Population-Based Study of the Adequacy of Well-Child Care Services

A Rural County’s Report Card

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Objective: To determine the adequacy of well-child care services using a population-based study.

Design: The medical records of all county providers and the immunization records at the local health department were reviewed. A county birth cohort, identified using electronic birth certificates, was compared with those who migrated into the area (hereafter, in-migrants).

Setting: All primary care sites (private, network, etc) in a rural county.


Main Outcome Measures: Immunization rates and preventive screenings.

Results: A total of 674 medical records were reviewed. Of these, 377 (56%) belonged to a county birth cohort and 297 (44%) were in-migrants. Medical records of 64% of the birth cohort were reviewed. Among all 2-year-olds, 80% received 4 doses of diphtheria and tetanus toxoids and pertussis vaccine; 89%, 3 doses of Haemophilus influenzae type b (Hib); 75%, 4 doses of Hib; 77%, 3 doses of hepatitis B vaccine; 89%, measles-mumps-rubella vaccine; 85%, 3 doses of oral poliovirus vaccine; 17%, varicella live virus vaccine (Varivax). The 4:3:1 rate was 75% at age 2 years. Sixty-eight percent had had 1 hematocrit, 74% had 1 lead screening test, and 43% had 2 lead screening tests. A total of 64% had had 6 well-child visits and 30% had had 9. The mean number of weights and heights measured was 4.8 and 4.5, respectively, at age 1 year and 7.3 and 6.8, respectively, at age 2 years. The birth cohort had notably higher rates of documented immunization and preventive screening than in-migrants.

Conclusions: This study demonstrated immunization coverage at or below the national average, and well-child care service provisions below American Academy of Pediatrics standards at a county level. This study enabled individual primary care sites to assess their well-child care provision and provided a useful baseline for targeting the improvement of well-child care services in the county.

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Many rural areas face notable access-to-care problems due to dwindling numbers of primary care practitioners, limited office hours, closure of small hospitals, long distances to travel for health care, and financial constraints due to the recession. These factors contribute to fragmented and inadequate primary care. Immunizations are commonly used as a convenient health care indicator to measure the adequacy of health care delivery. Numerous studies have demonstrated a link between underimmunization and insufficient health care utilization. The growth of managed care in our rural county as well as a perceived increase in the delivery of childhood immunization by the county health department prompted the following questions: What are the county immunization rates? Are the well-child services provided in this county adequate? What safety-net services are needed? Our public-private partnership, between the county health department and a not-for-profit rural health network, needed to address these questions to plan future child health interventions on a county level. (The structure of this partnership is described elsewhere.)

Editor’s Note: The report card for rural health services is really not that different from that of urban health services—a solid C. However, the authors get an A for providing needed data on rural populations.

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SUBJECTS AND METHODS

SETTING AND SUBJECTS

The setting was a rural central New York county (Otsego County) with a population of 59,478 in 1993 and an average population density of 59 persons per square mile. The largest city in the county is Oneonta, with a population of 13,954 (1990 census). The terrain is dominated by narrow winding valleys surrounded by rugged hills and mountains that place many residents 24 km or more from the nearest town. Distance is a barrier to accessing both social services and medical care. Two birthing hospitals in the county provide obstetric care to women from the surrounding 10 counties. The nearest out-of-county birthing centers are 96 km away from county birthing centers. The county birth rate is approximately 11 births per 1000 population with 645 births in 1995. The county has an infant mortality rate of 8 per 1000; 5% of infants are low birth weight; and the child poverty rate, based on the 1990 census, is 19%. Thirteen clinical sites provide well-child care within the county: 7 private practitioners and 6 members of a not-for-profit rural health network. The county health department does not provide well-child care but does conduct immunization clinics.

DESIGN

This is a study of county provider medical records using electronic birth certificates to identify those children born in the county. Chart reviews were conducted between June and October 1996. Electronic birth certificates were used to identify a birth cohort born in Otsego County between May 31, 1993, and May 30, 1994. Although the birth cohort predates the initiation of the Vaccines for Children Program in New York State, the youngest members of this cohort may have been affected by Vaccines for Children Program start-up in the county (started in October 1994) or by the first dollar vaccination coverage law (begun in 1994). This cohort may also have been affected by New York’s Child Health Plus program (started in 1991).

All providers in the county who render well-child care agreed to chart review of all 24- to 35-month-olds in their practice. The local health department’s immunization clinic records also were reviewed. Electronic birth certificates were used to create a master list to which children who migrated to the area (hereafter, in-migrants) were added as they were identified during the record review process. Unique study numbers were assigned to each birth cohort member and in-migrant so that when medical record scattering occurred (ie, a child was encountered using more than 1 source of care), data for that child were only entered once and duplicate entry was avoided. The study database was updated to reflect receipt of immunizations and preventive care at sites other than the current primary care provider.

The medical record reviewers were Otsego County Health, Cooperstown, NY, and New York State Department of Health, Albany, immunization staff. All participating clinics received copies of the Centers for Disease Control and Prevention Clinic Assessment Software Application (CDC-CASA) immunization data entry and analysis program and a printed summary of their immunization rates on study completion. The immunization data were reviewed with clinic providers and the database was edited prior to analysis when misclassifications of immunization status were identified.

STATISTICAL ANALYSIS

The CDC-CASA program was used to analyze immunization data. EPI-INFO (version 5, 1990) (CDC) was used for analysis of well-child care service data. County immunization rates were compared with 1994-1995 national averages (National Immunization Survey July 1994 to June 1995). Rates were calculated using the CDC-CASA program and compared using the χ² test. The 4:3:1 combined series completion rate was defined as receipt of 4 doses of diphtheria and tetanus toxoids and pertussis or diphtheria toxoids vaccine (DTP/DT), 3 doses of oral poliovirus or inactivated poliovirus vaccine (OPV/IPV), and 1 dose of measles-mumps-rubella vaccine (MMR) prior to the second birthday (age equal to 730 days was used as the cutoff). The 4:3:1:3 rate was defined as receipt of 4 DTP/DT, 3 OPV/IPV, 1 MMR, and 3 Haemophilus influenzae type b (Hib) doses prior to the second birthday.

Well-child care service provision was compared with the American Academy of Pediatrics (AAP) standards as well as those of the New York State Department of Health (NYS DOH) for well-child care. The specific criteria for the adequacy of well-child care services are 9 well-child care visits by age 2 years for the AAP or a minimum of 6 well-child care visits by age 2 years for the NYS DOH; growth monitoring at each well-child visit; and preventive screenings that include tests for hematoctrit, lead, and tuberculosis (TB) (in high-risk areas) by 1 year of age. Because Otsego is a high-risk lead area, screening for lead is recommended at age 1 and 2 years by the AAP and NYS DOH, respectively. However, Otsego County is a low-risk area for TB; therefore, TB screening is recommended for high-risk groups only.

This study was approved by the Institutional Review Board of the Bassett Healthcare Research Institute, Cooperstown, NY.

Immunization delivery to preschoolers by private practitioners has historically been relatively difficult to assess, especially in rural areas. Taylor et al found that children served by a pediatrician in a rural area (defined as a population of <50,000) have lower immunization rates (70%) vs those in suburban (95%) or urban (83%) areas. Thus, provision of well-child care in rural areas presents unique challenges.

The objectives of this study were to determine immunization rates as well as the adequacy of well-child services provided in our rural county. In effect, a report card for preventive services was needed to address what gaps in well-child care were occurring in the county and to plan safety-net measures.

RESULTS

A birth cohort of 597 children was identified using county of residence on the electronic birth records. Of these, only 383 (64%) had medical records in the county available for review. Including identified birth cohort and in-migrants, 674 charts of 24- to 35-month-old children were...
reviewed among the 13 providers in the county. Of these, 532 (79%) had structured health maintenance forms for well-child care visits. Most children were privately insured (276 [41%] managed care organizations; 142 [21%] other payers), 135 (20%) were under Medicaid coverage, and 20 (3%) had no insurance (Table). Only 2% of the children studied received 1 or more immunizations in the local health department immunization clinics while receiving well-child care from private providers. Although the AAP recommends 9 well-child care visits by age 2 years, only 202 (30%) of children studied had received this many visits. A total of 438 (65%) of the 2-year-olds had received the NYS DOH minimum number of 6 well-child care visits. The mean number of total visits (well child as well as acute) was 20 by age 2.

Because growth monitoring should occur at each well-child visit, the mean number of weight, length, and head circumference measurements should be a minimum of 6 (NYS DOH standard) and a recommended frequency of 9 by age 2 (AAP standard). In this study, the mean number of weight, length, and head circumference measurements documented by age 2 were 7.3, 6.8, and 5.7, respectively.

Chart review demonstrated that 80% of Otsego County 2-year-olds had received the recommended number of DTP immunizations, compared with the 1994-1995 National Immunization Survey average of 78% (Figure 1). Seventy-five percent received 4 doses of Hib vaccine and 89% received 3 doses of Hib vaccine compared with the national average of 91% of children receiving 3 or more doses of Hib vaccine \( P = .08 \) [not significant]). The county immunization rate for hepatitis B vaccine was 77%, which exceeds the national average of 51% and the Childhood Immunization Initiative goal of 70%. For both measles-mumps-rubella and 3 polio immunizations, the county immunization rate was 85%, slightly below the national average (89% and 86%, respectively). For all vaccines, children born in the county had higher immunization rates than in-migrants (eg, 84% vs 74% for 4 doses of DTP vaccine, respectively, \( P = .002 \)) (Figure 2).

The immunization rate for varicella was 17%, which demonstrates a relatively high acceptance rate for a new vaccine. Two sites in the not-for-profit network were responsible for 87% of the varicella live virus vaccine (Varivax, Oka/Merck, West Point, Pa) administered; thus, they appear to be early adopters. A national average for Varivax is not available because this vaccine was new at the time and was not included in the National Immunization Survey.

The timeliness of immunization receipt was also addressed. Most 2-year-olds had received 4 doses of DTP vaccine, 3 doses of OPV vaccine, 1 dose of MMR vaccine, and 3 doses of Hib vaccine before their second birthday. The combined series 4.3:1 and 4.3:1:3 immunization rates for 2-year-olds were both 73%, the same as the national average. The individual vaccine coverage rates administered before the second birthday were 76% for 4 doses of DTP vaccine, 83% for 3 doses of polio vaccine, 83% for 1 dose of MMR vaccine, and 89% for 3 doses of Hib vaccine.

Recommended preventive screenings include those for hematocrit, lead, and TB. Sixty-eight percent of the 2-year-olds had at least 1 hematocrit taken. Seventy-five percent of the 2-year-olds had 1 lead level screening, and 36% had 2 lead level screenings documented in their medical chart. Lead questionnaires were completed in the medical records of 44% of the children. Forty-three percent of the children had received 1 TB test by age 2 years.

### Table: Selected Demographic Characteristics of 674 Two-Year-Old Children Receiving Well-Child Care in Otsego County, New York, 1996

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All 2-Year-Olds</th>
<th>Birth Cohort*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex, %</td>
<td>53</td>
<td>51</td>
</tr>
<tr>
<td>Mean No. of visits, all types</td>
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<td>22.5</td>
</tr>
<tr>
<td>Insurance, % of patients</td>
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<td></td>
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<tr>
<td>MCO†</td>
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<tr>
<td>Private</td>
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<tr>
<td>Uninsured</td>
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<td>2</td>
</tr>
<tr>
<td>Nonprofit rural health network, % of patients</td>
<td>64</td>
<td>75</td>
</tr>
</tbody>
</table>

*\( n = 383 \)

†MCO indicates managed care organization.

[Figure 1](#) Comparison of selected immunization rates (percentage of 2-year-olds vaccinated), Otsego County, New York, 1996, and the United States, 1995. DTP4 indicates 4 doses of diphtheria and tetanus toxoids and pertussis vaccine; Hib3, 3 doses of Haemophilus influenzae type b vaccine; HepB3, 3 doses of hepatitis B vaccine; MMR, measles-mumps-rubella vaccine; OPV3, 3 doses of oral poliovirus vaccine; and Varivax, varicella live virus vaccine (Varivax, Oka/Merck, West Point, Pa).

[Figure 2](#) Comparison of selected immunization rates (percentage of 2-year-olds vaccinated), Otsego County, New York: birth cohort vs those children who migrated to the area (in-migrants), 1996. See Figure 1 for an explanation of the abbreviations of the vaccines.
This study is the result of a novel partnership between public and private sectors to address child health on a county level. While study results suggest that most 2-year-olds are receiving the immunizations they need, improvements are needed for certain immunizations as well as for some well-child care services. Immunization rates in the county are either below or at the national averages for 2-year-old children. Achieving a 90% immunization rate in preschool-aged children to meet the Healthy People 2000 goals will require intensification of record procurement for in-migrant children and careful tracking of immunization status by providers.

The finding that in-migrants have lower immunization rates than those born in the county suggests that continuity of care is important to the timely receipt of immunizations. It also implies that a high degree of mobility in a community or change in providers can independently affect the delivery of immunization. This weakens the use of immunization rates as quality indicators of medical systems that often have little control over mobility.

The periodicity of well-child care provision falls below AAP standards on the county level. Despite the below-recommended number of well-child care visits, county immunization rates compare favorably with national averages. We cannot exclude the possibility that immunizations are more reliably documented than receipt of certain well-child care services. Evidence is lacking regarding short-term and long-term effects of well-child care visits. Most of the recommendations for childhood preventive care made by the US Preventive Services Task Force are based on “insufficient evidence” to support the recommendation, with the exception of childhood immunization. The effectiveness of well-child care in addition to the number of well-child care visits needed to achieve beneficial effects must be the topic for future research.

This study was enabled by the high frequency of structured forms discovered in the medical records reviewed. Structured medical records not only improve documentation but also serve as a reminder to providers of the appropriate interventions that should take place during the well-child care visit. The advent of automated medical records incorporating a well-child care format should facilitate future studies of well-child care provision.

Limitations of this study include the fact that 214 (36%) of our birth cohort could not be located in clinics within our county. These children out-migrated, or attend clinic out-of-county, or do not receive any well-child care. County lines are arbitrary with respect to health-seeking behavior and the location of well-child clinics. Given the large geographic area served by the 2 county birthing centers, all children born in the county would not be expected to receive health care in the same county. Another limitation is that our study produced a 24-month-old point prevalence estimate of immunization coverage that was compared with the National Immunization Survey averages for children aged 19 to 35 months. The National Immunization Survey averages would be expected to be higher than a 24-month point prevalence; therefore, these figures are not strictly comparable. Insurance-related differences in well-child care could not be satisfactorily addressed in this study because the actual insurance status of 107 (16%) of the children studied could not be determined by chart review. It is possible that some of the differences between birth cohort and in-migrants may be due to insurance differences or lapses in coverage. New models for providing needed preventive health services during the managed care transition are needed. This study enabled our public-private partnership to target the improvement of well-child care services in the county. Thus, public and private agency collaboration in public health can lead to innovative partnerships to address safety-net measures for children and thereby share the responsibility of monitoring child health.

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