Timeliness of Childhood Vaccinations in Yap State, Federated States of Micronesia (FSM), 2006/2008

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Objectives

- Describe vaccination coverage in Yap State, Federated States of Micronesia (FSM)
- Explain the importance of including timeliness in assessment of vaccination coverage
- Discuss what can be learned about the population and immunization program from measuring timeliness of vaccination
Presentation Outline

I. Introduction
II. Survey Methods and Key Outcomes
III. Results
IV. Discussion
V. Recommendations
VI. Acknowledgements
INTRODUCTION
Yap State

Yap Proper and Neighboring Islands

Yap Proper


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Yap State

- **Yap State Vaccination Program**
  - **Yap Proper**
    - Vaccinations administered by the public health center and community health centers (CHCs)
    - CHC workers bring in children due for vaccination
    - Radio announcements remind parents to bring children in for vaccines
  - **Neighboring Islands:**
    - Vaccination visits several times a year by surveillance ship
  - Vaccines procured through the Centers for Disease Control and Prevention (CDC) and UNICEF
Federated States of Micronesia Childhood Immunization Schedule

- **DTaP** – diphtheria, tetanus, and acellular pertussis
- **Polio**
- **MMR** – measles, mumps, and rubella
- **HepB** – Hepatitis B
- **Hib** - *Haemophilus influenzae* type b
- **BCG** - tuberculosis

<table>
<thead>
<tr>
<th>Age</th>
<th>Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>BCG, HepB 1</td>
</tr>
<tr>
<td>2 Months</td>
<td>DTaP1, Polio1, HepB2, Hib1</td>
</tr>
<tr>
<td>4 Months</td>
<td>DTaP2, Polio2, Hib2</td>
</tr>
<tr>
<td>6 Months</td>
<td>DTaP3, Polio3, HepB3</td>
</tr>
<tr>
<td>12 Months</td>
<td>DTaP4, Polio4, MMR1, Hib3</td>
</tr>
<tr>
<td>13 Months</td>
<td>MMR2</td>
</tr>
<tr>
<td>School entry</td>
<td>DTaP5</td>
</tr>
</tbody>
</table>
Vaccination Assessment in Yap State, FSM


- Before 2005 used various methods, conducted sporadically, with limited time and resources

- In 2005, CDC began a new approach

- CDC, the FSM Immunization Program and Yap State Immunization Program conducted first survey in Yap
  - Yap Proper: 2006
  - Yap Neighboring Islands: 2008
Measuring Vaccination Coverage

- **Ways of defining “up-to-date” coverage**
  - Completion of all recommended doses regardless of the timing of vaccination
  - Timely completion: coverage at the recommended age
    - Were all doses of a vaccine given by the final recommended age?

- **Reasons for incorporating timeliness into vaccination coverage assessment**
  - Completion beyond the recommended age: doesn’t take timeliness into account
  - Timely completion identifies delays in vaccination that put children at risk of contracting vaccine-preventable diseases (VPDs)
METHODS AND KEY OUTCOMES
Survey Methods

- **Full census of Yap Proper and Yap Neighboring Islands (NI)**
  - Yap Proper: all households visited by survey staff
  - Yap NI: families gathered in central location for interviews

- **Eligibility for inclusion:**
  - Children 12–35 months or 6 years

- **Informed consent was given for interview and review of medical records**

- **Household, child, and maternal demographic information and shot card dates recorded**

- **Vaccines and dates of vaccination recorded from vaccination records**
Analytic Methods

- Coverage assessed in children 19 to 35 months using shot card and medical record combined (“combined record”)
- Demographic measures – Child, maternal, household
- Outcomes
  - Completion of 4 DTaP, 3 Polio, 3 HepB, 3 Hib, 1 MMR, 2 MMR (Yap State, Yap Proper Yap NI)
  - Completion by recommended age (Yap Proper and NI)
    - 4 DTaP – 12 months
    - 3 Polio – 12 months
    - 3 HepB – 6 months
    - 3 Hib – 12 months
    - 1 MMR – 12 months
    - 2 MMR – 13 months
  - Coverage with 4 DTaP and 1 MMR by age in months (Yap Proper and NI)
- Factors associated with not receiving any vaccine on time (Yap Proper Only)
Analytic Methods
Demographic Measures

- **Child**
  - Sex
  - Race/Ethnicity
  - Place of birth
  - Location of birth

- **Maternal**
  - Ethnicity
  - Age
  - Place of birth
  - Education level
  - Marital Status

- **Household**
  - Number of people living in household
  - Number of children in household
  - Income
  - Telephone service
Analytic Methods

- Coverage with 4 DTaP and 1 MMR by age in months
  - Cumulative percentage of children up-to-date at each month
  - No censoring for coverage beyond 19 months

- Factors associated with not receiving any vaccine on time (Yap Proper Only)
  - Significance of factors assessed using “24% Rule” (see Results section)

- All analyses completed using SAS v9.2
RESULTS
## Household and Population Information

<table>
<thead>
<tr>
<th></th>
<th>Yap Proper</th>
<th>Yap NI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Households Visited</td>
<td>1216</td>
<td>563</td>
<td>1779</td>
</tr>
<tr>
<td>Total Number of Children 19 to 35 Months</td>
<td>128</td>
<td>103</td>
<td>231</td>
</tr>
<tr>
<td>Shot Card</td>
<td>71</td>
<td>82</td>
<td>153</td>
</tr>
<tr>
<td>Vaccination Record</td>
<td>122</td>
<td>102</td>
<td>224</td>
</tr>
<tr>
<td>Combined*</td>
<td>125</td>
<td>103</td>
<td>228</td>
</tr>
</tbody>
</table>

*Number of children with either a shot card, medical record, or both*
### Demographic Characteristics of Children 19-35 Months, Yap Proper 2006 and Yap NI 2008

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>Yap Proper n=128</th>
<th>Yap NI n=103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>56% Male</td>
<td>58% Male</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>89% Yapese</td>
<td>&gt;90% Yapese</td>
</tr>
<tr>
<td>Born in Yap</td>
<td></td>
<td>&gt;90%</td>
</tr>
<tr>
<td>Hospital Birth</td>
<td>&gt;90%</td>
<td>70%</td>
</tr>
<tr>
<td>Mother’s Ethnicity</td>
<td>85% Yapese</td>
<td>&gt;90% Yapese</td>
</tr>
<tr>
<td>Mother Born in Yap</td>
<td></td>
<td>&gt;90%</td>
</tr>
<tr>
<td>Mother’s Age</td>
<td>~50% &lt;30 yrs</td>
<td></td>
</tr>
<tr>
<td>Mother’s Marital Status</td>
<td>81% Married/Living as Married</td>
<td>66% Married/Living as Married</td>
</tr>
<tr>
<td>Mother’s Education</td>
<td>62% high school graduates</td>
<td>~30% high school graduates</td>
</tr>
<tr>
<td>Demographic Characteristic</td>
<td>Yap Proper n=113</td>
<td>Yap NI n=94</td>
</tr>
<tr>
<td>----------------------------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Number of Household Members</td>
<td>62% 5 to 10 members</td>
<td>72% 5 to 10 members</td>
</tr>
<tr>
<td>Number of Children in Household</td>
<td>58% Three or more children</td>
<td>74% Three or more children</td>
</tr>
<tr>
<td>Household Income</td>
<td>79% Subsistence or &lt; $10,000</td>
<td>85% Subsistence or &lt; $5,000</td>
</tr>
<tr>
<td>Household Telephone Service</td>
<td>48% Landline service 30% Cellular telephone only</td>
<td>90% No telephone service</td>
</tr>
</tbody>
</table>
Vaccination Coverage* among Children 19 to 35 Months† (Weighted), Yap State, 2006/2008

Healthy People 2010 Target: 90%

94% 95% 97% 99% 100% 96%

Healthy People 2010 Target: 90%

*Coverage defined as completion of all doses regardless of timing
†Combined record, n=228
Vaccination Coverage among Children 19 to 35 Months*, Yap Proper, 2006

Healthy People 2010 Target: 90%

- 4 DTaP: 94% Completion, 22% Timely Completion
- 4 Polio: 94% Completion, 30% Timely Completion
- 3 Hib: 95% Completion, 57% Timely Completion
- 3 HepB: 99% Completion, 62% Timely Completion
- 1 MMR: 99% Completion, 66% Timely Completion
- 2 MMR: 95% Completion, 38% Timely Completion

*Combined record, n=125
Vaccination Coverage among Children 19 to 35 Months*, Yap NI, 2008

Healthy People 2010 Target: 90%

*Combined record, n=103
Coverage with 4 DTaP and 1 MMR by Age of Vaccination, Yap Proper, 2006
Coverage with 4 DTaP and 1 MMR by Age of Vaccination, Yap NI, 2008

- 1 MMR
- 4 DTaP

Age of Vaccination in Months

Coverage (%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Coverage with 1 MMR by Age of Vaccination, Yap Proper 2006 and Yap NI 2008

- Yap Proper 2006
- Yap NI 2008
Coverage with 4 DTaP by Age of Vaccination, Yap Proper 2006 and Yap NI 2008
Factors Associated with Not Completing Any Vaccines on Time for Children 19 to 35 Month Olds, Yap Proper, 2006

- Challenges for analysis and interpretation of associated factors
  - Full census; therefore statistics not applicable
  - Small cell sizes
    - Differences in coverage may be due to other factors affecting cohort
    - Confidentiality of the data

- Solution: "24% Rule" – if cell sizes represent 24% of total number of children (n=30) for the levels of a demographic factor, differences in coverage are “significant”
Factors Associated with Not Completing Any Vaccines on Time for Children 19 to 35 Month Olds, Yap Proper, 2006

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>% Didn’t Receive Any Vaccine on Time</th>
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</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>69</td>
<td>11.6</td>
</tr>
<tr>
<td>Female</td>
<td>56</td>
<td>28.6</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Mother’s Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30</td>
<td>60</td>
<td>13.3</td>
</tr>
<tr>
<td>30 years or older</td>
<td>61</td>
<td>26.2</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION AND RECOMMENDATIONS
Discussion

- Most children receive all required vaccines, but vaccines are delayed
- Timely completion higher in Yap Proper; completion at interview date higher in Yap NI
- 90% 1 MMR coverage and 90% 4 DTaP coverage reached by same age in both Yap Proper and Yap NI
- Child’s sex and age of mother may be associated with delayed vaccination – target vulnerable groups for outreach
Discussion

- Delays may leave children vulnerable to VPDs
- All vaccines reach 90% U.S. Healthy People 2010 goal but do not meet timely completion recommendations
  - Measles – high population coverage with MMR required for preventing transmission
- Coverage targets should be reached sooner in Yap Proper, where children have regular access to vaccinations
Recommendations

- **Yap Proper**
  - Increase outreach visits to children due or overdue for vaccinations
  - Continue providing incentives to public health workers to increase outreach visits
  - Give vaccines on outreach visits
  - Ensure catch-up schedule is followed when children receive vaccinations late
  - Provide clinic and community-wide education on importance of vaccines and the vaccine schedule

- **Yap Neighboring Islands**
  - More frequent vaccination trips would likely improve timeliness of vaccination
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Thank You

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