FROM THE CENTERS FOR DISEASE CONTROL AND PREVENTION

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Achievements in Public Health, 1900-1999: Family Planning

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2 tables, 1 figure, 1 photo omitted

DURING THE 20TH CENTURY, THE HALLMARK of family planning in the United States has been the ability to achieve desired birth spacing and family size. Fertility decreased as couples chose to have fewer children; concurrently, child mortality declined, people moved from farms to cities, and the age at marriage increased.[1] Smaller families and longer birth intervals have contributed to the better health of infants, children, and women, and have improved the social and economic role of women.[2,3] Despite high failure rates, traditional methods of fertility control contributed to the decline in family size.[4] Modern contraception and reproductive healthcare systems that became available later in the century further improved couples' ability to plan their families. Publicly supported family planning services prevent an estimated 1.3 million unintended pregnancies annually.[5] This report reviews the history of family planning during the past century; summarizes social, legal, and technologic developments and the impact of family planning services; and discusses the need to ensure continued technologic improvements and access to care.

Early History

Family size declined between 1800 and 1900 from 7.0 to 3.5 children.[4] In 1900, six to nine of every 1000 women died in childbirth, and one in five children died during the first 5 years of life.* Distributing information and counseling patients about contraception and contraceptive devices was illegal under federal and state laws[8,9]; the timing of ovulation, the length of the fertile period, and other reproductive facts were unknown.

In 1912, the modern birth-control movement began. Margaret Sanger (see box), a public health nurse concerned about the adverse health effects of frequent childbirth, miscarriages, and abortion, initiated efforts to circulate information about and provide access to contraception.[9] In 1916, Sanger challenged the laws that suppressed the distribution of birth control information by opening in Brooklyn, New York, the first family planning clinic. The police closed her clinic, but the court challenges that followed established a legal precedent that allowed physicians to provide advice on contraception for health reasons. During the 1920s and 1930s, Sanger continued to promote family planning by opening more clinics and challenging legal restrictions. As a result, physicians gained the right to counsel patients and to prescribe contraceptive methods.[10,11] By the 1930s, a few state health departments (e.g., North Carolina) and public hospitals had begun to provide family planning services.

During the first part of the 20th century, family planning focused on the need of married couples to space children and limit family size. Among a national probability sample† of 1049 ever-married white women born during 1901-1910 and interviewed in 1978, 71% reported having practiced contraception; common techniques used were the condom (54%), contraceptive douche (47%), withdrawal (45%), rhythm (24%), and the cervical diaphragm (17%).[12] Other reported methods included infrequent sexual intercourse (8%), intermittent abstinence (6%), and contraceptive sterilization (4%).‡ Using abstinence to prevent pregnancy was limited by uncertainty about the timing of a woman's ovulation. In 1928, the timing of ovulation was established medically, but the safe interval for intercourse was mistakenly understood to include half the menstrual period.[13] Nevertheless, by 1933, the average family size had declined to 2.3 children.

Modern Contraception

Family size increased from 1940 until 1957, when the average number of children per family peaked at 3.7 (14,15; CDC, unpublished data, 1999). In 1960, the era of modern contraception began when both the birth control pill and intrauterine device (IUD) became available. These effective and convenient methods resulted in widespread changes in birth control.[16] By 1965, the pill had become the most popular birth control method, followed by the condom and contraceptive sterilization.[16] In 1965, the Supreme Court (Griswold vs. Connecticut)[17] struck down state laws prohibiting contraceptive use by married couples.

In 1970, federal funding for family planning services was established under the Family Planning Services and Population Research Act, which created Title X of the Public Health Service Act.[18] Medicaid funding for family planning was authorized in 1972. Services provided under Title X grew rapidly in the 1970s and 1980s; after 1980, public funding for family planning continued to shift to the Medicaid program.[18]

Since 1972, the average family size has leveled off at approximately two children, and the safety, efficacy, diversity, accessibility, and use of contraceptive methods has increased. During the 1970s and 1980s, contraceptive sterilization became more common and is now the most widely used method in the United States.[16,19,20] IUD use increased during the early 1980s, then declined because of concerns about intrauterine infections.[16] In the 1980s and 1990s, the use of condoms increased among adolescents, presumably because of growing

concern about human immunodeficiency virus infection and other sexually transmitted diseases (STDs).[21-23] Since 1991, increased use of long-acting hormonal contraception (Depo-Provera® [Pharmacia & Upjohn, Inc., Peapack, New Jersey] and Norplant® [Wyeth-Ayerst Laboratories, St. Davids, Pennsylvania])§ also have contributed to the decline in adolescent pregnancy rates.[24,25] Emergency use of oral contraceptive pills might reduce the risk for pregnancy after unprotected intercourse by at least 74%.[26] Noncontraceptive health benefits of oral contraceptives include lower rates of pelvic inflammatory disease, cancers of the ovary and endometrium, recurrent ovarian cysts, benign breast cysts and fibroadenomas, and discomfort from menstrual cramps.[27]

In the United States, physicians are the primary providers of surgical sterilization, hormonal contraception, and IUDs. In 1994, 3119 agencies (e.g., health departments, Planned Parenthood affiliates, and hospitals) operated 7122 publicly subsidized family planning clinics for an estimated 6.6 million women.[28] These services prevent an estimated 1.3 million unintended pregnancies annually (534,000 unintended births, 632,000 abortions, and 165,000 miscarriages).[5] Publicly supported clinics have been effective in supplying contraception to populations that have high rates of unintended pregnancy and have limited access to private health-care providers. In 1988, of the women who obtained reversible contraception, 22.5% overall received services from public clinics. Those most likely to receive these services were adolescent (43%), poor (39%), and never-married (34%) women.[5]

Margaret Sanger

Sometimes social factors slow progress toward improving health more than lack of awareness or the absence of technology. No 20th century public health achievement demonstrates this more clearly than the struggle to provide women in the United States with safe and effective birth control. Margaret Sanger (September 14, 1879-September 6, 1966) risked scandal, danger, and imprisonment to challenge the legal and cultural obstacles that made controlling fertility difficult and illegal.

Margaret Louise Higgins was born in Corning, New York, the sixth of 11 children. Her free-thinking father's politics might have ignited her activism, but watching her mother, aged 50 years, die after 18 pregnancies probably had an even deeper impact. Higgins was a nursing student in 1902 when she married architect William Sanger. Although weakened by bouts of tuberculosis, she bore three children between 1902 and 1910. The Sangers immersed themselves in the radical political and intellectual world of Greenwich Village in New York City. She worked as a visiting nurse in the city's tenements and wrote about sex education and women's health.

In 1914, Sanger's articles in *The Woman Radical* brought her a federal indictment for violating federal postal obscenity laws, prompting her to flee to England. As soon as the ship left U.S. waters, she cabled a radical publisher in New Jersey to distribute 100,000 copies of her pamphlet, *Family Limitation*. Sanger remained exiled in Europe until late 1915; William Sanger had been arrested and jailed for distributing one copy of *Family Limitation*, and Margaret Sanger returned to face the charges against her. Personal tragedy intervened when the Sanger's 5-year-old daughter died suddenly from pneumonia; public sentiments resulted in dismissal of the charges against Margaret Sanger.

Rather than backing away from controversy, Sanger and her sister Ethel Byrne, also a nurse, opened the first birth control clinic in the United States, modeled after those Sanger had seen in Holland. On October 16, 1916, dozens of Jewish and Italian immigrant women from Brooklyn's crowded Brownsville section lined up to receive counseling and birth control information. Nine days later police closed the clinic and arrested Sanger, Byrne, and the clinic's interpreter. Byrne was tried and convicted first, and went on a hunger strike. Sanger was convicted and served 30 days in jail. Legal failure had brought victory, however. The publicity surrounding Sanger's activities had made birth control a matter of public debate.

After World War I, Sanger continued her U.S. leadership role, although during the 1920s and 1930s she refocused her energy toward international birth control, traveling and lecturing throughout Asia and Europe. In 1952, she founded the International Planned Parenthood Federation and served as its first president until 1959. Sanger died in Tucson, Arizona, aged nearly 87 years, a few months after the 1965 Supreme Court decision, Griswold vs. Connecticut, that made birth control legal for married couples, the culmination of events Sanger had started 50 years earlier.

Contraception Worldwide

The most important determinant of declining fertility in developing countries is contraceptive use, which explains 92% of the variation in fertility among 50 countries.[29-31] Overall fertility declined by approximately one third from the 1960s through the 1980s, from an average of six to four children per woman,[31] with dramatic decreases occurring in some parts of the world (e.g., 24% decline in fertility in Asia and Latin America, approximately 50% in Thailand, and approximately 35% in Colombia, Jamaica, and Mexico). As fertility declined in developing countries, the infant mortality rate decreased from approximately 150 deaths per 1000 live births in the 1950s to approximately 80 per 1000 in the early 1990s.[2,3] Among married women of reproductive age in developing countries, 53% plan the size of their families[32]; 90% of these women report using modern birth-control methods (e.g., female sterilization, oral contraceptives, and IUDs).[31]

Challenges

In the United States, unintended pregnancy remains a problem; 49% of pregnancies are unintended and 54% of these end in abortion.[33] These rates remain significantly higher than rates of many other industrialized countries. During 1982-1986, among 15 Western countries with similar

reproductive behavior (e.g., Canada, the Netherlands, and the United Kingdom), the United States ranked fourth highest in total fertility rate and had the second highest abortion rate and the highest pregnancy rate.[34] Although pregnancy and childbearing rates for adolescent women have declined since 1991, the proportion of adolescent women who are unmarried at the time of giving birth has increased[24,25] from 15% in 1960 to approximately 75% in 1998.

Despite advances in family planning, population growth remains a worldwide concern. In 1999, world population reached six billion, an increase of 4.4 billion births since 1900.[35] In 1994, an international conference on population and development in Cairo focused international attention on the full scope of family planning that can be addressed during delivery of family planning services, including reproductive and primary-care concerns.[36] For example, the introduction of cervical screening has led to a 20%-60% reduction in cervical cancer death rates.[37] Screening programs for chlamydia, the leading cause of preventable infertility, can lower the prevalence of chlamydia and reduce complications such as pelvic inflammatory disease.[38] The STD prevention benefits of family planning may be enhanced by new female-controlled barrier methods such as vaginal microbicides and the female condom.

Managed care is rapidly changing patterns of health-care delivery and creating new challenges for primary and reproductive health-care providers.[39] Managed-care plans often offer more comprehensive coverage of such services than traditional insurance plans.[39] In the late 1990s, legislatures in 19 states mandated partial or comprehensive insurance coverage for reversible methods of contraception.[40] Access to high quality contraceptive services will continue to be an important factor in promoting healthy pregnancies and preventing unintended pregnancy in this country.[41]

During the 20th century, restrictive policies and laws affecting family planning were largely replaced by legislative and funding support for family planning services by physicians and specialized reproductive health-care providers. Marshaling public support for efforts needed to reduce the high rate of unintended pregnancy and to provide the full array of reproductive health-care services remains a challenge.

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*Along with family planning improvements came the public health surveillance systems needed to track population fluctuations. In 1900, the standard U.S. death certificate was created, augmenting the 1880 national death registration area[6]; in 1915, the national birth registration area was created, combining state systems into a national system. In 1955, Growth of American Families, the first national survey of women to measure reproductive factors such as the use of contraception, infertility, and pregnancy intentions, was conducted using private funding.[7] Five cycles of the federally sponsored National Survey of Family Growth (in 1973, 1976, 1982, 1988, and 1995) have continued to provide data on contraceptive methods, the use of family planning services, and other information on reproductive health of women (cycle six will include men).
†Weighted data, adjusted to the 1950 census of white, ever-married women by age, education, urban-rural residence, and number of live-born infants.
‡Although 4% reported contraceptive sterilization, 28% reported having surgery before aged 50 years that rendered them infertile.
§Use of trade names and commercial sources is for identification only and does not imply endorsement by CDC or the U.S. Department of Health and Human Services.

Carbon Monoxide Poisoning Associated With Use of LPG-Powered (Propane) Forklifts in Industrial Settings—Iowa, 1998

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IN 1998, THE IOWA DEPARTMENT OF Public Health (IDPH) and Iowa State University (ISU) Extension Department, with the assistance of local health departments, investigated a series of carbon monoxide (CO) poisonings associated with the use of liquified petroleum gas (LPG)-powered forklifts in light industry. In each episode, forklifts emitting high CO concentration levels were operated in inadequately ventilated warehouse and production facilities, which resulted in high CO accumulations. Employees at each site developed symptoms of CO poisoning, and some employees received inadequate or inappropriate medical care. This report summarizes the investigations and provides recommendations to prevent such incidents.

Incident 1

On August 17 and 18, 1998, during three consecutive 8-hour shifts, 34 (45%) of 75 plastic manufacturing plant employees experienced symptoms of CO poisoning (primarily headaches) while at work. Ten ill employees were evaluated at three local emergency departments (EDs). Of five employees seen at one ED, possible CO poisoning initially was diagnosed in three workers. However, because of high pulse oximeter readings, this diagnosis was dismissed erroneously, and the three employees were discharged and returned to work. The other two employees had "possible poly vinyl chloride inhalation" and "syncopal episode"diagnosed, respectively; one was admitted to the hospital, and one was discharged home. Of four employees seen at a second ED, the first two had "migraine headache" and "torticollis" diagnosed, and the second two were suspected to be CO poisoned and had carboxyhemoglobin (COHb) levels of 3.8% (1 hour after leaving work) and 10.7% (2 hours after leaving work), respectively.* One employee was seen at a third ED, and a headache of undetermined cause was diagnosed.

A local physician notified IDPH when several plant employees sought follow-up treatment the next day. Overall, 25 (38%) of 65 plant employees interviewed by IDPH had illnesses that met the case definition of CO poisoning (i.e., headache and at least one of the following: weakness, dizziness, or nausea). Illness rates increased with each shift, and no substantial associations were found between illness and age, sex, recent illness such as cold or influenza, illness in family members, hay fever, asthma, or smoking.

When measured by investigators, the plant's two forklifts each emitted concentrations of CO in excess of 40,000 ppm (recommended guidelines range from 2000 to 10,000 ppm[1-3]). On August 17, the plant's air-conditioning system had been shut down for servicing, and an exhaust fan had malfunctioned, reducing the effective ventilation rate. However, the forklifts emitted such excessive amounts of CO that no practical level of ventilation could have maintained CO concentrations below recommended exposure limits.† Neither employees nor managers were aware that the symptoms they experienced were related to CO poisoning, which delayed recognition and response.

Incident 2

In November 1998, after experiencing headaches, nausea, and dizziness over several days, employees of a warehouse brought conventional residential CO detectors to work; these detectors registered CO concentrations of 30-136 ppm. In the adjacent office area, concentrations as high as 76 ppm were recorded before employees inactivated the detectors to silence the continuous alarms. Employing industrial CO detectors, the investigation by IDPH determined that the facility's LPG-powered forklifts (producing from 40,000 to 70,000 ppm of CO) and inadequate plant ventilation allowed accumulations of CO up to 267 ppm in the warehouse. No employees reported seeking medical treatment.

Incident 3

From December 1998 through January 5, 1999, employees of an embroidery company experienced headaches and fatigue, and an employee's puppy became somnolent when brought to work. A local energy company was called to investigate. The company measured CO concentrations of 100-200 ppm in the embroidery offices. While attempting to find the source of CO, investigators found levels of 200-450 ppm in a wooden pallet manufacturer located in the same building one floor below the embroidery offices.

One symptomatic office employee, a pregnant woman, consulted her obste-

trician and reportedly was told that no postexposure treatment existed. Approximately 24 hours after her last exposure to CO and after seeking medical advice from experts in CO poisoning, she and another symptomatic employee were treated with hyperbaric oxygen.[4] At the time of treatment, their COHb levels were within the normal range but both were still having symptoms. Both employees demonstrated substantial subjective improvement after treatment. The since-delivered child is being monitored for CO-related complications such as neurologic conditions and growth abnormalities.

In the subsequent investigation, 23 workers were interviewed; two (29%) of seven embroidery employees and four (25%) of 16 pallet company employees had illnesses that met the case definition for CO poisoning. Investigators found an association between illness and proximity of the person's work station to areas where the forklifts were operated. The pallet manufacturer's forklifts emitted up to 75,000 ppm of CO into the inadequately ventilated warehouse. The embroidery office's furnace was vented properly with satisfactory combustion. However, the furnace was in the warehouse of the pallet company and pulled high CO-content ambient air from the warehouse into the heating system and distributed it to the embroidery office.

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CDC Editorial Note: CO poisoning associated with indoor combustion sources has long been recognized but continues to be a problem in the United States. The events described in this report illustrate factors that result in failure to adequately prevent CO poisoning and to promptly recognize such incidents when they occur. Timely and correct clinical diagnosis of acute CO poisoning remains elusive because of the nonspecific and protean nature of its signs and symptoms (i.e., headache, nausea, lethargy, weakness, abdominal discomfort/pain, confusion, dizziness, visual disturbances [including blurred vision], numbness and tingling, ataxia, irritability, agitation, chest pain, dyspnea on exertion, palpitations, seizures, and loss of consciousness). In incident 1, failure to diagnose illness correctly in the first employees evaluated resulted in some CO-intoxicated employees being sent back to work and further exposure and in continued exposures to other workers at the plant. Correct diagnosis can be achieved by determining COHb levels in the patient. However, screening can be performed by breath analyzer instruments. Pulse oximeter testing does not reflect tissue hypoxia and cannot be used to screen or diagnose.[5] Correct identification of the CO source requires specific resources (i.e., proper monitoring equipment; time for thorough investigation; and knowledge about potential CO sources, such as LPG-powered forklifts); these resources often may be unavailable on site, particularly in small business or light industrial settings but are frequently available through local utility companies.

Treatment for acute CO poisoning varies. The Undersea and Hyperbaric Medical Society provides guidelines to physicians for treating CO poisoning.[6] These guidelines recommend that patients who manifest signs and symptoms of intoxication (e.g., altered mental status or neurologic signs, cardiovascular dysfunction, pulmonary edema, or severe acidosis) be referred for hyperbaric therapy regardless of their COHb levels.[4]

In June 1998, the Council of State and Territorial Epidemiologists (CSTE) adopted a surveillance case definition for acute CO poisoning[7] that delineates criteria for categorizing reported acute CO poisonings. However, no commonly accepted clinical case definition nor consistent constellation of signs or symptoms exists that would unequivocally identify a case. All cases described in this report met the CSTE surveillance criteria for classification as confirmed cases.

Circumstances surrounding the continuing occurrence of CO poisonings and related confusion about identification of disease symptoms and appropriate treatment of cases illustrate the need for (1) improved education for ED and primary-care physicians about symptoms of CO poisoning, appropriate testing, and treatment[4,6]; (2) improved education for employers, employees, and forklift maintenance providers about the hazards of using improperly or poorly maintained LPG-powered forklifts indoors, CO poisoning symptoms, and the appropriate response to CO symptoms; and (3) improved forklift maintenance, ventilation, and CO-monitoring procedures when LPG-powered forklifts are used in enclosed settings.

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*Normal COHb concentrations are <2% in nonsmokers and 5%-9% in smokers.
†CDC's National Institute for Occupational Safety and Health recommends that CO exposure not exceed 35 ppm as an 8-hour time-weighted average and that point exposure should never exceed 200 ppm.