Global Situation of Birth Defects and Initiatives for Prevention

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Cleft lip

Neural tube defect

Metabolic disease Mucopolysaccharidosis

Cerebral palsy

Thalassemia

Down syndrome

Cerebral palsy

Congenital syphilis

Congenital rubella syndrome
Birth Defects: Overall Global Burden

3.0% = 4,800,000 Globally

- Africa: 1,500,000
- South-East-Asia: 1,130,000
- West Pacific: 820,000
- East-Mediterranean: 540,000
- Americas: 470,000
- Europe: 340,000

Data of Total Births 2010 from WHO Statistics Website
March of Dimes Global Burden of Birth Defects
Estimated number (per 1,000 – per year) of infants with birth defects (BD, Chrom, Single Gene, Genetic-Haemolysis/Jaundice)

- Congenital heart defects: 1,000,000
- Neural tube defects: 350,000
- Down syndrome: 220,000

Reports of Neural Tube Defects in SE Asia

Zaganjor et al., PLOS ONE, 2016
Deaths Due to Birth Defects

Rate U-5y Deaths per 1,000

AFRICA: 5.3
EAST-MEDITER: 4.0
SOUTH-EAST-ASIA: 3.8
AMERICAS: 3.2
EUROPE: 2.6
WEST PACIFIC: 2.0

Globally 3.9 per 1,000

% of U-5y Deaths due to Birth Defects

EUROPE: 18.6%
AMERICAS: 17.3%
WEST PACIFIC: 11.9%
SOUTH-EAST-ASIA: 6.8%
EAST-MEDITER: 6.7%
AFRICA: 4.6%

Globally 6.2%

Number of U-5y Deaths

AFRICA: 263,000
SOUTH-EAST-ASIA: 143,000
EAST-MEDITER: 71,000
WEST PACIFIC: 56,000
AMERICAS: 49,000
EUROPE: 29,000

Globally 611,000

2010 Data from WHO Statistics Website
Burden of Birth Defects in South-East Asia

Hidden burden of birth defects

Easier to measure
Metrics readily available

Prevalence, Mortality:
- Neonatal
- Infant
- Under-5

Difficult to measure
Evaluated less frequently

Elective terminations
Spontaneous abortions
Stillbirths

Co-morbidities
Medical/surgical treatment
Hospitalizations
Long term disability
Quality of life
Social/emotional impact
Economic cost
Many birth defects can be swept away.
Birth defects

- Calls on Member States to prevent birth defects wherever possible, implement screening programs, and provide ongoing support and care to children with birth defects and their families.

- CDC and WHO are providing support to Member States in SEAR to improve birth defects data collection and implement prevention activities.
Risk Factors for Birth Defects

- Nutrition
  - Folate, vitamin B-12, iodine, or other micronutrient insufficiency; PKU
- Behavioral factors
  - Smoking, medications, recreational drugs, alcohol
- Maternal conditions
  - Obesity, epilepsy, mood disorders/mental health, diabetes, hypothyroidism, thalassemia, age
- Infectious disease
  - TORCH infections (e.g., congenital syphilis, congenital rubella syndrome)
- Environmental factors
  - Heat, radiation, industrial solvents, mercury
Goals and targets

• Reduce the prevalence of folic acid-preventable neural tube defects by 35%
• Reduce the number of thalassaemia births by 50%
• Reduce congenital rubella
• Eliminate congenital syphilis

FIGURE 2. Number of rubella and congenital rubella syndrome (CRS) cases — United States, 1966–2011

Introduction of rubella vaccine

Source: MMWR, Vol. 16, No. 4
FIGURE. Congenital syphilis (CS) rate* among infants aged <1 year and rate of primary and secondary syphilis (P&S) among females aged ≥10 years† — National Electronic Telecommunication System for Surveillance, United States, 1995–2008

CS rate (per 100,000 live births) vs P&S syphilis rate among females

Source: MMWR, Vol. 59, No. 14
The Global Challenge of Neural Tube Defects

- Each year there are more than 300,000 babies born with a neural tube defect (NTD).
- NTDs include spina bifida, anencephaly, and other related defects
- NTDs cause death, paralysis, or life-long disability – but, many are preventable!

Anencephaly  Encephalocele  Spina bifida
Global Burden of Neural Tube Defects

328,000 cases of spina bifida and anencephaly worldwide annually

246,000 cases are folic acid preventable

Prevention Strategy:
• Childbearing aged women should consume 400 mcg of folic acid for the prevention of neural tube defects.

Source: Center for Spina Bifida Research, Emory University
Periconceptional Folic Acid Community Trial to Prevent NTDs, China, 1993 – 1996

Intervention = 400 µg Daily Folic Acid Supplement Alone

NTDs per 10,000 pregnancies

North
- No folic acid: 7
- Folic acid: 10

South
- No folic acid: 6
- Folic acid: 4

85% reduction in NTDs with folic acid compared to no folic acid.
Approaches to Increase Folate/Folic Acid Intake

**Diet**…natural foods, vegetables, fruits, beans, yeast, liver

**Pills**… folic acid-containing dietary supplements

**Fortification** … folic acid added to foods - flour, rice, pasta, breakfast cereals
Challenges to Preventing Neural Tube Defects (NTDs)

• It is difficult to get sufficient folate from dietary sources alone
• NTDs result from the failure of closure of the neural tube by the 4th week of conception
• Women need sufficient blood folate concentrations before conception
• Prenatal vitamins are too late to prevent NTDs

http://www.who.int/nutrition/publications/birthdefects_atlas/en/
Are You Hungry?
Daily Intake Equivalent of 400 µg of Folic A

- 4 slices of fried beef liver
- 44½ medium ripe tomatoes
- 14½ cups of raw broccoli
- 17½ cups of orange juice
- 19½ cups of raw green beans
- 5½ cups of black beans
- 200 medium red apples
Neural Tube Defects Prevalence Changes: Before and After Folic Acid Fortification

<table>
<thead>
<tr>
<th>Country</th>
<th>Before Fortification</th>
<th>After Fortification</th>
<th>Change</th>
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<tbody>
<tr>
<td>US</td>
<td>10.8</td>
<td>6.9</td>
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<tr>
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<tr>
<td>South Africa</td>
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Sources:
## Cost Effectiveness of Fortification with Folic Acid

<table>
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<tr>
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<th>Year of Fortification</th>
<th>Return on Investment</th>
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<tbody>
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<td>2003</td>
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<tr>
<td>Chile</td>
<td>1998</td>
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<tr>
<td>US</td>
<td>1996</td>
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Sources:
Summary

- Birth defects are an important cause of morbidity and mortality in SE Asia
- Effective interventions can be implemented to prevent
  - Neural tube defects
  - Congenital rubella
  - Congenital syphilis
  - Thalassaemia
- Surveillance is a key piece of prevention
Questions?

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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