REPORT TO CONGRESS ON A PLAN FOR AN INDIAN HEAD START STUDY

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Part I

INTRODUCTION

The Improving Head Start for School Readiness Act of 2007 (the Act), Public Law 110–134, Section 649(k)(4), requires the Secretary of the Department of Health and Human Services to work in collaboration with the Head Start agencies that carry out Indian Head Start programs, the Indian Head Start collaboration director, and other appropriate entities, including tribal governments and the National Indian Head Start Directors Association to:

a) undertake a study or set of studies designed to focus on the American Indian and Alaska Native Head Start-eligible population, with a focus on issues such as curriculum development, availability and need for services, appropriate research methodologies and measures for these populations, and best practices for teaching and educating American Indian and Alaska Native Head Start children;

b) accurately determine the number of children nationwide who are eligible to participate in Indian Head Start programs each year; and

c) document how many of these children are receiving Head Start services each year.

This report provides the Department's plan to conduct a set of studies designed to focus on the American Indian and Alaska Native (AI/AN) Head Start-eligible population. There are two requirements addressed in the report: (1) a plan for a set of studies that will focus on the AI/AN Head Start-eligible population related to the following areas: curriculum development, availability and need for services, appropriate research methodologies and measures, and best practices for teaching and educating American Indian and Alaska Native Head Start children; and (2) a plan to accurately determine the number of children nationwide who are eligible to participate in Indian Head Start programs each year and to document how many of these children are receiving Head Start services each year.

For the purposes of responding to the requirements in the legislation related to consultation and collaboration in developing the plan, ACF conferred with the National Indian Head Start Directors Association (NIHSDA), the AI/AN Head Start collaboration director, AI/AN Head Start Program Directors, staff from the U.S. Department of Education, the Bureau of Indian Affairs, the Indian Health Service (IHS), the U.S. Census Bureau, the Annie E. Casey Foundation, the American Indian and Alaska Native Head Start Research Center at the University of Colorado - Denver, Dr. C. Matthew Snipp of Stanford University, Dr. Angela Willeto of Northern Arizona University and participants at the tribal consultation sessions held in Denver, Colorado; Kansas City, Missouri; Seattle, Washington; and Phoenix, Arizona. Written comments responding to the proposed plan were received from NIHSDA, and are included as Appendix A.

On September 24, 2008 a notice for public comment was published in the *Federal Register* regarding the plan for carrying out Section 649(k)(1)(A)-(D). A period of 60 days was provided for public comment. Only two comments were received: one was critical of research in general,

and the other provided information on a commercially available curriculum that had been used in AI/AN Head Start settings. Neither comment specifically addressed the plan that is presented below.

Part II

A PLAN FOR CARRYING OUT SECTION 649(k)(1)(A):

To address the first requirement, to undertake a study or set of studies, the Administration for Children and Families (ACF) intends to build upon previous and current efforts to develop a viable research and evaluation agenda for AI/AN Head Start. Specifically, ACF will support and work with the AI/AN Head Start Research Center (AI/ANHSRC) at the University of Colorado in Denver to build research capacity in AI/AN communities, and to develop and expand a set of studies that target issues of interest to the AI/AN Head Start community.

A. BACKGROUND

Research in AI/AN communities must take into account the unique characteristics of those communities. Stakeholders typically voice concerns about community participation and oversight of research conducted in tribal settings; the cultural appropriateness of methods and measures used; the relevance of the research topics to community needs and interests; and the process of reviewing and publishing findings within and outside the community research sites. In Fiscal Year 2002, a project funded by ACF undertook to document the existing knowledge base concerning early childhood programming and assessment in tribal settings, and to collect information on the research needs and priorities of tribal Head Start programs. Listening sessions with AI/AN Head Start stakeholders resulted in documentation of the topics of particular interest in tribal communities, as well as concerns about the processes of implementing research and disseminating findings.

These and other efforts documented the scarcity and lack of rigor of existing research for American Indian and Alaska Native children and families, the need to develop the capacity for early childhood research in tribal settings, and the need to increase the number of qualified individuals who have the ability to effectively partner with tribes to implement methodologically sound empirical research.

In recognition of these needs, ACF announced in Fiscal Year 2005 a competitive funding opportunity for an AI/ANHSRC to (1) support local research projects that focus on the development of young children and families in AI/AN Head Start and Early Head Start programs, and (2) offer training opportunities and on-site support to build capacity for research in tribal communities. A cooperative agreement was awarded to the University of Colorado at Denver, Health Sciences Center, to lead this work. The AI/ANHSRC has worked to identify existing data on AI/AN Head Start, locate gaps in the available literature and reporting on programs, generate policy-relevant findings, give shape to research and training priorities, and build a national network of programs for future research efforts and participate in data collection and developing research partnerships between researchers and AI/AN Head Start programs.

The AI/ANHSRC is guided by a steering committee that includes AI/AN Head Start program directors, other tribal representatives, NIHSDA representatives, the Head Start Collaboration Director, staff from the ACF's Office of Planning, Research and Evaluation and the Office of Head Start, and researchers who are working in tribal settings. The first years of this cooperative agreement were focused on establishing local research partnerships, developing community participatory models to identify research needs, and agreeing on processes for conducting research in local sites. Over the past three years, the AI/ANHSRC competed and awarded three subcontracts to Arizona State University in partnership with the Gila River Tribe, Michigan State University in partnership with the Inter-Tribal Council of Michigan and Oregon State University in partnership with the Confederated Tribes of Warm Springs to develop and conduct research in collaboration with local tribal Head Start programs and tribal communities. These projects place significant emphasis on tribal participation in the research and on the implementation of methodologically sound studies. The AI/ANHSRC also has supported the professional development of researchers by awarding three training fellowships to doctoral level individuals who now are conducting research in conjunction with the Seneca, Inter-Tribal Council of Michigan and Jemez Head Start programs. The AI/ANHSRC, through the building of a network of AI/AN Head Start program staff and researchers, and through the development of the local research partnership projects and training fellowships, has laid the foundation for addressing study areas identified in legislation, including studies of professional development to enhance best practices for teaching AI/AN children, and appropriate research methodologies and measures.

ACF intends to continue to support and work with the AI/ANHSRC to build on its network of partnerships, its research portfolio, and its training activities to target more specifically the research aims described in the Head Start Act. These aims are being addressed by the establishment of a Research Consortium that includes two of the ongoing AI/ANHSRC local research partnership projects (Michigan State University and Oregon State University), the three training fellowships, and direct participation of a number of additional Head Start AI/AN programs. The Research Consortium includes the Seneca Nation of Indians, the Rosebud Sioux Tribe, the South Central Foundation of Alaska, the Blackfeet Nation, Rincon Band of Luiseno Indians, Turtle Mountain Chippewa Tribe of Indians, Red Cliff Band of Lake Superior Chippewa, and the Cherokee Nation of Oklahoma. Discussions with additional tribal communities are also underway. The inclusion of these tribes represents an expansive representation of AI/AN Head Start programs and a commitment by many tribes and tribal Head Starts to conduct in-depth research on the areas identified by the Act.

B. PLANNED STUDIES

Following are descriptions of ongoing and planned studies as they relate to the areas prescribed by the legislation. It should be noted that these are seen as early building blocks of a developing research agenda, rather than a definitive set of studies on AI/AN Head Start. Although the studies are aimed at significant needs within the AI/AN early childhood communities, they also represent an investment in developing research expertise for working within those settings, as well as models of establishing true collaborative partnerships for the conduct of research in tribal communities.

CURRICULUM DEVELOPMENT

The issue of how to incorporate the unique and important aspects of native culture into pre-existing curricula, as well as the development and validation of the efficacy of new cultural curricula has been a priority for the AI/ANHSRC Steering Committee. The following activities address this topic:

- A study by the Confederated Tribes of Warm Springs and Oregon State University examining the implementation of a staff training model that incorporates culture and heritage into developmentally appropriate pedagogy for children from birth through age five, while also focusing on strategies for children's cultural learning between home environments and the Head Start program. In accord with a theoretical foundation in Transformative Learning Theory (Mezirow, 2000)[1], opportunities are provided for participants to consider both traditional and science-based ways of delivering services.

- Development and evaluation of a culturally based curriculum for use in a tribal Head Start program; the curriculum will foster the maintenance of tribal language and cultural knowledge and skill building (Jemez Pueblo in New Mexico).

- Collaboration within the Research Consortium sites in Fiscal Year 2009 and Fiscal Year 2010 to promote community dialogues on cultural values, existing curricula, and the processes through which new curricula and the science to support them can be developed.

PROFESSIONAL DEVELOPMENT

Several studies will focus on best practices for teaching and educating young children in AI/AN Head Start:

- Evaluation of a model for individualized educational planning for early childhood employees, including three education approaches (individual online mentoring, face-to-face tutorials, cohort model mentoring), while developing and testing an approach to staff training in children's cultural learning (the Confederated Tribes of Warm Springs and Oregon State University).

- Examination of Head Start teacher recruitment, retention and professional development at the local level and how they intersect and interact with efforts to indigenize the curriculum (the Gila River Indian Community and Arizona State University).

- Evaluation of a program designed to increase the number of American Indian teachers in Early Head Start (EHS) and Head Start (HS) classrooms, increase teachers' academic credentials and infuse cultural knowledge into EHS/HS curricula (the Inter-Tribal Council of Michigan and Michigan State University). In order to improve teaching credentials of teachers in Michigan's Tribal EHS/HS system, the project has adopted a community-based

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[1] Mezirow, J., *Learning As Transformation: Critical Perspectives On A Theory In Progress*. San Francisco, CA: Jossey - Bass, 2000

participatory research approach to work in concert with tribal community members to define the questions and establish evaluation plans guided by conceptual models of child success based on teacher characteristics embedded in a tribal-parent system of influences.

AVAILABILITY AND NEED FOR SERVICES

In consultation with AI/AN Head Start directors, the AI/ANHSRC is working with communities to analyze existing data to determine where there are service needs and identify and evaluate approaches to service provision:

- A partnership between the AI/ANHSRC and interested members of the Consortium will examine the cultural appropriateness of approaches offered by the Center on Social and Emotional Foundations for Early Learning (CSEFEL) at Vanderbilt University and the kinds of supports required for teachers in AI/AN Head Start to implement some of the practices recommended by CSEFEL.

- The AI/ANHSRC is working with the Seneca Tribal Head Start program on a project to better understand behavior problems among AI/AN children with speech and language delays/problems, with the goal of developing/adapting an intervention targeting these behaviors among children with speech and language delay problems.

- Systematic coordinated data collection strategies for assessing the needs of parents and children, as well as data on service utilization, is under development by the Research Consortium and should be ready for pilot work in early 2010.

APPROPRIATE RESEARCH METHODOLOGIES AND MEASURES

In addition to building on the partnerships seeded in the first phase of the AI/ANHSRC (2005-2008), the work sponsored by ACF will expand to include coordinated data collections on program and classroom quality (2008-2009) and child outcomes (2009-2010) within the broader Consortium. Existing measures of classroom quality, teacher effectiveness, and child outcomes were developed without consideration of the goals of AI/AN Head Start teachers, programs and communities. Studies in this domain include:

- Using Head Start Family and Child Experiences Survey (FACES) measures as a point of departure, research under this component will include focus groups, using a common protocol, to determine the acceptability and appropriateness of these measures and will then pilot both the original and modified versions of these measures to evaluate their performance in AI/AN Head Start programs. The coordinating center for the AI/ANHSRC will serve as a data repository for these efforts, analyzing cross-site data for final reports to inform the Office of Head Start and the AI/AN Head Start community.

- The Center will guide the development of a proposed common measurement strategy for assessing child and family needs, teacher effectiveness, and children's outcomes. AI/ANHSRC staff and collaborators will complete training on the Classroom Assessment

[2] which has been proposed for use in Head Start's FACES study and conforms to the monitoring section requirements in the Head Start Act. Workgroups within the Consortium have now formed to identify additional measures required for the appropriate assessment of family and children's outcomes. The goal is to establish this common measurement approach (with local additions that reflect the unique characteristics of each participating AI/AN Head Start program) in 2009.

- A cultural critique and analysis will be conducted of the Nursing Child Assessment Satellite Training (NCAST) (Barnard, 1978)[3] for the assessment of American Indian caregiver-child relationships and interactions.
- There will be an examination of the reliability and validity of the Infant Toddler Social-Emotional Assessment (ITSEA) (Carter and Briggs-Gowan, 2005)[4] for use among AI/AN children.

- The Center will complete standard "partnership" measures, using data collected across local research partnership sites. Results from these measures, in conjunction with the employment of the community based participatory research (CBPR) model by all three sites will inform the field on how to effectively engage with tribes to conduct research.

C. PLAN FOR DISSEMINATION

ACF will sponsor development and enhancement of the AI/ANHSRC website, which will include areas for interactive discussions of measurement and research strategies, both within the Research Consortium and nationally. AI/ANHSRC collaborators have formed the nucleus of the new Native Children's Research Exchange, sponsored by the Society for Research on Child Development (SRCD), which is designed to foster research on AI/AN children's development over the first two decades of life. Finally, the Co-Principal Investigator for the AI/ANHSRC, Dr. Paul Spicer, has been invited to serve on the board of Zero to Three, which will facilitate the dissemination of the AI/ANHSRC's work in infant and toddler service settings. The involvement of the AI/ANHSRC in these organizations will promote a national presence for the AI/AN Head Start research agenda.

Part III

A PLAN FOR CARRYING OUT SECTION 649(k)(1)(B)-(D):

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[2] Pianta, Robert C., La Paro, Karen M., and Hamre, Bridget K.,. *Classroom Assessment Scoring System (Class) Manual, Pre-K*. Baltimore, MD: Paul H Brookes Pub Co., 2008.

[3] Barnard, K. (1978). Nursing Child Assessment Satellite Training (NCAST): Learning resource manual. (Available from NCAST, University of Washington, Child Development and Mental Retardation Center, WJ-10, Seattle, WA 98195).

[4] Carter, Alice & Briggs-Gowan, Margaret. *Infant Toddler Social-Emotional Assessment (ITSEA)*. San Antonio, TX: Pearson Education, Inc., 2005.

To address the requirement to accurately determine the number of children nationwide who are eligible to participate in AI/AN Head Start programs each year and to document how many of these children are receiving Head Start services each year; the Administration for Children and Families contracted with National Opinion Research Center (NORC) to propose an initial estimation methodology. The following plan details the population of interest for AI/AN Head Start, lays out the process and criteria that will be used to assess the data sources, describes the data sources which have been examined and the results of the evaluation, and describes the proposed process for producing the estimates. Alternate methods that were examined also are described, along with the reasons they were not selected.

A. DEFINITION OF POPULATION OF INTEREST

The goal of the estimation process is to produce population estimates of the number of AI/AN children birth to age five who are eligible for the Indian Head Start program. Designation as an Indian Head Start program requires that the grantee must be affiliated with a Federally-recognized tribe and at least 51 percent of the children must fall at or below the Federal poverty level. Therefore, eligible children must be affiliated with a Federally-recognized tribe and living on or near Reservations.

For purposes of producing these estimates, we assume the following definitions.

1. Affiliated with a Federally-recognized tribe is defined as self-reported affiliation with 1 of the 562 AI/AN tribes officially recognized by the Federal Government. Though we recognize some children may be affiliated with a State-recognized tribe, for the purposes of the current estimate only Federally-recognized tribes at the time of the estimate will be included in the count. However, as a practical matter, these kinds of data are not available and self-reported AI/AN racial identification will be used.[5] We include any child whose reported race is AI/AN, either alone or in combination with other races.

2. Living on or near a reservation is defined as residence on or in a county adjacent to a recognized American Indian Reservation.[6] Specifically, we use the Indian Health Service (IHS) definition of on or near a reservation, which includes the counties served by the IHS Contract Health Service Delivery Areas, or CHSDAs.[7] We refer to these groups as *county clusters*.

B. GENERAL ESTIMATION APPROACH

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[5] Tribal affiliation is asked as part of the Census, but 20% of AI/AN respondents do not list a tribe, and the data are generally considered unreliable.

[6] The Census Bureau recognizes AIRs (American Indian Reservations) as Territory over which American Indians have primary governmental authority. These entities are known as Colonies, Communities, Pueblos, Rancherias, Ranches, Reservations, Reserves, tribal towns, and Tribal Villages. The Bureau of Indian Affairs (BIA) maintains a list of Federally-recognized Tribal Governments.

[7] The list of CHSDAs we use comes from, "Geographic Composition of the Contract Health Service Delivery Areas (CHSDA) and Service Delivery Areas (SDA) of the Indian Health Service" 72 *Federal Register* 119 (21 June 2007), pp. 34262 - 34267.

There are three primary characteristics that define the eligible population that is the object of this estimation process:

1. Children ages five and under of American Indian or Alaskan Native ancestry;
2. And who live on or near a Reservation;
3. And at least 51 percent of the age- and race-eligible children fall at or below the Federal poverty level.[8]

Therefore, the basis for these estimates is a count for each county cluster defined above that enumerates all AI/AN children ages five and under that fall above and below the Federal poverty level.

To produce these counts, we employ several data sources that in combination produce the most accurate and up-to-date estimates feasible. Unfortunately, no single source of data contains all the elements needed to estimate the eligible population, with the possible exception of the U.S. Census. The 2000 Census data have disadvantages (primarily that they will be nine years out of date when the estimates are produced) that make it desirable to employ multiple data sources.

C. EVALUATION CRITERIA FOR DATA SOURCES

ACF has evaluated each data source in comparison to the criteria described above. The criteria are chosen in order to provide guidance as to the benefits and limitations of each source, as well as guidance in using the sources in the estimation process. Because a multi-year recommendation will be made on which data sources to use, the data sources employed in the first year may change in later years, although the initial emphasis is on the first year.

D. PRECISION

One of the key criteria for each data source is the precision of the estimates that can be produced with the data. Our estimation methodologies are based on statistical models and data derived from the Census Bureau and other administrative sources detailed in Section H of Part III of this report. The accuracy of the estimates will be limited by the accuracy of the assumed models and by the error structure of the various data inputs. We attempt to provide a description of all of the known limitations in the estimates.

E. GEOGRAPHIC REPRESENTATION

Although some data sources under consideration can provide estimates at the national level, there are others, such as State data sources, which are representative of a smaller geography. It is

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[8] The eligibility requirements for an Indian Head Start program are more complex than the 51% rule, and include provisions for non-AI/AN children who meet the low-income guideline, children with disabilities, and others. However, producing estimates that account for all these possibilities is outside the scope of this estimation. A complete assessment of eligible children would require data that do not currently exist, and thus we are forced to draw a compromise between the text of the law and what data are available. As a result, we define eligibility based only on the AI/AN population, according to income.

necessary to assess the scope and completeness of geographic coverage of each data source, as well as what levels of sub-geography are available. In addition, the desired geographic units of analysis must be determined in conjunction with the achievable precision.

F. COVERAGE

Data sources have different rates of coverage of the target population, not only by geography, but in subgroups based on important demographic characteristics, such as low-income, urban/rural, or others. We evaluate each data source, with particular attention to any issues that may arise due to insufficient coverage of crucial subgroups within the population.

G. TIMELINESS

Data sources are updated on different schedules, some annually and others much less frequently. The more recently updated data sources may be preferred to more outdated sources, even if their estimates may be less precise. For example, the schedule of updates for each data source will guide us as to when and how they may be employed not only in the first year, but in the future during the five years the plan will cover. There also will be implications for precision and coverage for some sources as additional years of data become available.

H. DATA SOURCES

As part of the evaluation process each of the following data sources was reviewed against the criteria listed above. A description is presented of each data source and the results of the evaluation:

1. **Census** - The decennial Census is the premier source of population data for the United States. It has been used successfully in past Census studies of the AI/AN population and provides the highest levels of precision and coverage available. The data gathered on the Census long form also allow estimates of children by income to be constructed, and thus the estimates could in principle be constructed from the Census data alone.

   The Census data suffer from one primary drawback that leads us to consider alternate approaches. The data which are currently available date from 2000, which will make them nearly nine years out of date at the time the first estimates will be produced. To produce more up-to-date numbers the data would require substantial adjustment to account for changes over time. This is especially challenging given the young age of the target population. Data from the 2010 Census will start to become available in 2011 but the detailed data files needed for the estimation may not be available until 2012 or later.

2. **American Community Survey** - The American Community Survey (ACS) is a new survey conducted by the U.S. Census Bureau. This survey uses a series of monthly samples to produce annually updated data for the same small areas (Census tracts and block groups) as the decennial census long form sample formerly surveyed. Initially, five years of samples are required to produce these small area data. Once the Census Bureau has collected five years of data, new small area data are produced annually.

Five-year period estimates will be available in 2010 for areas down to the smallest block groups, census tracts, small towns and rural areas. Beginning in 2010, and every year thereafter, the Nation will have a five-year period estimate available as an alternative to the decennial census long form sample, a community information resource that shows change over time, even for neighborhoods and rural areas.[9]

As the American Community Survey is designed to provide estimates comparable to the Census, the data collected contain all the elements necessary to produce the desired figures for the target population. In principle, the ACS could be used as the only data source, but currently the five-year estimates are not available. There are other drawbacks that lead us to consider using the ACS in conjunction with other sources. These sources are described below, along with an assessment of their strengths and limitations.

3. **Vital Statistics** - A technique that has been used on other studies that concern populations of young children requires the use of National Center for Health Statistics (NCHS) vital statistics data on births. This allows up-to-date estimates of age-eligible children based on births, with adjustments for deaths and estimated migration in the AI/AN population.

   There are two chief advantages that the vital statistics data bring to the process. First, the data on births is in principle a complete census of all births in the U.S. and therefore is not subject to sampling variability. Second, the data are produced on an annual basis for the entire U.S., and thus can be updated in a timely fashion with an exact count of births.

   Natality data require adjustments to account for deaths, and possibly migration, to compute an accurate count of children within a certain age range in a geographic area. These adjustments take into account infant mortality, which also is reported in the NCHS vital statistics. Adjustments for migration after birth also are made, using estimates from the Census.

   Although the vital statistics data provide accurate counts of children, they contain no data on income, and thus cannot be used to compute all the figures necessary for the estimates. This limitation will be addressed in the detailed estimation methodology section described below.

4. **Program Information Report (PIR)** - The PIR data will be used only for computing the numbers of AI/AN children enrolled in Head Start programs. These data cannot be used to estimate the overall population of enrolled and eligible-but-not-enrolled children.

5. **Other Sources**

   a) Indian Health Service, National Patient Information Reporting System (NPIRS) - The Indian Health Service (IHS) gathers data on patients that make use of IHS services.

[9] Adapted from U.S. CENSUS BUREAU, *Design and Methodology,* American Community Survey, U.S. Government Printing Office, Washington, DC, 2006.

As part of our proposed estimation procedure, we employ IHS service catchment areas in the construction of the county clusters. This would suggest that IHS data may be useful in the estimation. However, our inquiries with IHS have indicated that household-level income is not a required field to be collected at the local level and the NPIRS does not receive income data from the local sites. Household-level income data would be necessary for the proposed analysis. It is possible that NPIRS data could supplement the vital statistics data in the age-eligible child counts, if the data provide sufficient coverage of the population.

b) Chickasaw Nation Tribal Census - In 2005 the Chickasaw Nation conducted a tribal census. Information of this kind is extremely valuable for studying specific tribes. However, for a nationwide estimation, it is difficult to incorporate one tribe-specific data source with other data for the rest of the nation. It would be impossible to assess the comparability of the data for the Chickasaw with the remainder of the U.S. Given that the goal is to produce national estimates, rather than tribal estimates, we recommend using a single source for all of the U.S. when possible. We will attempt to compare our estimates to those obtained from other sources, such as the Chickasaw census[10] where possible.

Part IV

DETAILED ESTIMATION METHODOLOGY

This section describes in detail ACF's recommended methodology for producing the estimates of the target population, including the data sources to be used, the method for combining the data, and the implementation of the eligibility rule. In estimating the number of AI/AN children, we recommend the methodology for estimating the number of age- and race-eligible children not living on or near a Reservation.

A. OVERVIEW

There are four primary tasks to perform in order to produce the estimates. They are:

1. Construct the geographic areas, or county clusters, that will be used;
2. Estimate the total number of AI/AN children under age six living in these areas;
3. Estimate the proportion of age-and race-eligible children living in these areas that meet the income criterion; and
4. Use these counts and the eligibility rule to compute the final estimates.

All steps of the estimation methodology assume that the target year of estimation is 2005 (the most recent year that data are available from all sources as of this writing). However, at the time

[10] The Chickasaw data can potentially be used for purposes of evaluating the population estimates we will produce for the corresponding county cluster.

the estimates are produced more recent data may be available. Adjustments to the procedure should be made to take advantage of the most recent data at the time the estimates are produced.

B. GEOGRAPHIC AREA

Construct geographic areas using Contract Health Delivery System Areas (CHDSA) definitions. The eligibility requirements for an Indian Head Start program include children living on or near a Reservation. As described in the definitions above, the Indian Health Service uses a similar definition for establishing their Contract Health Delivery System Areas by creating clusters of counties that include all or part of a Reservation, and any county or counties that have a common boundary with a Reservation. The same areas are used for the estimation process in order to account for programs that serve AI/AN children who do not live on or near a Reservation, such as in the Alaska Native Regional Corporations and the Oklahoma Tribal Statistical Areas.

The definitions used in this plan were published in the *Federal Register* on June 21, 2007, cited in footnote 7. Some areas overlap at the county level with more than one Reservation. In these cases, we combine the joint set of counties together into one county cluster.[11] For example, a simple cluster would consist of a set of counties linked to one reservation, such as the Poarch Band of Creek Indians, which are linked to Baldwin, AL; Escambia, AL; Escambia, FL; Elmore, AL; Mobile, AL; and Monroe, AL. An example of a more complex cluster is the overlapping areas of the Miccosukee Tribe (Broward, FL; Collier, FL; and Miami-Dade, FL) and the Seminole Tribe of Florida (Broward, FL; Collier, FL; Glades, FL; and Hendry, FL). Together these form one cluster of counties that includes Broward, FL; Collier, FL; Glades, FL; Hendry, FL; and Miami-Dade, FL.

Four States are included in their entirety as Contract Health Delivery System Areas: Alaska, Nevada, Oklahoma, and South Carolina as part of the Catawba Indian Nation area. California also is included in part as a separate area.

For the rest of the estimation process, all numbers are computed within county clusters, until the final national estimate is produced from the sum over all clusters.

C. ESTIMATE NUMBER OF AI/AN CHILDREN UNDER AGE SIX USING VITAL STATISTICS DATA

The number of children ages five and under of AI/AN descent in each county cluster is estimated using the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) vital statistics natality data, with a series of adjustments. The steps are:

1. Defining the Reference Period;
2. Counting Births (NCHS Vital Statistics Natality Data);
3. Adjustment for Infant Mortality (National Vital Statistics Reports); and

[11] It is possible in these instances that more than one Head Start program provides services in these areas, but for purposes of the estimates they are treated as a group. As the final estimates are at the national level, this doesn't pose any significant difficulties.

4. Adjustment for Migration between States (Public-Use Microdata Samples Data).

Each step is described in detail in this section.

1. Defining the Reference Period

   This step involves choosing the exact date at which child age will be determined and the corresponding range of birth dates to be included in the time period of estimation. For example, for the reference date of December 31, 2005 (the most recent Vital Statistics data available as of this writing), the range of eligible birth dates is from January 1, 2000 through December 31, 2005.

2. Counting Births

   Data on births is reported by the National Center for Health Statistics Division of Vital Statistics annually.[12] The number of AI/AN births nationally from 2000 through 2005[13] according to Vital Statistics data is:

   2000: 41,668
   2001: 41,872
   2002: 42,368
   2003: 43,052
   2004: 43,927
   2005: 44,813

   Data at the individual level are available from NCHS for all births, including county of mother's residence, mother's and father's race, and other demographic characteristics.[14] Following IHS definitions, we classify children as AI/AN based on either father's or mother's race including AI/AN on the birth certificate.[15]

   It is important to note that while we have information on the mother's residence at time of birth, we assign births based on place of birth because the Census data only has place of birth, and does not have mother's residence. Therefore, the migration adjustment described below is a combination of switching from place of birth to mother's residence and the migration of one resident State to another.

3. Adjustment for Infant Mortality

   In order to account for infant mortality, the birth counts are first adjusted using one-year infant mortality rates for the AI/AN race/ethnicity group within each State.[16] The most recent rates are available from Table 3 of Infant Mortality Statistics from the 2004 Period

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[12] The representative figures reported here are from tables available from the VitalStats reporting system, *Centers for Disease Control and Prevention. National Center for Health Statistics. VitalStats.* http://www.cdc.gov/nchs/vitalstats.htm. [07/22/2008].
[13] For the reference year of 2005, these years form the range of birthdates of all children ages five and under.
[14] Data including geographic identifiers have restricted access and require special agreement with NCHS to obtain. For more details, see http://www.cdc.gov/nchs/about/major/dvs/NCHS_DataRelease.htm.
[15] This definition attempts to avoid undercounting AI/AN children, at the suggestion of Angela Willeto.
[16] The State level is the most detailed level of reporting for these statistics that is available.

Linked Birth/Infant Death Data Set. National Vital Statistics Report (NVSR) Volume 55, Number 14. 33 pp. (PHS) 2007-1120.

These rates are applied to the counts of births. However, this is an overestimate of the survivors to age five because it does not consider deaths between age one and age five. In order to account for this, adjustments are made by year up to age five.[17] The most recent rates come from Table 1 of United States Life Tables, 2004. NVSR Volume 56, Number 9. 40 pp. (PHS) 2008-1120.

4. Adjustment for Migration between States

To account for migration, ACF used State of birth to estimate migration between States. This adjustment, however, necessarily combines migration with an adjustment for babies born in a different State from the mother's residence because the births were assigned based on mother's residence, but the Census Public Use Microdata Samples (PUMS) data only contains State of Birth. The State with the largest percentage gain is Rhode Island (+ 6.48%). At the bottom, Washington, D.C. loses the highest percentage (- 9.20%), partially due to the fact that Washington, D.C. has hospitals with many Maryland and Virginia births.

D. ESTIMATE PROPORTION OF CHILDREN IN DIFFERENT INCOME GROUPS USING ACS/CENSUS

Once the counts of AI/AN children in the appropriate age range are computed, they must be allocated into two groups above and below the Federal poverty level.[18] Direct computation of these figures is not possible since income information is not available from the Centers for Disease Control and Prevention's Vital Statistics. Here we describe how these groups are allocated.

The ACS Public Use Microdata Samples are used to produce estimates of the proportion of AI/AN children living in families at or below the Federal poverty level. These data are available at the Public Use Microdata Area, or PUMA level, which can be mapped to counties using the PUMS Equivalency files.[19] PUMS data allows the researcher to create custom tabulations of

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[17] These rates are available only at the national level for all races combined.

[18] The income guidelines that determine eligibility for Head Start are complex. For example, Section 645(a)(3)(A) of the Head Start Act requires that certain types of pay and allowance to members of the uniformed services not be counted as income for purposes of determining Head Start eligibility. In addition, under 37 U.S.C. 402a(g), the child or spouse of a member of the armed forces receiving a "supplemental subsistence allowance" who, except on account of such allowance, would be eligible to receive a service provided under the Head Start Act, shall be considered eligible for such benefits notwithstanding the receipt of the allowance. Likewise, the definition of family used in the guidelines has several complexities that make exact implementation difficult. Due to limitations in the data that are available regarding income, we use family income to divide children into the two groups, above and below the Federal poverty level.
For further explanation, see the *2008 Family Income Guidelines.* ACF-IM-HS-08-05-R. HHS/ACF/OHS. 2008 (http://eclkc.ohs.acf.hhs.gov/hslc/Program Design and Management/Fiscal/Program Management/Management Systems Procedures/resour_ime_005_020508.html).

[19] Each PUMA has a minimum population of 100,000; as a result there are PUMAs which contain more than one county and counties with more than one PUMA. For example, Cowlitz County, Washington is part of a PUMA that also includes Klickitat, Skamania, and Wahkiakum counties; in contrast Miami-Dade County, Florida consists of 12

information that are not published by the Census Bureau in standard reports.[20] When the multi-year data become available, ACF will include them in the estimates in order to increase precision.

Using the PUMA Equivalency files, PUMAs are grouped into the defined county clusters. The records are limited to AI/AN children age five and under. Using the family income, State of residence, and family size, we assign the children to the two groups.[21] ACF can then compute the proportion of children in each cluster that fall in the low-income group. This proportion is used in the next step.

E. COMBINE ESTIMATES AND COMPUTE ELIGIBLE CHILD COUNTS USING ELIGIBILITY RULE

The proportions derived from the ACS data are multiplied by the counts of children computed from the vital statistics data to estimate the number of children in the low and high-income groups in each cluster. The total number of eligible children in each cluster is then estimated as:

$$E = \min\{L / 0.51, L / R\},$$

where

E = total estimated eligible children,
L = total estimated low-income children,
H = total estimated high-income children, and
$R = \dfrac{L}{L+H}$.

The logic of the formula is that Head Start guidelines specify that at least 51 percent of children served by the program must meet the income eligibility guideline, and therefore the maximum number of children that could be served must be no more than the number of low-income children divided by 0.51, or the number of all AI/AN children, whichever is less.[22]

Part V

STRENGTHS AND LIMITATIONS OF THE METHODOLOGY

PUMAs. In instances where multiple counties are part of one PUMA, we will allocate children according to the proportion of AI/AN age-eligible children in the county. Due to the small sizes of these counties, the proportions will most likely need to be taken from the 2000 Census. We expect the number of counties for which this adjustment needs to be made will be small.

[20] As an additional option, we will attempt to obtain clearance from the Census Bureau to access restricted data files for the ACS. These data permit the tabulation of data at levels lower than the PUMA, and thus more closely match the county clusters, especially for small counties. Due to the time required to obtain clearance and the potential impact to the delivery schedule, we include this as an option. This option was added at the suggestion of Matthew Snipp.

[21] The income guidelines for the reference year of 2005 are found in *Head Start Family Income Guidelines for 2005.* ACYF-IM-HS-05-01. DHHS/ACF/ACYF/HSB. 2005.

[22] As noted above, this rule is more simplistic than the guidelines actually allow. However, given the data that are available this is a reasonable simplification.

Due to the complexities of the rules and regulations that govern Head Start eligibility and the exact nature of what data are available, this plan makes some difficult choices in both what data sources to employ and how they are used. Both the strengths and limitations of the plan are discussed here, while Part VI provides an overview of alternatives considered.

A. STRENGTHS

The estimation plan described in this document has several key benefits that cause us to recommend it above the alternatives. First, it provides the best achievable combination of accuracy, coverage, and timeliness in the estimation of the number of children of AI/AN descent in the U.S. Because the NCHS Vital Statistics natality data are a census of all births in the U.S., they represent the definitive source of data for young populations. The natality data also are more up-to-date than alternatives such as the Census.

Second, by using the ACS it allows a very accurate estimate of the income distribution of families with AI/AN children in specific geographic areas, yet unlike the Census is updated on an annual basis. By design, the ACS is rapidly becoming the primary source of demographic data for researchers, particularly when dealing with areas below the State level. Continued data collection will allow for even more precise estimates in the future as additional multi-year data become available.

A further strength of this approach is the close alignment of the county clusters with the Indian Health Service service areas. This method provides both a recognized way of identifying areas where Indian services are provided and avoids complexities associated with areas such as Alaska and Oklahoma, where defining Reservations is difficult.

A fourth consideration in its favor is that it is based on publicly available data sources, and thus brings a measure of transparency to the estimation process. Thus stakeholders will be confident that the estimates are reasonable and can be replicated.

An additional strength is that the multi-stage estimation method allows the substitution of other data, specifically the 2010 Census, in circumstances when superior data become available. Because the estimation relies on analytical units that are well-defined in Census data sources, it is straightforward to substitute 2010 Census data for the ACS to estimate the income distribution, for example, in the future.

B. LIMITATIONS

Any estimation method that could be chosen will suffer from some drawbacks as well as advantages and although the recommended strategy is sound and defensible, the following points warrant consideration:

1. The NCHS Vital Statistics natality data has the advantage of being a census, rather than a sample, of births, but the mortality statistics used to adjust the population counts are reported based on rates, rather than counts of actual deaths, with the exception of the first year of life. In addition, the best rates available are at the State level for all races, and

2. A limitation that arises from using ACS data is that sampling variability is introduced, since the ACS by design is a sample survey. This limitation is true of nearly all data we might employ with the exception of the Census, but as a practical matter up-to-date estimates even from the Census will require adjustments that introduce similar variation. As a consequence of the ACS sample design, the mapping from PUMA to county is not exact in some cases, particularly when sparsely populated counties are combined into a single PUMA.

3. One final limitation to consider is that the estimates are produced from multiple sources of data; population counts from the vital statistics and income distributions from the ACS. All else being equal, it would be preferable to estimate these from a single source. In principle this could be done entirely with the Census or the ACS but we believe the benefits in terms of timeliness and precision outweigh the costs. See below for a further discussion of these approaches.

C. CALCULATIONS OF THE ESTIMATES

The specific formula for the calculations of the estimates can be found in the Appendix B.

Part VI

ALTERNATE PLANS CONSIDERED

In devising this plan we considered several alternative strategies, which are discussed here.

A. CENSUS DATA AT ALL STAGES

Because of the sheer size and scope of the decennial Census, it is a natural choice for consideration as the primary data source for the estimates. Using the Census PUMS data it would be possible to directly compute the estimated counts of children within each income group, and thus from there the eligible population. However, given the data collection schedule of the Census, it is difficult to produce estimates for any given point in time in the intercensal years without relying on the Census Bureau population projections and adjustments, most of which are not produced at the fine level necessary for this estimation. Past experience also has shown that these projections tend to undercount the number of Indians in the population.[23] These considerations in conjunction with the young age of the population lead ACF to propose the use of Vital Statistics data instead.

B. ACS DATA AT ALL STAGES

[23] See IHS Statistical Note Number 1, *American Indian and Alaska Native Population Figures Used by the Indian Health Service.*

Similar to the Census, the ACS PUMS data contain all the elements necessary to produce the estimates. However, although they are produced in a more timely way than the Census, the actual counts obtained from the ACS are adjusted using the intercensal population estimates produced by the Census Bureau. This is done to adjust the ACS sample estimates to match the population estimates using population weights. The implication of this is that although proportions calculated from the ACS are accurate (for example, based on income), the population counts are based on population estimates and suffer from similar drawbacks.

In addition, the ACS data are collected annually, but due to the sample design, estimates are available for small geographic areas only by combining multiple years of data. These multi-year figures are therefore a kind of "moving average" of the area, spread over three or five years for the smallest areas. As a result, although the data are more up-to-date than the 2000 Census, they are less recent than they might first appear.

The Current Population Survey (CPS) is another commonly used source of demographic data, particularly on labor force characteristics. It includes data on race and income and thus is a potential source for income estimates. However, the CPS is not designed to collect reliable data at any level below the State, and even State data can suffer issues with precision. This limits the usefulness of the data for our estimates.

Part VII

NEXT STEPS

The next steps for this project are to facilitate the plan that has been proposed in this report as part of ACF's continued commitment to build upon current efforts to develop a successful research and evaluation agenda for AI/AN Head Start and to satisfy the requirements for an Indian Head Start Study as outlined in the Act. Specifically, there are two main objectives that will be carried out:

1. Complete the studies described in Part II of this report, and continue to develop the planned activities of the AI/ANHSRC; and

2. Conduct the annual population estimates described in Part III, beginning in 2009 and continuing through 2013.

Throughout all of these activities, ACF will consult and engage with stakeholders such as NIHSDA, AI/AN Head Start administrators, parents and tribal communities whenever possible. Results from these studies will be shared with the Congress, the early childhood research community, AI/AN Head Start programs, and interest groups.

Appendix A

Comments from Consultants

NATIONAL INDIAN HEAD START DIRECTORS ASSOCIATION
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December 4, 2008

Ms. Anne Bergan
Office of Planning, Research and Evaluation
Administration for Children and Families
370 L'Enfant Promenade, S.W.
Washington, DC 20447

Sent via email to abergan@acf.hhs.gov

Dear Anne,

Thank you for inviting comments on these very important studies. NIHSDA has advocated for a research agenda that addresses AIAN Head Start and Early Head Start issues and concerns for building quality early childhood programming in "Indian Country" for over 10 years. As a result of the new legislation we are excited to see ACF's beginning research efforts as articulated in the Federal Register dated September 24, 2008. The following are our supportive comments for your consideration as the Office of Planning, Research and Evaluation moves forward on the "Indian Head Start Study:"

Section I. A Plan for Carrying Out Section 649 Subsection (K) Paragraph (1) Subparagraph (A).

NIHSDA concurs with the continued support and work with the AIANHSRC. The Center has worked well with NIHSDA and current and former board members serve on the Center's advisory committee. Paul Spicer, Ph.D., has a good understanding of AIAN Head Start programs, and under his leadership he has been open and inclusive regarding approaches to research in diverse native communities. Nevertheless, NIHSDA believes that the work underway and planned by the AIANHSRC is preliminary, and while the work accomplished by the AIANHSRC is extremely important, none of the studies outlined in the Federal Register definitively address the questions suggested in the Head Start School Readiness Act of 2007.

- The topics of utmost priority are culturally appropriate curricula and examples of best practice and would concur with the activities described in the "Curriculum Development" sub-section in the Federal Register page 55099.

- In the “Professional Development” sub-section the studies now going on at the three universities seem appropriate and should begin to show best practice techniques for staff qualifications.

- The research that has begun in the “Availability and Needs for Services” sub-section appear to be appropriate and should be continued.

- In the “Appropriate Research Methodologies and Measures” sub-section NIHSDA is pleased that Congress and OHS have finally realized that over 3% of the children and families served by Head Start nationwide have almost always been left out of any type of study on assessing needs of the AIAN population. The studies that are proposed appear to be in line with today’s Head Start. We would like to suggest that findings from these studies be written so they are understandable by all that read them and that they are not just filled with statistical information understood by professional researchers.

- In the “Plan for Dissemination” we would concur that the AIANHSRC website should be enhanced and kept very current. In addition NIHSDA suggest that a link between AIANHSRC and the Early Learning and Knowledge Center should be instituted. The broader early childhood development and education community must have researched based information on working with AIAN children.

Section II. A Plan for Carrying Out Section 649 Subsection (K) Paragraph (I) Subparagraphs (B-D).

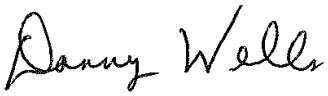
Since much of the Head Start and Early Head Start funding issues hinge on population estimates, this research is of the highest priority to NIHSDA members and federally recognized tribal government who have interest in providing comprehensive early childhood development and educational programs for their memberships.

How this study is conducted and reported is critical to the future of the expansion and funding for AIAN programs. It appears that you have researched a variety of ways to find the most current and accurate way to account for “eligible” AIAN children and families. NIHSDA understands that all data available have a risk of being under-reported and it is unclear how this will be adequately accounted for, it does appear that OPRE has used the best available data. Our question is why the Indian Health Services’ data is not projected to be used in the population study because this data provides estimates of the user population in specific service areas as defined in the Notice.

Thank you for accepting NIHSDA’s comments and suggestions regarding OPRE’s efforts. NIHSDA encourages you to stay on this path and consult with NIHSDA once you have determined which way you think would be the most accurate in counting for “eligible” children.

Thank you for your consideration and please know NIHSDA is extremely interested in these studies and is willing to help where appropriate. Please keep us included as you move forward on these studies.

Sincerely,



Danny Wells
NIHSDA President

Appendix B

Public Comments to the Federal Register Notice

From: Roxanne Burns [Roxanne@TheGreatBodyShop.net]
Sent: Monday, October 06, 2008 3:03 PM
To: Bergan, Anne (ACF)
Subject: Preschool curriculum for your study

Attachments: 09research proposal alaska native.doc

Hello Anne,

It was a pleasure speaking with your about possible opportunities to partner with you in your upcoming research project. I have attached a letter which summarizes our phone conversation last week. As we discussed, The Children's Health Market would be interested in discussing those possibilities further. I'll be interested in hearing from you after you have the opportunity to share the letter with your colleagues.

Sincerely,
Roxanne Burns
Director of Curriculum and Instruction
The Children's Health Market, Inc.
800-848-1958
Roxanne@TheGreatBodyShop.net

From: Bk1492@aol.com
Sent: Wednesday, September 24, 2008 8:00 AM
To: Bergan, Anne (ACF); americanvoices@mail.house.gov; info@taxpayer.net
Subject: public comment on federal register below

the taxpayers of this country believe this is wasteful spending. it is opposed. this project should be shut down and this agency should be downsized. theyve been "studying" for years with no apparent help for this country. their efforts at "study" are useless and wasteful. this is simply a runaway bureaucracy that needs sunset.

b. sachau
15 elm st
florham park nj07932

Appendix C

Calculations for the Precision of the Estimates

PRECISION OF THE ESTIMATES.

The counts produced at the first stage from the Centers for Disease Control and Prevention's Vital Statistics natality data are based on a complete census of all births in the US, and thus within the limitations of the data collection process are the actual numbers of AI/AN children and are not subject to sampling variation. Children under age 6 at the time of estimation will have been born within the defined reference period.

Let B_i denote the number of AI/AN births to mothers living in the *i*-th county-cluster during the reference period. Let B_{ia} be the number of AI/AN births to mothers living in the *i*-th county-cluster during year *a* of the reference period, with *a* coded as follows

a	Age of Child at the time of Estimation
1	Age < 1
2	1 ≤ Age < 2
3	2 ≤ Age < 3
4	3 ≤ Age < 4
5	4 ≤ Age < 5
6	5 ≤ Age < 6

Note that $B_i = \sum_{a=1}^{6} B_{ia}$.

Let d_{ia} be the death rate to AI/AN children in the *i*-th county cluster in the *a*-th year of life, for *a* = 1, …, 6. Let I_{ij} be the number of survivors at the reference date among AI/AN children who lived in county cluster *j* at birth and now live in county-cluster *i* at the reference date (the in-migrants). And let O_{ij} be the number of survivors at the time of estimation among eligible children who lived in county cluster *i* at birth and now live in county-cluster *j* at the reference date (the out-migrants).

Let C denote the set of county-clusters that represent areas on or near Reservations. Define one additional county-cluster for each State (except for AK and OK) that represents all other counties in the State not on or near reservations. And let U be the union of C and these rest-of-State pieces, or in other words, let U be the set of all areas in the U.S.

Then, by definition, the total number of AI/AN children age under 6 living in the *i*-th county-cluster, for $i \in U$, is given by

$$N_i \equiv \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - d_{ib}) + \sum_{j \in U} I_{ij} - \sum_{j \in U} O_{ij} \ ,$$

or more simply N_i = survivors among births in the county-cluster plus in-migrants less out-migrants.

Earlier in this report we outlined a demographic-analysis procedure for estimating the number of children in the population. Our procedure is equivalent to the expression

$$\hat{N}_i = \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - \hat{d}_{ib}) + \sum_{j \in U} \hat{I}_{ij} - \sum_{j \in U} \hat{O}_{ij} \ ,$$

where births are known without error (or virtually without error) from the US Vital Statistics system, the death rates are estimated, the numbers of in-migrants are estimated, and the numbers of out-migrants are estimated. There is error in the estimated population size by virtue of error in the estimated death rates and error in the estimated counts of in- and out-migrants.

The estimated death rates are obtained from the U.S. Centers for Disease Control and Prevention, National Center for Health Statistics, Vital Statistics system. Because all deaths are registered in this country, death rates are not subject to sampling error. In the procedure, ACF uses death rates calculated at the State by race/ethnicity level. Error in the estimated death rates arises because the AI/AN specific rates are calculated at the State level and then applied at the county-cluster level within State. Individual county-clusters may experience a higher or lower death rate than the State in which they are located, resulting in some over or under-estimation of the population in the county cluster. Because infant mortality is relatively low and rates do not vary extensively from cluster to cluster, ACF expects this component of error to be relatively small.

The estimated numbers of in-migrants are derived from registered births and from estimated migration rates derived from the American Community Survey (ACS). The estimator is of the form

$$\hat{I}_{ij} = B_j \hat{m}_{ij} \ ,$$

where $\hat{m}_{ij}$ is an estimator derived from ACS data of the rate of migration from county-cluster *j* to county cluster *i*. The ACS data are based upon a sample, not a complete enumeration. Moreover, because of ACS sample size limitations, ACF estimates the migration rate at a higher level of aggregation than the county-cluster level. Thus, the estimated numbers of in-migrants are subject to both sampling error and error due to failure of the "synthetic" assumption.

The estimated numbers of out-migrants are obtained similarly as

$$\hat{O}_{ij} = B_i \hat{m}_{ji} \ ,$$

and are similarly subject to sampling error and error due to failure of the synthetic assumption.

It is worth noting that the main goal of the estimation is to obtain an estimate of the number of AI/AN children under 6 for the aggregate set of areas that are on or near Reservations. The goal is not strictly to estimate the number of children at the county-cluster level. Indeed, at the national level, the numbers of in-migrants must equal the numbers of out-migrants, except for deviations due to international migration, which are likely to be trivially small for the AI/AN population. Thus, at the national level, ACF can write the number of AI/AN children under 6 as

$$N_U = \sum_{i \in U} N_i = \sum_{i \in U} \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - d_{ib}) + \sum_{i \in U} (\sum_{j \in U} I_{ij} - \sum_{j \in U} O_{ij}) = \sum_{i \in U} \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - d_{ib}) \ .$$

For the aggregate set of areas on or near Reservations, the population size is

$$N_C = \sum_{i \in C} \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - d_{ib}) + \sum_{i \in C} (\sum_{j \in U} I_{ij} - \sum_{j \in U} O_{ij}) =$$

$$\sum_{i \in C} \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - d_{ib}) + \sum_{i \in U} (\sum_{j \in U} I_{ij} - \sum_{j \in U} O_{ij}) - \sum_{i \in C^c} (\sum_{j \in U} I_{ij} - \sum_{j \in U} O_{ij}) = ,$$

$$\sum_{i \in C} \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - d_{ib}) - \sum_{i \in C^c} (\sum_{j \in U} I_{ij} - \sum_{j \in U} O_{ij})$$

and the corresponding estimator is

$$\hat{N}_C = \sum_{i \in C} \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - \hat{d}_{ib}) + \sum_{i \in C} (\sum_{j \in U} \hat{I}_{ij} - \sum_{j \in U} \hat{O}_{ij}) =$$

$$\sum_{i \in C} \sum_{a=1}^{6} B_{ia} \prod_{b=1}^{a} (1 - \hat{d}_{ib}) - \sum_{i \in C^c} (\sum_{j \in U} \hat{I}_{ij} - \sum_{j \in U} \hat{O}_{ij}) ,$$

where C^c is the set of areas that are not on or near Reservations and $U = C \cup C^c$.
Thus, error in the estimate of the population in the aggregate set of areas on or near Reservations is due to error in the estimated death rates and error in the estimated net migration into areas that are not on or near Reservations. While migration in or out of any one county cluster may be nontrivial, the net migration into the aggregate of clusters that are not on or near Reservations is likely to be quite small.

The income proportions estimated from the ACS are subject to sampling variability, as the ACS is a sample survey. This variation can be estimated using standard statistical techniques when the estimates are produced and will be included with the final estimates.