

# TIMELINESS OF IMMUNIZATIONS OF CHILDREN IN A MEDICAID PRIMARY CARE CASE MANAGEMENT MANAGED CARE PROGRAM

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*Objective:* This study assessed the timeliness of immunization for children in a Medicaid managed care primary care case management program controlling for patient and provider predictors of immunization status.

*Methods:* Using administrative data and patient medical records, up-to-date (UTD) and age appropriate immunization (AAI) status were reviewed for 5598 children. The 4:3:1 immunization series (four diphtheria, pertussis, tetanus vaccinations; three polio vaccinations; and one measles, mumps, rubella vaccination) was the standard.

*Results:* Childhood immunization rates were low when assessed using strict adherence to vaccination recommendations. At age 18 months, 28.3% were classified as UTD, and 6.3% were classified as AAI. Compared to children not up-to-date, UTD children were more likely to have public rather than private providers, to have had older mothers, and less likely to have been African American. Among UTD children, AAI children were more likely to reside in urban areas.

*Conclusions:* Low-income children continue to be under-immunized, even under a managed care initiative. Health care providers and child health advocates need to continue pressure for programs that will increase adherence to nationally recommended guidelines. (*J Natl Med Assoc.* 2002;94:833-840.)

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**Key words:** Medicaid ♦ managed care  
♦ immunization ♦ children

## INTRODUCTION

Although childhood immunization is a primary disease prevention strategy, children, especially low-income children, often do not receive their vaccinations on time. Up to 40% of two-year-olds do not receive their immunizations at age-appropriate intervals.<sup>1-2</sup> During the last two decades, sporadic outbreaks of measles in the US affected thousands of children and the number of cases of other preventable child-

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hood diseases rose,<sup>3-4</sup> while immunization levels in some urban areas have even declined.<sup>5</sup>

The expansion of Medicaid benefits in the 1990s,<sup>6</sup> and the increasing enrollment of Medicaid recipients in managed care sought to improve access to care for low-income children. Managed care programs, in general, have emphasized their ability to provide enhanced preventive services. In particular, primary care case management has been held up as correctly incentivized to improve preventive care. Yet, Medicaid managed care has a mixed record in achieving immunization rates at recommended levels and intervals.<sup>7-8</sup>

This paper describes the timeliness of immunization for children in a Medicaid managed care primary care case management program. Important patient and provider predictors of appropriate immunization status were identified using claims data, health department records, and medical records.

## METHODS

Rates of immunization for 5598 children who were moved from fee-for-service care to a newly implemented primary care case management managed care program were reviewed in 1995 as part of the Quality Assessment and Improvement Project for Medicaid Managed Care in Virginia.<sup>9</sup> Managed care was implemented for Virginia's Medicaid population through a staged geographic approach. This project studied managed care as implemented in the first geographic area to be included in Medicaid managed care. The managed care program assigned each Medicaid recipient to a primary care physician (PCP) who, in exchange for a monthly per-patient management fee, was responsible for preventive services and functioned as a gatekeeper for access to medical care.

We identified all children who turned two years old during a one-year period (July 1, 1993 to June 30, 1994) and who were enrolled in the Medicaid primary care case management program for a period of at least six months. In primary care case management, the Medicaid

recipient is assigned to a designated primary care provider for management of health care. Although some information on immunizations was available through the administrative database of the Medicaid agency, we surveyed providers for additional information regarding the immunization status of each child. The administrative database was deemed inadequate on its own to answer the research question because a) providers sometimes immunize without billing, b) some of the patients may have received their immunizations before they came on to the Medicaid program, either from the same provider or another provider, and c) some patients may obtain their immunizations from local public health departments.

We informed all primary care providers in the primary care case management program about the purpose and scope of the immunization study, and sent them a survey about the immunization status of each child. Included with the survey were letters of endorsement from the state medical society and the state chapter of the American Academy of Pediatrics. To reduce the burden of data collection, we first combined immunization information from the state Medicaid claims and the state health department databases and gave it to each PCP using a customized data collection instrument. The PCP was then asked to complete the immunization assessment through abstraction from his/her own patient records.

For all immunizations, state Medicaid records accounted for 36% of received immunizations, state Health Department records accounted for 10%, and providers documented another 24% of the required immunizations; thus 70% of the immunizations were accounted for with this method. There was no documentation of completion for the remainder (30%) of the required immunizations.<sup>10</sup> At the time of the study, the American Academy of Pediatrics and the American Academy of Family Practice recommended 16 vaccinations at specific intervals by the age of 18 months.<sup>11</sup> We used this database to study predictors of children having received the 4:3:1 immunization

series (four vaccinations with diphtheria, pertussis, tetanus; three polio vaccinations; and one measles, mumps, rubella vaccination). Up-to-date immunization (UTD) was defined as receipt of all recommended vaccinations by 18 months of age, even though the child may not have received individual shots at the age-appropriate interval.<sup>12</sup> Age appropriate immunization (AAI) was defined as receipt of appropriate vaccinations at no more than 30 days past the recommended age for the vaccination in the immunization series. For example, a child was considered to have received age-appropriate immunizations at two months if the appropriate shots were received by 90 days post-partum. By definition, AAI children were a subset of the group of UTD children.

### Demographic Variables and Analyses

Race was defined from the administrative data as African American, white, or other; there were insufficient numbers of children of Latino, Asian or Native American origin to analyze separately. Race was self-reported at time of application for Medicaid. Mother's age was classified as either young (<20 years of age) or older (20 years of age and above); for 9% of the children, mother's age was not available and was coded as unknown. Urban status was defined as residence in a standard metropolitan statistical area. Assigned primary care providers in this Medicaid managed care program were classified as public providers (health departments and community health centers) or private providers (family practice, pediatrics, and other specialties).

Chi-square analysis was used in unadjusted analyses of UTD status and AAI status. Two logistic regression models were used to estimate relative odds of being immunized versus not immunized after adjustment for gender, race, provider type, mother's age, and rural/urban residence. The first model estimated the relative odds of the child having UTD immunization status at 18 months of age. The second model estimated the relative odds of AAI status among UTD children. All analyses used SAS.<sup>13</sup>

### RESULTS

Among the 5598 children studied, most were African American (73.4%), approximately one-half were male (51%), and most mothers were in the 20 years and over age group. The designated primary care providers included public health providers (9.3%), and private providers (90.7%). Private providers included family practitioners (10.7%), pediatricians (78.3%), and other specialists. Of the 5598 children, 2583 (46.1%) were immunized (4:3:1 series) by 24-months of age and 1582 (28.3%) were classified as UTD at 18 months. Of the UTD children, 351 (22.2%) were classified as AAI at 18 months. Thus 6.3% of all children were AAI (see Table 1).

As children grew older, increasingly smaller percentages of them received their immunizations at age appropriate intervals (Figure 1). The percentage of UTD children decreased for children beginning with two months of age but then rose again among children aged 15 months and older.

Table 2 shows that, in adjusted analysis, children who were UTD at 18 months were more likely to have been served by public as compared to private providers and that African American children were less likely to be UTD than others. In addition, children with mothers over the age of 20 were more likely to have had their immunizations by 18 months than those with younger mothers. Among UTD children, AAI children were more likely to reside in urban areas. No other predictors were associated with AAI status among the UTD children.

### DISCUSSION

We found that among Medicaid children in a managed care program, who were assigned to a primary care case manager physician, up-to-date immunization rates at 18 months were still low. Age appropriate immunization rates were even lower. The temporal patterns of immunizations indicated that compliance with the immunization schedule faltered after the second month of life (see Figure 1). By 18 months of

**Table 1. Characteristics for the Sample of 5,598 Children in Each Immunization Status Group, for the 4:3:1 Immunization Series.**

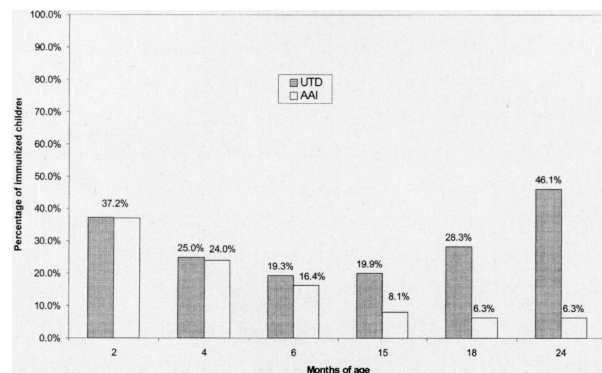
Characteristics	Total	Not immunized by 18 mos.	UTD by 18 mos.	AAI for 18 mos.
	% (n = 5,598)	% (n = 4,016)	% (n = 1,582)	% (n = 351)
Male	50.7	51.0	50.0	49.6
Female	49.3	49.0	50.0	50.4
<i>Provider type</i>				
Public	9.3	7.1	15.0*	16.2
Private	90.7	92.9	85.0	83.8
<i>Race</i>				
White	21.0	18.5	27.2*	29.9†
African-American	77.2	79.9	70.5	66.1
Other	1.8	1.6	2.2	4.0
<i>Mother's age</i>				
< 20 years	16.1	17.0	13.8*	12.0
20 years and older	74.4	77.5	79.2	73.1
Age not known	9.5	8.7	8.8	9.9
<i>Rural/urban</i>				
Non-MSA	4.8	5.0	4.4	1.7‡
MSA	95.2	95.0	95.6	98.3

Note: UTD - Up-to-date with immunizations by 18 months; AAI - age-appropriate immunization.

\*Significant ( $p < .05$ ) differences between UTD and children not immunized by 18 mos. Significant difference ( $\dagger p < .01$  and  $\ddagger p < .05$ ) between AAI and UTD children.

age AAI status declined from 37% to 6%. UTD status declined from 37% to 19% at 15 months and then increased to 28% at 18 months and to 46% by 2 years of age. Other studies of low-income urban populations have found similar rates.<sup>12,14-15</sup>

African American children and those with young mothers were less likely to be up-to-date



**Figure 1.** Timeliness of Immunizations of Medicaid Children During First 24 Months of Life (n = 5,598)

at 18 months. Although some studies have found little effect of race on immunization status,<sup>16,17,18</sup> our results are consistent with those that found racial disparities in immunization rates.<sup>19-20</sup> Our finding that children of mothers under 20 were less likely than children of older mothers to achieve full immunization for their children by 18 months, although not extensively reported previously,<sup>17,20</sup> confirms another recent study.<sup>21</sup> It is likely that younger mothers had fewer resources and less knowledge and experience of the need to help their children achieve full immunization status.

Our findings that low-income children served by public health departments or community health centers were more likely to have received complete immunizations by 18 months of age parallels results of other studies,<sup>22</sup> even though in studies of a general population (not studied here), private providers have higher rates.<sup>23-24</sup> It may be that patient compliance was easier due to the traditional

**Table 2. Results of Multivariate Logistic Regression Analysis: Predictions of Immunization Status, for the 4:3:1 Immunization Series.**

Variables	UTD vs. Other Children	AAI vs. Other UTD
	Odds Ratio, (CI)	Odds Ratio (CI)
Gender: (referent = male)	1.04 (0.93–1.18)	1.01 (0.80–1.28)
Provider: (referent = private)	2.41 (2.00–2.90)	1.07 (0.77–1.49)
Race: (referent = white)		
African-American	0.56 (0.49–0.65)	0.78 (0.60–1.02)
Other race	0.84 (0.55–1.30)	1.88 (0.92–3.85)
Mother's age (referent = under 20 years of age)		
20 years of age and older	1.25 (1.06–1.48)	1.19 (0.82–1.21)
Age not known	1.03 (0.80–1.33)	1.18 (0.70–2.00)
Urban (referent = not in MSA)	1.24 (0.93–1.65)	3.24 (1.38–7.59)

Note: CI denotes confidence intervals.

reliance on health departments by these patients for immunizations. Also, the traditional emphasis of public health providers on preventive care may have been an important component of assuring compliance with immunization recommendations.

In the model predicting AAI status among UTD children, we found rural residence was the only significant predictor of not being immunized at appropriate age intervals. A potential area for further research is whether the long travel time to care in rural areas may affect access to timely follow-up; immunization at exact age-appropriate intervals may, therefore, be difficult. A catch-up strategy of achieving multiple vaccinations at the same visit on the part of both mothers and providers could have been utilized as a more expedient, convenient option.

Age-appropriate rates were considerably lower than UTD rates and variables that predicted UTD status did not predict AAI status. Immunization at the appropriate age is important for conferring immunity and is a public health goal. Numerous children are incompletely protected during a period when they are most susceptible to preventable childhood diseases. This trend is particularly alarming as the recommended schedule of immunizations has expanded. Studies demonstrate that the

techniques and interventions with patients and providers that are important to achieve UTD status may not be similarly effective to achieve AAI status. Opportunities for proactive prevention may differ depending on the desired immunization level. Further research on these criteria with a nationally representative sample is needed.<sup>7</sup>

As HMOs exit the Medicaid market, states are reverting to primary care case management programs. Our results raise concerns about the effectiveness of primary care case management as a mechanism to promote timely immunization to these patients. A recent survey has shown that physician attitudes in great measure determine whether immunizations are given.<sup>25</sup>

The already-stressed, safety-net provider pool caring for vulnerable populations in managed care may be stressed beyond their resources to promote adherence. This population, despite Medicaid coverage, may have limited psychosocial resources to aid compliance with recommendations for preventive care. Fostering adherence for resource-poor populations requires more intensity than for other groups. Safety-net providers may not have the resources to implement such programs. Additionally, parents may not act assertively in obtaining immunization for their child. Although outbreaks have occurred,<sup>26</sup>

and children may be increasingly susceptible to certain childhood diseases,<sup>27</sup> the danger from childhood diseases may be incorrectly perceived by parents as minimal.

Thus, we believe our results imply that community advocates and providers must work together to design improved systems of health care delivery that do not impede, but rather foster, successful immunization programs. A number of proactive strategies have proven effective, including outreach to families, both in-person and by telephone. Scheduled home visits would ensure that mothers, especially young mothers, are aware of the importance of immunizations. More effective tracking systems, such as assessment and feedback of coverage levels to providers and immunization registries, could be useful in assisting parents to obtain immunization in a timely manner and also monitor how well the population is immunized against childhood illnesses.

Georgia public health clinics were able to double their vaccination coverage levels in six years through the use of assessment and feedback to health district offices and clinics.<sup>28</sup> Registries hold the potential to improve vaccination coverage, especially for children with many providers, by giving better information to providers and setting up systems of reminder notices. Currently, only about one-half of children under the age of six are covered in an immunization registry.<sup>29</sup>

Another area of the system of service delivery with potential for improvement is the use of acute care visits for immunizations.<sup>30</sup> The Center for Disease Control developed a number of system-changing strategies to improve immunization rates including improved financing of recommended vaccines, improved reminder systems, better information systems for monitoring outcomes of immunization delivery; and continued education of families.<sup>31</sup> Last, the Institute on Medicine has recommended "increased financial and administrative support" for state immunization infrastructure programs. We would hope that such support encompasses additional resources for safety-net

providers. The efforts to implement these strategies must continue to be a focus of providers and public health advocates.<sup>32</sup>

### Limitations

The validity of the reported immunization rates has not been verified. The data collection methodology relied on documentation from state administrative records and provider chart reviews. Physician practice office staff completed the abstraction of information from the PCP's medical record. Independent chart reviews were not conducted to verify the data submitted.<sup>10</sup> Also, unless the mothers shared formal immunization records, the assigned PCP may not have had an accurate record of immunizations given prior to their involvement with the patient. Attribution of immunization status by provider type should, thus, be interpreted cautiously.

These Medicaid children may not have been representative of the general population of Medicaid children. Children were served through one type of managed care program in one state, although many states have similar managed care programs. Further, the age of the data is a shortcoming. Immunization recommendations have been adjusted since the time of the study. However, the addition of more immunizations to the recommended schedule will only exacerbate the difficulties of ensuring age appropriate immunization. Also, the Vaccine for Children program became fully operational after the time period of this study and offered the potential to positively impact immunization rates for children on Medicaid.<sup>21,33</sup> Thus, subsequent surveys of immunization rates for this population might find higher rates of timely immunization.

In our analysis, we have used a strict interpretation of immunization recommendations. Although the immunization schedule called for all 16 vaccinations to be given by the age of 18 months, most studies report results based on 24 months. The CDC has used a range of 19 to 35 months.<sup>11</sup> Less rigorous reporting methods have suggested that current estimates of immu-

nization rates are higher than they would be if judged against the full recommendations.<sup>24,33</sup>

## CONCLUSION

Our analysis suggests that the timeliness of immunization of children in a primary care case management programs needs to be improved. The rates are lower than the goal of Healthy People 2000, the major goal statement of the public health service at the time of the study. Quality assessment and improvement efforts should concentrate not simply on assuring that children are up-to-date by age 24 months, but also that each child has maximum immunity across their first 18 months of life. The importance of immunization at appropriate intervals should be emphasized. State Medicaid programs may want to intensify their efforts with both parents and managed care providers to assure immunizations are received at the appropriate intervals. Child health advocates must better educate parents and physicians about the need for timely immunization, must make access to vaccinations easier, and must reevaluate how to provide improved resources for compliance.

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