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Early Childhood Immunization Coverage and Completion—Alaska, 2012–2021

Background

To prevent serious childhood diseases, U.S. immunization guidelines recommend that children receive a combined seven-vaccine series (7-series) by 24 months of age.^{1,2} Children under 5 years of age and others who are not fully vaccinated remain at heightened risk of serious illness and death from these diseases.³ Full vaccination protects individual children and reduces the risk of disease outbreaks in communities. Identifying gaps in vaccine timeliness and completion supports effective patient outreach and care planning. This *Bulletin* describes the estimated cumulative incidence of 7-series completion among Alaska children, as well as frequently missed doses, and maternal factors associated with series completion and missed doses.

Methods

We conducted a retrospective study of children born to Alaska Pregnancy Risk Assessment Monitoring System (PRAMS) respondents during 2012–2021 who linked to a VacTrAK record. Alaska PRAMS is a survey of mothers in the months following a live birth. When linked with VacTrAK, Alaska’s immunization information system, these combined data enable the assessment of maternal factors associated with childhood vaccination coverage. Children in the linked dataset were followed from birth through December 31, 2023, to assess completion of the 7-series, defined as receipt of the following vaccines (doses): diphtheria, tetanus, and acellular pertussis (DTaP) (4), polio (3), measles, mumps, and rubella (MMR) (1), Hib (3), hepatitis B (3), varicella (1), and pneumococcal conjugate vaccine (PCV) (4). We used Kaplan-Meier analysis to estimate cumulative incidence of 7-series completion by age in years and logistic regression to calculate the adjusted odds of children missing only one dose from the 7-series. We focused on children missing only one dose, reasoning that their parents may be more receptive to outreach motivating timely vaccination than those of children missing many doses.

Results

During 2012–2021, there were 10,346 children (weighted N = 98,689) of Alaska PRAMS respondents who were followed for 7-series completion. An estimated 60.6% of children completed the 7-series by age 2 years, and 73.1% completed it by the end of the follow-up period (median age: 1.6 years; maximum age: 11.7 years). Among children who did not complete the series by age 2 years (n = 3,349), 25.1% (n = 907) failed to complete the series in the study period by missing only one dose; PCV dose 4 was the most frequently missed vaccination (Table 1).

Table 1. Five Most Frequently Missed 7-Series Doses

7-series Dose	Sample Count	*Estimated Population	Proportion (95%CI)
4 th PCV	815	7,261	88.6 (85.7–90.9)
1 st Varicella	29	283	3.5 (2.3–5.2)
3 rd HiB	28	324	3.9 (2.6–6)
4 th DTaP	21	174	2.1 (1.3–3.5)
3 rd HepB	9	89	1.1 (0.5–2.3)
Total	902	8,131	N/A

*Weighted estimated count of Alaska children born 2012–2021 missing doses; 5 children missed other doses (not shown).

Several maternal factors were associated with the odds of children missing one dose compared to completing the 7-series (Table 2). Previous live births were associated with the highest odds of incomplete 7-series vaccination, followed by being below 200% the federal poverty level, intermediate or less prenatal quality care, education, and maternal vaccination for influenza in the 12-month period prior to delivery.

Table 2. Factors Significantly Associated with Increased Odds of Missing One Dose from the 7-Series

Maternal Factor	Missed 1 Dose vs. Complete aOR (95%CI) [†]
Education attainment	Ref. (>High School)
≤ High School	1.40 (1.11–1.76)
Poverty threshold	Ref. (>200% FPL)
≤ 200% FPL	1.59 (1.19–2.14)
Previous live births	Ref. (None)
1	1.58 (1.22–2.04)
2 or 3	2.19 (1.70–2.81)
4 or more	2.25 (1.61–3.13)
Flu shot receipt	Ref. (Yes)
No	1.27 (1.05–1.54)
Prenatal Care Utilization	Ref. (Adequate or better)
Intermediate or less	1.45 (1.20–1.76)

[†]CI = Confidence interval; FPL = federal poverty level; Ref. = reference category.

Discussion

This analysis underscores ongoing gaps in timely childhood vaccination in Alaska. Although 73.1% of children eventually completed the recommended 7-vaccine series, only 60.6% did so by their 2nd birthday, compared to 69% nationally.¹ The fourth dose of pneumococcal conjugate vaccine was the most frequently missed, which may be partly due to its exclusion from Alaska’s school entry requirements. It may also reflect broader challenges for routine vaccination after infancy, when well-child visits become less frequent.⁴

Linking maternal survey data with immunization records revealed socioeconomic and behavioral factors that are associated with incomplete vaccination. Children of mothers with lower education, lower income, multiple prior births, missed maternal flu vaccination, or lower-quality prenatal care were more likely to miss at least one dose. There may be other relevant factors among children who have missed more than one dose. These findings highlight opportunities to improve vaccination coverage by promoting earlier engagement during pregnancy and postpartum, especially for underserved families, to ensure children receive optimal protection against vaccine-preventable diseases.

Recommendations

- 1. Providers should proactively follow up with children missing doses in the seven-vaccine series, giving particular attention to families who may face barriers to completion.
- 2. Providers should engage in discussion with parents about the risks and benefits of timely vaccination in the context of their children’s unique healthcare needs.
- 3. Families should be encouraged to utilize the Docket App, (available at vaccinationrecords.alaska.gov) to view their children’s vaccination records and receive personalized reminders for upcoming or overdue vaccinations.

References

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