Trends in Vaccination Coverage Disparities among Children, United States, 2001-2010

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Background:

- One of two overarching goals of *Healthy People 2010* was to eliminate health disparities.

Objectives:

- To evaluate trends in vaccination coverage disparities by socio-demographic characteristics among children in the United States from 2001 through 2010.

Methods:

- Disparities in the 4:3:1:3:3:1 (at least 4 doses of diphtheria-tetanus-pertussis, 3 poliovirus, 1 measles-mumps-rubella, 3 hepatitis B, 3 *Haemophilus influenzae* type B, and 1 varicella) vaccination coverage were assessed with 2001-2010 National Immunization Surveys (NIS).

- During 2001–2010 the NIS overall household response rates based on Council of American Survey and Research Organizations (CASRO) guidelines ranged from 63.2% to 80.2%.

- The disparities and the significance status among population segments in 2001 were compared to those in 2010. Disparity was defined as difference between two vaccination coverage for the two socio-demographic groups.

- The slopes of weighted linear regression in disparities across 2001-2010 were used to evaluate the average disparities per year and examine whether each of the 12 disparities narrowed or widened over 2001-2010.

- The 12 socio-demographic groups compared are:
  - Child characteristics
    - Race/ethnicity
      - non-Hispanic white only vs. non-Hispanic black only
      - Hispanic vs. non-Hispanic white only
    - Number of siblings
      - 0 vs. $\geq$ 1 siblings
    - First born status
      - yes vs. no
    - Number of providers
      - Child with 1 vs. $\geq$ 2 vaccination providers.

- Family characteristics
  - Poverty status
    - above vs. below
  - Locality
    - suburban vs. urban
    - suburban vs. rural.
- Maternal characteristics
  - Mother's education
    - >12 vs. ≤12 years
  - Marital status
    - yes vs. no,
  - Mother's age
    - ≥30 vs. ≤ 29.
- Provider characteristics
  - All private vs. all public vaccination providers.

Results:

- In 2001, 10 disparities were significant ($p<0.05$), as shown in the columns 3-4 of Table 1.

- In 2010, 10 disparities were lower than the corresponding disparities in 2001, as shown by the negative numbers in the last column of Table 1.

- In 2010, six disparities were reduced from level of significance to not significance (child race/ethnicity non-Hispanic white only vs. non-Hispanic-black only; family poverty status above vs. below, suburban vs. rural locality; mother's education > 12 vs. <=12 years, marital status yes vs. no, and mother's age >=30 vs. <=29 years), as shown in the column 6 of Table 1.

- In 2010, Hispanic children had significantly higher coverage than non-Hispanic white only children; children who were first born, no siblings, and with all private vaccination provider remained to have significantly higher coverage among the respective segments.

Table 1. Disparities in 4:3:1:3:3:1* vaccination coverage (%) for 2001 and 2010 among children age 19-35 months by socio-demographic groups.

Characteristics	Socio-demographic groups compared	2001	Disparities significant for 2001	2010	Disparities significant for 2010	Difference of disparities 2010-2001
Child Characteristics	White vs. Black	5.3	Yes	-0.8	No	-6.1
	Hispanic vs. White	3.0	Yes	3.5	Yes	0.5
	Siblings 0 vs. >=1	6.7	Yes	3.1	Yes	-3.6
	First Born Status Yes vs. No	8.2	Yes	3.1	Yes	-5.1
	Child with 1 vs. >=2 Vaccination Providers	0.1	No	2.3	No	2.2
Family Characteristics	Poverty Above vs. Below	6.1	Yes	2.0	No	-4.1
	Suburban vs. Urban	1.2	No	0.1	No	-1.1
	Suburban vs. Rural	5.5	Yes	0.5	No	-5.0
Maternal Characteristics	Mother's Education >12 years vs. <=12 years	5.7	Yes	2.0	No	-3.7
	Mother marital status Yes vs. No	5.9	Yes	-1.0	No	-6.9
	Mother's Age >=30 vs. <=29	5.2	Yes	2.1	No	-3.1
Vaccination Provider Characteristics	All Private vs. All Public Vaccination Provider	7.3	Yes	6.4	Yes	-0.9

* at least 4 doses of diphtheria-tetanus-pertussis, 3 poliovirus, 1 measles-mumps-rubella, 3 hepatitis B, 3 *Haemophilus Influenzae* type B, and 1 varicella.

- Across 2001-2010, 8 disparities narrowed significantly in the range of 0.30% to 0.56% ($P<0.05$) per year as shown in Table 2 (child's race/ethnicity non-Hispanic white only vs. non-Hispanic black only, siblings 0 vs. >= 1, first born status yes vs. no; family poverty level above vs. below, locality suburban vs. urban, suburban vs. rural; mother's education > 12 vs. <= 12 years, and marital status yeas vs. no).

- The disparity between Hispanic vs. non-Hispanic white only children widened at 0.35% per year, but not statistically significant.

- The remaining 3 disparities narrowed but not statistically significant.

Table 2. Average disparities per year across 2001-2010 in 4:3:1:3:3:1[*] vaccination coverage between socio-demographic groups among US children.

Characteristics	Socio-demographic groups compared	Average disparities (%) per year	Average disparities significant	Disparities narrowed (-) or widened (+)
Child Characteristics	White vs. Black	-0.56	Yes	Narrowed
	Hispanic vs. White	+0.35	No	Widened
	Siblings 0 vs. >= 1	-0.34	Yes	Narrowed
	First Born Status Yes vs. No	-0.64	Yes	Narrowed
	Child with 1 vs. >=2 Vaccination Providers	-0.14	No	Narrowed
Family Characteristics	Poverty Above vs. Below	-0.30	Yes	Narrowed
	Suburban vs. Urban	-0.37	Yes	Narrowed
	Suburban vs. Rural	-0.52	Yes	Narrowed
Maternal Characteristics	Mother's Education > 12 vs. <=12	-0.34	Yes	Narrowed
	Mother Marital Status Yes vs. No	-0.55	Yes	Narrowed
	Mother's age >=30 vs. <=29	-0.15	No	Narrowed
Vaccination Provider Characteristics	All Private vs. All Public Vaccination Providers	-0.31	No	Narrowed

[*] at least 4 doses of diphtheria-tetanus-pertussis vaccine, 3 doses of poliovirus vaccine, 1 dose of measles-mumps-rubella vaccine, 3 doses of hepatitis B vaccine, 3 doses of *Haemophilus Influenzae* type B vaccine, and 1 dose of varicella vaccine.

Limitations:

- The NIS is a random-digit-dial residential landline telephone survey and may be affected by representativeness due to the non-response and wireless telephone use. However recent studies suggested that the total survey error in the NIS may be small.

Conclusions:

- Significant success has been achieved in reducing disparities in vaccination coverage for children in most of the major socio-demographic subpopulations in the United States by 2010. This might be attributed to The Vaccine for Children (VFC) grogram which was created to reduce cost as a barrier to vaccinate vulnerable children.