Each year in the United States, an estimated 3,000 pregnancies are affected by neural tube defects (NTDs), including spina bifida (an incomplete closure of the spinal cord and spinal column) and anencephaly (severe underdevelopment of the brain).1,2 NTDs are among the most common birth defects that contribute to perinatal mortality, infant mortality, and serious disability in surviving children.2 Research indicates that daily consumption of 400 mcg of folic acid before pregnancy through the first trimester can reduce the occurrence of NTDs by 50%-70%, and some birth defects other than NTDs.1,2,3 Although folic acid can be obtained from foods rich in naturally occurring folates or fortifying foods, not all women obtain adequate levels of folic acid through their diets. Therefore, the United States Public Health Service (PHS) and Centers for Disease Control and Prevention (CDC) recommend that all women of childbearing age who are planning on or capable of becoming pregnant take a daily multivitamin, which generally contains the recommended daily allowance of 400mcg of folic acid, to reduce their risk of having a pregnancy affected with NTDs.3

The purpose of this report is to 1) describe the trends in daily use of multivitamins prior to pregnancy among Rhode Island women with a live birth, and 2) identify disparities in preconception multivitamin use among subpopulations.

**Methods**

Data from the Rhode Island Pregnancy Risk Assessment Monitoring System (PRAMS) were analyzed to assess the multivitamin use prior to pregnancy in Rhode Island. PRAMS, a surveillance project of the CDC and state health departments, collects state-specific, population-based data on maternal behaviors and experiences before, during, and after delivery of a live infant.4 The PRAMS sample of women who have had a recent live birth is drawn from the state's birth certificate file.4 Rhode Island has participated in PRAMS since 2002, and about 1,400 recent mothers respond to the survey each year.

---

**Figure 1. Trends in Daily Use of Multivitamin prior to Pregnancy among Rhode Island Women with a Live Birth, 2002-2009.**

**Figure 2. Multivitamin Use prior to Pregnancy among Rhode Island Women with a Live Birth, 2004-2008.**
The 2002-2009 PRAMS data were analyzed to assess the trends of daily multivitamin use in Rhode Island and the 2004-2008 aggregated data were analyzed to identify disparities among subgroups.

Multivitamin use prior to pregnancy was assessed using a survey question, “During the month before you got pregnant with your new baby, how many times a week did you take a multivitamin or a prenatal vitamin? These are pills that contain many different vitamins and minerals.” The response categories included were 1) I didn’t take a multivitamin or a prenatal vitamin at all, 2) one to three times a week, 3) four to six times a week, and 4) every day of the week. To identify disparities among subpopulations, the proportion of women who used a daily multivitamin was examined by selected characteristics, such as maternal age, ethnicity, race, education, annual household income, marital status, health insurance type before pregnancy, parity, WIC (the Special Supplemental Nutrition Program for Women, Infants, and Children) participation status, and pregnancy intendedness.

Data analyses were performed using survey data analysis (SUDAAN) software, which accounts for the complex sample design of the survey. The trend was examined using logistic regression analysis with linear trend test and the disparities among subgroups were examined using the chi-square tests. All unknown and missing responses were excluded from the analysis.

**RESULTS**

**Trends in Daily Use of Multivitamin prior to Pregnancy**

Between 2002 and 2009, the proportion of Rhode Island women who reported daily use of multivitamins prior to pregnancy fluctuated somewhat, ranging from 32.0% (95% CI: 29.1%-35.0%) to 36.7% (95% CI: 33.9%-39.7%). However, a statistical test for linear trends revealed that the proportion did not significantly improve during those periods (p = 0.8672). (Figure 1) Rhode Island’s rates for daily use of multivitamins prior to pregnancy fell far below the Healthy People 2010 objective of 80%.

**Prevalence of Multivitamin Use prior to Pregnancy**

Among Rhode Island women with a live birth during 2004-2008, 51.8% (95% Confidence Interval: 50.4%-53.2%) reported not taking a multivitamin at all prior to conception, 7.1% (95% CI: 6.4%-7.8%) reported taking one to three times per week, and 6.4% (95% CI: 5.7%-7.7%) taking four to six times per week. About one third of Rhode Island recent mothers (34.7 %, 95% CI: 33.4%-36.1%) reported taking a multivitamin daily as recommended by the PHS and CDC. (Figure 2)

**Daily Multivitamin Use by Selected Characteristics**

The 2004-2008 aggregated data shows that the percentage of women who took a daily multivitamin prior to pregnancy varied significantly by socio-demographic characteristics. Mothers who were older than 30 years (46.2%), Non-Hispanic (36.3%), White (36.1%), Asian or Pacific Islander (37.6%), married (44.0%), and non-WIC participants (43.8%) were more likely to report daily use of multivitamins, compared to their counterparts. Mothers who had more than a high school

---

<table>
<thead>
<tr>
<th>Table 1. Prevalence of Daily Multivitamin Use Prior to Pregnancy by Selected Characteristics, Rhode Island, 2004-2008 PRAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Size</strong></td>
</tr>
<tr>
<td><strong>Overall</strong></td>
</tr>
<tr>
<td><strong>Maternal Age</strong></td>
</tr>
<tr>
<td>&lt; 20</td>
</tr>
<tr>
<td>20-24</td>
</tr>
<tr>
<td>25-29</td>
</tr>
<tr>
<td>≥ 30</td>
</tr>
<tr>
<td><strong>Maternal Ethnicity</strong></td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Non-Hispanic</td>
</tr>
<tr>
<td><strong>Maternal Race</strong></td>
</tr>
<tr>
<td>White</td>
</tr>
<tr>
<td>Black</td>
</tr>
<tr>
<td>American Indian</td>
</tr>
<tr>
<td>Asian/Pacific Isl.</td>
</tr>
<tr>
<td><strong>Maternal Education</strong></td>
</tr>
<tr>
<td>&lt; High School</td>
</tr>
<tr>
<td>High School</td>
</tr>
<tr>
<td>&gt; High School</td>
</tr>
<tr>
<td><strong>Household Income</strong></td>
</tr>
<tr>
<td>&lt;$25K</td>
</tr>
<tr>
<td>$25K - &lt;$50K</td>
</tr>
<tr>
<td>≥ $50K</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
</tr>
<tr>
<td>Married</td>
</tr>
<tr>
<td>Not married</td>
</tr>
<tr>
<td><strong>Insurance before Pregnancy</strong></td>
</tr>
<tr>
<td>No Insurance</td>
</tr>
<tr>
<td>Public</td>
</tr>
<tr>
<td>Private</td>
</tr>
<tr>
<td><strong>Parity</strong></td>
</tr>
<tr>
<td>1st Born</td>
</tr>
<tr>
<td>2nd or Higher</td>
</tr>
<tr>
<td><strong>WIC Participation</strong></td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td><strong>Pregnancy Intendedness</strong></td>
</tr>
<tr>
<td>Intended</td>
</tr>
<tr>
<td>Unintended</td>
</tr>
</tbody>
</table>


*Sample size in each category; unknown and missing categories were excluded.

*95% Confidence Interval.
education (44.5%), annual household incomes greater than $50,000 (50.5%), private health insurance (44.0%), a first born child (37.1%), and an intended pregnancy (44.5%) were also more likely to report daily use of multivitamins, compared to their counterparts. (Table 1)

**DISCUSSION**

The findings of this report clearly demonstrate that the majority of women in Rhode Island do not take a daily multivitamin prior to pregnancy, no progress was made during 2002-2009, and there are considerable disparities among subpopulations in multivitamin use.

Because NTDs occur within the first month after conception, before most women are aware of their pregnancy, and because nearly 40% of pregnancies in Rhode Island are unplanned, it is important for all women of childbearing age to get enough folic acid, not just those who are planning to become pregnant.³

The Rhode Island Department of Health’s Birth Defects Program is working with maternal and child health programs to educate women of reproductive age and health care providers about the importance of folic acid and multivitamin use. Specifically, the Birth Defects Program, with funding from the CDC, has purchased multivitamins for distribution to uninsured women who receive negative pregnancy tests at Title X funded family planning clinics. Additionally, the Program is working with the New England Birth Defects Consortium to distribute multivitamins to WIC participants at selected clinics in Rhode Island.

Health care providers can play a critical role in educating women of childbearing age about the importance of adequate folic acid consumption to reduce the risk of NTDs. They can incorporate information about folic acid into their health encounters with women of childbearing age.

**REFERENCES**


Hyun (Hanna) Kim, PhD is Senior Public Health Epidemiologist in the Center for Health Data and Analysis, Rhode Island Department of Health, and Clinical Assistant Professor in the Department of Community Health, The Warren Alpert Medical School of Brown University.

Rachel Cain, BA is the PRAMS Program Coordinator in the Center for Health Data and Analysis, Rhode Island Department of Health.

Samara Viner-Brown, MS is Chief of the Center for Health Data and Analysis and Director of the Birth Defects Program at the Rhode Island Department of Health.

Mei-Fen Yang is a MPH candidate in the public health program at The Warren Alpert Medical School of Brown University.

**Disclosure of Financial Interests**

The authors and/or their significant others have no financial interests to disclose.

**CORRESPONDENCE**

Hyun (Hanna) Kim, PhD
Rhode Island Department of Health
3 Capitol Hill
Providence, RI 02908-5097
e-mail: hanna.kim@health.ri.gov