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BLOOMBERG
SCHOOL *of* PUBLIC HEALTH

Introduction to the Problem of Infant Mortality

Melissa Hawkins, PhD

Johns Hopkins University



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Section A

Introduction: Definition and Rates of Infant Mortality

- Infant mortality refers to the death of an infant during the first year of life
 - Number of deaths among infants under one year old per 1,000 live births in a given year
- Worldwide, approximately 10 million infants die each year
 - More than 90% of these infant deaths occur in the developing world

Introduction

- Worldwide, approximately 10 million infants die each year
 - In poorer countries, estimated 10-20% of all infants die before their first birthday
- Only a small proportion occur in the U.S.
 - 2002—7.0 per 1,000; 2001—6.8; 1999—7.2
 - 28,000 infant deaths and 4,059,000 live births in the U.S.

Infant Mortality in the U.S.

- U.S. ranks 23rd among industrialized countries in 1997, 28th in 1998, 34th in 2003
 - Rate about 45% higher than the rate for Japan, Sweden, or Singapore
- Black infants continue to die at twice the rate of white infants—this is referred to as “the gap”

Potential Reasons for Poor Ranking of U.S.

- Measurement differences
 - Sources of data for rates
 - Debate over what to measure
 - First day mortality rates much greater for the U.S.

Potential Reasons for Poor Ranking of U.S.

- Variations in registration of vital events
 - Not all countries subscribe to the WHO definition of a live birth
 - In many European countries, fetal deaths are not reported until after 28 weeks gestation, but earlier live births are reported
- The higher incidence of low birth weight (LBW) in the U.S.

Causes of IM: Developed and Developing Countries

Developed

- Post neonatal
 - SIDS
 - Congenital anomalies
 - Injuries
 - Infection

Developing

- Post neonatal
 - Infection
 - Malnutrition
 - Injury

Causes of IM: Developed and Developing Countries

Developed

- Neonatal
 - LBW
 - Congenital anomalies
 - Maternal complications

Developing

- Neonatal
 - LBW
 - Trauma/asphyxia
 - Tetanus
 - Pneumonia

Developed and Developing Countries

- Developed countries
 - Ratio NM:PNM \sim 3–4:1
- Developing countries
 - Ratio NM:PNM \sim 1:1–2

Causes of Infant Mortality in U.S. in 2001

- Leading causes of infant death
 - Congenital anomalies—5,513
 - Pre-term birth/low birth weight—4,410
 - Sudden infant death syndrome—2,230
 - Problems related to maternal complications of pregnancy—1,404
 - Problems related to complications of placenta, cord, membranes— 1,018
 - Respiratory Distress Syndrome—1,011

Infant Mortality in Developing Countries

- More than 500,000 women die in childbirth worldwide
 - Leading causes are infection and postpartum hemorrhaging
 - Easily treated by skilled healthcare provider
- Series of articles in Lancet in 2003 on reduction of global childhood mortality

Infant Mortality in Developing Countries

- India, Nigeria, China, Pakistan, the Democratic Republic of Congo, and Ethiopia account for 50% of the 10 million child deaths annually
- 2/3 of the 10 million child deaths worldwide could be prevented with existing knowledge and treatment
- Focus on community-based interventions to identify and treat pneumonia

Low Birth Weight in Developing Countries

- Higher rate of LBW primarily due to intrauterine growth restriction (IUGR) rather than preterm birth
- Most important determinants are ...
 - Low energy intake/low gestational weight gain
 - Low pre-pregnancy body mass index (BMI)
 - Short stature
 - Primiparity
 - Pregnancy-induced hypertension
 - Cigarette smoking
 - Malaria

U.S. Secular Trends in Infant Mortality

- *Decline in IM?*
 - Yes
- *Decline in LBW?*
 - No

U.S. Secular Trends in Infant Mortality

- *Increased survival of LBW infants?*
 - Yes
 - Decline in bw specific mortality
 - ▶ Technologic developments
 - ▶ Regionalization

Are U.S. Infant Mortality Rates Good or Bad?

- IMR has dropped sharply in the past 20 years
 - No change at all from 1997–1998
 - Increase in 2002 for the first time in 44 years (from 6.8 in 2001 to 7.0 in 2002)
- Rate of approximately seven deaths per 1,000 births is double the rate of most other industrialized countries

Are U.S. Infant Mortality Rates Good or Bad?

- Infants in the U.S. have a lower survival rate than infants born in many of the other industrialized nations of the world
 - U.S. has more small babies (LBW and preterm)
 - Although it has neo-natal intensive care units (NICU), U.S. has higher rate of IM
 - Rising number of multiple births here is also a factor



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Section B

The Significance of Infant Mortality

Infant Mortality and Life Expectancy

- Life expectancy is closely tied to infant mortality
- Tremendous gains in life expectancy in the first 70 years of this century were almost exclusively the result of a declining infant and childhood mortality

Infant Mortality Reflects the Health Status of a Population

- Late 1800s through the early part of this century, infants and children were viewed as victims of an unhealthy and unsafe environment
- IMR became a sentinel index for the health status of the population

Infant Mortality Is a Personal Tragedy

- In 1990, 1,428 infants were buried in mass graves in Potter's Field on Hart Island in New York City, just as paupers were buried in this same location at the end of the Nineteenth Century
- The infants died in New York hospitals but either their bodies were not claimed for burial or their families could not afford a private burial



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Section C

History of Infant Mortality: 1800s to the Present

Infant Mortality in the Mid-1800s

- Industrial Revolution brought about rapid urbanization
- IMR were very high
 - New York City—248 infant deaths per 1,000 live births
- Viewed as a consequence of an unsanitary environment on its disadvantaged residents
- Prevention strategies focused on foul air and water of the urban environment

Infant Mortality in the Late-1800s

- IM was viewed as a consequence of improper infant nutrition
- Surge in knowledge of bacteriology and communicable diseases
 - High IMR linked to diarrhea epidemics
 - Focus on infant feeding (pediatrics)
- Prevention strategies focused on provision of clean milk to all babies
 - Milk stations were developed

Children's Bureau Studies of Infant Mortality (1915–1923)

- New U.S. birth registry shows one in every 10 live birth results in an infant death
- Attributed approximately 36% of infant deaths to prematurity
- Developed risk factors (distal causes)
- Emphasized importance of poverty
- Efforts to launch maternity insurance

Infant Mortality in the Early 1900s: Maternity-Infancy Act

- Maternity and Infancy Act (Sheppard-Towner Act) passed in 1921
 - Began development of a national program for maternal and infant health
- Support for this legislation came overwhelmingly from women's organizations around the country
- Failed to overcome continuing opposition and was repealed in 1928

Infant Mortality in the Early and Mid-1900s

- White House conference on child health and protection created a children's charter
 - Rights of children and pregnant women to receive necessary care and treatment
- In 1935, Title V of the Social Security Act
 - Extension of many of the concepts developed by the Children's Bureau
 - Devoted solely to the promotion of the health of women and children

Infant Mortality in the Mid-1900s

- In 1928 the first antibiotic drug (penicillin) is discovered (major impact on treatment of infections)
- In the 1930s nursery incubators are dramatically improved
- CDC publishes infant death data for U.S. for the first time in 1933
- In the 1940s, the IMR began to decline

Infant Mortality in the Mid-1900s

- By 1960—47 deaths per 1,000 live births
 - Black rate twice that of the white rate
- In 1963, JFK's second son dies after being born premature, national increase to save small babies
- Children's Bureau organized the Emergency Maternity and Infant Care (EMIC) program to serve the wives and infants of men in the armed forces

Infant Mortality in the Mid-1900s (1960s)

- Expansion of MCH services
 - Social and health programs included neighborhood health centers
 - Improved Pregnancy Outcome Project focused on organization and utilization of prenatal and infant care services
 - Special Supplemental Food Program for Women, Infants and Children (WIC) was established

Infant Mortality in the Mid-1900s (1960s)

- Medicaid (1965)
 - Pregnant women and children eligibility was often linked to eligibility for the Aid to Families with Dependent Children (AFDC) program
- IMRs began to decline again by the mid-1960s and into the early 1970s
 - Unknown what proportion of the decline was due to decreases in poverty or to improvements in access/quality of care

Infant Mortality in the Late 1900s

- 1970s—Explosion of technology advances led to increased survival of the smallest and frailest newborns
 - Services only available in hospitals in major cities, so access was limited for most of the population
 - Some states later developed regionalization plans which included transportation of mothers and newborns to needed services

Infant Mortality in the Late 1900s

- Early 1980s—End of expansion, beginning of retrenchment
 - Narrowing eligibility requirements for AFDC program
 - Authority for major maternal and child health programs was transferred to the states

Infant Mortality in the Late 1900s

- Mid-1980s to early 1990s—Expansion of Medicaid eligibility and eligible services
 - States were given the option to offer enhanced services to assure access
- Artificial surfactant drugs improved the survival of small infants with respiratory distress syndrome (RDS)

- Sudden Infant Death Syndrome (SIDS)
 - Studies determined that sleep position was related to SIDS, the leading cause of post neonatal mortality
 - These studies were responded to with public health campaigns to educate parents

Infant Mortality in the Late 1900s

- IM rates continue to drop, while steady increase in number of premature births
- Managed care, with an emphasis on capitated payments rather than fee for service, was being quickly adopted by many states
- The effects of this shift in reimbursement of medical care has yet to be evaluated with regard to infant mortality

Infant Mortality in the Early 2000s

- Medicaid paid for 1.4 million births (37% of all U.S. births) in 2000
- For the first time in over 40 years, the 2002 IMR in the U.S. rises from previous year
- With advent of genetic analysis, likely on the threshold of significant decreases in infant morbidity and mortality