Accomplishments in Child Survival Research and Programs

Executive Summary

USAID-sponsored child survival initiatives such as research in vitamin A, oral rehydration therapy (ORT), and acute respiratory infections (ARI), along with programs emphasizing immunization, diarrheal disease treatment, and nutrition, have contributed to improve child survival in developing countries.

Vitamin A research has played an important role in reducing morbidity and mortality in children, making vitamin A deficiency prevention a part of the health policy of most developing countries. This could contribute toward the reduction of 250,000 deaths and 400,000 cases of partial or complete blindness that occur annually.

ORT research has shown the effectiveness of oral rehydration solution (ORS), a simple and inexpensive alternative to intravenous rehydration that can be used for most cases of dehydrating diarrhea. This procedure saves the lives of one million children annually.

ARI research has resulted in the development of an effective case-management strategy that can be undertaken by community health workers with adequate training, backed by a referral system. This approach can contribute toward the prevention of four million deaths annually due to ARI.

Immunization against six vaccine-preventable diseases has risen from 37 percent coverage to 80 percent worldwide during the last ten years, preventing three million deaths and 500,000 cases of paralytic polio. Sixty-six nations have already achieved the 80 percent coverage target.

Diarrheal disease control has utilized an ORT-based case-management approach that has made ORS or home fluids available for three out of four episodes of diarrhea. The approach has been used in half of all episodes of diarrhea for children under five worldwide.

Nutrition programs, through the promotion of breast-feeding and nutrition education, along with correction of micronutrient deficiencies, have reduced the number of malnourished children in many areas, and may contribute to reversing the global trend of decline in breast-feeding. Past achievements in research and program implementation must be consolidated and maintained, while developing new approaches to combat unsolved problems and new threats.

The Consultation on Child Survival

On March 7, 1996, nearly 40 representatives of USAID, BASICS (Basic Support for Institutionalizing Child Survival), and other USAID contractors, researchers, and international donor and advocacy groups, including UNICEF, The Rockefeller Fund, WHO, The World Bank, and UNDP, met to discuss achievements in child survival, review common objectives in improving child health, and explore constraints to achieving those objectives. The meeting was sponsored by USAID in cooperation with the BASICS project, and was chaired by Dr. William H. Foege, Task Force for Child Survival, Carter Center of Emory University. BASICS coordinated the Policy Advisory Group meeting as part of its role of technical leadership, technical assistance, and support to USAID missions.

In addition to members of the Policy Advisory Group, other panelists at the meeting included:

- Dr. Pierre-Marie Metangmo, Johns Hopkins Institute for International Programs
- Dr. Jacques Baudouy, Chief, Population and Human Resources Division, Middle East and North African Region, The World Bank
- Dr. Mary Eming Young, Early Childhood Development, The World Bank
- Ambassador Sally Shelton, Assistant Administrator, Bureau for Global Programs, Field Support and Research Services, USAID

Four background papers were written for the session and are presented in this series, Current Issues in Child Survival.

Papers in the Current Issues in Child Survival Series:

Review of Child Survival Funding, 1980-95, by Dr. Deborah McFarland, Emory University

Accomplishments in Child Survival Research and Programs, by Dr. Bradley Sack, Dr. Ricardo Rodrigues, and Dr. Robert Black, The Johns Hopkins University

The Recent Evolution of Child Mortality in the Developing World, by Dr. Kenneth Hill and Rohini Pande, The Johns Hopkins University

Overcoming Remaining Barriers:The Pathway to Child Survival, by Dr. Ronald Waldman, BASICS, Dr. Alfred V. Bartlett, USAID, Dr. Carlos C. Campbell, University of Arizona Health Sciences Center, and Dr. Richard W. Steketee, CDC

Policy Advisory Group members:

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Dr. Jon Rohde, UNICEF/India

Dr. Olive Shisana, Ministry of Health, South Africa

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Accomplishments in Child Survival Research and Programs

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Introduction

Since 1985, USAID has devoted close to two billion dollars (US) to improve child survival.[1] Although considerable, child survival expenditures represent only one percent of international affairs appropriations and have never accounted for more than 3.7 percent of the total USAID budget.[2] Nonetheless, the returns have been substantial.

Among USAID-assisted countries, infant mortality has declined from an average of 97 deaths per thousand live births in 1985 to 87 in 1991, with some countries showing declines of 25 to 50 percent.[3] For children under five, mortality declines have also been significant, ranging from 20 to 40 percent in most countries.[4] This trend has been shown to occur at various levels of economic performance, although there is a broad relationship between economic growth and improvement in child survival.

It is difficult to determine how much the Child Survival Initiative has contributed to this decline in child mortality. However, USAID-sponsored initiatives such as research in vitamin A, oral rehydration therapy (ORT), and acute respiratory infections (ARI), along with programs dealing with immunization, improved treatment of diarrhea, and the promotion of breast-feeding and micronutrient availability have doubtless been important factors. Each will be examined, along with an example of a country where these initiatives have been applied.

Vitamin A Research

Micronutrient deficiencies that impair health, increase infant, child, and maternal mortality, and impede economic development represent major unmet needs in the developing world. In terms of child survival, vitamin A (VA) deficiency is of particular importance. The most recent figures available show that 43 million children under five suffer from VA deficiency, which will be a factor in 250,000 premature deaths per year as a result of related complications. In addition, 400,000 children become partially or completely blind.[5]

USAID's investment in research in VA deficiency throughout the 1980s, through its Office of Health and Nutrition, has resulted in more than 200 USAID-supported scientific publications on VA-related issues, numerous international presentations, and their consequent translation into policy and program action by various agencies.

Some important discoveries that have resulted from research conducted on the role of VA in reducing morbidity and mortality include the following observations:

- "mild" VA deficiency increases the risk of some childhood infections and death,
- VA supplementation can reduce the risk of mortality in children,
- measles case-fatality rates can be halved by the use of prompt VA treatment.

These, along with other findings, have generated global recognition of VA deficiency prevention as an effective child survival strategy that has been adopted by WHO and UNICEF. This strategy was recognized in the UN's Declaration of the Rights of the Child in 1989 and accepted as a goal in the International Conference on Nutrition in 1992. VA deficiency prevention has been incorporated into the national health and nutrition policy of most

developing countries. These findings have also led USAID to accelerate its VA initiative, which includes distribution of VA capsules, food fortification, and long-term strategies to modify diets and increase production and consumption of VA-rich foods. The initiative is in 50 countries.

Further investment in research can be expected to 1) reveal the extent, severity, and public health consequences of micronutrient deficiencies in high-risk populations, 2) identify potential causes and major determinants of micronutrient deficiencies responsive to interventions, 3) develop new, practical, less expensive, and valid methods for assessing micronutrient status and intake, and 4) guide the development of reliable program pathways toward achieving health goals through micronutrient initiatives. For VA in particular, ongoing research is examining its role in improving reproductive health and in preventing maternal HIV transmission.

Oral Rehydration Therapy Research

It is estimated that three to four million annual deaths in children under five in developing countries occur as a result of 1.5 billion episodes of diarrhea. It is one of the most common illnesses among children.[6] Despite the many improvements in water treatment, sanitation, education, and medical care, diarrhea remains a leading cause of death among children in developing countries.

Although attempts at treating patients with dehydrating diarrhea using replacement solutions date from the previous century, the use of therapeutically effective intravenous (IV) fluids did not become widespread until the 1950s. Studies in the 1960s documented the effectiveness of IV rehydration fluids in cholera treatment. The need for effective therapy applicable to economically disadvantaged populations provided the impetus to develop simple and effective oral rehydration solutions (ORS). These solutions are easy to administer, less expensive, and reduce the need for IV fluids and hospital admissions.

USAID has supported research on the development of ORT since its inception approximately 25 years ago, when it was found that a mixture of glucose and electrolytes given orally can adequately treat dehydration. One of the first utilizations of this therapy was the mass treatment of cholera among refugees in Asia. ORS can be used to treat any dehydrating diarrhea regardless of the patient's age, causative pathogen, or nutritional status.

When ORS was shown to be effective in children as well as adults, USAID was one of the first agencies to propose that ORS packets be made widely available. The development of ORT for the rehydration and maintenance of children with dehydrating diarrhea and the early feeding of children with diarrhea have become the worldwide mainstay of national diarrhea control programs since 1975. In that year, WHO and UNICEF agreed to promote a single solution (WHO-ORS). As a result of these successful ORT programs, diarrhea case-fatality rates have decreased significantly in most countries, with one million child deaths prevented annually.[7]

One ongoing research activity attempts to identify and overcome the behavioral and service delivery obstacles to effective utilization of ORS. This will presumably result in its wider use. Another area of research deals with alternative and improved ORS formulations, which would appreciably reduce the volume and duration of diarrhea while maintaining hydration. These alternatives include rice-based ORS and reduced osmolarity ORS.

ARI Research

Of the more than 12 million deaths in children under the age of five years in developing countries, approximately one third are caused by acute lower respiratory infections (ARI), primarily pneumonia.[8] The disease burden brought on by ARI is high. It accounts for 30-50 percent of visits by children to health facilities, and 20-40 percent of hospitalizations.[9] With the decrease in deaths due to vaccination and improved diarrhea case management, ARI has now become the leading cause of death in this age group in developing countries.

Until recently, interventions for the control of respiratory infections were seen as difficult to develop and implement. The difficulty results from problems in the identification of the etiologic agents, the proper utilization of antibiotics for treatment, and the limited access to clinical services by those at highest risk.

Research co-sponsored by USAID has demonstrated the effectiveness of a case-management strategy for correct diagnosis and treatment of ARI. A series of intervention trials, conducted in various settings in Asia and Africa, demonstrated the impact of the case-management strategy on infant and under-five mortality. This strategy is based on early recognition of pneumonia, prompt treatment of non-severe cases at home with standard antibiotics, and quick identification and referral of severe cases to a hospital. This approach can be undertaken by community health workers adequately trained and linked to a referral system for medical support. Overall results showed a 20 percent reduction in infant mortality and a 25 percent reduction in under-five mortality.[10] Furthermore, this effect was seen in high-risk groups, in areas with high prevalence of malnutrition or high infant mortality, and in settings where case management relied almost entirely on community health workers.

Since then, the incorporation of the ARI case-management strategy into routine health practice has been taking place. Currently, 81 countries have adopted these programs, and USAID supports this type of program in 37 countries that have incorporated ARI activities. Current priorities include assessment of efficient ways to implement pneumonia case-management and to integrate it with other interventions to control childhood mortality. An integrated case-management approach for the sick child which addresses pneumonia, as well as diarrhea, malaria, measles and malnutrition, is also under development by WHO and UNICEF. In addition, USAID supports research in areas such as health-seeking behavior, anti-microbial resistance, and potential preventive technologies, such as new respiratory vaccines.

Figure 1
Trends in Immunization Coverage, by Vaccine, Developing Countries 1985, 1990, 1993

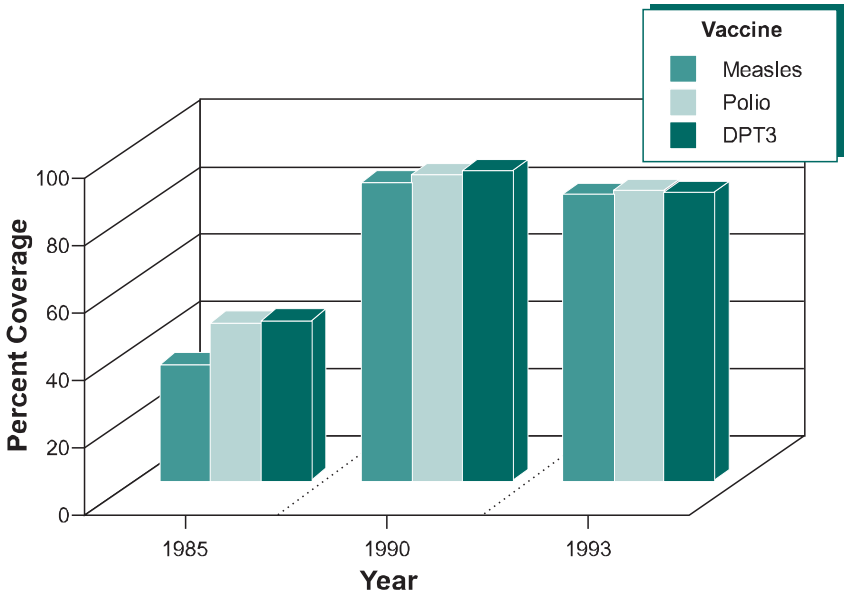
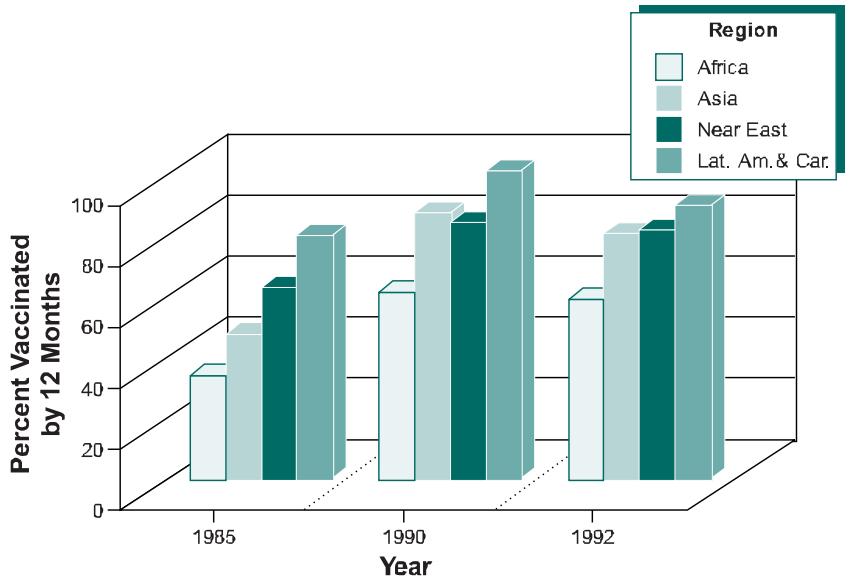


Figure 2
DPT3 Vaccination Coverage in USAID-Assisted Countries, by Region, 1985, 1990, 1992



Immunization Programs

The World Summit for Children of 1990 endorsed ten mid-decade goals to be achieved by developing countries. Of those, four were related to immunization: 1) raise immunization coverage by at least 80 percent; 2) eliminate neonatal tetanus; 3) reduce measles deaths by 95 percent and cases by 90 percent; and 4) eradicate polio in key areas.

The proportion of the world's children vaccinated against the major vaccine-preventable childhood diseases has risen from 37 percent in 1984 to approximately 80 percent in the early 1990s. The vaccinations have prevented an estimated three million deaths from the major vaccine preventable diseases and over 500,000 cases of paralytic polio annually.[11] In developing countries, DPT3 coverage has risen from 38 percent in 1985, to 79 percent in 1992. Polio coverage has gone from 48 percent in 1985 to 81 percent in 1993. Measles coverage has climbed from 37 percent in 1985 to 80 percent in 1993.[12] In 1994, polio was eradicated from the Western Hemisphere.

Although immunization rates started to slow down in recent years in some areas, recent figures show that most countries are back on track to achieve their mid-decade goals, and that the possibility of a widespread decline in immunization levels has not occurred. Of the 66 countries that had achieved the 80 percent immunization target by the end of 1990, approximately 30 percent have been able to increase their coverage, 50 percent have maintained coverage, and 20 percent have shown a decline.[13] Of the 44 USAID-assisted countries, 25 had attained or exceeded the goal of 80 percent coverage by 1990.[14]

USAID currently participates in the Children's Vaccine Initiative (CVI), aimed at creating a global commitment for the development, production, and delivery of a new generation of children's vaccines. The initiative is based on the development and testing of improved vaccines while simultaneously strengthening the capacity of developing countries to obtain new and existing vaccines through procurement and local production. It also supports the development and testing of new vaccines, including a vaccine against malaria.

Diarrheal Disease Control Programs

USAID has taken an important role in developing and implementing programs to treat diarrhea. Diarrheal Disease Control (CDD) programs have had great success in the treatment of diarrhea associated with dehydration by utilizing an ORT-based case-management approach. An estimated one million lives are saved annually.[15] More recent efforts have focused on the training of health workers, development of local capacity to produce ORS, the promotion of breast-feeding, and other strategies for prevention of transmission of enteric pathogens. Over 100 countries are conducting their own CDD programs, and ORS is being produced locally in 60 of them.[16]

Global access to ORS is estimated to be in the order of three out of four episodes of diarrhea for children under five, and actual use of ORS or home fluids is occurring in one out of two diarrheal episodes for this age group.[17] It is estimated that if ORS became universally accessible, an additional one million child deaths could be prevented annually.[18]

Figure 3
ORS Access and ORS/Home Fluid Use Rates, Global Estimates, 1985-1993

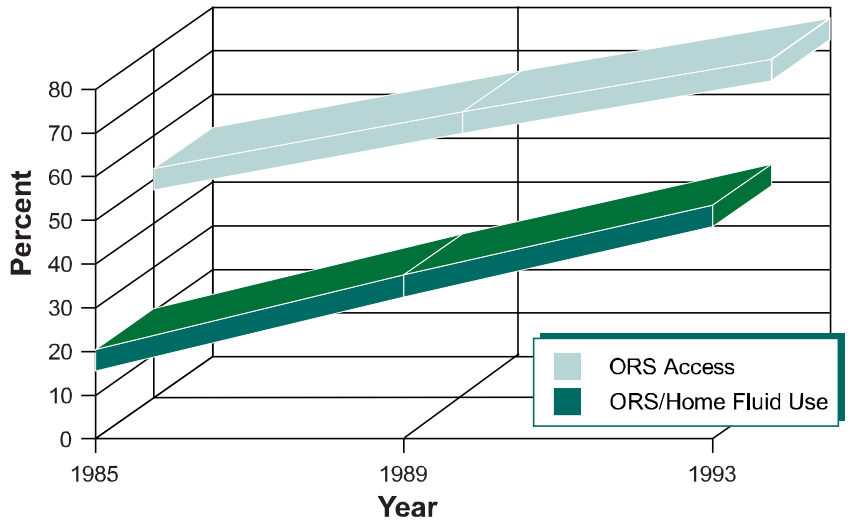


Figure 4
Estimated ORS/Home Fluid Use Rates, by Region, 1984, 1992

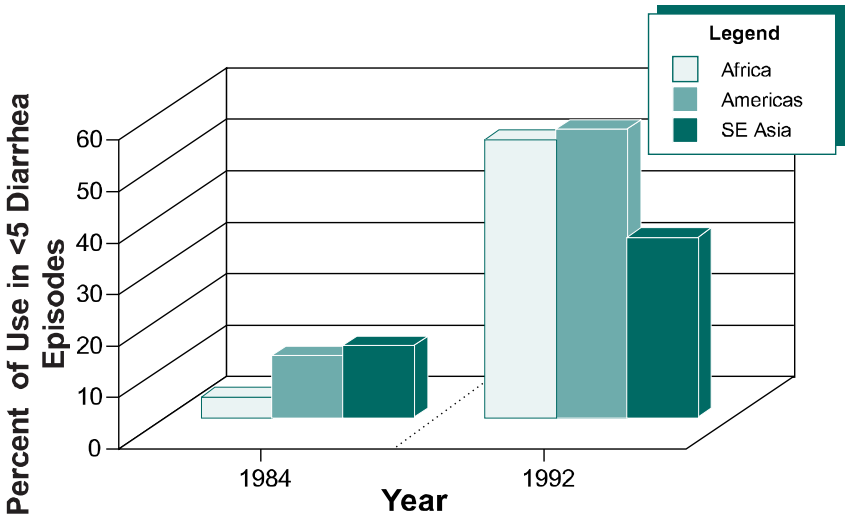


Figure 5
Under-fives Who Are Underweight by Region, 1980-1990

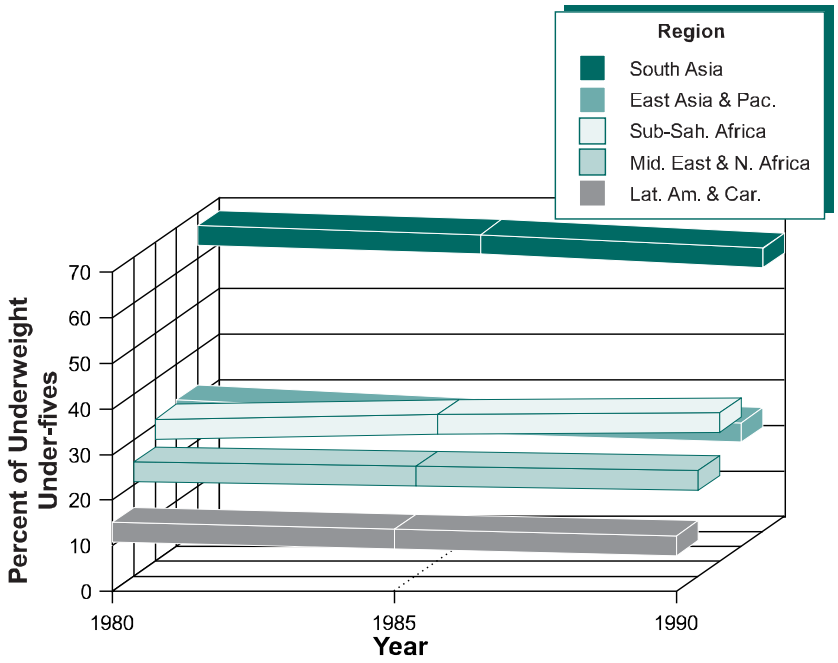
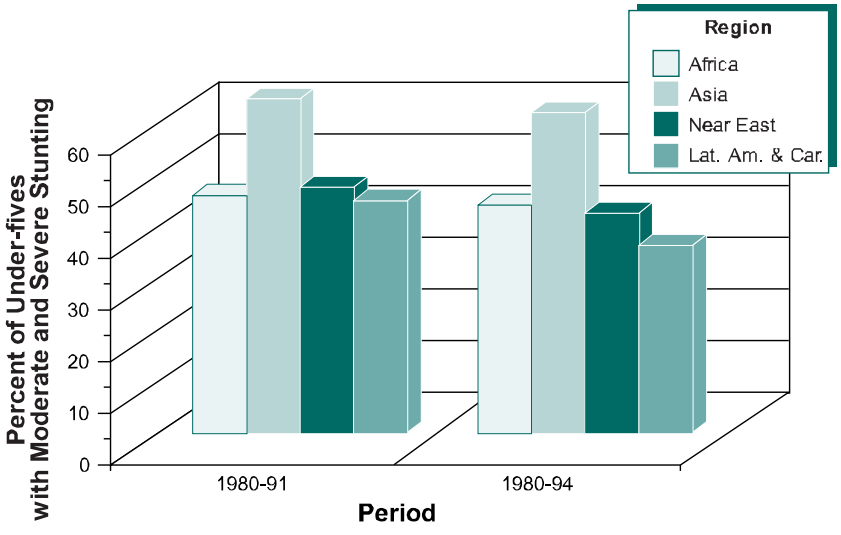


Figure 6
Stunting of Under-fives in USAID-Assisted Countries, by Region, 1980-91, 1980-94



Nutrition Programs

Malnutrition is a contributing factor in up to 60 percent of child deaths, especially when accompanied by diarrhea.[19] The most recent figures available show that 36 percent of children under five in developing countries (excluding China) are malnourished (in terms of weight-for-age), 39 percent are stunted (in height-for-age), and 8 percent are wasted (in weight-for-height).[20]

USAID's strategy has been to promote breastfeeding, intervene to correct micronutrient deficiencies and improve infant feeding practices, target supplementary feeding programs, and promote nutrition education and the use of growth monitoring to stimulate action at the household level.

Although reliable and recent figures that would permit a trend analysis of nutritional status indicators are not available, there are some indications that progress is being made in some regions. Of the 19 USAID-assisted countries for which more than one malnutrition survey has been conducted during the last 15 years, 12 showed a reduction in the percentage of under-fives who are moderately or severely underweight (from a mean of 31 percent to 24 percent). Seven showed increases (from a mean of 28 percent to 35 percent).[21]

Another nutritional status indicator, stunting, shows that for the 30 USAID-assisted countries with data available for two different periods within the last 15 years, the overall percentage of under-fives that suffered from moderate or severe stunting dropped slightly (from 41 percent to 36 percent) from the earliest to the latest figures available.[22]

When it launched its Breastfeeding for Child Survival Strategy in 1989, USAID began promoting optimal breastfeeding. Global trends had been showing a decline in breastfeeding. This strategy concentrated on supporting research, on training health professionals, and providing technical assistance in 50 countries that have ongoing programs.

Worldwide, of the 87 developing countries that pledged to reduce child malnutrition by 20 percent by mid-decade in 1990, 16 had already reduced malnutrition to a level where less than 10 percent of children are now more than 2 standard deviations below expected weight-for-age, and six more were on track to reach or exceed that level by the target date.[23]

Egypt: A Health Profile

Egypt is one of three USAID-assisted child survival emphasis countries in the Near East Region (the others are Morocco and Yemen). Starting with two key interventions, ORT and an expanded immunization program, the local child survival program has shown encouraging results. More recently, the program has been expanded to include additional activities such as child nutrition, ARI control, and child spacing.

During the mid-1980s, diarrhea was the leading cause of under-five deaths. This has dropped significantly since then, largely due to the success of the ORT program. ORS access has reached a level of 95 percent (1991), and ORS use is at 58 percent (1991).[24] The decrease in infant deaths due to diarrhea is shown in Figure 8.

Figure 7
Trends in Infant and <5 Mortality, Egypt, 1985-2000

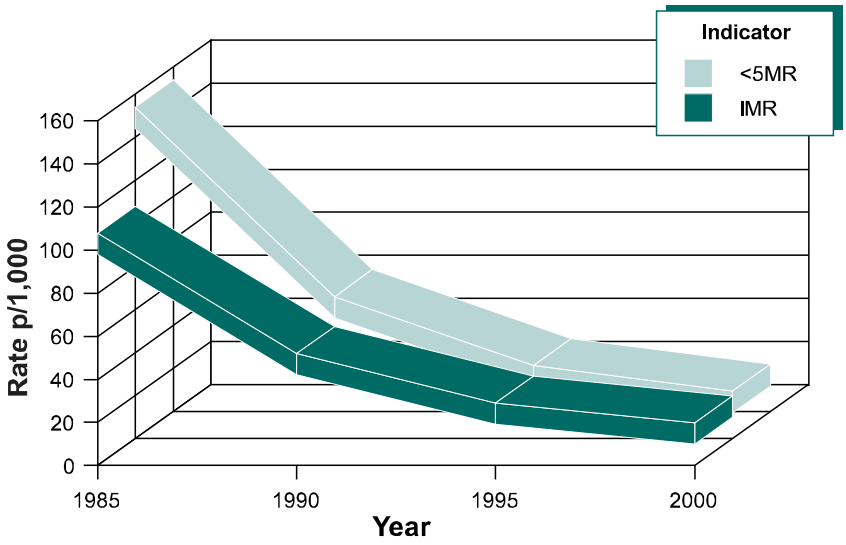
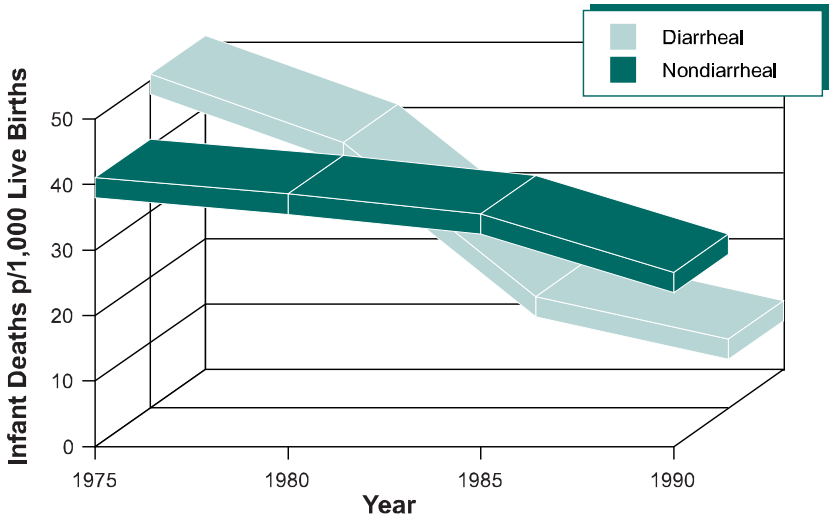


Table 1
Latest Available Demographic and Child Survival Indicators, Egypt

Demographic Indicator	Value	Year
Total Population	59,151,096	1993
Infant Mortality	43 : 1,000	1988
Under 5 Mortality	49 : 1,000	1986
Maternal Mortality	299 : 100,000	1985
Life Expectancy at Birth	62	1993
Children Under 1	1,775,698	1992
Annual Infant Deaths	79,345	1992
Total Fertility Rate	3.9	1992

Child Survival Indicator	Value	Year
Vaccination Coverage		
BCG	92%	1992
DPT3	89%	1992
Measles	89%	1992
Polio3	89%	1992
Tetanus 2+	69%	1992
DPT Drop-out	10%	1990
Oral Rehydration Therapy		
ORS Access	95%	1991
ORS and/or RHF Use	58%	1991
Contraceptive Prevalence	49%	1988
Adequate Nutritional Status	85%	1990

Figure 8
Infant Deaths, Diarrheal and Nondiarrheal, Egypt, 1975-1990



The success of the diarrheal disease program was largely due to the extensive amount of research carried out in-country that was used to build the control strategies for this program. The research involved clinical studies in the use of ORT, as well as behavioral studies and operations research. All studies were incorporated into the control program.

The immunization program has also reached high coverage rates. Starting from a rate of approximately 70 percent in 1980, steady increases have raised the total vaccination coverage rate to almost 90 percent in 1991.[25] The percentage of mothers receiving two doses of tetanus toxoid has also risen, from 8 percent in 1985 to 69 percent in 1992, with a concomitant reduction of neonatal tetanus of 62 percent during the same period.[26]

Between 1980 and 1990, Egypt has shown a decline in infant mortality of over 60 percent, which corresponds to 3.5 times the average of all USAID-assisted countries.[27] Recently, the country completed and has been implementing a national plan of action for reaching the goals of the 1990 World Summit for Children, and President Mubarak declared 1989-99 the decade of Egyptian child care and protection.

With the reduction in number of deaths caused by diarrhea and vaccine-preventable diseases, ARI has recently emerged as the leading cause of death among children. Infant mortality due to ARI is currently at 12 percent, and is responsible for 30 to 40 percent of illnesses in children seen at primary health care facilities.[28] To counteract this, the ARI program established 26 training centers,

having trained nearly half of PHC/MOH physicians nationally in ARI case management.

Factors that influence the performance and impacts of the child survival intervention in Egypt include 1) the homogeneity of culture and concentration of population along the Nile River, 2) the extensive health care infrastructure and large number of trained health personnel, 3) the use of simple, low-cost technologies of ORT and immunization, 4) high levels of commitment and close collaboration among the Government of Egypt, USAID, UNICEF, and WHO, and 5) program structures that provide a degree of management autonomy and flexibility that promotes innovation.

Current priorities include the need to sustain the successes achieved so far as the programs shift from a highly focused, vertical orientation, to reintegration within the regular Ministry of Health (MOH) structure. This transition will be facilitated by the high level of commitment and pride that the MOH has shown in these programs.

Conclusion

The combined international effort to promote child survival is now a decade old. Its accomplishments have been significant, as measured by the various rates of decline in infant and child morbidity and mortality in most regions of the world. Reductions in the number of cases and deaths due to vaccine-preventable and diarrheal diseases also indicate the overall success of this initiative.

USAID's contribution toward the development and utilization of technologies and practices that promote health benefits to infants and children has been fundamental. By linking research on proven technologies (utilization of micronutrients in nutritional promotion programs, application of ORT towards the management of cases of diarrheal diseases, and case-management methods for ARI treatment) with the delivery of services and immunization, USAID acts as an important partner in the effort to improve well-being of the world's children. In order to meet the goals for the year 2000 set in the 1990 World Summit for Children, the dual challenge of maintaining already-achieved accomplishments and developing new approaches to combat recent health threats (HIV/AIDS and the resurgence of malaria, cholera, and tuberculosis) should remain on the agenda for the rest of this decade.

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Figure 1: UNICEF. *State of the World's Children 1996*.
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Figure 7: UNICEF. *State of the World's Children 1991*, 1996.
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USAID

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