

Determinants and Policy Implications of Male Circumcision in the United States

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Three recent randomized clinical trials in South Africa, Kenya, and Uganda found that male circumcision reduces a man's risk of becoming infected with HIV through contact with a female partner by 55% to 76%.¹⁻³ These results are consistent with meta-analyses based on observational studies in Africa^{4,5} and the United States.^{6,7}

The recent randomized clinical trial findings prompted the American Academy of Pediatrics (AAP) to form a committee in June 2007 to review its position on male circumcision.⁸ In 1999 the AAP had adopted a neutral stance, stating that the medical benefits were not compelling enough to recommend routine neonatal circumcision. In the wake of the AAP statement, several states withdrew Medicaid coverage for routine, nontherapeutic circumcision. Currently, 16 state Medicaid plans do not cover the procedure. In 2006, legislators in Hawaii and Vermont introduced resolutions challenging the need for state funding of routine male circumcision.⁹

In view of the striking results from the African clinical trials, it is timely to examine the impact of US hospital- and state-level policies on domestic rates of male circumcision. In particular, we hypothesized that male circumcision rates would be higher in states in which the Medicaid program pays for routine circumcision.

METHODS

Sample and Measures

Data for this study came from the 2004 Nationwide Inpatient Sample (NIS), from the Healthcare Cost and Utilization Project of the Agency for Health Care Research and Quality. The NIS is the largest all-payer inpatient-care database in the United States and consists of a random sample of hospitals in 37 states. It contains information included in a typical discharge abstract: hospital characteristics and patient demographics, expected payment source, diagnoses, procedures, length of stay, and discharge status. The 2004 NIS contains

Objective. We sought to determine whether lack of state Medicaid coverage for infant male circumcision correlates with lower circumcision rates.

Methods. We used data from the Nationwide Inpatient Sample on 417 282 male newborns to calculate hospital-level circumcision rates. We used weighted multiple regression to correlate hospital circumcision rates with hospital-level predictors and state Medicaid coverage of circumcision.

Results. The mean neonatal male circumcision rate was 55.9%. When we controlled for other factors, hospitals in states in which Medicaid covers routine male circumcision had circumcision rates that were 24 percentage points higher than did hospitals in states without such coverage ($P < .001$). Hospitals serving greater proportions of Hispanic patients had lower circumcision rates; this was not true of hospitals serving more African Americans. Medicaid coverage had a smaller effect on circumcision rates when a hospital had a greater percentage of Hispanic births.

Conclusions. Lack of Medicaid coverage for neonatal male circumcision correlated with lower rates of circumcision. Because uncircumcised males face greater risk of HIV and other sexually transmitted infections, lack of Medicaid coverage for circumcision may translate into future health disparities for children born to poor families covered by Medicaid. (*Am J Public Health*. 2009;99:138-145. doi: 10.2105/AJPH.2008.134403)

data from more than 8 million discharges from 1004 hospitals,¹⁰ reflecting roughly 20% of inpatient visits to US community hospitals. We used data from NIS records on newborn males who had a routine discharge from the hospital. Because many facilities reported no births, our analysis incorporated data from 683 hospitals, which reported 417 282 routine discharges of newborn males.

The outcome of interest was circumcision status, measured by the presence of an *International Classification of Diseases, Ninth Revision (ICD-9)*,¹¹ procedure code indicating circumcision among any of up to 15 procedures performed during the hospital stay. The unit of analysis was the hospital, so rates of circumcision for each hospital were calculated by dividing the number of circumcised newborn male infants by the total number of newborn boys in the hospital.

The main explanatory measure was a state policy variable reflecting whether Medicaid covered routine circumcisions for newborn males in the hospital's state in 2004.¹² Other explanatory variables were those that had been found in previous analyses to predict male

circumcision and that were also available in the NIS.¹³ Individual-level variables were aggregated to a hospital-level summary. Table 1 presents definitions and mean circumcision rates by each of the variables.

Missing Data

Complete data were available for all hospital and policy variables. However, there were missing data for some patient characteristics. All hospitals reported primary payer data for at least 75% of admissions, and all but 8 hospitals had income data for at least 80% of patients. We based the hospital-level insurance and income variables on those cases with complete data.

Race/ethnicity information was missing at higher rates. Patients' racial/ethnic group was not provided at all in hospital records from 10 states, accounting for 178 of the 683 hospitals analyzed. An additional 36 hospitals in other states provided race/ethnicity data for fewer than half of their patients.

Appending county-level and state-level population data on the proportions of infant

TABLE 1—Circumcision Rates as a Function of Hospital and State Predictors (Hospitals Weighted by Number of Male Births): Nationwide Inpatient Sample, 2004

	Mean Circumcision Rate (SD)	ANOVA F	ANOVA P
All hospitals (N=683)	55.9 (29.9)		
State Medicaid program coverage of routine male circumcision		412.5	<.001
Not covered	31.2 (29.6)		
Covered	69.6 (20.8)		
Hospital size ^a		1.5	.216
Small	61.0 (21.9)		
Medium	55.8 (29.5)		
Large	54.9 (34.1)		
Hospital location		5.3	.021
Rural	63.7 (14.9)		
Urban	55.1 (36.3)		
Hospital teaching status		12.0	<.001
Nonteaching	52.3 (26.6)		
Teaching	60.2 (39.1)		
Region		132.4	<.001
Northeast	68.7 (15.7)		
Midwest	77.2 (16.7)		
South	59.7 (28.2)		
West	27.1 (29.0)		
Proportion of male births with LOS of ≤1 day ^b		65.9	<.001
Low	64.8 (26.4)		
Medium	61.4 (28.5)		
High	36.0 (27.4)		
Proportion of male births with LOS of 2 to 5 days ^b		77.6	<.001
Low	37.5 (29.3)		
Medium	61.2 (30.4)		
High	68.4 (20.2)		
Proportion of male births with LOS of ≥6 days ^b		1.1	.345
Low	55.1 (18.2)		
Medium	58.9 (27.0)		
High	55.0 (40.4)		
Proportion of male births with Medicaid as primary payer ^b		63.4	<.001
Low	65.1 (27.0)		
Medium	59.9 (25.9)		
High	36.8 (29.6)		
Proportion of male births with no insurance ^b		11.9	<.001
Low	57.1 (28.2)		
Medium	60.8 (31.8)		
High	47.3 (28.2)		
Proportion of male births with private insurance ^b		61.4	<.001
Low	36.3 (28.8)		
Medium	59.9 (25.7)		
High	64.5 (28.2)		
Proportion of male births living in a lower income area (lowest quartile) ^{b,c}		17.5	<.001
Low	62.5 (24.2)		

Continued

males falling into each category,^{14,15} we performed a 2-step multiple imputation procedure for the proportion of newborn boys in the hospital who were White, African American, Hispanic, or other race/ethnicity.^{16,17} State-level data were appended for hospitals in all states; county-level data was appended only for hospitals in states in which county code was provided in the NIS. In the first step of the procedure, we imputed racial/ethnic proportions for 140 hospitals that had available county-level racial/ethnic data as well as the measures presented in Table 1. For the second imputation step we used state-level, rather than county-level, racial/ethnic percentages, and imputed values for 74 hospitals for which we did not have county-level data. We performed multiple imputation procedures with the SAS version 9.1 PROC MI (SAS Institute Inc, Cary, NC), by using the Markov Chain Monte Carlo method. Time-series plots for the worst linear function remained stable across iterations. Five imputed data sets were produced.

Results from sensitivity analyses that tested the inclusion of hospitals from the 3 states (Georgia, Nebraska, and Ohio) that accounted for 73 of the 74 hospitals that did not report race or county data did not differ meaningfully. Therefore, we present estimates based on all 37 available states.

Statistical Analysis

We used simple analysis of variance to compare average hospital circumcision rates by state and hospital characteristics. For characteristics measured on a continuous scale (such as proportion of patients with a hospital length of stay of 1 day), neonatal male circumcision rates were calculated for hospitals that fell into the lowest third of the distribution of the characteristic across hospitals (low), the middle third (medium), and the highest third (high).

Many of the factors that correlated with hospital male circumcision rates were correlated with each other (e.g., region and percentage Hispanic). To isolate the effect of each variable, we performed ordinary least squares regression with circumcision rate as our dependent variable and with state policy and hospital characteristics as predictors. Regressions were weighted by the normalized number of male births reported in each hospital. We included all stratification variables used to develop the sample as regressors. Because the circumcision

TABLE 1—Continued

Medium	56.7 (34.6)		
High	44.4 (27.9)		
Proportion of male births living in a medium-low income area (second quartile) ^{b,c}		1.0	.380
Low	57.6 (29.0)		
Medium	56.0 (34.4)		
High	53.1 (25.8)		
Proportion of male births living in a medium-high income area (third quartile) ^{b,c}		8.2	<.001
Low	44.6 (22.0)		
Medium	56.7 (32.4)		
High	58.7 (33.2)		
Proportion of male births living in a higher income area (highest quartile) ^{b,c}		11.3	<.001
Low	55.4 (18.3)		
Medium	48.1 (36.2)		
High	60.1 (33.2)		
Proportion of male births who are White ^b		67.5	<.001
Low	43.8 (37.0)		
Medium	65.0 (23.4)		
High	72.3 (18.1)		
Proportion of male births who are African American ^b		18.4	<.001
Low	45.6 (30.3)		
Medium	55.2 (29.1)		
High	62.7 (28.1)		
Proportion of male births who are Hispanic ^b		142.5	<.001
Low	75.5 (16.9)		
Medium	66.6 (22.6)		
High	39.0 (33.2)		
Proportion of male births who are another race/ethnicity ^{b,d}		8.3	<.001
Low	47.9 (30.4)		
Medium	58.8 (30.0)		
High	58.4 (28.4)		

Note. ANOVA = analysis of variance; LOS = length of hospital stay.

^aDetermined based on the number of beds. Classifications were relative to a hospital's region, urban or rural location, and teaching status.

^bFor characteristics measured on a continuous scale, neonatal male circumcision rates were calculated for hospitals that fell into the lowest third of the distribution of the characteristic across hospitals (low), the middle third (medium), and the highest third (high).

^cProportion of newborns in each hospital who resided in zip codes with median income of \$1 to \$35 999 (lowest quartile), \$36 000 to \$44 999 (second quartile), \$45 000 to \$58 999 (third quartile), and \$59 000 or higher (highest quartile). This was calculated from Nationwide Inpatient Sample data on median household income quartile for each patient's zip code.³¹

^dOther ethnicity includes non-White, non-African American, non-Hispanic (e.g., Asian/Pacific Islander, American Indian).

rate variable was bounded below by 0 and above by 1, we used a logistic (logit) transformation of the measure as follows to conform with regression model assumptions:

$$(1) y_i = \log(p_i / (1 - p_i)),$$

where p_i is the circumcision rate for hospital (i).

To avoid extreme values of y_i , values of p_i that were less than 0.01 were recoded to 0.01, and values of p_i that were greater than 0.99

were recoded to 0.99. To assess the sensitivity of findings to this transformation, we also tested an arcsine transformation, which allows values of 0 or 1 for p_i :

$$(2) y_i^* = \arcsine(\sqrt{p_i}).$$

Results from analyses with the arcsine transformation did not differ meaningfully from analyses with the logit transformation; we present only the logit-transformation results.

In fitting the regression model, we examined quadratic and interaction terms. Only significant terms were retained in the final model. We performed model fitting on 1 of the 5 imputed data sets produced by SAS PROC MI in an initial run. We then reran the imputation with a new random seed, and we performed final analyses on all 5 imputation data sets; we combined results by using SAS PROC MIANALYZE.

We used the regression results to predict circumcision rates as a function of state Medicaid policy, proportion of patient stays covered by Medicaid, and proportion of Hispanic newborns, in each case maintaining all other predictors at their observed values. In the "Discussion" section, we present predicted values of male circumcision rates under different Medicaid policy scenarios.

RESULTS

Across the 683 hospitals in the sample, the average weighted circumcision rate was 55.9%. Table 1 summarizes observed male circumcision rates. When we did not control for correlated factors, routine circumcision was less common in hospitals with higher proportions of births paid for by Medicaid (36.8%), in hospitals with greater proportions of uninsured deliveries (47.3%), and in hospitals that serve a greater share of patients in the lowest quartile of the income distribution (44.4%; $P < .001$). Male circumcision rates were higher (72.3%) in the one third of the hospitals with the largest proportion of infants who are White ($P < .001$) and lower (39.0%) in the one third of the hospitals with the largest proportions of infants who are Hispanic ($P < .001$). Male circumcision rates were lower (36.0%) in hospitals with the largest proportions of newborns with 1-day stays ($P < .001$).

Neonatal male circumcision rates differed significantly across regions of the country ($P < .001$). Male circumcision rates averaged 77.2% in the Midwest, 68.7% in the Northeast, 59.7% in the South, and just 27.1% in the West. Bivariate analyses showed that neonatal male circumcision rates were higher in teaching hospitals ($P < .001$) and in hospitals located in rural areas ($P = .021$). However, a hospital's circumcision rate was not significantly related to the number of beds ($P = .216$).

Our public policy measure also showed a significant relationship with neonatal male circumcision rates. In states whose Medicaid program covers neonatal male circumcision, rates were more than twice as high (69.6%) as in states whose Medicaid program does not pay for male circumcision (31.2%).

Regression results, presented in Table 2, show effects of each factor with control for all other predictors. The set of primary payer variables significantly predicted neonatal male circumcision rates ($F=22.96$; $P<.001$). Hospitals with higher proportions of Medicaid-covered births ($P<.001$) and uninsured births ($P<.004$) had lower circumcision rates than did hospitals with more patients covered by private insurance. However, in states in which Medicaid paid for routine neonatal circumcision, rates were significantly higher than in states in which this was not the case ($P<.001$). As expected, the greater the share of Medicaid-covered births in the hospital, the greater the effect of state coverage for neonatal male circumcision on the hospital's circumcision rate.

Circumcision rates varied significantly by region in the regression analysis ($F=16.13$; $P<.001$). Relative to hospitals in the South, and with control for other factors, neonatal male circumcision rates were significantly lower in the West ($P<.001$) and the Northeast ($P<.001$), but not significantly different in the Midwest ($P=.164$). Even net of region effects, the race/ethnicity variables remained highly significant predictors of male circumcision ($F=29.35$; $P<.001$). Hospitals that had a greater proportion of Hispanic newborns relative to Whites showed significantly lower circumcision rates ($P<.001$), although hospitals in which African Americans accounted for a larger share of the births relative to Whites did not differ significantly.

The length-of-stay variables were also significantly related to male circumcision rates in the regression analysis ($F=12.20$; $P<.001$). Hospitals with greater proportions of very short maternity stays ($P<.001$) had lower circumcision rates. Hospitals with larger shares of very long stays also had lower circumcision rates ($P<.001$) compared with hospitals in which a greater share of the maternity stays were between 2 and 5 days.

Although they had significant bivariate relationships with neonatal male circumcision

TABLE 2—Multiple Regression Results With Multiply Imputed Data Sets For Predictors of Male Infant Circumcision: Nationwide Inpatient Sample, 2004

	b ^a (95% CI)	P
Intercept	1.276 (0.629, 1.923)	<.001
State Medicaid program covers routine male circumcision	0.866 (0.375, 1.357)	<.001
Hospital size ^b (Ref=large)		.866
Small	0.068 (-0.186, 0.323)	.599
Medium	0.021 (-0.168, 0.210)	.827
Rural hospital location	0.213 (-0.182, 0.607)	.290
Teaching hospital	-0.162 (-0.447, 0.124)	.267
Region (Ref=South)		<.001
Northeast	-0.549 (-0.859, -0.239)	<.001
Midwest	0.210 (-0.085, 0.504)	.164
West	-0.813 (-1.189, -0.436)	<.001
Hospital ownership ^c		.122
Income quartile of patient's zip code ^d (Ref=lowest)		.373
Proportion in second quartile	0.341 (-0.176, 0.857)	.196
Proportion in third quartile	0.038 (-0.560, 0.637)	.900
Proportion in highest quartile	-0.107 (-0.634, 0.421)	.692
Length of stay (LOS; Ref=2 to 5 d)		<.001
Proportion with LOS=1 d, centered	-1.487 (-2.343, -0.632)	<.001
Proportion with LOS=1 d, squared	-4.601 (-8.497, -0.706)	.021
Proportion with LOS≥6 d, centered	-5.267 (-8.009, -2.525)	<.001
Proportion with LOS≥6 d, squared	4.303 (-0.824, 9.431)	.1
Primary payer (Ref=private insurance)		<.001
Proportion with Medicaid as primary payer	-2.986 (-3.758, -2.215)	<.001
Medicaid coverage×Medicaid proportion	2.080 (1.165, 2.996)	<.001
Proportion with no insurance	-1.561 (-2.625, -0.496)	.004
Race/ethnicity (Ref=non-Hispanic White)		<.001
Proportion African American	1.324 (-0.258, 2.905)	.099
Medicaid coverage×African American proportion	-1.029 (-2.814, 0.756)	.251
Proportion Hispanic	-2.095 (-2.846, -1.344)	<.001
Medicaid coverage×Hispanic proportion	-0.961 (-1.834, -0.087)	.031
Proportion other race/ethnicity	0.550 (-0.994, 2.095)	.445
Medicaid coverage×other race proportion	-0.428 (-2.111, 1.255)	.615

Note. CI = confidence interval.

^aLogit-transformed scale.

^bDetermined based on the number of beds. Classifications were relative to a hospital's region, urban or rural location, and teaching status.¹⁰

^cIn sampling, hospitals were first assigned to strata on the basis of their region, location, and teaching status and then broken down further by hospital ownership. Number of categories used to define ownership depended on the size of these initial strata. Because of these context-specific aggregation levels, this variable is difficult to interpret, but was included in the multivariate analyses as a means of control for stratification. Hospital size was also used in stratification.

^dThis was based on zip codes with median income of \$1 to \$35 999 (lowest quartile), \$36 000 to \$44 999 (second quartile), \$45 000 to \$58 999 (third quartile), and \$59 000 or higher (highest quartile). This was calculated from Nationwide Inpatient Sample data on median household income quartile for each patient's zip code.⁶

rates, rural status, hospital teaching status, and median income in the zip code of the child's residence were not significantly associated with circumcision rates once we controlled for region and other patient characteristics. Neither

hospital size ($F=0.14$; $P=.866$) nor hospital ownership ($F=1.82$; $P=.122$) was significantly associated with male circumcision rates.

Retransforming the parameter estimates in Table 2 to the original scale, we can predict

differences in hospital circumcision rates when varying a single factor. For example, other factors being equal, we estimated that a hospital in the Northeast would have a circumcision rate 10 percentage points lower than would a comparable hospital in the South; a comparable hospital in the West would have a male circumcision rate 15 percentage points lower than would a hospital in the South.

A hospital with 35% of newborn males having only a 1-day length of stay (which is 1 SD above the mean of 19%) would be expected to have a circumcision rate that is 6 percentage points lower than would a comparable hospital with the percentage of newborns having a 1-day length of stay at the mean. Other factors being equal, a hospital whose percentage of newborn males staying 6 days or more is 12% (mean + 1 SD), is predicted to have a circumcision rate 7 percentage points lower than is a hospital with the average proportion of length of stay of 6 days or more (4%).

The estimated impact of Medicaid coverage for routine circumcisions is substantial: given the proportions of patients with Medicaid as primary payer across observed hospitals, the model predicted that hospitals in states that cover routine circumcisions have circumcision rates averaging 24 percentage points higher than comparable hospitals in states in which Medicaid does not cover neonatal male circumcision. This overall effect is complicated by the significant interaction effects of state Medicaid coverage with the percentage of births that are Hispanic.

Figure 1 shows that even in states in which Medicaid pays for neonatal male circumcision, the rates of circumcision fall with increasing shares of births that are paid for by Medicaid. However, the decline in circumcision associated with a higher proportion of patients with Medicaid insurance is much steeper when Medicaid does not cover the procedure.

Further, the greater the share of Hispanic births at a hospital, the smaller the difference in male circumcision rates between states with and without Medicaid coverage of routine circumcision ($P=.031$), as illustrated in Figure 2. These predictions, based on the regression, show that although when the proportion of Hispanic births is low there is a large differential between male circumcision rates in states with and without Medicaid coverage of

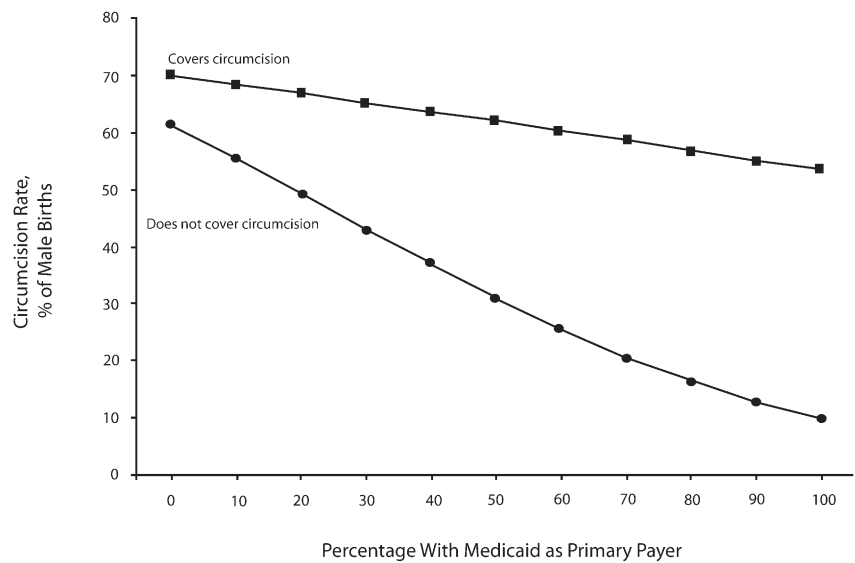


FIGURE 1—Predicted neonatal male circumcision rates as a function of Medicaid coverage of circumcision and the percentage of male newborns in hospital for whom Medicaid is their primary payer: Nationwide Inpatient Sample, 2004.

neonatal male circumcision, this differential narrows when the proportion of Hispanic births is very high.

DISCUSSION

How relevant to the United States are recent findings from randomized clinical trials in Africa that strongly support the positive effects of male circumcision in reducing female-to-male HIV transmission? Major differences in the HIV epidemic in Africa and the United States signal a need to be cautious about applying the clinical trial results in the US context. The African results relate to transmission from female sexual partners to uninfected men. However, in the United States, only 16% of all AIDS cases among men are linked to heterosexual transmission, whereas 18% are linked exclusively to injection drug use and 65% are linked to male-to-male sexual contact.¹⁸ Male circumcision may have only a limited role in protecting men who have sex with men (MSM) from HIV infection because the receptive partner in anal intercourse is at the greater risk of becoming infected, yet the African clinical trials relate to transmission to the male insertive partner of an HIV-infected woman.^{19–21}

Nonetheless, observational data support a protective effect for male circumcision among

both MSM and heterosexual men. Kreiss and Hopkins⁶ found that HIV was twice as prevalent among uncircumcised MSM as among those who were circumcised, but Millett et al.²² found no such effect. In a prospective study of MSM, Buchbinder et al.⁷ found that HIV seroconversion was twice as likely among uncircumcised men as among those who were circumcised.⁷ Among heterosexual men with a known HIV-positive female sexual partner, those who were circumcised had a significantly lower rate of HIV infection.²³

Meta-analyses document other health benefits for circumcised men, including lower rates of urinary tract infections,²⁴ lower rates of penile human papillomavirus,²⁵ lower rates of penile cancer,^{26,27} and lower risk of chancroid and syphilis.⁴ Moses et al. reported that medical complications from the circumcision procedure occur at the rate of 0.2% to 0.6%, and that most are minor. They did not find evidence for long-term adverse psychological or physical effects.²⁶

Observational data suggest health benefits, as well, for women partners of circumcised men in terms of a reduced risk of cervical cancer.^{25,26} However, a randomized clinical trial in Rakai, Uganda, in which the effect of male circumcision on transmission by HIV-positive men to their female partners was examined found no protective effect for women within the

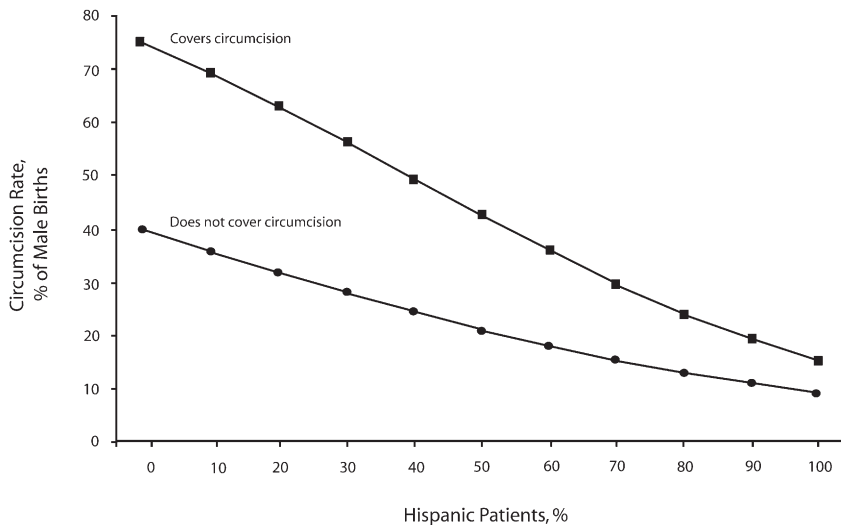


FIGURE 2—Predicted neonatal male circumcision rates as a function of Medicaid coverage of circumcision and percentage of births that are Hispanic: Nationwide Inpatient Sample, 2004.

first 6 months after the surgery and was terminated early.²⁸ A statistically insignificant trend toward increased HIV transmission by newly circumcised HIV-positive men relative to uncircumcised men was attributed to resumption of sexual activity before complete wound healing. However, this adverse consequence of circumcising adult men would not be a relevant issue for infant circumcision. Indeed, observational data from Rakai documented lower HIV transmission rates by HIV-positive men circumcised at a prior date. Reductions in female-to-male transmission that lower the population prevalence rates of HIV will also result in fewer male-to-female transmissions.²⁹

Despite likely positive effects of circumcision on health, male circumcision rates in the United States have been falling since the 1980s.³⁰ If trends continue toward having shorter hospital stays, fewer states offering Medicaid coverage for neonatal male circumcision, and a larger share of the US population being of Hispanic origin, it is reasonable to expect male circumcision rates to continue to fall.

Early hospital discharge (within 24 hours), which our analyses showed correlates with lower neonatal male circumcision rates, is becoming more common.³¹ Ongoing emphasis on reducing inpatient costs will continue to accelerate hospital discharge following delivery, thereby making it difficult to schedule a circumcision.

Demographic changes may also put downward pressure on neonatal male circumcision rates because Hispanics, whom we found to have low circumcision rates, account for an increasing share of all US births. In 2004, 23% of all US births were to Hispanic or Latino mothers, up from 17.4% in 1995.³² Low male circumcision rates among Hispanics appear to depend more on personal preferences and cultural factors than on the cost of the procedure; we found that, in hospitals with large proportions of Hispanic births, male circumcision rates seemed less responsive to Medicaid coverage for circumcision (i.e., male circumcision rates were low among Hispanics regardless of whether the state Medicaid program pays for circumcision).

Further, Medicaid pays for a large and increasing share (now more than 41%) of all births in the United States,³³ and male children whose delivery is paid for by Medicaid are less likely to receive circumcision. This finding appears to reflect the preferences of Medicaid clients and not solely their low income, because the negative relationship between Medicaid and male circumcision persists even when the state Medicaid plan pays for the procedure and ability to pay should not be an issue. Nevertheless, the choices of Medicaid clients can be somewhat affected by the context. As shown in Figure 1, neonatal male circumcision rates were higher in states that cover the cost of the procedure. We

conclude that the lack of reimbursement for neonatal male circumcision may act as an additional deterrent to circumcision among low-income non-Hispanic families. This finding is consistent with the evidence from Great Britain, whose declining rates of male circumcision have been attributed to a lack of coverage by the British National Health Service.³⁴

We found pronounced differences in neonatal male circumcision rates across regions of the United States. High variability in the rates of elective surgery has been documented for other discretionary procedures, especially in cases in which the scientific evidence of benefits is still being debated.³⁵ In these instances, physician attitudes or patient preferences may lead to persistent differences across regions, which have been termed “surgical signatures.”³⁶ The AAP’s neutral stance on neonatal male circumcision may, therefore, contribute to variation in circumcision rates across regions by allowing a greater role for the exercise of patient and physician preferences.

Male circumcision is likely to have its greatest effects among poor and minority populations, among whom the prevalence of HIV and other sexually transmitted infections is highest.^{18,37} Medicaid coverage of childbirth may be a more accurate indicator of poverty status than a zip code income average, a measure that did not significantly predict neonatal male circumcision rates in the regression analysis. It is therefore of concern that low-income families who receive Medicaid coverage for childbirth seem less likely to opt for infant circumcision in states that do not include circumcision among covered Medicaid benefits. This lack of coverage deprives the most disadvantaged children of an array of apparent health benefits, including fewer urinary tract infections and lower rates of human papillomavirus and HIV infection in the future. In this manner, current efforts to reduce Medicaid costs may generate future health disparities and greater medical costs as a consequence.

Limitations

A limitation of this study was its use of cross-sectional data, which allowed us to detect relationships between predictors and neonatal male circumcision rates but did not provide any proof of causality. A further limitation was that circumcision rates were measured by the presence of ICD-9 procedure codes on hospital

discharge records, which a 1985 to 1986 study showed may underreport circumcision.³⁸ We believe that hospital recordkeeping has become more accurate since that time. Further, underreporting of male circumcision would affect our results only in the unlikely event that the underreporting were correlated with the explanatory factors in our model. Some circumcisions are performed outside the hospital, as is the custom among Jewish people and Muslims. Although our hospital-based data did not account for these circumcisions, this omission is unlikely to affect our results, because circumcision is almost universal for Jewish and Muslim boys, who, in any case, account for a minor proportion of all US births. Adult male circumcision is also extremely rare (approximately 50 000 surgeries among nearly 100 million men in 1995, a rate of 0.05%).³⁹

Conclusions

Although religion and culture are strong determinants of the male circumcision decision, we have demonstrated the importance of financing and insurance coverage for some parents. We have shown that the lack of Medicaid coverage for neonatal male circumcision is associated with lower rates of the procedure, with expected long-term differential effects on the health of low-income newborns. Using the regression presented in Table 2, we predicted the effect of the Medicaid policy variable on the circumcision rate under different state policies. If all states whose Medicaid plans did not cover routine, infant male circumcision altered their policy to cover male circumcision, and all other variables remained as they currently are, one would expect the national circumcision rate to increase from the current 55.9% to 62.6%. Alternatively, if all states dropped male circumcision coverage from their Medicaid plans, one would expect only 38.5% of all male infants to be circumcised.

The reevaluation by the AAP of its position on male circumcision is of more than academic interest. The historical record shows that in the wake of the 1999 AAP statement on male circumcision, which adopted a neutral stance, many states opted to remove the procedure from Medicaid coverage. In deciding whether to recommend routine neonatal male circumcision, we believe that the AAP should weigh the impact of their recommendation on the

long-term health of both male and female children and the potentially disparate effects of their decisions on poor children. ■

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Contributors

A. A. Leibowitz originated the study and supervised all aspects of its implementation. K. Desmond created the database and conducted the data analysis. T. Belin advised on the statistical design. All authors originated ideas, interpreted findings, and contributed to the writing of the article.

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