



Colorado Department
of Public Health
and Environment

Health Statistics Section

Alyson Shupe, Ph.D.,
Section Chief

Monica Clancy

Rickey Tolliver, M.P.H.

Patricia Holguin

Research and Evaluation Unit

Jodi Drisko, M.S.P.H.,
Director

Janelle Mares

Debra Tuenge

Chris Wells, M.S.

Survey Research Unit

Becky Rosenblatt, M.A.,
Director

Mark King

Kathleen Rice

Vital Statistics Unit

Mary Chase, Director

Kirk Bol, M.S.P.H.

Juanita Galvan

4300 Cherry Creek Drive South
Denver, Colorado 80246-1530
(303)692-2160
(800)886-7689

health.statistics@state.co.us
www.cdph.state.co.us/hs/

Knowledge and Consumption of Folic Acid: Working to Reduce Neural Tube Defects in Colorado

Kirk Bol, M.S.P.H.¹; Rickey Tolliver, M.P.H.¹; April Montgomery, M.H.A.²; Russel Rickard, M.S.²

Introduction

Neural tube defects (NTDs) are birth defects of the central nervous system, including spina bifida and anencephaly, arising from the incomplete or incorrect closure of the neural tube during embryologic development. The consumption of folic acid, a B vitamin, prior to pregnancy has been shown to successfully prevent a substantial portion of both of these NTDs.

In 1992, the U.S. Public Health Service recommended that all women of child-bearing age who are capable of becoming pregnant consume 400 micrograms of folic acid daily through (1) improved dietary habits, (2) fortified foods, or (3) dietary supplements. It is difficult to consume the recommended amount of folic acid through diet alone; therefore, the U.S. Food and Drug Administration mandated fortification of the U.S. flour and enriched grain supply with 140 micrograms of folic acid per 100 grams of grain, allowing optional fortification in March 1996, and requiring fortification in January 1998. Fortification of grains alone would not assure the consumption of the recommended amount of folic acid, but would increase the amount consumed by most women.

This report sets out to present the burden and trends of spina bifida and anencephaly among Colorado births over the past decade. Additionally, it presents trends of knowledge of folic acid and its benefits as well as adherence to the recommended daily consumption of folic acid. Finally, it identifies those subpopulations of Colorado women at potentially increased risk of having a neural tube defect-affected pregnancy, defined as those with the least knowledge of folic acid and the smallest likelihood of adhering to the recommended daily intake of folic acid.

Methods

Prevalence estimates for neural tube defects, namely spina bifida and anencephaly, were provided by Colorado Responds to Children With Special Needs (CRCNSN), Colorado's statewide birth defects surveillance program located at the Colorado Department of Public

¹ Health Statistics Section, Colorado Department of Public Health and Environment

² Colorado Responds to Children With Special Needs, Colorado Department of Public Health and Environment

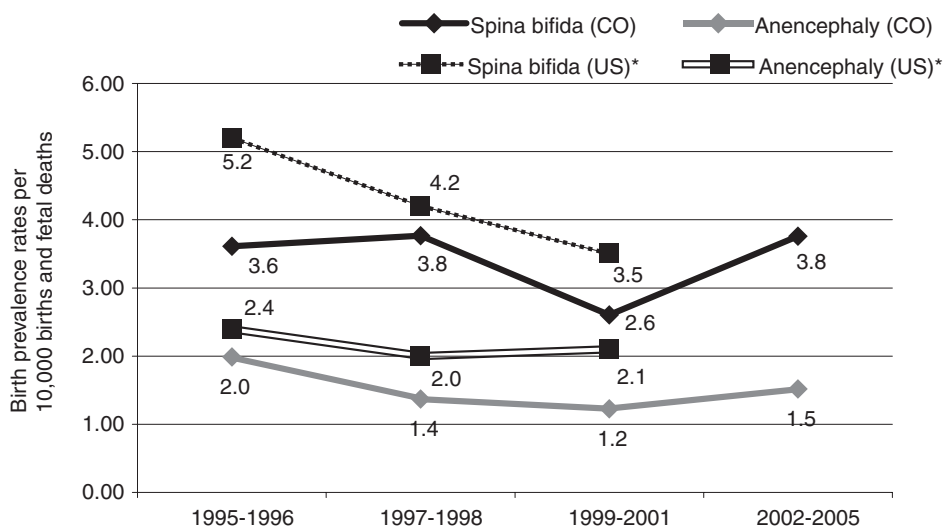
Health and Environment. The prevalence estimates presented in this report are the numbers of spina bifida or anencephaly cases ascertained per 10,000 live births to Colorado residents and fetal deaths (adjusted to expected date of delivery).

Women’s knowledge of folic acid in preventing birth defects and consumption of the recommend daily amount is monitored by the Colorado Behavioral Risk Factor Surveillance System (BRFSS), a system of telephone surveys sponsored by the Centers for Disease Control and conducted by the Health Statistics Section at the Colorado Department of Public Health and Environment. The BRFSS is also used to monitor behaviors related to other leading causes of mortality and morbidity in Colorado. Because the survey is conducted with only a small sample of the total number of people in Colorado, the responses collected are statistically weighted so they are representative of Colorado’s total population.

Results

Between the period of no folic acid fortification (1995-1996) and the period of mandatory fortification (late 1998-1999), the prevalence of spina bifida in the US decreased 31 percent (5.15 to 3.54 per 10,000) and the prevalence of anencephaly decreased 16 percent (2.43 to 2.05 per 10,000)¹. Similar declines in NTD rates were seen in Colorado: Between 1995-1996 and 1999-2001, rates of spina bifida declined 28 percent (3.61 to 2.60 per 10,000) and rates of anencephaly declined 38 percent (1.99 to 1.23 per 10,000). In spite of these declines, the rate of anencephaly increased slightly during the 2002-2005 period (to 1.52 per 10,000), while the rate of spina bifida returned to the same rate as that observed during the 1997-1998 time period (3.76) (Figure 1).

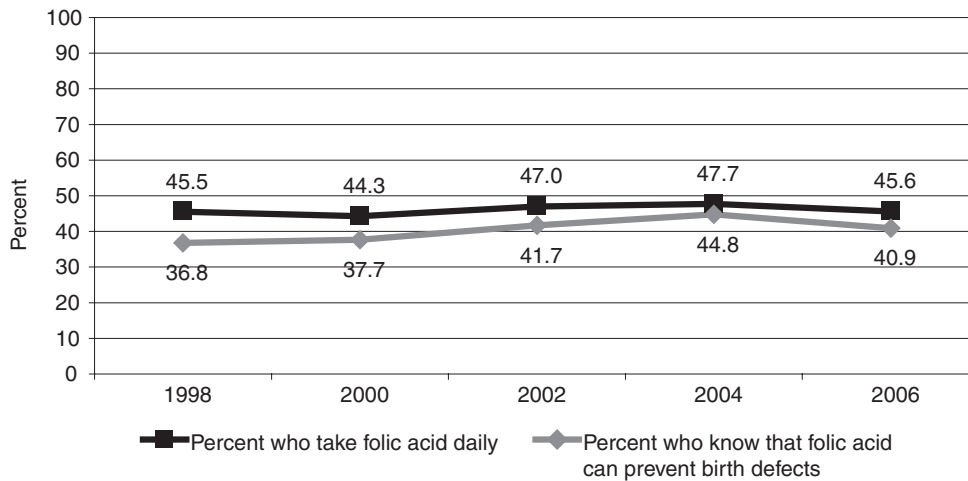
Figure 1. Spina bifida and anencephaly prevalence trends: Colorado and United States residents, 1995-2005



*Time periods shown for U.S. prevalence rates are Jan. 1995-Dec. 1996; Jan. 1997-Sept. 1998; and Oct. 1998-Dec. 1999. Source: Colorado Responds to Children With Special Needs, Colorado Department of Public Health and Environment

Regarding behaviors that may prevent neural tube defects, in 1998, 37 percent of Colorado women ages 18-44 knew that taking folic acid could prevent NTDs, while in 2006, that percentage had increased to 41 percent. In 1998, 46 percent were taking folic acid daily, a percentage unchanged in 2006 (Figure 2).

Figure 2. Trends in knowledge and daily consumption of folic acid: Colorado women ages 18-44, 1998-2006

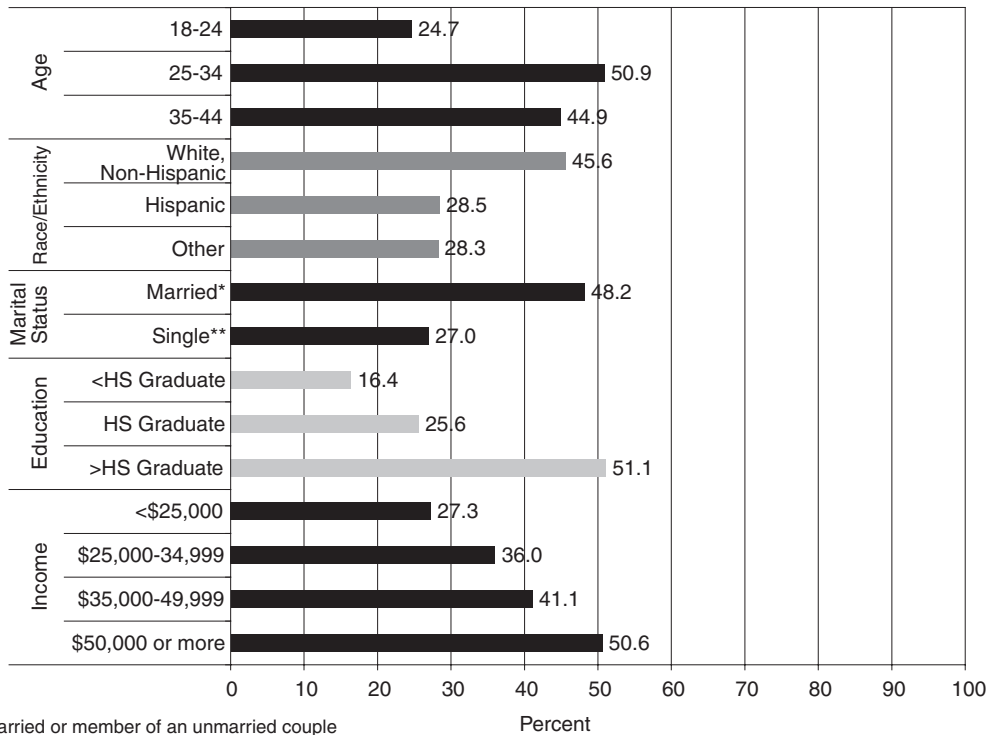


Source: Colorado Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

The proportion of women in Colorado aware of and taking folic acid daily is higher than the national average. In 2005, The March of Dimes reported that nationally, of women ages 18-45 years who were aware of folic acid, 19 percent knew that it could prevent birth defects while 33 percent were taking it daily².

Knowledge that folic acid can prevent birth defects varied in Colorado women across a host of demographic characteristics. Women ages 18-24 were the least likely of the age groups studied to know about these benefits of folic acid (25%), as were women in Hispanic and other Non White racial/ethnic categories (28%), those who were single (27%), those who did not graduate from high school (16%), and women in the lowest income strata (27%) (Figure 3).

Figure 3. Knowledge that folic acid can prevent birth defects: Colorado women ages 18-44, 2006



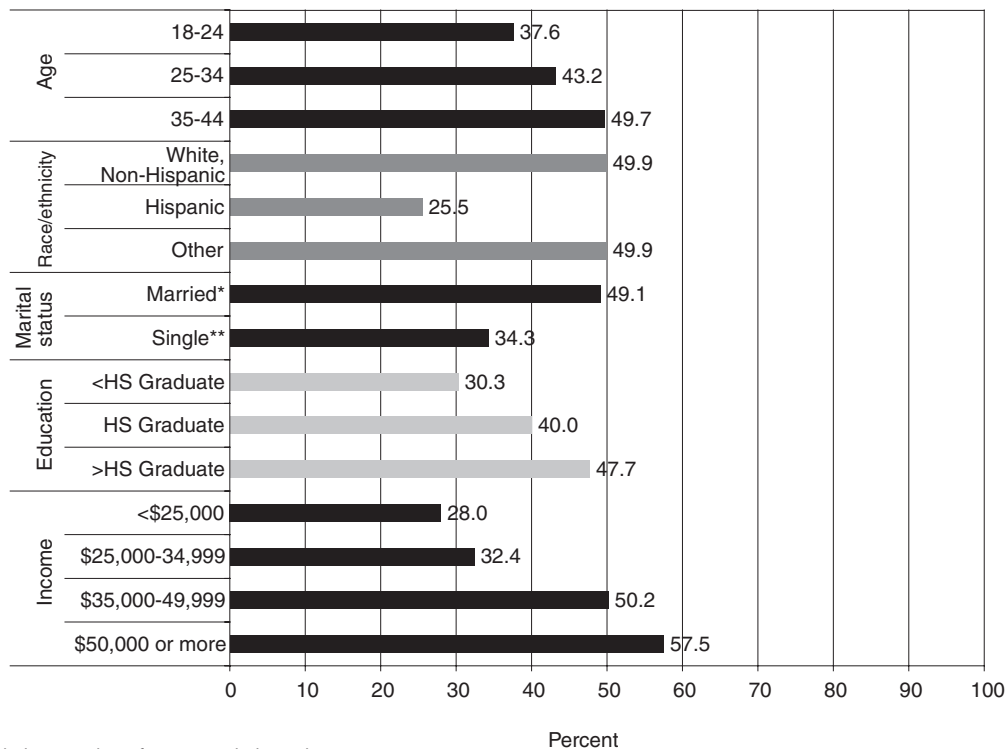
*Married: married or member of an unmarried couple

**Single: divorced, widowed, separated, never married

Source: Colorado Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

There was similar variation in the likelihood of taking folic acid daily. Among Colorado women, those ages 18-24 were least likely to take folic acid daily (38%), as were Hispanic women (26%). As with knowledge of folic acid, those women who were single (34%), did not graduate from high school (30%), and those in the lowest income strata (28%) were least likely to take folic acid daily (Figure 4). These disparities among subgroups of women concerning both knowledge of the benefits of folic acid and daily consumption were present in 1996 (when these questions were first asked in the Colorado BRFSS) and have persisted through 2006.

Figure 4. Daily consumption of folic acid: Colorado women ages 18-44, 2006



*Married: married or member of an unmarried couple

**Single: divorced, widowed, separated, never married

Source: Colorado Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

Summary

Healthy People 2010 calls for an increase to 80% of nonpregnant women ages 18-44 years who consume the recommended amount of folic acid daily³. Key to achieving reductions in the number of NTD-affected pregnancies is increasing the knowledge that consuming folic acid can help prevent birth defects and increasing the number of women who consume the recommended amount daily before pregnancy. In Colorado, the focus is on: (1) educating women least likely to consume the recommended amounts of folic acid; and (2) educating their health care providers to counsel them to consume folic acid.

There are a number of resources available to women, physicians, and researchers who are interested in finding out more information about folic acid, including:

- Colorado Responds to Children With Special Needs (www.cdph.state.co.us/dc/crcsn or 303- 692-2700)
- The National Center on Birth Defects and Developmental Disabilities at the Centers for Disease Control and Prevention (www.cdc.gov/ncbddd)
- The National Birth Defects Prevention Network (www.nbdpn.org)
- The National Council on Folic Acid (www.folicacidinfo.org)
- March of Dimes, Colorado Chapter (www.marchofdimes.com/colorado or 303-692-0011)
- March of Dimes, National Office (www.marchofdimes.com or 914-997-4488)

It is evident based on the statistics presented here that not only are there certain subpopulations of women in Colorado who

are less likely than others to know about the benefits of folic acid and to take folic acid daily, but also that there is much progress to be made in raising awareness of the benefits of folic acid and the recommendations for folic acid consumption among all Colorado women. It is the hope of the authors of this report that the statistics and resources found here can be employed for continued prevention of neural tube defects in Colorado.



SOURCES

- 1 Williams LJ, Mai CT, Edmonds LD, et al. *Prevalence of spina bifida and anencephaly during the transition to mandatory folic acid fortification in the United States*. *Teratology*. 2002;66:33-39.
- 2 March of Dimes Foundation. *Folic acid and the prevention of birth defects: a national survey of pre-pregnancy awareness and behavior among women of child-bearing age, 1995-2005*. White Plains, NY. 2003.
- 3 *Healthy People 2010*. The Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services. www.healthypeople.gov.