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ORIGINAL PAPER

A Status Report from 1996–2004: Are More Effective Immunization Interventions Being used in the Women, Infants, and Children (WIC) Program?

Thomas George · Abigail M. Shefer · Donna Rickert · Felicita David · John M. Stevenson · Daniel B. Fishbein

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Abstract *Background*: The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) enrolls almost 50% of the US birth cohort and these children have significantly lower immunization coverage rates than their counterparts not eligible for WIC. In 1994, the Centers for Disease Control and Prevention (CDC) and USDA began a national initiative to increase immunization coverage in low-income children by incorporating immunization-promoting activities into WIC visits (WIC/Immunization linkages). Since 1998, CDC has monitored the WIC/Immunization linkages assessment and referral (with and without the more aggressive strategy of monthly voucher pick-up, client outreach and tracking and parental incentives) and three other immunization supporting activities (computerized systems to assess immunization status, collocation of WIC and immunization services, coordination of WIC and immunization services).

Methods: Through an annual survey of state Immunization and WIC programs, a trend analysis was conducted for years 1998 through 2004 to determine changes in the use and frequency of WIC/Immunization linkage activities.

Results: During the 7-year study period, the use of assessment and referral increased from 71% to 94%, monthly voucher pick-up from 24% to 35%, and coordination of WIC and immunization services from 61% to 78% ($p < 0.0001$ for all comparisons) in WIC sites nationwide. The frequency of assessment and referral (at each visit [four or more times/ year] versus certification visits [two times/year]) was reported to decrease during the study period ($p < 0.0001$). Outreach and tracking and collocation of services did not change significantly while the use of parental incentives decreased ($p < 0.0001$). The availability of computers and their use immunization assessment increased during the period. From 2002–2004, the number of states reporting that they base assessment and referral on a single vaccine (diphtheria-tetanus-acellular pertussis) instead of counting multiple vaccines increased from 5 to 10.

Conclusions: Immunization promoting activities, especially those known to be most effective in improving coverage such as monthly voucher pickup, are increasing in WIC. Focusing on effective interventions including supporting activities such as computerized assessment will be essential in meeting Healthy People 2010 infant and childhood immunization coverage goals. In addition, the use of WIC resources can be minimized by encouraging evaluation of diphtheria-tetanus-acellular pertussis coverage as a marker for up to date status, instead of counting all vaccine doses.

Keywords WIC (Women, Infants, Children) · Immunization · Women · Infants and Children · Evaluation · Underserved · Policy · Diphtheria vaccine · Pertussis vaccine · Tetanus vaccine · Assessment and referral · Monthly voucher pickup · Vaccination coverage

At the time the manuscript was written, all authors were at the Health Services Research and Evaluation Branch, Immunization Services Division, National Immunization Program, Centers for Disease Control and Prevention, Atlanta GA 30333. Mr. George and Dr. Fishbein are currently with the Division of Global Migration and Quarantine, Coordinating Center for Infectious Diseases. Dr. Donna Rickert is deceased. Ms. David is a contracted employee.

T. George · A. M. Shefer · D. Rickert · F. David · J. M. Stevenson · D. B. Fishbein (✉)
Centers for Disease Control and Prevention,
1600 Clifton Road NE, MS E-52,
Atlanta, GA 30333, USA
e-mail: dbf1@cdc.gov

Background

Children eligible for enrollment in the Unites States Department of Agriculture's (USDA) Special Supplemental Nutrition Program for Women, Infants and Children (WIC) have significantly lower immunization coverage rates than those not eligible for WIC [1]. Almost half of the annual birth cohort in the United States participates in WIC, especially during infancy [1]. Some activities in WIC that promote immunizations (WIC/Immunization linkages) have been shown to dramatically improve vaccination coverage rates among WIC-enrolled children [2–5]. Since 1994, USDA and the Centers for Disease Control and Prevention's (CDC) National Immunization Program (NIP) have collaborated to meet the Healthy People 2010 Objective of a 90% immunization completion rate in children 2 years of age and under [6]. The importance of this collaboration was highlighted in a December 2000 White House Executive Memorandum instructing WIC and CDC to partner in order to improve the immunization coverage rates of WIC-enrolled children (White House Executive Memorandum December 11, 2000). The memorandum guided WIC to assess each child's immunization status during a WIC visit, and refer those children in need of immunizations to providers. A subsequent memorandum (WIC Policy Memorandum #2001–7) outlined a simple protocol (assessment based on receipt of single vaccine [diphtheria, tetanus, acellular pertussis]) for screening children served by WIC for immunization status.

Since 1998, CDC has monitored this collaboration by collecting electronically-reported survey data on WIC/Immunization linkages for every state and the District of Columbia (DC). This report describes the status of WIC/Immunization activities from 1998–2004 and the data provide a process evaluation of WIC/Immunization promoting activities in WIC clinics.

Methods

WIC/Immunization linkage survey (WIC survey)

This survey is distributed annually to the immunization programs of 50 states and DC. The survey was completed by the Immunization Program Manager in each state, usually with the assistance of the State WIC Director. Every survey is approved and signed by both the State Immunization Program Manager and WIC Director. For simplicity of reporting, all immunization programs are referred to as "states" for the remainder of the paper. The survey is part of routine public health management and program evaluation, and thus institutional review board approval was not required.

The WIC Survey collected the following information: (1) total number of WIC sites in the state; (2) the average number of infants less than one year old and children 1–5 years of age who participate monthly in WIC; and (3) the number of WIC sites that perform assessment and referral, monthly voucher pick-up, client outreach and tracking, or provide parental incentives. Additional questions also ask about linkage supportive activities: collocation, coordination, computerized systems in WIC sites, and frequency of immunization assessment. If there was an increase or decrease of 40% from one year to the next in the number of WIC sites, assessment or referral sites, or monthly voucher pickup sites, values were verified by contacting the state immunization program. If the exact number was not available but the state indicated that there was no change from the previous year, the previous year's value was used.

WIC/Immunization linkages

Assessment and referral must be performed to conduct the minimal WIC/Immunization linkage, and this activity forms the basis for all other more intensive activities. Assessment consists of reviewing a child's immunization record to determine if he/she is up to date with immunizations. If the WIC participant's immunizations are not up to date, the child is referred to an immunization provider, preferably at his/her primary care setting. Assessment and referral can be conducted at every visit (4–6 times/year) including voucher pick-up visits or only at WIC certification/recertification visits (2 times/year).

Assessment and referral can be implemented alone, or with monthly voucher pick-up, outreach and tracking, or parental incentives. For the purpose of this report, it is implied that monthly voucher pickup, outreach and tracking, and parental incentives also includes the underlying strategy of assessment and referral. When monthly voucher pickup is conducted, the parent of the child who is not up to date and/or does not present a vaccination record is given only a one-month supply of food vouchers (versus the normal two- to three-month supply). Though WIC benefits are never denied or made contingent on vaccination, this intervention requires the parent to return to the clinic monthly to obtain food vouchers until up to date status is documented. Outreach and tracking involves phone and mail reminders, and in some instances home visits, to help keep children up to date. Parental incentives involve providing gifts, coupons, or other items as a reward for ensuring that children are up to date.

In addition to these linkages, there are a number of other WIC site practices and policies that support the WIC/Immunization initiative. These practices and policies include: (1) the use of computerized systems to assess immunization status; (2) collocation of WIC sites with immunization service providers; and (3) the coordination of WIC services with immunization services. Information collected regarding availability and use of computerized systems at

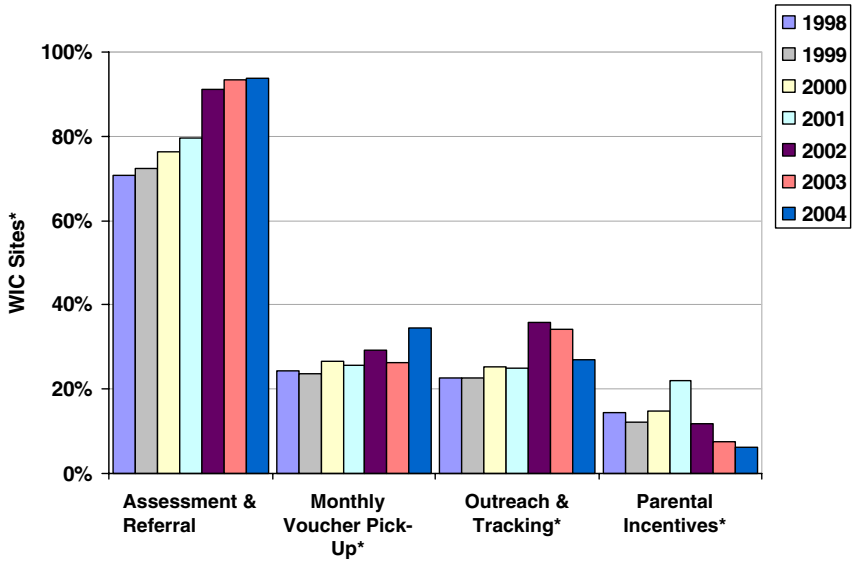

Fig. 1 Percent of WIC sites reporting immunization linkages 1998–2004

***Assessment and referral: Percent of all WIC sites; Others: Percent of WIC sites conducting assessment and referral**

the WIC site included the number of sites using computers and whether computers were utilized for immunization assessment. Collocation of services was defined as the provision of WIC and immunization services in close proximity, such as in the same or adjacent buildings, clinics, or mobile vans. Coordination of WIC and immunization services was defined as a sharing of service delivery strategies and resources, whether service locations are collocated or not. We classified a site as "coordinated" if both programs (1) shared data or other resources, (2) referred clients to WIC from immunization and vice versa, or (3) planned clinic visits so that clients could receive both WIC and immunization services at the same visit or time.

Data quality and analysis

We used EpiInfo (version 3.3.2) to calculate the Mantel-Haenzel and Chi-Square tests for linear trend in the national usage of assessment and referral, monthly voucher pickup, outreach and tracking, parental incentives, use of computer systems, collocation, and coordination from 1998 to 2004.

Data were reported as the number of WIC sites that performed a particular linkage, the number that did not perform the linkage, and the number of sites where performance was unknown. Unknown values were excluded in the reported statistical analysis of the linkages. However, we examined the reporting of "unknown" values over the study period to understand better how improving completeness of reporting may have affected the results. Finally we reanalyzed the data including the unknown values as a negative response.

Results

All states reported data on WIC activities each year except 2000, when 1 state did not report. The number of states reporting that linkage activities were occurring in their state varied from 47 (each year from 1999 to 2001) to 49 (2004). The number of WIC sites nationally decreased during the period, from 7885 in 1998 to 7292 in 2004.

Immunization linkage interventions

Figure 1 displays the distribution of 4 different immunization linkage activities between 1998 and 2004. The number of WIC sites conducting assessment and referral increased steadily during the study period (from 5586 [70.8%] in 1998 to 6702 (93.6%) in 2004, $p < 0.0001$). WIC sites shifted from conducting assessment and referral at every visit to the biannual certification/recertification visits ($p < 0.0001$, Fig. 2), although the majority were still conducting assessment and referral at every visit. There was also an increase in the proportion of WIC sites using monthly voucher pick-up (from 24.2% in 1998 to 34.7% in 2004, $p < 0.0001$), while the proportion of WIC sites using outreach and tracking increased from 1998 to 2002, they decreased in 2003 and 2004, with no significant overall change. The use of parental incentives also varied somewhat from year to year, and there was an overall decreasing trend ($p < 0.0001$).

Between 2002 (when the option of conducting assessment based on a single vaccine was first introduced) to 2004, we found that the number of states reporting that assessment and referral was based on diphtheria-tetanus-acellular pertussis increased from 5 to 10. The number that based assessment

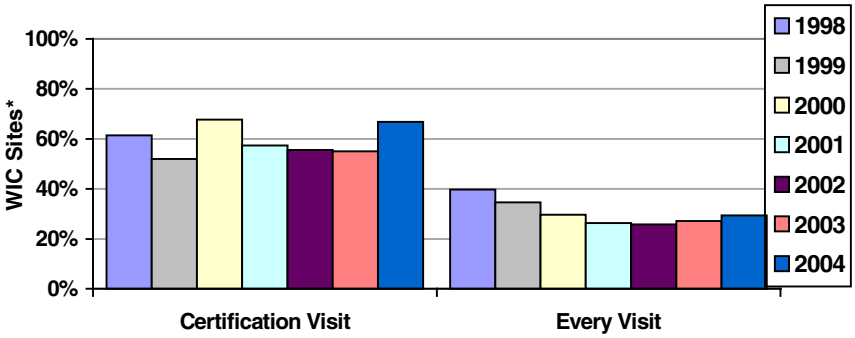

Fig. 2 Change in proportion of sites conducting assessment at certification every visit versus certification visit, 1998–2004

and referral on counting all vaccines decreased from 42 to 33 states; and based on a combination of both methods increased from 3 to 7 states. One or two states failed to report an assessment method during these years.

Immunization supporting activities

The proportion of WIC sites using computerized systems to track WIC client information increased over the study period as shown in Fig. 3 ($p < 0.0001$) as did the use of computers for immunization status assessment (from 27% to 37%, $p < 0.0001$). Coordination increased steadily during the first three years of the period and remained fairly constant thereafter with a significant overall upward trend, and collocation had a downward trend during the period ($p < 0.0001$ for both comparisons, Fig. 3).

Analysis for geographic distribution

We examined the distribution of WIC linkage activities for 2004 at the state level (Fig. 4). In general, states implemented a linkage activity in most or all WIC sites, or in none or very few sites. For example, in 40 states, more than 90% of WIC sites conducted assessment and referral, while in only two states less than 10% of WIC sites did so. Similarly, for monthly voucher pick-up, nine utilized this activity in ≥90% of their WIC sites, while 34 states reported less than 10% usage. Nine states used outreach and tracking in greater than 90% of WIC sites, while 27 states used it in less than 10% of sites. Finally, parental incentive was the least-used immunization promoting activity, with only four states using it in over 90% of sites, and 41 states using it in less than 10% of sites.

Data quality

The quality and completeness of reporting improved for almost all variables during the study period, as can be seen with decreasing percentage of WIC sites with "unknown" linkage activities. (Table 1). The trends observed appeared independent of improved reporting in that they were similar whether or not missing data was included as "unknown" or "no" linkage (data not shown).

Discussion

This evaluation shows that nationally more WIC sites are now conducting assessment and referral, increasing from 70.8% at the beginning of the study to 93.6% in 2004. At the same time, the frequency of assessment and referral decreased (less commonly conducted at each visit and more commonly at biennial certification visits). The use of

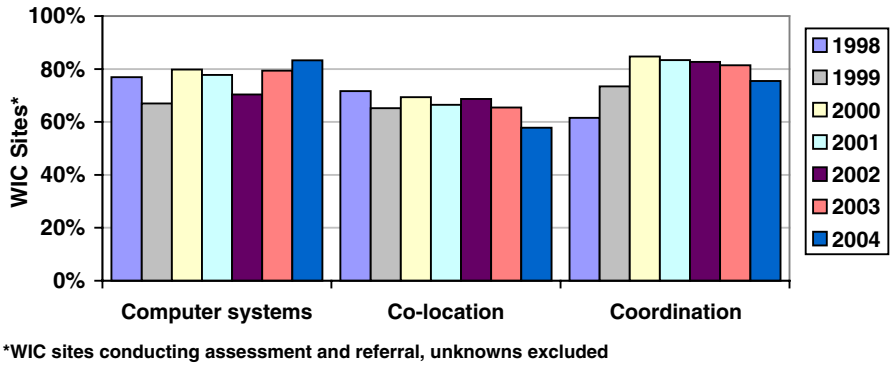

Fig. 3 WIC/Immunization supportive activities 1998–2004

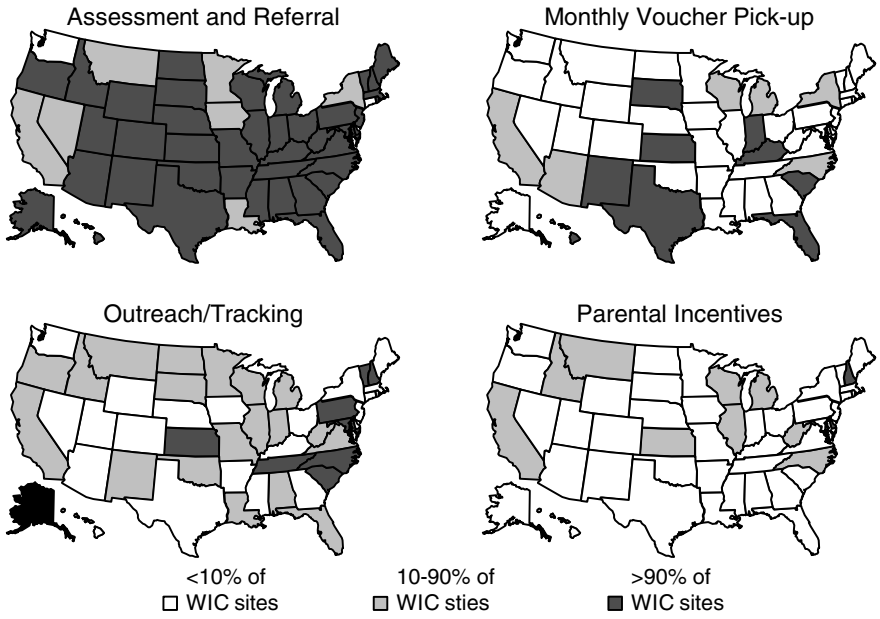

Fig. 4 Geographic distribution of WIC linkage activities, univariate statistics, 2004

monthly voucher pick-up increased during the study period but even in 2004, only 34.7% of WIC sites conducted this activity. WIC sites used computers more often to store patient information and these computers were progressively used more often for immunization status assessment. Our data suggest that immunization and WIC programs are coordinating their activities to a larger extent, but that immunization and WIC services are now less likely to be collocated.

Since the partnership linking WIC and Immunization services was begun in 1994, our findings compared to previous surveys suggest that this partnership has matured and there is now more coordination between WIC and Immunization programs [7]. In this earlier survey, it was found that 8 (16%) states relied on parental recall to assess vaccination status; currently, states that conduct assessment activities all use immunization records for status assessment and none rely on the less accurate parental recall. In addition, we see more states and more WIC sites adopting some of the more effective immunization-promoting strategies such as monthly voucher pick-up.

Nationally, the increasing number, as well as proportion, of WIC sites at which assessment and referral is conducted may be related to the 2000 Presidential Memorandum which stressed the importance of assessment and referral as the first step in increasing linkage activities. However, we found that more WIC sites were shifting to less frequent assessment and referral (from 4 times each year to 2 times each year). It is interesting to note that recent studies suggest that more frequent assessment may not necessarily translate into higher coverage, at least in populations in which coverage is already high [8]. One study, conducted in Los Angeles in a WIC population with high baseline coverage (almost 80%), assessment and referral did not improve coverage more than no intervention, regardless of frequency. In populations with lower baseline coverage, the frequency of assessment and referral may have an effect on overall coverage in the WIC population. In an effort to decrease the burden of assessment activities for WIC staff, recent WIC policy makes clear that assessment activities only at certification/recertification visits are a viable option, although more frequent assessments are encouraged (WIC Policy Memorandum #2001–7, August 30, 2001). Recent national WIC policy also allows sites to base assessment and referral on a single vaccine (diphtheria-tetanus-acellular pertussis) instead of on multiple vaccines. During 2002–2004, the number of states reporting that WIC counted only diphtheria-tetanus-acellular pertussis doses to determine up-to-date status increased from 5 to 10. Time saved using this method may allow more WIC sites to

Table 1 Percentage of reported unknown WIC/Immunization linkage activity for years 1998–2004

Year	1998	1999	2000	2001	2002	2003	2004
Monthly voucher pickup	32.6%	24.2%	8.2%	14.0%	10.1%	5.0%	2.2%
Parental incentives	10.5%	11.3%	10.5%	14.1%	47.6%	15.4%	6.3%
Outreach and tracking	5.5%	10.0%	5.7%	13.1%	13.8%	18.4%	9.7%
Freqency of assessment	20.3%	20.9%	6.1%	5.2%	14.3%	1.2%	12.6%
Computers	25.6%	23.3%	7.7%	10.7%	17.6%	10.1%	5.7%
Collocation	41.3%	31.6%	25.8%	22.9%	14.1%	7.0%	17.4%

conduct assessment and referral and may allow some sites to expand more effective immunization linkage activities [9].

Changes in the use of the other 3 WIC/Immunization linkages are consistent with the evidence that supports their use. For example, monthly voucher pickup, which increased during the study period, has been repeatedly studied and found to result in dramatic improvement immunization coverage among WIC clients [5, 10, 11]. Monthly voucher pickup may be implemented whenever the child is found to be not up to date during a WIC visit, or only at certain age milestones. Indeed, some WIC sites only implement monthly voucher pickup once during the first year of the child's life (commonly at age 7–9 months) and once during the 2nd year of life (commonly at age 18–20 months); this strategy may decrease the resource burden on WIC sites that want to conduct the more aggressive strategy of monthly voucher pickup. In contrast, rigorous trials do not support the effectiveness of outreach and tracking [11, 12] or parental incentives, both of which were used less frequently over time.

Although more WIC sites used computer systems to track information on WIC clients, we found that the percentage of sites using computers for immunization assessment and forecasting remained relatively constant during the study period, except for 2004 when it increased from 27% to 37%. More computerization in WIC has important benefits, including improved tracking of clients to support both reminder systems and continuity of services. A number of factors may further increase the use of computers for immunization linkages, including (1) availability of a standardized, easy-to-use immunization module or (2) knowledge on how to develop the necessary immunization algorithms. In addition, WIC staff can be further educated about computerized immunization assessment, because manual assessment of immunization status has been shown to lack accuracy [13].

WIC/Immunization site coordination, which increased during the study period, may be more convenient for parents whose children need both WIC and immunization services. There has been no previous research evaluating the impact of coordination upon immunization coverage levels, but increased collocation may raise coverage indirectly by increasing the coordination between WIC and immunization services [14]. The marked increase in coordination provides positive reinforcement of the collaboration between WIC and immunization services. With an increase of 42% over the seven year study period, it appears that the coordination of services is feasible and that local sites are able to organize the coordination of services and resources.

Completeness of reporting increased and the proportion of unknown responses decreased every year for most of the variables collected in our survey. Improvement in data reporting may be attributed to a better understanding of what was being asked on the WIC Survey and improved technical assistance to program managers in completing the survey. In the future, more accurate data collection methods may continue to foster improved data quality.

A strength of this analysis is that we had a consistently high response rate every year (>90%), translating into greater generalizability of the data. There are several limitations, however. The trends described in the results section are limited by the unknown responses. The decision to exclude the unknowns from the analysis assumes the proportion of unknowns who did or did not use a given linkage activity matched the observed proportions. There was insufficient information on which to impute missing values. We don't know whether the accuracy of state responses increased (or decreased) over time, although there is no a priori reason to believe that missing data was biased in one direction or the other. Finally, though the data collected by the WIC Survey are self-reported, we do not think inaccuracies related to this should differ from year to year and thus should not have affected our ability to examine trends over time.

Usefulness of the data may be improved by providing annual state to state comparisons of WIC/Immunization linkage activities to both immunization and WIC staff in the states. Feedback of the status of WIC/Immunization activities would provide information to make improvements or to increase linkage activities. To improve information dissemination between states, it may be possible to set up an internet-based discussion board where each state can ask questions, obtain feedback from each other and/or from CDC, and view updated status of WIC/Immunization activities. The data obtained by the states was often from the local level, and there is no way to verify the accuracy of this local data.

Our findings are also limited by the absence of vaccination coverage data, so we cannot know for sure the extent to which, if any these WIC/immunization activities increased immunization coverage (or decreased disease). However, other studies have shown that some of these activities improve vaccination coverage in WIC populations [2–5]. According to national data up-to-date coverage rates (4 doses of diphtheria-tetanus-pertussis vaccine; 3 doses of poliovirus vaccine; 1 dose of measles containing vaccine; and 3 doses of *Haemophilus influenzae* type b vaccine) in the population of children 19–35 months who were ever enrolled in WIC have increased from 1998 to 2004 (CDC, unpublished data), from 77.0% (95% CI, ±1.5) to 80.7% (95% CI, ±1.3), respectively. This may be at least partly due to more WIC/Immunization linkage activities occurring, as well as more aggressive WIC activities such as monthly voucher pickup being conducted in a greater number of WIC sites now. This data needs to continue to be monitored closely.

While there has been improvement in the reporting of some linkage activities with the WIC Survey, some WIC sites are still not conducting WIC/Immunization linkages. Further research is necessary to identify the barriers to implementing

these linkages, and clarify what might be done to better support state efforts. With the on-going cooperation between WIC and CDC, the impetus of the Presidential Memorandum, and the recent streamlining of the assessment process, WIC may be better able to help immunization programs to reach the Healthy People 2010 objective of immunizing 90% of children under 2 years of age.

Disclaimer: The findings and conclusions of this study have not been formally disseminated by the CDC and should not be construed to represent any agency policy or determination.

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