In an alternative two variable model the welfare variable is replaced by the proportion of males employed full time; the higher the rate of full time employment among males, the higher the abortion ratio. The three variable model explains 84 per cent of the variance in the dependent variable and adds another predictor variable—the proportion of people living in hogans (negatively correlated).

When we examine the ratio of abortions within age groups, we observe that for women under 20 years of age the variables which explain most of the variance are identical to those for the total ratio model (R² = 48 per cent); distance to surgery or to a hospital does not enter the model at all.

In the 20-34 year category, access to surgery enters as an added variable; the closer the hospital providing surgery, the higher the ratio. However, access to surgery is the only variable in this model which is not significant at the 0.05 level, and thus its contribution to the explanation of the variance in the dependent variable may not be important. Once again the major explanatory variables are measures of involvement in the wage economy rather than access to medical care (R² = 57 per cent).

In the oldest age group, access does become important. The only model which attains statistical significance (R² = 25 per cent) is the one with distance from surgery as the predictor variable; the greater the distance, the lower the rate of induced abortions.

These observations suggest that two different processes may be at work. Young women may be likely to seek in-

TABLE 2—Number of Deliveries by Age and Age-Specific Ratio of Induced Abortions per 1,000 Deliveries; Navajo Reservation 1972–1978

Year	Age					
	15–19 years		20–34 years		35–49 years	
	# Births	Abortion Ratio	# Births	Abortion Ratio	# Births	Abortion Ratio
1972	463	32.4	2254	38.6	421	33.8
1973	506	98.8	2353	52.7	411	53.6
1974	688	93.0	2365	65.5	358	69.8
1975	731	73.9	2372	68.3	339	67.1
1976	699	78.7	2313	61.4	331	67.0
1977	787	66.1	2552	67.4	369	64.2
1978	752	85.1	2391	70.6	296	76.5

**Available on request to author.

TABLE 3—Age-Specific Ratio of Bilateral Tubal Ligations per/1000 Deliveries

Fiscal Year	Age 15-19	Age 20-34	Age 35-49	Total
1972	2.2	38.2	123.5	41.3
1973	7.9	42.9	158.2	48.4
1974	0.0	45.2	150.8	47.2
1975	1.4	49.7	147.5	49.1
1976	0.0	55.8	184.3	56.8
1977	0.0	56.0	219.5	60.4
1978	0.0	44.8	155.4	46.7

duced abortions and overcome whatever barriers to service exist because of their desire for the procedure. Those who are most intensely involved in the wage economy may be especially interested in reducing their fertility and may not be deterred by distance to a facility. Older women who become pregnant may be much less concerned about reducing their childbearing and may do so primarily when they are influenced by health care providers.

Bilateral Tubal Ligations

The number of tubal ligations performed has varied considerably from year to year and does not reveal any consistent trend. We do, however, observe a decline in the mean and median ages of patients—from a mean of 33.1 and a median of 33.0 in 1972 to a mean and a median of 31.5 and 31.0 respectively in 1978. When we examine the overall ratio of tubal ligations per 1,000 deliveries, we notice that there seems to have been an increase from 1972 through 1978 (Table 3), with the ratio increasing with age. This is similar to a national trend²⁰ and may reflect both larger changes in policy which does not discriminate on the basis of age and parity,²¹ and the desires of women themselves.

Both of these factors may be reflected in the changing timing of tubal ligations in relation to pregnancy (Table 4). Between 1972 and 1978 the percentage of interval sterilizations has more than doubled from 15.1 per cent in 1972 to 30.7 per cent in 1978.

When we examine the overall ratio of tubal ligations per 1,000 deliveries using regression analysis,^{***} we observe that the one variable model is the most appropriate choice ($R^2 = 47$ per cent). This model measures involvement in the wage economy using the proportion of income derived from welfare which is negatively related to the dependent variable; the greater the dependence on welfare as a source of

***Available on request to author.

income, the lower the ratio of tubal ligations. The ratio of tubal ligations is best predicted by a single variable—proportion of income from welfare—regardless of the age of patients.

It appears that as with induced abortions, measures of involvement in the wage economy and not access to medical care are the best predictors of the variability in the ratio of tubal sterilizations on the Navajo Reservation.

Hysterectomy

The procedures examined excluded those usually done to remove cancerous lesions and included only ICDA codes 69.1, 69.2, and 69.4. The age-specific ratios appear to have fluctuated from year to year with no readily discernible pattern.‡ The timing of hysterectomies in relation to pregnancy has remained essentially unchanged with the majority of cases being done as an interval procedure.

The regression analyses indicate that among younger Navajo women the variance in the ratio of hysterectomies is best explained by the so-called modernization variables. Among older women the degree of modernization is still important but such factors as prevalence of gynecological problems emerge as important as well.

Discussion

Navajo Indians have traditionally been a high fertility population. While birth rates have been declining, they have remained generally high and the pattern of childbearing has not been unlike that of many developing countries. Family planning and contraceptive programs and services, including abortion and sterilization, have not been easily available and were not well received on the Navajo Reservation. In this context, it appears that the recent developments in the utilization of abortion and sterilization services may indicate an emergence of a new trend with respect to childbearing on the Navajo Reservation.

- There has been a major shift in the age distribution of childbearing particularly among older women. The percentage of all deliveries attributed to women age 35 and above has declined steadily between 1972 and 1978. At the same time, there has been a considerable increase in the proportion of deliveries among teenagers.

- There has been a significant increase in the frequency of induced abortions among the Navajo women residing on the Reservation, largely attributable to women in the prime

‡Data available on request to author.

TABLE 4—Per Cent Distribution of Bilateral Tubal Ligations, According to Stage of Pregnancy, Navajo Reservation, 1972-1978

Timing	1972	1973	1974	1975	1976	1977	1978
Interval	15.1	25.3	24.8	28.4	36.3	27.2	30.7
Post-abortion	2.2	2.4	7.5	7.1	4.7	5.4	2.6
Post-delivery	82.7	72.3	67.7	64.5	58.9	67.4	66.7
No. women	139	170	161	169	190	224	153

of the reproductive cycle. Access to medical care is not an important consideration in obtaining abortion for women in this age class. Rather it is involvement in the wage economy which is a primary consideration.

- The number of women obtaining sterilization by tubal ligation has also increased among women aged 20-34. During the time period under observation, an increasingly large proportion of tubal ligations were done as interval procedures. As in the case of induced abortions, access to medical services appears to have been of no major importance in obtaining the services being sought.

- Although in recent years both abortions and tubal sterilizations have become more frequent on the Navajo Reservation, their incidence is still far lower than that observed for the total US population of women.

Perhaps the most interesting finding of this analysis is that the utilization of surgical fertility regulation on the Navajo Reservation, unlike other surgical procedures,²² is in virtually no instance affected by access to hospitals providing surgery, measures of involvement in the wage work economy being of major importance. In general, those populations which have the highest levels of such involvement, or the lowest levels of dependence upon welfare, have the highest rates. The consistency of results from one procedure to another supports the validity of the findings. In populations in which wage work involvement is high, it is likely that attitudes towards childbearing are changing dramatically. Limiting family size by the use of contraception appears to be related to educational attainment. There is every reason to expect that similar effects would be observed in the use of surgery for purposes of terminating a particular pregnancy or childbearing in general.

Finally, it is worth remarking that virtually all studies of the incidence of surgery use as major explanatory variables characteristics of providers and the health care system and for the most part ignore characteristics of the population being served.²³⁻²⁶ This is probably a reflection of growing interest in cost containment and undoubtedly provides important and valid insights into the workings of different systems. It appears to be based upon the assumption of increasing homogenization of western societies, particularly with regard to attitudes concerning health care utilization. Thus it is providers who increasingly make the difference in utilization patterns. At the same time it is important to keep in mind that patients do exercise some control over what happens to them and hence the study of the interaction of patient and provider characteristics may, particularly in a rapidly changing society, give an even more complete picture than the study of either alone.

REFERENCES

1. Aberle DF: A plan for Navajo economic development. IN: *Toward Economic Development for Native American Communities, A Compendium of Papers Submitted to the Subcommittee on Economy in Government of the Joint Economic Committee of the U.S. Congress.* Washington, DC: U.S. Govt Printing Office, 1969.
2. Levy JE: Who benefits from energy resource development: the

special case of Navajo Indians. *The Soc Sci Journal* 1980; 17:1-19.

3. Robbins L: *The Impact of Industrial Developments on the Navajo Nation.* Lake Powell Research Project, Bulletin No. 7, Los Angeles: University of California, Institute of Geophysics and Planetary Physics, 1975.
4. Kunitz SJ: Underdevelopment and social services on the Navajo Reservation. *Human Organization* 1977; 36:398-404.
5. Kunitz SJ: Factors influencing recent Navajo and Hopi population changes. *Human Organization* 1974; 33:7-16.
6. Kunitz SJ: Navajo and Hopi fertility, 1971-1972. *Human Biology* 1974; 46:435-451.
7. Bailey FL: *Some Sex Beliefs and Practices in a Navaho Community.* Cambridge: Harvard University, 1950.
8. Slocumb JC, Odoroff CL, Kunitz SJ: The use-effectiveness of two contraceptive methods in a Navajo population: The problem of program dropouts. *Am J Obstet and Gynecol* 1975; 122:717-726.
9. Slocumb JC, Kunitz SJ, Odoroff CL: Complications with use of IUD and oral contraceptives among Navajo women. *Public Health Rep* 1979; 94:243-247.
10. Kunitz SJ, Slocumb JC: Use of surgery to avoid childbearing among Navajo and Hopi Indians. *Human Biology* 1976; 48:9-21.
11. Davis S, Kunitz SJ: Hospital utilization and elective surgery on the Navajo Indian Reservation. *Soc Sci and Med* 1978; 12B:263-272.
12. Faich RG: (Memorandum) *New Issues for a Ten Year Plan.* Information Services Department, The Navajo Nation, Window Rock, AZ, 1979.
13. Wistisen MJ, *et al*: *A study to identify potentially feasible small businesses for the Navajo Nation.* Provo, UT: Center for Business and Economic Research, Survey Research Center, Brigham Young University, 1975.
14. Kunitz SJ: Economic variation on the Navajo Reservation. *Human Organization* 1977; 36:186-193.
15. Barr AJ, *et al*: *A User's Guide to SAS,* SAS Institute Inc., 1976.
16. *Navajo Times,* 1979.
17. Weinstock E, *et al*: Abortion need and services in the United States, 1974-1975. *Fam Plann Persp* 1976; 8:58-69.
18. Sullivan E, *et al*: Legal abortion in the United States, 1975-1976. *Fam Plann Persp* 1977; 9:116-129.
19. Shelton JD, *et al*: Abortion utilization: Does travel distance matter? *Fam Plann Persp* 1976; 8:260-262.
20. Center for Disease Control: *Surgical Sterilization.* US Department of HEW, PHS, 1979.
21. Edwards LE, Hakanson EY: Changing status of tubal sterilization. *Am J Obst Gyn* 1973; 115:348-353.
22. Kunitz SJ, Temkin-Greener H: *Changing Patterns of Mortality and Hospitalized Morbidity on the Navajo Indian Reservation.* A Working Paper from the Department of Preventive, Family, and Rehabilitation Medicine, University of Rochester School of Medicine, Rochester, NY, 1980.
23. Lewis CE: Variations in the incidence of surgery. *N Engl J Med* 1969; 281:880-884.
24. Bunker JP: Surgical manpower: a comparison of operations and surgeons in the United States and in England and Wales. *N Engl J Med* 1970; 282; 135-144.
25. Vayda E: A comparison of surgical rates in Canada and in England and Wales. *N Engl J Med* 1973; 289:1224-1229.
26. Bombardier C, *et al*: Socioeconomic factors affecting the utilization of surgical operations. *N Engl J Med* 1977; 27:699-705.

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