

Tubal Sterilization in the United States, 1994–1996

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Context: *Although the number and rate of tubal sterilizations, the settings in which they are performed and the characteristics of women obtaining sterilization procedures provide important information on contraceptive practice and trends in the United States, such data have not been collected and tabulated for many years.*

Methods: *Information on tubal sterilizations from the National Hospital Discharge Survey and the National Survey of Ambulatory Surgery was analyzed to estimate the number and characteristics of women having a tubal sterilization procedure in the United States during the period 1994–1996 and the resulting rates of tubal sterilization. These results were compared with those of previous studies to examine trends in clinical setting, in the timing of the procedure and in patient characteristics.*

Results: *In 1994–1996, more than two million tubal sterilizations were performed, for an average annual rate of 11.5 per 1,000 women; half were performed postpartum and half were interval procedures (i.e., were unrelated by timing to a pregnancy). All postpartum procedures were performed during inpatient hospital stays, while 96% of interval procedures were outpatient procedures. Postpartum sterilization rates were higher than interval sterilization rates among women 20–29 years of age; interval sterilization procedures were more common than postpartum procedures at ages 35–49. Sterilization rates were highest in the South. For postpartum procedures, private insurance was the expected primary source of payment for 48% and Medicaid was expected to pay for 41%; for interval sterilization procedures, private insurance was the expected primary source of payment for 68% and Medicaid for 24%.*

Conclusions: *Outpatient tubal sterilizations and procedures using laparoscopy have increased substantially since the last comprehensive analysis of tubal sterilization in 1987, an indication of the effect of technical advances on the provision of this service. Continued surveillance of both inpatient and outpatient procedures is necessary to monitor the role of tubal sterilization in contraceptive practice.*

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Tubal sterilization is the most commonly used method of birth control in the United States: The 1995 National Survey of Family Growth (NSFG) reported that 28% of all women 15–44 years of age currently practicing contraception relied on tubal sterilization.¹ Tubal sterilization also is a highly effective method for women choosing to permanently terminate their reproductive ability. For example, the Collaborative Review of Sterilization (CREST) study reported a first-year probability of pregnancy of 5.5 pregnancies per 1,000 sterilization procedures and a 10-year cumulative probability of 18.5 per 1,000.²

The number and rate of tubal sterilizations performed, the settings in which they are performed and the characteristics of the women obtaining sterilization procedures provide important information on contraceptive practice and trends to public health programs such as Title X, to the Health Resources and Services Administration and state family planning agencies, and to managed care organiza-

tions, health care providers, research institutions and advocacy organizations. Information on trends in sterilization rates contributes to the general knowledge of contraceptive practice in the United States and the role of sterilization within that framework. These data can inform health care programs and providers of shifts in the need for services.

No national reporting system exists to count sterilizations performed in the United States. In the past three decades, a number of studies by the Centers for Disease Control and Prevention (CDC) and EngenderHealth (formerly AVSC International) have attempted to estimate the number of procedures performed each year, by combining data from a variety of sources, including physicians who perform sterilizations, medical facilities where sterilizations are performed and comprehensive national surveys.³

Since 1965, CDC's National Center for Health Statistics (NCHS) has relied on the National Hospital Discharge Survey (NHDS) to collect data each year on inpa-

tient surgical and nonsurgical procedures. In response to the shift of many surgical procedures to outpatient settings, in 1994 NCHS initiated the National Survey of Ambulatory Surgery (NSAS) to augment the NHDS. These two surveys provide the most comprehensive estimates available of tubal sterilizations performed in the United States. We used data from the NHDS and NSAS to estimate the number and rate of tubal sterilizations for 1994 through 1996, as well as the clinical settings, timing of procedures and characteristics of women undergoing tubal sterilization.

Methods

The data sources for this analysis were the 1994, 1995 and 1996 NHDS⁴ and the 1994, 1995 and 1996 NSAS.⁵ These years represent the most recently available data on all tubal sterilizations in the United States; the NSAS has not been repeated since 1996.

Clinical setting was classified as hospital inpatient (i.e., involving an overnight hospital stay), hospital ambulatory surgery centers (including procedures performed in hospitals as outpatient procedures) or freestanding surgery centers.

Hospital inpatient tubal sterilization discharges were estimated using the NHDS, an annual multistage probability sample of discharges from nonfederal, short-stay hospitals in the United States. Up to seven diagnosis codes and four procedure codes were collected for each patient. Demographic and medical information was obtained either from the face sheets of sampled records or from automated sources.

We estimated the number of outpatient visits for tubal sterilization using the NSAS, a multistage probability sample of ambulatory surgery visits in hospital-based and freestanding ambulatory surgery centers and of outpatient proce-

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Table 1. Mean annual number, rate and percentage distribution of tubal sterilization procedures, by timing of procedure and clinical setting, United States, 1994–1996

Timing/setting	Mean annual no.	Rate†	SE	% dist.	SE
Total	684,000	11.5	0.4	100	na
Postpartum					
Inpatient (hospital)	338,000	5.7	0.3	49.5	3.0
Interval	345,000	5.8	0.3	50.6	na
Inpatient (hospital)	15,000	0.2	0.03	2.1	0.3
Outpatient	331,000	5.6	0.3	48.5	
Hospital ambulatory surgery center‡	288,000	4.9	0.3	42.2	3.2
Freestanding outpatient surgery center	43,000	0.7	0.1	6.3	0.9

†Tubal sterilizations per 1,000 women of reproductive age (20–49 years) in the U.S. civilian resident population. ‡Includes procedures performed in hospitals as outpatient procedures. Note: SE=standard error.

cedures performed in hospitals. (Procedures performed in hospital ambulatory surgery centers included those performed in hospital operating rooms on an outpatient basis.)

The sample universe included surgery centers in noninstitutional, nonfederal, short-stay hospitals and freestanding facilities listed in the 1993 SMG Freestanding Outpatient Surgery Center Database. If a freestanding facility was owned by a hospital but located some distance away, was separately listed in the 1993 SMG Freestanding Outpatient Surgery Center Database and was selected into the NSAS sample from this universe, it was considered a freestanding surgery center. Facilities specializing in abortion, family planning or delivery were excluded from the survey. A maximum of seven diagnostic codes and six procedure codes were collected for each patient.

Tubal sterilization is a permanent method of birth control in which a portion of the fallopian tube is cut and either tied, clipped, cauterized or removed. For this analysis, we defined postpartum tubal sterilizations as procedures that were completed during the same hospital stay as a delivery; interval tubal sterilizations were unrelated by timing to a pregnancy or a delivery. Our analysis is restricted to women aged 20–49.

We identified postpartum tubal sterilizations using International Classification of Disease, Clinical Modification, Ninth Revision (ICD-9-CM)⁶ codes that restricted the case selection to those that matched for a vaginal or cesarean delivery (diagnosis code V27) and tubal sterilization

*The “other” category included self-pay, Medicare, other government payments and those marked as “other, specified.”

codes (procedure codes 66.2–66.3 or procedure codes 65.6, 66.5, 66.63 or 66.97 and diagnosis code V25.2), and excluded any procedures in which the removal of the fallopian tubes was an integral part of a hysterectomy or a procedure for reasons other than sterilization. Inpatient interval tubal sterilizations were identified similarly, excluding any matches with delivery codes. Outpatient interval procedures were identified using ICD-9-CM codes;

again, we excluded any procedures in which the removal of the fallopian tubes was an integral part of a hysterectomy or a procedure for reasons other than sterilization. Postpartum sterilizations are not routinely performed in outpatient settings, because by definition, they take place less than 48 hours after a delivery.

We categorized type of delivery (vaginal or cesarean) associated with postpartum sterilization procedures from ICD-9-CM procedure codes. We also ascertained the surgical procedure for interval sterilizations using ICD-9-CM procedure codes, and categorized these procedures as laparoscopic or not laparoscopic. Additionally, information on the type of anesthesia (local or general) used in outpatient procedures was available from NSAS.

Women 20–39 years of age were grouped in five-year age intervals, while those aged 40–49 comprised a single group. For the analysis by race, we classified women as white, black, American Indian or Alaska Native, Asian or Pacific Islander, other race or unknown race. Hispanic women were classified by their reported racial group. Due to small sample sizes and large relative standard errors, we do not discuss here any race-specific information on racial groupings other than white and black. Because of the large number of discharges (NHDS) and visits (NSAS) of unknown (“not stated”) race (nearly 22% of discharges and 29% of visits), we conducted a sensitivity analysis to evaluate whether apparent differences by race remained statistically significant if all women with unknown race were classified as white (the group with lower rates).

Hospitals and ambulatory surgery centers were classified by location in one of the four geographic regions of the United States, as defined by the U.S. Bureau of

the Census: Northeast, Midwest, South and West. Expected primary source of payment was categorized as private insurance (including health maintenance organizations and preferred provider organizations), Medicaid and other.* Region and expected source of payment could not be analyzed by race because of the large percentage with race not stated.

We weighted sampled discharges (NHDS) and visits (NSAS) meeting the case definition to obtain national estimates. To achieve more reliable estimates, we combined the 1994–1996 data; thus, all estimates are based on data for the three-year period. The estimated number of sterilization procedures was based on an unweighted sample of 7,838 hospital records (NHDS) and 5,629 outpatient surgical records (NSAS) for the three-year period.

Rates were calculated as the number of tubal sterilizations per 1,000 women of reproductive age (ages 20–49) in the U.S. civilian resident population. Population estimates for 1994, 1995 and 1996 were computed by the U.S. Bureau of the Census, and are included in the NHDS documentation package. When computing percentage distributions for expected primary payment source, we excluded discharges (NHDS) and visits (NSAS) with unknown primary payment source (2% of discharges and 4% of visits) from the analysis.

We computed standard errors for estimates derived from the NHDS and NSAS using SUDAAN,⁷ a software package that accounts for complex survey designs. For rates, the denominator was treated as a known quantity (without variance). NHDS and NSAS estimates were considered statistically independent in the computation of standard errors for estimates, which combined data from the two surveys.

Results

We estimate that more than two million women aged 20–49 had a tubal sterilization procedure in the United States between 1994 and 1996. An average of al-

Table 2. Estimated number of tubal sterilizations per 1,000 women, by timing of procedure, according to age

Age	All		Postpartum		Interval	
	Rate	SE	Rate	SE	Rate	SE
20–24	12.6	0.7	7.5	0.5	4.8	0.4
25–29	18.8	0.8	10.4	0.6	8.2	0.6
30–34	18.6	0.8	9.6	0.5	8.5	0.6
35–39	12.4	0.6	5.2	0.3	7.0	0.5
40–49	2.8	0.2	0.6	0.1	2.1	0.2

Notes: Rate is the number of tubal sterilizations per 1,000 women of the designated age-group in the U.S. civilian resident population. SE=standard error.

Table 3. Estimated number of tubal sterilizations per 1,000 women, by race, according to timing of procedure and clinical setting, and percentage of procedures for which race was not stated

Timing/setting	White		Black		Race not stated and white		% with race not stated
	Rate	SE	Rate	SE	Rate	SE	
	All	7.7	0.4	13.4	1.1	11.2	
Postpartum	3.8	0.3	7.6	0.8	5.3*	0.3	21.4
Interval	3.8	0.3	5.5	0.7	5.8	0.4	28.6

*Significantly different from black women at $p < .05$. Notes: Rate is the number of tubal sterilizations per 1,000 women of the designated age-group in the U.S. civilian resident population. SE = standard error.

most 684,000 women underwent tubal sterilization procedures each year (Table 1). The 1994–1996 rate was 11.5 tubal sterilizations per 1,000 women, and the annual rate varied little in the three-year study period.

Approximately half of all sterilizations were performed postpartum and half were interval procedures. All postpartum procedures were performed during inpatient hospital stays, whereas only 4% of interval procedures were performed on an inpatient basis (2% of all sterilization procedures). Most interval sterilizations were performed as outpatient procedures in hospital ambulatory surgery centers or in freestanding surgery centers.

Among women aged 20–29, postpartum sterilization rates were higher than interval rates, whereas the reverse was true among women aged 35–49 (Table 2). Women choosing postpartum tubal sterilization tended to be younger than women electing to have an interval procedure.

Tubal sterilization rates varied by race. Among women whose race was known, postpartum sterilization rates for black women were twice those of white women (Table 3). (For 21% of postpartum procedures, race was not available.) Postpartum rates remained significantly higher among black women than among white women after we recoded to white all cases in which race was not stated. Inpatient and outpatient interval sterilization rates among women with stated race were also higher for black women than for white women; however, the difference was not statistically significant when cases with unknown race were recoded as white.

Sterilization rates were higher in the South than in the other three regions, which had similar rates (Table 4). Regional differences in rates varied by the timing of the sterilization procedure: Postpartum rates were higher in the South than in the other regions, while outpatient interval rates were lower in the West than in any other region.

in the West and South. Among women having a postpartum procedure, private insurance was the expected source of payment for 48% overall, while 41% were paid for through Medicaid. In contrast, private insurance was the expected source of payment for the large majority of outpatient interval sterilization procedures (68%), and Medicaid paid for 24%. In the Northeast, Medicaid was the expected source of payment for a smaller proportion of outpatient interval sterilizations than in any other region.

Fifty-eight percent of women who had a postpartum sterilization had a vaginal delivery, and 42% had a cesarean delivery. Among women obtaining an interval sterilization, laparoscopic procedures were used in 89% of outpatient sterilizations and in 53% of inpatient procedures. For women who underwent tubal sterilization on an outpatient basis, general anesthesia was the method of anesthesia used most frequently (in 93% of procedures), while topical or local anesthesia (2%), regional anesthesia (2%) and methods classified as other (6%) were used rarely. (These percentages exceed 100% when totaled because some records indicate more than one type of anesthesia.) Data on anesthesia were not available from NHDS.

Discussion

In the 1970s, tubal sterilization emerged as one of the most common methods of contraception for women of reproductive age in the United States. Female sterilization rates increased from 4.7 per 100,000 women in 1970 to 12.4 per 100,000 by 1980,⁸ and appear to have remained stable over the next two decades, with the rate for 1994–1996 (11.5 per 100,000) being similar to the rate in 1980.

While all postpartum tubal sterilization procedures continue to be performed in hospitals, there has been a significant change in clinical setting for interval procedures in the past 25 years. Technical advances, particularly the use of the laparo-

scope, have significantly affected the setting in which tubal sterilization procedures can be performed and the trend toward interval sterilization.⁹ In 1970, fewer than 1% of sterilizations not associated with a delivery were performed on an outpatient basis; by 1980, 19% of women having an interval tubal sterilization did not remain in the hospital overnight. Both the number and rate of interval procedures performed in hospitals decreased beginning in 1980, as more ambulatory procedures were performed in hospitals or in freestanding surgery centers. In 1987, 34% of all tubal sterilizations were performed in outpatient settings;¹⁰ this proportion increased to almost 50% by 1994–1996. Although most interval procedures are performed in outpatient settings, a small proportion of interval procedures are performed on an inpatient basis, most likely for medical indications.

The timing of a sterilization procedure influences the surgical approach. Most inpatient tubal sterilizations are completed by surgical approaches other than laparoscopy. Postpartum sterilizations are performed at the time of cesarean delivery, when the abdomen is open, or following a vaginal delivery, using a 2–5 cm subumbilical minilaparotomy incision.¹¹ Laparoscopy is not used for postpartum sterilization because the size of the uterus would make insertion of the instrument unsafe. Most interval sterilization procedures in the United States are laparoscopic procedures performed under general anesthesia in an outpatient setting. The proportion of interval procedures performed using laparoscopy increased dramatically between 1970 and 1978 (from fewer than 1% to 51%).¹² Laparoscopy continued to increase in usage, from 79% of outpatient interval sterilizations in 1987¹³ to 89% during the current study period.

Similar to what was seen in previous studies,¹⁴ overall tubal sterilization rates in 1994–1996 were highest among women aged 25–34. The peak childbearing years

scope, have significantly affected the setting in which tubal sterilization procedures can be performed and the trend toward interval sterilization.⁹ In 1970, fewer than 1% of sterilizations not associated with a delivery were performed on an outpatient basis; by 1980, 19% of women having an interval tubal sterilization did not remain in the hospital overnight. Both the number and rate of interval procedures performed in hospitals decreased beginning in 1980, as more ambulatory procedures were performed in hospitals or in freestanding surgery centers. In 1987, 34% of all tubal sterilizations were performed in outpatient settings;¹⁰ this proportion increased to almost 50% by 1994–1996. Although most interval procedures are performed in outpatient settings, a small proportion of interval procedures are performed on an inpatient basis, most likely for medical indications.

Table 4. Estimated number of tubal sterilizations per 1,000 women, by timing of procedure, according to region

Region	All		Postpartum		Interval	
	Rate	SE	Rate	SE	Rate	SE
Total	11.5	0.4	5.7	0.3	5.6	0.3
Northeast	10.5	1.0	3.4	0.4	6.7	1.0
Midwest	10.7	0.7	4.5	0.3	6.1	0.6
South	14.2	0.9	8.1	0.7	5.8	0.6
West	9.0	0.6	5.2	0.4	3.6	0.4

Notes: Rate is the number of tubal sterilizations per 1,000 women of the designated age-group in the U.S. civilian resident population. SE = standard error.

Table 5. Percentage distribution of tubal sterilizations, by expected primary source of payment for sterilization procedure and region, according to timing of sterilization

Region and payment source	All		Postpartum		Interval	
	%	SE	%	SE	%	SE
U.S. total						
Private	57.9	3.5	48.1	1.7	68.0	2.0
Medicaid	32.6	2.1	41.1	1.8	24.1	1.6
Other	9.5	0.9	10.8	1.0	7.9	1.1
Self-pay	2.3	0.3	3.1	0.4	1.3	0.2
Medicare	0.8	0.1	0.6	0.1	1.1	0.2
Other government	1.8	0.4	2.0	0.6	1.6	0.4
Other, specified	4.6	0.7	5.2	1.0	3.9	1.0
Northeast						
Private	72.4	11.1	58.5	3.1	80.0	4.0
Medicaid	19.1	3.0	34.7	2.6	11.0	2.5
Other	8.5	2.1	6.8	1.4	9.0	2.5
Midwest						
Private	62.7	7.1	54.6	4.1	68.9	3.3
Medicaid	27.7	3.2	31.8	2.2	24.6	2.9
Other	9.6	1.7	13.5	3.0	6.5	1.5
South						
Private	51.2	5.3	44.8	2.6	60.0	3.4
Medicaid	38.9	4.0	45.7	3.3	29.9	2.9
Other	9.9	1.4	9.6	1.1	10.1	2.1
West						
Private	53.3	5.8	44.3	3.3	66.5	3.3
Medicaid	37.1	4.4	41.9	3.0	31.0	3.5
Other	9.5	2.0	13.8	3.0	2.5†	1.3
Total	100.0	na	100.0	na	100.0	na

†Estimate is not reliable, because relative standard error is greater than 30%. Notes: SE=standard error. na=not applicable.

are 20–29,¹⁵ and most women have had the number of children they desire before age 35. As a result of the cumulative effect of sterilizations over the reproductive age span, 50% of all contraceptive users 40–44 years of age relied on female sterilization in 1995.¹⁶

Tubal sterilization rates among black women were more than twice those of white women in 1970 (9.0 versus 4.1 per 100,000).¹⁷ Although by 1975 tubal sterilization rates had increased twofold among white women and differences by race had narrowed,¹⁸ rates increased more for black women and have remained higher than those for white women since 1976.¹⁹ Our ability to conduct analyses by race in this article was limited because of the high proportion of procedures with unknown race (21–29%), and because hospitalizations in the NHDS for which the patient's race is marked as unknown are not proportionally distributed among all race groups.²⁰ Comparisons of data from the NHDS with data from other sources suggest that race was underreported to a greater extent for white patients than for patients of other races.

While our results must be interpreted with caution, the differences we found between black and white postpartum rates are large enough to remain significant

when all women whose race was not stated are added to the white category. This difference by race in some sterilization rates may be explained in part by the fact that non-Hispanic white married or cohabiting women rely on vasectomy as a method of permanent sterilization more frequently (10%) than do black married or cohabiting women (1%).²¹ Women who choose tubal sterilization tend to be less-educated and to have lower levels of income;²² likewise, black women have been shown to have lower levels of income, education and access to health care.²³ These and other factors, rather than race itself, most likely account for differences between black and white women in tubal sterilization rates.

We found that regional differences in overall tubal sterilization rates continued in a pattern similar to those reported for the 1970s and 1980s, with the South having the highest rates.²⁴ Notable in our findings are the higher share of interval versus postpartum procedures in the Northeast and Midwest, compared with an inverse relationship between interval and postpartum rates in the South and West. Although our data do not provide insights into the reasons for regional differences, other researchers have suggested that these may be due in part to variations in physicians' attitudes toward sterilization, in the medical care delivery system and in patients' religious beliefs.²⁵ Offsetting variations in vasectomy rates may also account for regional variations in tubal sterilization rates, although published studies have presented conflicting estimates of regional vasectomy rates.²⁶

Previous studies have not examined the source of payment for tubal sterilizations. We found significant differences by region and timing of procedure in the expected primary source of payment. In all regions, Medicaid was the expected source of payment for a higher proportion of postpartum tubal sterilizations than of outpatient interval sterilizations. This difference is ex-

plained by Medicaid restrictions in most states limiting coverage of family planning services, including tubal sterilization, for Medicaid recipients to 60 days postpartum.²⁷ Although nine states had expanded coverage under their Medicaid programs by 1997 to include eligibility for family planning services, in most of these states the expanded coverage was restricted to no more than two years' postpartum for Medicaid recipients or up to two years after loss of regular Medicaid coverage.²⁸ In contrast, women covered by private insurance have greater latitude in choosing the timing of their sterilization, given that tubal sterilization is routinely covered by 85–90% of private health insurance policies.²⁹ In addition, the 30-day waiting period required for federally funded sterilization may adversely affect women covered by Medicaid, compared with women who have private insurance; we cannot measure that impact in this study, however.

Several limitations of this study need to be considered. The estimates of sterilization reported here are lower than the total number of tubal sterilizations in the United States, because our analysis did not include any tubal sterilizations performed in federally operated hospitals and clinics or in family planning clinics. However, in 1987, the Association for Voluntary Surgical Contraception reported that only 2% of all sterilizations were performed in military hospitals and family planning clinics.³⁰

Another shortcoming is that our calculation of tubal sterilization rates includes already-sterile women in the denominator; if women who were already sterile from previous tubal sterilization, from hysterectomy or as a result of other medical conditions were excluded from the denominator, tubal sterilization rates would be higher. Further, the apparent decline in sterilization rates with increasing age would be less dramatic if rates were based only on women at risk.

Additionally, differences in methodology used to determine outpatient estimates preclude a strict comparison with some previous reports.³¹ Finally, race and ethnicity are not available for all records (as previously discussed), and rates for specific race groups are underestimated to an unknown extent.

A number of factors may affect future trends in sterilization. Recent shifts toward delayed childbearing³² may reduce the number of younger women choosing tubal sterilization. Women marry later and wait longer after marriage to start fami-

lies.³³ In addition, although early reports suggested an increased risk for cardiovascular disease among oral contraceptive users of older ages, data now support pill use among healthy women older than 35 who do not smoke.³⁴ While overall use of oral contraceptives declined between 1988 and 1995, pill use doubled among women aged 35–39 and rose sixfold among those aged 40–44.³⁵ These factors may increase the age at which a woman considers permanent contraception and the rates at which they choose sterilization.

This study is the first comprehensive analysis of all tubal sterilizations since 1987. Our report updates trends in timing, setting and surgical method of sterilization procedures, and provides information on differences by region and source of payment. The availability of NSAS data from outpatient surgical facilities during 1994–1996 has provided key information for a more complete analysis of tubal sterilization rates in the United States.

While NHDS and NSAS offer the most comprehensive data on tubal sterilizations for 1994–1996, further research would be enhanced by data on patient characteristics not available from these surveys, such as parity, prior method of contraception, marital status and education. In addition, improved reporting of race would allow for an analysis of the interaction of race, region and source of payment.

Currently, national data are not collected annually on procedures performed in hospital ambulatory surgery centers or freestanding surgery centers; NSAS was only conducted during the 1994–1996 time period. Clearly, data on inpatient sterilizations from NHDS, used to determine sterilization estimates in the 1970s and early 1980s, are no longer representative of all sterilizations. Continued surveillance of both inpatient and outpatient procedures is needed to monitor the role of tubal sterilization in contraceptive practice.

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Fertility Desires and Intentions...

(continued from page 152)

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