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## Evaluation of an adult immunization composite measure in the Indian Health Service

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### ABSTRACT

**Background:** Government agencies, healthcare accreditation bodies and quality improvement organizations support the development of new quality measures. Composite quality measures use more than one measure to develop a broader assessment of healthcare system function. Currently, no composite measures for adult immunization coverage exist. Development of such measures could facilitate improvements in adult immunization coverage by focusing on measurement of receipt of all age-recommended vaccines.

**Methods:** We recruited five Indian Health Service (IHS) and Tribal health clinics to pilot an Adult Immunization Composite Measure (AICM). Data were collected monthly over seven months using a pre-programmed electronic health record (EHR) reporting tool (IHS sites); Tribal sites used third-party software or a programmable EHR reporting function. Data collected included: number of adults aged 19 years and over who were active users of the facility with at least two visits in the last three years; the cumulative number fully immunized per age-based recommendations for tetanus toxoid-containing vaccines, pertussis, zoster and pneumococcal vaccines; and the percent immunized for the AICM and for each individual vaccine. Coverage was calculated for three age groups: 19–59 years; 60–64 years; and 65 years and older.

**Results:** All sites reported aggregate immunization data monthly from patient EHR records. For all adults 19 years and older, AICM coverage ranged from 49% to 87% at the end of the report period. Two sites showed increases in AICM coverage  $\geq 3\%$ . Improvements in zoster vaccine coverage accounted for most of the increase observed. One site specifically focused on improving zoster coverage as a result of using the AICM.

**Conclusions:** We demonstrated the feasibility of implementing a composite measure of adult immunization coverage. This is the first measure capable of monitoring immunization completeness, coverage improvement and overall adult vaccine program effectiveness for adults who receive all recommended, age-based vaccines.

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### 1. Introduction

Vaccination is a cornerstone of preventive health and has contributed to significant declines in many infectious diseases, saving millions of lives worldwide [1]. In addition to protecting individuals from vaccine-preventable diseases (VPD), vaccination can confer community-wide protection by reducing the incidence of

disease and the likelihood of transmission to those who are unvaccinated. In the United States, a strong routine immunization program for children has resulted in coverage rates of over 90% for many routinely recommended childhood vaccines and significant declines in VPD morbidity and mortality among children [1]. However, adults also experience a considerable burden of VPD, and coverage with most routinely recommended adult vaccines has remained consistently low [2,3]. There are many factors contributing to low levels of adult vaccination [2] including payment and reimbursement, patient and provider knowledge of adult vaccine recommendations and a lack of application of systematic

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approaches to vaccinating adults [4]. Better strategies are needed to monitor progress in the effort to increase adult immunization coverage, particularly taking into account the recent growth in vaccines indicated for adults.

Over the last decade, several new vaccines for adults have been recommended by CDC's Advisory Committee on Immunization Practices (ACIP) [4]. Prior to 2006, the only age-based, routinely recommended vaccines for adults were, influenza and the pneumococcal polysaccharide vaccines (PPSV) with a particular emphasis on those 65 years and older. Licensure of newer adult vaccines, such as tetanus, diphtheria and acellular pertussis vaccine (Tdap) and herpes zoster vaccine (HZV), as well as expansions of existing recommendations to include larger proportions of the adult population [5] have offered new opportunities and challenges for providers in ensuring adults are up to date with recommended immunizations.

Healthcare accreditation bodies and quality improvement organizations are giving increasing attention to the development, testing, and implementation of quality measures in healthcare settings to increase adherence to standards of care. In 2011, the U.S. Department of Health and Human Services (HHS) National Quality Strategy called for better alignment of clinical quality measures used in federal programs [6]. HHS also charged the National Quality Forum (NQF) to identify gaps and priorities for quality measure development in several areas, including adult immunization. The NQF noted the majority of current adult immunization performance measures in use by federal programs were for influenza and pneumococcal vaccines, and identified gaps in measures for other adult vaccines. The report also recommended development of composite measures combining other preventive services and multiple immunizations into one measure [7].

While monitoring coverage of individual vaccines can focus efforts and resources for a particular vaccine, a composite immunization measure that includes several vaccines, as the Institute of Medicine noted, "... can provide a potentially deeper view of the reliability of the care system encouraging and facilitating systems-level changes by highlighting the need for better care coordination and accountability across multiple providers." [8] The long-standing two-year old childhood immunization measure is an example of a composite immunization measure, which assesses complete receipt of seven routinely recommended vaccines against 11 diseases by the age of two [9]. For adult vaccines, however, there are no composite measures to evaluate whether adults are up-to-date on all age-based, ACIP-recommended immunizations [7]. In 2012, the National Adult Immunization and Influenza Summit recommended a study to assess the feasibility of implementing an Adult Immunization Composite Measure (AICM) [10]. Acting on this expert recommendation, the HHS National Vaccine Program Office funded the Indian Health Service (IHS) to evaluate the feasibility and the usefulness of an AICM as a quality performance measure.

## 2. Methods

### 2.1. Adult immunization composite measure (AICM)

Table 1 shows the age groups and immunizations included in the AICM. Data collected from participating clinical sites included aggregated numerator, denominator and percent immunized for each individual vaccine and for the AICM. For the AICM, only individuals who received all of the vaccines included in the composite measure were counted as vaccinated. The focus of the vaccines included in the AICM were those recommended for adults based on the age of the patient rather than diagnosis of specific medical conditions.

**Table 1**  
Adult immunization composite measure (AICM) definition.

Age group	Vaccines Included	Optional
19–59 years	Td-containing vaccine in the last 10 years, and Tdap ever	Influenza
60–64 years	Td-containing vaccine in the last 10 years, and Tdap ever, and Zoster	Influenza
65 years and older	Td-containing vaccine in the last 10 years, and Tdap ever, and Zoster, and PPSV23 or PCV13	Influenza
19 years and older	Proportion of adults who received all vaccines recommended for their age group	Influenza

Td = tetanus and diphtheria toxoid.

Tdap = tetanus and diphtheria toxoid and acellular pertussis.

PPSV23 = pneumococcal polysaccharide vaccine 23-valent.

PCV13 = pneumococcal conjugate vaccine.

Human papillomavirus vaccine (HPV), was not included in the AICM as this vaccine is recommended routinely for adolescents, and only recommended for adults who have not received it previously. In addition, vaccination with either PPSV23 or the pneumococcal conjugate vaccine (PCV13) was considered adequate as at the time of the study the adult PCV13 vaccine recommendation was relatively new, potentially temporary and the study period was not long enough to account for the minimum interval required between the two vaccines.

### 2.2. Project description

The Northwest Portland Area Indian Health Board Tribal Epidemiology Center (NWTEC) led the IHS AICM pilot to determine the feasibility of including the AICM as an agency-wide performance measure for IHS. We recruited five sites representing different facility types (Federal and Tribal; rural ambulatory care and one hospital) from three IHS regions (Portland, Great Plains and Phoenix Areas). Three sites used the IHS Resource and Patient Management System (RPMS) electronic health record (EHR), two sites used a commercially available EHR system (NextGen, Irvine, CA).

### 2.3. Data reporting and analysis

Each IHS site submitted baseline and monthly data using the IHS RPMS Clinical Reporting System (available at <https://www.ihs.gov/crs/software/fy16/>). For the two Tribal facilities that used NextGen (clinics 3 and 4), we attempted to replicate the Clinical Reporting System logic. One site used a query tool that was part of its EHR. Another site used a separate software package to generate reports (i2i Systems, Santa Rosa, CA). All sites submitted aggregate data without any personal identifiers using standard email in either text format or comma-delimited spreadsheets. Baseline data for the 2015 IHS reporting year (July 1, 2014–June, 30, 2015) was collected after June 30, 2015. From July 1, 2015 to January 31, 2016 sites reported data monthly for American Indian/Alaska Native (AI/AN) adults aged 19 years and over with at least two visits to the facility in the last three years and who resided in the official set of communities associated with each site used for official reports. Changes in denominators at each site occurred because new patients entered and others left the patient population. At clinic 3, the denominator was reported twice (baseline and November) because of technical difficulty.

Qualitative evaluation data was obtained through monthly web-based discussions with staff from participating clinical sites and in-person site visits in which semi-structured interviews were conducted with clinical providers, nurses, pharmacists and administrators.

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