

Vaccination Coverage of American Indian/Alaska Native Children Aged 19 to 35 Months: Findings From the National Immunization Survey, 1998–2000

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The federal government has placed a priority on eliminating racial and ethnic health disparities, such as disparities in vaccination coverage, by 2010.¹ This study was conducted to examine recent vaccine coverage rates for American Indian/Alaska Native (AIAN) children aged 19 to 35 months and to compare these rates with those of non-AIAN children.

METHODS

The National Immunization Survey is a multistage, random-digit-dialed survey that estimates US national vaccination coverage. In households with children aged 19 to 35 months, a parent or guardian is interviewed to collect demographic information, the child's immunization history, and consent to contact the child's immunization provider. Providers are surveyed by mail, and only provider-verified vaccinations are included in the analysis. National Immunization Survey

methods, including the weighting procedure designed to compensate for nontelephone coverage, response propensity, and other characteristics of the respondents and sampling plan, have been described elsewhere.^{2,3}

National AIAN and non-AIAN coverage estimates and confidence intervals were calculated with SUDAAN, Version 7.5.3.⁴ In addition, coverage rates for the 10 states with the highest percentage of AIAN children, as determined by the Census Bureau (Alaska, Arizona, Montana, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Washington, and Wyoming), were examined to maximize the chance of surveying American Indians/Alaska Natives. These states have Indian Health Service and tribal programs that provide integrated primary health care specifically targeted toward American Indians/Alaska Natives.

RESULTS

AIAN children aged 19 to 35 months had a higher prevalence of several risk factors for underimmunization (e.g., larger family size and lower socioeconomic status) than did non-AIAN children (Table 1).⁵

Nationally, American AIAN children aged 19 to 35 months had a slightly lower, although not statistically significant, 4:3:1:3 series (4 or more doses of diphtheria and tetanus toxoids and pertussis vaccine, 3 or more doses of poliovirus vaccine, 1 or more doses of measles-containing vaccine, and 3 or more doses of *Haemophilus influenzae* type b vaccine) vaccination coverage compared with non-AIAN children (Table 2). All other vaccines showed the same pattern, with coverage for all AIAN children slightly lower than coverage for non-AIAN Native children.

In contrast, in the 10 states with the highest population percentages of American Indians/Alaska Natives, 4:3:1:3 series coverage was slightly higher, although not statistically significant, for AIAN children than for non-AIAN children (Table 2). With the exception of varicella and *Haemophilus influenzae* type b, all other vaccine coverage rates in the 10 states showed the same pattern, with coverage for AIAN children slightly higher than coverage for non-AIAN children.

TABLE 1—Characteristics of American Indian/Alaska Native (AIAN) Children Aged 19–35 Months: National Immunization Survey, 1998–2000^a

Characteristic	10 States ^b AIAN (Unweighted n = 674) % (95% CI)	10 States ^b Non-AIAN (Unweighted n = 10 105) % (95% CI)	US AIAN (Unweighted n = 996) % (95% CI)	US Non-AIAN (Unweighted n = 66 310) % (95% CI)
Gender				
Male	46.6 (41.3, 51.9)	51.3 (50.0, 52.6)	50.5 (45.4, 55.6)	51.0 (50.4, 51.6)
Female	53.4 (48.1, 58.7)	48.7 (47.4, 50.0)	49.5 (44.4, 54.6)	49.0 (48.4, 49.6)
First born				
Yes	35.6 (30.5, 40.6)	40.4 (39.1, 41.6)	41.8 (36.6, 47.1)	40.8 (40.2, 41.4)
No	64.4 (59.4, 69.5)	59.7 (58.4, 60.9)	58.2 (52.9, 63.4)	59.2 (58.6, 59.8)
Mother's age, y				
≤ 19	5.8 (3.5, 8.1)	3.6 (3.0, 4.1)	5.9 (3.6, 8.1)	3.6 (3.4, 3.9)
20–29 ^{c,d}	62.3 (57.3, 67.3)	50.3 (49.0, 51.6)	58.0 (52.8, 63.3)	46.5 (45.9, 47.1)
≥ 30 ^{c,d}	32.0 (27.2, 36.6)	46.1 (44.8, 47.4)	36.1 (30.9, 41.3)	49.9 (49.3, 50.5)
Telephone interrupted in past year				
Yes	11.0 (8.1, 14.0)	8.7 (7.9, 9.6)	9.6 (7.1, 12.2)	7.5 (7.2, 7.8)
No	89.0 (86.0, 91.9)	91.3 (90.4, 92.1)	90.4 (87.8, 92.9)	92.5 (92.2, 92.9)
Income, \$				
0–30 000 ^{c,d}	71.0 (65.8, 76.2)	48.5 (47.2, 49.9)	65.1 (59.9, 70.4)	47.2 (46.6, 47.9)
30 001–50 000 ^c	19.3 (14.7, 23.9)	25.3 (24.1, 26.4)	21.1 (16.5, 25.6)	21.9 (21.4, 22.4)
50 001–75 000 ^{c,d}	7.4 (4.3, 10.6)	15.8 (14.8, 16.8)	9.3 (6.1, 12.5)	16.5 (16.0, 16.9)
≥ 75 001 ^{c,d}	2.3 (1.1, 3.5)	10.4 (9.7, 11.1)	4.5 (2.4, 6.7)	14.4 (14.0, 14.9)
Education of mother				
< 12 y ^c	24.5 (19.5, 29.5)	17.8 (16.7, 18.9)	20.2 (15.5, 25.0)	17.1 (16.6, 17.6)
12 y ^{c,d}	46.8 (41.4, 52.2)	37.8 (36.5, 39.2)	44.1 (38.9, 49.2)	36.8 (36.2, 37.4)
Some college	17.1 (13.8, 20.3)	19.6 (18.6, 20.5)	18.0 (14.6, 21.5)	17.8 (17.4, 18.3)
College graduate ^{c,d}	11.6 (8.8, 14.5)	24.8 (23.8, 25.8)	17.7 (13.7, 21.6)	28.2 (27.7, 28.7)
Moved to different state				
Yes ^c	6.7 (4.2, 9.2)	13.9 (12.9, 14.9)	7.5 (5.0, 10.0)	9.7 (9.3, 10.0)
No ^c	93.3 (90.8, 95.8)	86.1 (85.1, 87.1)	92.5 (90.0, 95.0)	90.4 (90.0, 90.7)
No. of people in household				
2	3.2 (1.4, 4.9)	3.1 (2.6, 3.6)	4.4 (1.4, 7.3)	3.1 (2.9, 3.3)
3 ^c	19.0 (14.8, 23.3)	24.1 (23.0, 25.2)	23.2 (18.6, 27.8)	23.5 (23.0, 24.0)
4	31.4 (26.5, 36.4)	35.2 (34.0, 36.5)	32.5 (27.7, 37.3)	36.6 (36.0, 37.2)
5 ^c	17.1 (13.5, 20.8)	21.2 (20.2, 22.3)	17.4 (13.3, 21.5)	20.7 (20.2, 21.2)
≥ 6 ^{c,d}	29.2 (24.1, 34.4)	16.3 (15.3, 17.3)	22.6 (18.7, 26.4)	16.1 (15.6, 16.5)
Mother's marital status				
Widowed/separated/divorced	11.0 (7.8, 14.2)	10.3 (9.5, 11.2)	11.5 (7.8, 15.3)	8.8 (8.5, 9.2)
Never married ^{c,d}	35.2 (30.4, 40.1)	16.6 (15.6, 17.6)	32.9 (28.1, 37.7)	19.7 (19.2, 20.2)
Married ^{c,d}	53.8 (48.4, 59.2)	73.1 (71.8, 74.3)	55.5 (50.3, 60.7)	71.5 (70.9, 72.1)
Child ever received Special Supplemental Nutrition Program for Women, Infants, and Children services				
Yes ^{c,d}	82.6 (78.5, 86.8)	55.5 (54.1, 56.8)	76.3 (71.9, 80.9)	53.7 (53.0, 54.3)
No ^{c,d}	17.4 (13.2, 21.5)	44.5 (43.2, 45.9)	23.7 (19.1, 28.2)	46.4 (45.7, 47.0)

*Continued***DISCUSSION**

Despite increased risk factors for underimmunization, immunization coverage for American Indians/Alaska Natives is comparable to that for other races/ethnicities. One potential reason for high AIAN coverage rates in the ten states with the highest American Indian/Alaska Native population percentage is the provision of comprehensive health services through the US Department of Health and Human Services's Indian Health Service and, increasingly, tribal health programs established under Public Law 93 638 (Indian Self Determination and Education Assistance Act).⁶

In 1998 and 1999, 60% of all US American Indians/Alaska Natives lived in an Indian Health Service area, which, in many areas, is the only source of health care.⁶ The Indian Health Service and tribal organizations provide integrated, primary care that includes several different services. For example, public health nurses make home visits; track underimmunized children; and hold field clinics at tribal community centers, clinics, schools, or other locations on reservations. In addition, many Indian Health Service and tribally operated clinics collaborate with other programs such as Special Supplemental Nutrition Program for Women, Infants, and Children; Community Health Representative Program; and, in Alaska, the Community Health Aide Program. The Special Supplemental Nutrition Program for Women, Infants, and Children provides food, nutrition counseling, and access to health services to low-income women, infants, and children.⁷ Community Health Representative Programs provide community outreach and education, and the Community Health Aide Programs provide primary and emergency care in remote Alaska villages.⁸

Another program that may be responsible for high AIAN coverage is the Vaccines for Children Program, which provides free vaccines to providers who care for children in 4 risk groups, one of which is AIAN children.⁹

Several caveats apply to our results. First, our data are from the National Immunization Survey, a random-digit-dialed survey. Although adjustments are made for nonresponse and nontelephone households by race/ethnicity (White, Black, Hispanic, other) on a national level, it was not possible to

TABLE 1—Continued

Age of child, mo				
19–24	39.8 (34.6, 45.0)	35.4 (34.1, 36.6)	40.5 (35.4, 45.7)	35.9 (35.3, 36.4)
25–29	27.1 (22.3, 31.9)	29.0 (27.8, 30.2)	28.0 (23.5, 32.5)	29.3 (28.7, 29.8)
30–35	33.1 (27.9, 38.2)	35.6 (34.4, 36.9)	31.4 (26.5, 36.3)	34.9 (34.3, 35.5)
Shot card availability				
Yes ^{c,d}	41.0 (35.8, 46.2)	54.6 (53.3, 56.0)	44.1 (38.8, 49.3)	49.6 (49.0, 50.2)
No ^{c,d}	59.0 (53.8, 64.2)	45.4 (44.0, 46.7)	55.9 (50.7, 61.1)	50.4 (49.8, 51.0)
No. of providers				
1 ^d	64.8 (59.7, 70.0)	61.3 (60.0, 62.5)	60.9 (55.6, 66.2)	67.8 (67.2, 68.3)
≥ 2 ^d	35.2 (30.0, 40.3)	38.7 (37.5, 40.0)	39.1 (33.8, 44.4)	32.2 (31.7, 32.8)
Type of provider				
All public ^{c,d}	46.3 (41.0, 51.7)	17.6 (16.6, 18.6)	36.2 (31.2, 41.2)	16.0 (15.5, 16.4)
All private ^{c,d}	19.1 (14.7, 23.4)	49.7 (48.4, 51.0)	31.5 (26.7, 36.3)	54.7 (54.1, 55.3)
Other/mixed/unknown	34.6 (29.4, 39.8)	32.7 (31.5, 34.0)	32.3 (27.4, 37.2)	29.4 (28.8, 29.9)

Note. CI = confidence interval.

^aChildren in survey period born between February 1995 and May 1999.

^bAlaska, Arizona, Montana, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Washington, and Wyoming.

^cSignificant difference between 10 states AIAN and 10 states non-AIAN.

^dSignificant difference between US AIAN and US non-AIAN.

TABLE 2—Vaccine Coverage Levels Among American Indian/Alaska Native (AIAN) Children Aged 19–35 Months, by Selected Vaccines: National Immunization Survey, 1998–2000^a

	10 States ^b AI/AN % (95% CI)	10 States ^b Non-AI/AN % (95% CI)	US AI/AN % (95% CI)	US Non-AI/AN % (95% CI)
DTP/DT/DtaP				
≥ 3 doses	94.2 (90.7, 97.8)	93.7 (93.0, 94.4)	92.7 (88.7, 96.6)	95.2 (94.9, 95.5)
≥ 4 doses	84.4 (80.0, 88.7)	80.2 (79.1, 81.3)	79.1 (74.2, 83.9)	83.0 (82.6, 83.5)
Poliovirus				
≥ 3 doses	90.2 (86.3, 94.1)	88.8 (87.9, 89.6)	87.7 (83.4, 92.0)	90.0 (89.6, 90.4)
<i>Haemophilus influenzae</i> type b				
≥ 3 doses	91.5 (87.6, 95.4)	91.7 (90.9, 92.4)	90.5 (86.4, 94.6)	93.5 (93.2, 93.8)
MCV				
≥ 1 dose	90.4 (86.4, 94.4)	89.2 (88.3, 90.0)	90.0 (86.7, 93.3)	91.5 (91.1, 91.8)
Hepatitis B				
≥ 3 doses	87.0 (82.8, 91.2)	86.0 (85.0, 86.9)	86.0 (81.4, 90.5)	88.5 (88.1, 88.9)
Varicella ^c				
≥ 1 dose	46.6 (41.2, 51.9)	49.7 (48.4, 51.0)	48.5 (43.3, 53.7)	58.2 (57.6, 58.8)
Combined series				
4:3:1:3 ^d	78.2 (73.4, 83.0)	75.1 (73.9, 76.3)	74.0 (69.0, 79.0)	78.0 (77.5, 78.5)

Note. CI = confidence interval; DTP = diphtheria and tetanus toxoids and pertussis vaccine; DT = diphtheria and tetanus toxoids; DtaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; MCV = measles-containing vaccine.

^aChildren in survey period born between February 1995 and May 1999.

^bAlaska, Arizona, Montana, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Washington, and Wyoming.

^cSignificant difference between US AIAN and US non-AIAN.

^dFour or more doses of diphtheria and tetanus toxoids and pertussis vaccine, 3 or more doses of poliovirus vaccine, 1 or more doses of measles-containing vaccine, and 3 or more doses of *Haemophilus influenzae* type b vaccine.

make this adjustment to the relatively small AIAN population. Given that many American Indians/Alaska Natives live in a nontelephone household, a positive bias likely exists. Second, because National Immunization Survey nontelephone adjustments are not state specific, it is unknown whether adjustments would have had more or less effect on coverage estimates in the selected 10 states. Third, the study combined multiple years of National Immunization Survey data, which implicitly assumes no strong secular trend. Despite these limitations, our coverage estimates were remarkably similar to estimates from several smaller Indian Health Service surveys of AIAN populations (R. Singleton, MD, Alaska Native Tribal Health Consortium, unpublished data, October 12, 2001; R. Singleton, MD, oral communication).

A precept of public health is the equitable distribution of preventive services benefits to all regardless of poverty, race/ethnicity, limited access, and so forth. The high immunization coverage estimates in a minority population with higher prevalence of several “traditional” risk factors for underimmunization suggest that sufficiently targeted, community-based, culturally appropriate programs can affect racial/ethnic and other health disparities. ■

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Contributors

T. W. Strine developed the research idea, analyzed the data, and wrote the brief. A. H. Mokdad suggested revisions to the analysis and provided editorial assistance. L. E. Barker provided statistical guidance and editorial assistance. A. V. Groom produced the Indian Health Service analysis and co-wrote the Discussion section. R. Singleton produced the Alaska analysis and commented on the Discussion section. C. S. Wilkins co-wrote the

Discussion section and communicated with Indian Health Service partners. S.Y. Chu provided editorial assistance and assisted in developing collaborative relationships with Indian Health Service partners.

Human Participant Protection

No protocol approval was needed for this study.

References

1. *Healthy People 2010: Understanding and Improving Health*. Washington, DC: US Dept of Health and Human Services; 2001.
2. Smith PJ, Battaglia MP, Huggins VJ, et al. Overview of the sampling design and statistical methods used in the National Immunization Survey. *Am J Prev Med*. 2001;20(suppl 4):17–24.
3. Zell ER, Ezzati-Rice TM, Battaglia MP, Wright RA. National Immunization Survey: the methodology of a vaccination surveillance system. *Public Health Rep*. 2000;115:65–77.
4. Shah BV, Barnwell BG, Bieler GS. *SUDAAN User's Manual*, Release 7.5. Vol 1. Research Triangle Park, NC: Research Triangle Institute; 1997.
5. Marks JS, Halpin TJ, Irvin JJ, Johnson DA, Keller JR. Risk factors associated with failure to receive vaccinations. *Pediatrics*. 1979;64:304–309.
6. *Trends in Indian Health 1998-1999*. Washington, DC: US Dept of Health and Human Services, Indian Health Service, Office of Public Health, Program Statistics Team; 2001.
7. Shefer AM, Luman ET, Lyons BH, et al. Vaccination status of children in the Women, Infants, and Children (WIC) Program: are we doing enough to improve coverage? *Am J Prev Med*. 2001;20(suppl 4):47–54.
8. Indian Health Service. Comprehensive health care program for American Indians and Alaska Natives: paraprofessional training opportunities. Available at: <http://www.ihs.gov/nonmedicalprograms/profiles/profiletraining.asp>. Accessed October 28, 2002.
9. Wood DL, Halfon N. The impact of the Vaccine for Children's Program on child immunization delivery: a policy analysis. *Arch Pediatr Adolesc Med*. 1996;150:577–581.