



# World Ecology Report

Critical Issues in Health and the Environment

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## **SPECIAL FOCUS**

**Special Issue**

### **Eleventh International Conference on Health and Environment: Global Partners for Global Solutions**

**Executive Summary for the Eleventh International Conference, Health and the Environment: Global Partners for Global Solutions on the theme, "Childhood Antecedents to Adult Illness" April 25 and 26, 2002, United Nations, New York City**

Organized by World Information Transfer

Co-sponsored by  
Government of Jamaica  
Government of Ukraine  
American Academy of Pediatrics



*Dr. Christine K. Durbak, Dr. Walter J. Rogan, Ms. Melissa Holtz, and Dr. Devra Davis at the 11th International Conference on Health and Environment*

There is an old saying that translates into many languages and it is "salud es riqueza" in Spanish; "zdorovia je majetok" in Ukrainian; and "Health is Wealth" in English. By emphasizing children's health as the theme for World Information Transfer's 11th Annual Conference on Health and Environment: Global Partners for Global Solutions, WIT focused attention on our most valuable and vulnerable resource for the future. That resource is healthy children who can become healthy, productive, creative adults.

The Conference provided government delegates, medical experts, the United Nations secretariat and intergovernmental agencies, and the public with new research that identifies how environmental contaminants impact children and youth and later affect them as adults. The second day of the Conference, April 26, coincided with the 16th anniversary of the Chernobyl nuclear disaster. The latest report on the continuing consequences to human health in the most contaminated areas was presented by the Minister of Health of Ukraine. The results and recommendations of this conference were presented at the UN General Assembly Special Session on Children in May 2002.



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**H. E. Miss Patricia Durrant, Permanent Representative of Jamaica to the UN** continued the theme of childhood antecedents to adulthood illness in relation to the work of the UN Special Session on

Children. New commitments are needed to implement actions that demonstrate the full appreciation of children's health and secure a world of safety that includes peace and dignity for children. Today, 120 million children have no access to schooling. More than 12 million children die from preventable diseases such as malaria, malnutrition, and respiratory illnesses. The HIV/AIDS pandemic has had a devastating effect. 13 million children have lost parents to AIDS—most of them have died in sub-Saharan Africa. There is a clear need for children to be protected from environmental contamination. This is why the Special Session on Children is of such importance. Direct investments in children will result in social and economic benefits. For example, there is 5-10% increase on a person's yearly income for every additional year of education. We must take responsibility to foster better lives for the children of today.



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**Keynote speaker—H.E. Professor Vitaliy Moskalenko, Minister of Health of Ukraine.** In Ukraine, Chernobyl still plays an important role in policy making. The immediate victims of Chernobyl include more

than one million children. The incident has affected almost 6% of the country's population. People have suffered from the development of thyroid cancer, respiratory problems, and chromosome aberrations. Nearly 500,000 children are constantly under medical conditions. Percentages of healthy children have diminished dramatically. Therefore, we must pay attention to the following aspects in order to better address the continuing consequences of Chernobyl: improve the quality of health issues, continue to evaluate exposure, find prevention to thyroid cancer, and continue to prevent the development of disorders in the effected persons.

**H. E. Valeriy Kuchinsky, Permanent Representative of Ukraine to the UN,**



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opened the second day of the conference which commemorated the 16th anniversary of the Chernobyl Nuclear Disaster. He expressed the importance of continuing to focus on the health impacts of the radiation contamination to the environments. He also introduced the keynote speaker, the Minister of Health of Ukraine, Professor Vitaly Moskolenko

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**Mr. Kenzo Oshima, Under Secretary-General for Humanitarian Affairs, represented by Carolyn McAskie, Deputy to the Under Secretary General.** To this day, hundreds and thousands

of people are still living under the tragedy of the Chernobyl incident. The governments of Belarus, Russia and Ukraine are trying to help their citizens recover from the tragedy and also to build themselves as independent states and economies. The double impact of a depressed economic situation and environmental contamination is causing problems in these regions. Chernobyl is an issue that can foster international sharing of responsibility. The international community must not withdraw help from these three countries.

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**Mr. Olara Otunnu, Under Secretary General for Children in Armed Conflict** explained that the role of

USG is to ensure the protection of the rights of children who are caught in situations of conflict. This includes displaced children within a country and across countries and children, especially girls, who are abused, who have lost access to education and healthcare because of war. In at least 50 countries around the world, the impacts of war is still being felt. It is, therefore, important to raise greater awareness about what happens to children in conditions of war and to develop stronger international efforts for children caught in war. There are five things that are needed immediately: a rapid medical assessment team; capacity to respond and intervene in emergencies; the need for community medical centers to involve local and outside support; the importance of effective public health education; and the organization and facilitation of exchanges of health experts and technical assistance.



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**Dr. Durbak, Founder and Chair of World Information Transfer,**

opened the conference with remarks that shed light on the linkages between hazardous environmental conditions and their health impacts. She noted the environmental conditions that contribute to communicable diseases which account for 20–25 percent of deaths worldwide. Some of these environmental conditions include, unclean water and associated poor sanitation, which kill over 12 million people each year, and air pollution which kills nearly 3 million more. Moreover, infants and children are especially exposed and vulnerable to dangerous environmental conditions including chemical, physical and biological hazards.



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**Dr. Adnan Amin, Director of UNEP, (United Nations Environment Program) Regional Office in North America,**

indicated how UNEP is particularly interested in the topic of providing emotional support for children. This is important to the quality of their characters and their physical and mental health. UNEP is also slowly but surely realizing the impacts of environmental conditions to human health children's health and is actively engaged in raising awareness on environmental health issues. The median age for the development of cancer in children is six years old in the USA. Cancer rates seem to be rising for children of other countries. Long-term exposures of many to radon, UV-rays and toxic chemicals can be contributing factors to the early development of cancers and other illnesses. It is especially important that children are emphasized in public health policies. Moreover, prevention of these health problems is essential and a safe environmental is crucial to the prevention of illnesses.



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**Dr. Devra Davis, Carnegie Mellon University, Heinz School,**

presented her findings that a number of experimental and ecological studies reveal the exquisite vulnerability of the developing organism to toxicants. Recent studies have discovered widespread exposure to a number of persistent organic

compounds, many of which have been found to be hormonally active in various test systems. She presented evidence supporting the need for policies that take into account increased vulnerability of the young to developmental and respiratory toxicants. She cited the case of cancer in women and young girls as an example of the need to practice precautionary principles. Her presentation included power point slides and short documentary film footage showing harm to wildlife as well as historic footage of episodes of lethal pollution in the past.



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**Dr. Lynn Goldman, Johns Hopkins University,**

discussed the increase of childhood exposures to chemicals and pesticides as a result of globalized trade. Children are especially at high risk to the effects of chemicals and pesticides in the environment. There are transboundary impacts of environmental hazards, such as pollutants in the air and water, substances in trade, pesticides, industrial waste and export of hazardous waste. Governments, she said, need to take a more active approach to solving the problem. There needs to be an agreement to help educate people even at the grassroots level about the risks of pesticides, also governments need to promote safer products and possess more control over the production and marketing of pesticides. Currently, more than 100,000 are being produced worldwide. Many are hazardous to children causing endocrine disruption which is defined as "an exogenous agent which interferes with the synthesis, secretion, transport, binding action, or elimination of natural hormones in the body which are responsible for homeostasis, reproduction, development, or behavior." Other effects on children include cancer hazards such as the thyroid cancer increase in Ukraine mentioned already. What is now needed is the phasing down of production, identifying and managing stockpiles of obsolete materials, information exchange, and research and technical assistance. In conclusion she states that globalization of trade has not been matched by international progress in health, environment, safety and labor standards and more needs to be done to create advancement in health and the environment.



**Mr. Cary Granat, President, Walden Media,** considered what the media can do to help provide solutions on a country-to-country basis. He believes that many of these

media companies can support the efforts around the world to build infrastructures and begin initiatives in countries. Media, for instance, can generate positive economic outcomes in many countries, by providing jobs. Media can also bring about a focus on problems in a region that may not have been noticed before by the rest of the world. Africa and Southeast Asia can be the next places where media can contribute much needed philanthropy.



**Dr. Philip J. Landrigan, Mount Sinai School of Medicine,** analyzed the long-term consequences of early exposure to toxic chemicals in the environment. He noted that exposures are particularly hazardous to

children these days. Of even greater concern is the fact that public information on toxicity is only available for 7 per cent of high production volume (HPV) chemicals. Children have heightened biological vulnerability to these chemicals. One example is thalidomide used in Europe years ago to prevent nausea and vomiting in pregnant women. It was discovered that many of these children exposed to thalidomide in utero were born without arms and legs. Patterns of disease in children change as nations undergo transition to industrialization. The effects of chronic diseases and the environmental factors that contribute to them are one of the leading causes of death in developed countries. Some of these include asthma, pediatric cancer and heart disease. Children who had more exposure to air pollution achieved less lung growth, and consequently, they start to lose their lung capacity at an accelerated rate. The actions needed are training for generalists and specialists, child-protection risk assessment, employing the precautionary principle, for example, to presume that children are more vulnerable to toxins, child-protective regulation, right-to-know legislation as well as more international programs and conferences on children and environmental health.



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**Dr. Hanifa Mezoui, Chief, NGO Section, UN DESA,** began her presentation with footage on Chernobyl. She believes that safeguarding our children should be paramount for all society. At this

moment, child-centered decision-making tends to be rare. It requires the involvement of all the diversity to be found in the NGO community to start creating this focus on children. It is vital to the future well being of human kind if NGOs can continue to address issues of peace, security, poverty eradication, protecting the vulnerable, and the protection of our common environment. In order to meet the challenges of the 21st century, national government, international organizations, NGOs, and the private sector must all work together for the mental, physical, and emotional health conditions of the next generation.



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**Dr. Walter Rogan, US National Institute of Environmental Health Sciences, Epidemiology Branch,** discussed endocrine disruptors by first explaining how hormones work in animals. Animals with

circulatory systems have glands, called endocrine glands that secrete hormones. Hormones affect the structure or function of organs or cells elsewhere in the body. These organs and cells can recognize that a hormone is present because they have structures called receptors on their surfaces. Hormones fit into receptor like locks fit into keys. The timing, amount, and duration of hormonal secretion is the way in which many vital functions, such as growth and development, metabolism, and some behavior are regulated. Some pollutant chemicals that are widespread in the environment can fit these receptors and affect endocrine signaling in animals in the laboratory and in the wild. Although human beings are commonly exposed to such pollutant chemicals, the exposures are generally low and clear effects on endocrine function from such exposures have been difficult to demonstrate. Several instances in which there are data from human beings, on both exposure to the chemical agent and the endocrine outcome do exist, however, including age at weaning, age at puberty, and sex ratio at birth.

Although endocrine disruption in humans by pollutant chemicals remains largely undemonstrated, the underlying science is sound and the potential for such effects is real.



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**Dr. Michael Shannon, Children's Hospital, Boston, and Harvard Medical School,** explained that children are more sensitive to the effects of environmental neurotoxicants mainly because of their diet, interaction with the environment (crawling, hand-in-mouth behaviors etc.) and also because they lack the protective natural "barrier" to prevent many dangerous substances from entering the brain. Gestation, lactation, infancy and early childhood are critical development periods in a child's life and when exposed to pesticides and other harmful materials the effects are worse on them due to the fact that they have longer to live and of course, the blood brain barrier is underdeveloped in the first three years of their life. The major environmental neurotoxicants are lead, mercury and pesticides. According to estimates, as many as 17% of American children have a neurodevelopmental disorder. Such illnesses like autism and attention deficit-hyperactivity disorder (ADHD) are easily transmitted to fetuses by their mothers who have been exposed to lead. He calls for more research in environmental protection to secure a healthy future for all the world's children.



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**Dr. Katherine M. Shea, Duke University,** stated that our current environmental health challenges are large and complex, and solutions will need to be innovative, interdisciplinary, cooperative and flexible. She discussed two concepts, "human health risk assessment (RA)" and the "precautionary principle (PP)" as specific approaches that can be used complementarily to limit environmental health hazards. According to Dr. Shea, the number of synthetic chemicals developed since 1950 is estimated to be about 80,000, with 15,000 produced in quantities over 10,000 pounds per year and 28,000 produced in quantities over 1 million pounds per year. She recommended that we cannot and should not wait

for scientific proof of harm before minimizing or eliminating potentially dangerous exposures to populations of infants and children.



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**Mr. Jacob Simonsen, United Nations Development Program Regional Bureau for Europe.** Emergency humanitarian efforts have addressed the fall out and clean up of Chernobyl and provided immediate needs of those affected. However, as time passes, the need to address the human dimension has come to the forefront. UNDP, UNICEF, and WHO have shifted their efforts from humanitarian to the developmental phase. The vision of UNDP, in this case, is to involve other UN agencies to review and adopt policies that support long-term development goals hand in hand with other practical steps such as targeting health, environment and socioeconomic development. UNDP is also working on furthering the details of these project outlines and ensuring donor engagement through the financing of these projects.



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**Ms. Vanessa Tobin, Chief, Water and Sanitation, UNICEF.** Water-related environmental threats to children's health include contamination from disease producing microbes, fluoride, arsenic, and nitrates. In relation to water, the major illnesses killing children include diarrhea, measles, and malaria. Currently, malnutrition is a big problem. More than one billion people today have no access to safe water, and almost three billion have no sanitary means to trash disposal. The most immediate benefit of water interventions would be a drastic improvement of mortality rates. A focus on hygiene education that targets families and schools for the behavioral change is a simple but effective message that can improve the lives of millions. The various UN agencies should focus on water quality, quantity, hygiene promotion, and water related disease reduction.



Statement by Christine K. Durbak to the 11th International Conference on Health and Environment: Global Partners for Global Solutions "Childhood Antecedents to Adult Illness"

We are most pleased to welcome you today to our Eleventh International Conference on the theme of "Childhood Antecedents to Adult Illness", co-sponsored

by the Government of Jamaica, the Government of Ukraine and the American Academy of Pediatrics.

We are here today, three weeks before the United Nations General Assembly Special Session dedicated to the children and adolescents of the world. H. E. Patricia Durrant, Permanent Representative of Jamaica to the United Nations, who will give the Opening Address at our conference today, is chairing the Special Session's preparatory process. One of the key outcomes of this landmark meeting, which will be attended by many Heads of State, will be the outcome document entitled "A World Fit For Children" which governments will consider and which will delineate the new commitments and goals for children.

Many of you may recall that at the 1990 World Summit for Children, world leaders designed a blueprint for improving the lives of children within a decade. Much, according to UNICEF, has been accomplished.

- Mortality rates for children up to age five have been reduced by 14%.
- Neonatal tetanus has been eliminated in 104 of 161 developing nations.
- Vitamin A and iodized salt have been delivered to almost 75% of the world's children.

But while progress has been made, the health of the world's children today remains particularly heartbreaking due to the inextricable relationship between population levels, environmental stress and human health.

Let's look first at world population. In 1999, world population exceeded 6 billion people, with 4.8 billion people, or 80%, living in developing countries. The average number of live births varies widely from 1.6 per woman in more developed countries to 5.1 per woman in the least developed countries. In the least developed countries the number of live births per 1,000 women aged 15 to 19 is 128 per 1,000 vs. 31 per 1,000 in the most developed countries. Given the geometry of these demographics it should not be surprising that our future is one in which all future population growth is likely to occur in the world's poorest countries, precisely those nations that are already straining to provide basic social services to their children. The implications of this

future for our planet's environment and the health of its inhabitants...young and old alike...should be a matter of enormous concern.

But what is to be done? Where to begin? How to change the future?

Amartya Sen, the Indian Nobel Laureate and Economist, said it well: "Advancing gender equality, through reversing the various social and economic handicaps that make women voiceless and powerless, may also be one of the best ways of saving the environment, and countering the dangers of overcrowding and other adversities associated with population pressure. The voice of women is critically important for the world's future—not just for women's future." Therefore, the future of our children will depend on the choices and commitments we will make in the coming years.

Two initiatives seem to be of paramount importance. First, we must ensure that the rights to education; to political equality; and to health, including reproductive health, becomes a reality for all women. Second, we must attack the poverty that affects the 1.2 billion people who live on less than \$1 a day. Study after study in developing coun-

tries have shown that investments in health infrastructure have a 700% return on investment, as measured by gross domestic product. In other words, every \$1 invested yields a \$7 return.

If we are to halt the runaway environmental devastation that is assaulting human health, we must empower women and attack poverty in the developing world. These two initiatives are interrelated because most of the absolutely poor are female, so action towards one will reinforce the other.

Unrestrained population growth has an enormous impact on environmental conditions. Environmental conditions, in turn, help determine whether people are healthy or not, and how long they live. Population growth can affect reproductive health and reproductive choices and can help determine prospects for social cohesion and economic growth, which further effect health. Changes in the environment—pollution and land degradation, climate change, fresh water depletion and contamination—also change prospects for health and development.

Environmental conditions contribute significantly to communicable diseases, which account for about 20-25 per cent of deaths annually worldwide. The illnesses most closely related to environmental conditions—infectious and parasitic diseases and respiratory infections and diseases—endanger development prospects, particularly in poor countries and among poor people in any country. Unclean water and associated poor sanitation kill over 12 million people each year. 1.1 billion people, many of them children, remain without safe water. Air pollution kills nearly 3 million more.

Changes in land use can create new breeding grounds for disease. Irrigation or dam construction, for example, can

***It has been estimated that roughly 60 per cent of the global burden of disease from acute respiratory infections, 90 per cent from diarrhoeal disease, 50 per cent from chronic respiratory conditions and 90 per cent from malaria could be avoided by simple environmental interventions.***

encourage waterborne disease; schistosomiasis established itself in Egypt and Sudan after the building of the Aswan dam. The clearing of tropical forest creates hardpan on which rainwater can collect and mosquitoes can breed. Malaria results in over 1 million deaths each year and accounts for some 300 million new clinical cases each year. Malaria causes 10 per cent of the total deaths in sub-Saharan Africa. Approximately 3 million children will die this year from environmental hazards and accidents.

It has been estimated that roughly 60 per cent of the global burden of disease from acute respiratory infections, 90 per cent from diarrhoeal disease, 50 per cent from chronic respiratory conditions and 90 per cent from malaria could be avoided by simple environmental interventions.

We are here to focus on research emanating from a field that is now called "environmental pediatrics". Infants and children's special vulnerabilities and their unique exposure to environmental toxins are only now beginning to be understood. It is because of committed and talented medical leaders, like those you will hear from at this conference, that the field of environmental pediatrics is now "coming of age" both as it relates to medical research and to clinical application.

What's urgently needed, however, are ways to give voice to what researchers and clinicians are learning. Events like this and the recently concluded conference in Bangkok organized by the World Health Organization provide a tremendous potential education for us all. WHO research suggests that over 40% of the global burden of disease due to environmental risk factors may fall on children under five, since their immune systems and detoxification mechanisms are not fully developed and they are particularly vulnerable to chemical, physical and biological hazards, even though they constitute less than 10% of the world's population.

The American Academy of Pediatrics, which is graciously co-sponsoring this conference, has also taken a leadership role in educating physicians about the relationships between the environment and children's health. The AAP, for example, has published a superb Handbook of Pediatric Environmental Health that is proving to be an invaluable reference for clinicians.

Slowly but surely governments and non-governmental organizations alike are also becoming involved, as are a number of commercial entities in identifying how environmental contaminants impact children in their youth and later in life as adults.

This growing knowledge gives my colleagues at World Information Transfer great hope for the future. Fifteen years ago, we founded World Information Transfer in the aftermath of the Chernobyl tragedy. Since 1992, we have convened ten annual conferences here at The United Nations on various aspects of the relationship between our polluted environment and human health. We have published and digitally transferred thousands of pages of information on the subject and we have been actively involved in aid missions and in research and development efforts.

I am most pleased to report that the proceedings of this conference will be provided for the ministerial attendees at the forthcoming UN Special Session on Children. We are also planning to distribute the proceedings of this conference to leaders in government, civil society and to physicians through a variety of communications channels.

In conclusion, I would like to thank H. E. Ms. Patricia Durrant, Permanent Representative of the Government of Jamaica and H. E. Mr. Valeriy Kuchinsky, Permanent Representative of the Government of Ukraine. I would also like to thank the American Academy of Pediatrics for their co-sponsorship. Finally, I'd like to thank all of our prestigious speakers for sharing their valuable insights and time and all of our supporters.

Many observers believe, correctly in my view, that our devaluation of our children coupled with our abuse of the environment is stealing the healthy inheritance of future generations. To quote Nelson Mandela, "We cannot waste our precious children. Not another one. Not another day. It is long past time for us to act on their behalf."



### **Keynote Address**

Patricia Durrant, Permanent Representative of the Government of Jamaica to the United Nations, Assistant Secretary General-United Nations

At the outset, let me extend my apologies for my Minister of Health, John Junor, who unfortunately is unable to join us today, but who has asked me to convey his best wishes for a successful outcome of your deliberations. Let me also say how pleased I am, as Chair of the Preparatory Committee of the Special Session on Children, to be able to address a theme of concern to the vision of child protection and development which forms a core principle in the expected outcome of the Special Session. The theme, "Childhood Antecedents to Adult Illness", eloquently encapsulates an overriding concern which has inspired several goals and targets in the work of the Preparatory Committee. In a little less than two weeks, we will undertake new commitments to specific actions and initiatives for the improvement of children's health with the full appreciation of the importance of such actions to preventing adult illness and securing a world fit for children. There can be no question that in order to achieve this objective, we must place children at the center of our

***Unforeseen circumstances have also served to place at risk many of the gains in social and human development in the last 50 years. The HIV/AIDS pandemic has had a devastating impact on children.***

endeavours and ensure that they can realize their full potential in health, peace and dignity.

During the past decade the goals set at the 1990 World Summit for Children have been rigorously and systematically monitored. Some 63 countries achieved the Summit goal of reducing by one-third the death rate of children under five, while over 100 countries cut such deaths by one-fifth. This means that there are now 3 million fewer under-five deaths each year than at the beginning of the 1990s; one-third of these young lives are saved by the attainment of the Summit goal of reducing child mortality from diarrhoeal deaths by 50 per cent.

An important outcome of the World Summit was the demonstrated links between health and poverty. Childhood poverty was also recognized as having long-term effects on adult health, with its costly consequences on mortality rates, particularly for children and women. For example, in 1990, about 1.6 billion people were at risk from iodine deficiency which, in childhood, leads to mental retardation, goiter and in women, a higher risk of still-birth and miscarriage. The solution to this was the iodization of table salt, a simple and relatively inexpensive remedy. Similarly, a lack of Vitamin A can lead to irreversible blindness, and even before that stage is reached, a child deficient in Vitamin A, had a far greater risk of dying from common ailments such as measles, malaria and diarrhoea. The remedy for this costly nutritional deficiency is one Vitamin A pill annually, costing a few cents per year.

The striking success of campaigns to end these simple but deadly nutritional conditions can be attributed to the global partnerships which have been developed between the United Nations system and civil society organisations which work in the health field. The campaigns have often caught the imagination of many people in many countries. For example, the eradication of polio is within our reach, and major efforts, such as the Global Alliance for Vaccination and Immunization, have made significant strides in addressing childhood illnesses.

At the same time, while undoubted progress has been made in many of the goals—and I should mention that more children are now in school and the right to education has been universally acknowledged—there are still 120 million children who have no access to schooling, and population growth has cancelled out the increase in the enrollment ratio. It is also still a fact that 1 in 12 children worldwide dies from preventable diseases before the age of five. Of the 132 million children who are born every year, a little over 11 million die before age five from such conditions as malaria, respiratory infections, malnutrition measles and diarrhoeal dehydration.

Unforeseen circumstances have also served to place at risk many of the gains in social and human development in the last 50 years. The HIV/AIDS pandemic has had a devastat-

ing impact on children. At the end of the last century, an estimated 13 million children had lost either a mother or both parents to AIDS; 95 percent of these children are in sub-Saharan Africa. These statistics highlight the imperative of urgent action to address the social and economic concerns that expose our children to risk. The Millennium Development Goals provide a framework for action and require priority attention if poverty eradication and inequality are to be addressed and if developing countries in particular are to be empowered to tackle the environmental and health concerns that affect children.

Over the past 50 years, the health sector in my own country, Jamaica, has been able to lower and, in some instances, eradicate the incidence of communicable diseases, such as polio, increase life expectancy and improve the health status of women and children. Jamaica, like other countries at a

similar stage of development, has however seen a significant epidemiological transition over the past three to four decades. Social changes have resulted in a shift in the pattern of health problems from communica-

ble diseases to chronic and lifestyle related diseases.

Decreasing physical activity and increasing sedentary lifestyle associated with increased access to technology, automation, urbanization, excessive consumption of alcohol, tobacco smoking and high-risk sexual behaviours have contributed to this pattern. While pockets of under-nutrition and malnutrition still exist, over-nutrition with inappropriate choices has implications for higher levels of obesity and its attendant problems in later life. In 1999, the level of over-nutrition was highest at 10.6 per cent in children less than one year old, falling to 5.3 in children 12–23 months, and between 1.6 and 2.5 per cent in older children. Obesity in children is becoming a challenge for the health sector.

However, Jamaica has been polio free since 1986 and immunization coverage for infants 0–11 months is at a level of over 90 per cent. We have also made significant progress in the area of congenital syphilis.

HIV/AIDS has serious implications for global health care. The Caribbean has the highest rate of HIV infection next to Sub-Saharan Africa and the early onset of sexual activity in our population also has implications for this epidemic. A recent study highlighted that upwards of 45 per cent of children surveyed had their first sexual engagement by the age of ten. Only seven percent of males and nine per cent of females in the 15 to 19 age groups are delaying the initiation of sexual activity. More adolescents are having multiple sex partners and are contracting STDs, including HIV. New infections in adolescents in the 10 to 19 age group have been increasing alarmingly since 1995 and adolescent girls have three times higher risk of HIV infection than females the same age. Poverty is undoubtedly a central issue in contributing to the spread of the disease; income inequalities play a central and even more important role in this process.

***Jamaica has been polio free since 1986 and immunization coverage for infants 0-11 months is at a level of over 90 per cent.***

This is particularly true in Latin America and the Caribbean, where several middle-income countries, despite being relatively prosperous, have profound socio-economic inequalities that have led to high rates of infection and fuelled explosive epidemiological trends.

In every region, HIV/AIDS and other health concerns are of primary concern in child protection. Today's discussion provides an opportunity for frank discussion of these issues and the implications for global change. We must focus on meeting the most urgent needs of our children, including the promotion of environmental health. The environmental component of child protection and healthcare is central. Children often live in overcrowded slums, and suffer from the noxious effects of chemical and industrial wastes. The threat to children, adolescents and pregnant women from environmental contamination and pollution is constant and deadly.

It is a sad commentary, that in every part of the world, children are suffering from abuse, neglect and exploitation. We now have an impressive body of knowledge of how millions of children are living—if we could use such a word to describe their short and sad lives. That is why the Special Session on Children is of such importance. It will enable the international community to reaffirm its commitment to the survival, protection, growth, and development of children everywhere. These commitments also cover the provision of access to primary education of all girls and boys, the protection from harm, exploitation and war and from the devastations of HIV/AIDS.

The document which will result from the deliberations before and during the Special Session is entitled, "A World Fit for Children". It should not be seen as an overly ambitious goal because it is not. In fact, it is quite modest - and it encapsulates what I truly believe to be the goal of human beings everywhere. That is, a world where all peoples have a chance to live their lives in peace and dignity and be able to fulfill their human potential. This world can only be achieved through a partnership involving all members of society.

Our conference will be held at the mid-point between two other United Nations Conferences that will impact greatly on the future of children. These are the Monterrey Conference, where there was an acknowledgement that more resources have to be made available to help countries develop, and the Durban Conference on Sustainable Development next September.

These Conferences are focusing on the benefits to be gained from investment in people, as an imperative, if the cycles of poverty and environmental degradation which are a reproach to humanity, are to be broken. I know that it is of fundamental importance that, through the Special Session, we promote the message that young people are crucial to all efforts to break those cycles of poverty, violence and hate that now threaten the peace and security of the entire world.

We now have well-documented evidence of the economic benefits of investing in children. The World Bank has stated that for every year of schooling, people raise their earnings by 5 to 10 percent. A 1998 study by the Rand Corporation found that for every US\$1 invested in the physical and cog-

nitive development of babies, there is a US\$7 return, mainly from future savings on expenditure on health and social services. Healthy and educated children are the solid foundations on which a successful assault on poverty can be based. Our goal is to ensure that the commitments national leaders make next month will be realized.

At the Special Session, they will be asked to see that children get the best possible start in life, recognizing that the survival, protection, growth and development of children in good health and with proper nutrition are the essential foundations of human development. In this context, concerted efforts must be made to fight infectious diseases, tackle major causes of malnutrition, and nurture children in a safe environment that enables them to be physically healthy, mentally alert, emotionally secure, socially competent and able to learn.

I am convinced that leaders are determined to seize this historic opportunity to change the world for and with children. If we are to change our world for the better we have no choice but to make it a world fit for children. We can all relate to this because we were all children once. Every child is our child and this each and every one of us gives us a responsibility and a role.



### **United Nations Environment Programme (UNEP)**

Dr. Annan Z. Amin, Director, New York Office, United Nations Environment Programme (UNEP)

It is once again a pleasure for me to address the annual International Conference on Health and the Environment, continuing a long-standing tradition of UNEP's support for World Information Transfer's efforts in focusing the attention of the international community on pertinent issues—this year, on childhood antecedents to adult disease. This topic is particularly relevant in light of the forthcoming General Assembly Special Session on Children, as well as the fact that the linkages between poverty, environment and health are becoming a major issue in the preparations for the World Summit on Sustainable Development, which will be held in August of this year in Johannesburg.

Just as we know that the emotional support and encouragement that we provide our children from their earliest days is an essential element in the formation of their characters, so too is it clear that the quality of the environment in which a child is born and raised can have a profound impact on his or her physical and mental development. We are slowly but surely improving our understanding of how childhood exposure to the effects of environmental degradation and pollution can have long-lasting impacts, including contributing to the onset of certain diseases in adult life.

In minimizing the negative environmental impacts on

children's health, UNEP firmly believes that prevention is the only sustainable solution—a healthier future for our children will be ensured only through safeguarding the environment. This message is central to a new publication entitled, *Children in the New Millennium: Environmental Impact on Health*, that UNEP, UNICEF and WHO will be launching in two weeks time, during the General Assembly Special Session on Children. We hope that the publication will help raise awareness and deepen our understanding of children's environmental health issues, serving as a call to action, stimulating discussion and intensifying action to support the mutually reinforcing goals of managing environmental challenges of the 21st century and improving child health.

Among the specific environmental issues addressed in the book are the potential effects of exposure to chemicals, such as lead, certain pesticides, mercury and arsenic. Such chemicals can potentially have a devastating effect on the development of the fetus and child, contributing to the onset of certain diseases including cancers. In the United States, cancer is the second biggest killer of children after accidents, with the median age of child victims of cancer being 6 years old. Acute leukemia is the most common type of cancer found in children, and its incidence appears to be rising in some developed countries. While the causes remain unclear, certain toxic substances and radiation in the environment are believed to be factors in the cell changes that lead to cancer. Among the environmental factors that may play a role are tobacco smoke, radon, asbestos, ultraviolet light radiation, hazardous waste, and some pesticides.

When children are exposed from infancy onward, their bodies can accumulate more chemicals and have more time to develop various diseases with long latency periods that have been connected to certain chemical pollutants. For example, a growing body of epidemiological research and studies of laboratory animals suggest the possible link of long-term exposure to certain pesticides and certain cancers, including leukemia, sarcoma, lymphoma, and brain cancer in children. Studies have indicated that the risk of developing cancer might be higher if exposure to carcinogens begins in childhood.

Recognizing such risks, UNEP's Governing Council at its recent special session held in February in Cartagena, Columbia, adopted a forward-looking decision to move towards a new global strategy for reducing the environmental and health risks from toxic chemicals and hazardous wastes. Under the decision, nations requested a stocktaking exercise to pin point crucial gaps in mankind's knowledge on chemicals and wastes.

We have chemicals that we use in our day-to-day lives, some of which are safe, some of which are not safe and most of which we know little or nothing about. The project mandated by UNEP's Governing Council will take stock of

progress made, identify gaps in our knowledge and look towards an approach that solves these problems. It was agreed that developing a strategic approach to international chemicals management should build upon the Bahia Declaration and Priorities for Action Beyond 2000 drawn up two years ago in Brazil by the Intergovernmental Forum on Chemical Safety.

UNEP's Governing Council also decided that the time had come to begin linking chemical safety and health issues with development ones. It is hoped that this will encourage the lending or donating programs of multilateral banks, Governments and development organizations, to take into account issues of chemicals and hazardous wastes in their activities. For example, a hospital incinerator constructed in a developing country should use the best available technology to ensure that the minimum amount of carcinogenic

substances known as dioxins and furans are emitted when it operates.

Another significant development in the field of chemicals was the formal adoption and signing of the Stockholm Convention on

Persistent Organic Pollutants (POPs) on 22 May 2001. Governments have recognized that POPs endanger human health globally, as well as the environment from one generation to the next. They agreed on a series of policies to minimize and eliminate some of the most toxic chemicals ever created in order to secure the health of future generations and the integrity of the chain of life. The Stockholm POPs Convention will enter into force after 50 Governments have signed and ratified it, but voluntary implementation of the Stockholm Convention has already begun prior to its entry into force.

Both indoor and outdoor air pollution have been linked to a series of health problems which are particularly damaging to children, leading to diseases that can continue to plague them in adult life. Outdoor air pollution can cause pulmonary irritation, interfere with fetal growth and infant development, impair lung functions, exacerbate viral infections, bronchitis and pneumonia, and worsen heart problems, asthma, and emphysema. Studies in developing countries have also linked exposure to indoor air pollution with chronic respiratory diseases such as asthma, chronic obstructive pulmonary disease, lung cancer, as well as stillbirths and low-birth weight. In China, lung cancer has also been found to result from long-term exposure to cooking with coal.

Another environmental problem that has been cited as a causal factor in the development of cancers is ozone layer depletion. Skin cancer is the most worrisome health impact of ozone depletion. Overexposure to the sun's harmful ultraviolet (UV-B) light may damage children's skin. Recent studies indicate that excessive sunburns experienced by children 10 to 15 years of age increase by threefold the chance of developing malignant melanoma, the most deadly kind of skin cancer, later in life. In Europe, evaluations of ultraviolet-related skin cancers suggest that, despite the

***We have chemicals that we use in our day-to-day lives, some of which are safe, some of which are not safe and most of which we know little or nothing about.***

decline in the concentrations of ozone depleting substances, skin cancer incidences will not begin to fall until about 2060.

The international response to this issue is embodied in the Convention for the Protection of the Ozone Layer, which was concluded in Vienna in 1985, under UNEP's auspices. The Convention's 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, which gave teeth to the treaty, has been remarkably successful. Production of the most damaging ozone-depleting substances was eliminated, except for a few critical uses, by 1996 in developed countries and should be phased out by 2010 in developing countries. Thanks to these measures, it is currently estimated the CFC concentration in the ozone layer is expected to recover to pre-1980 levels by

the year 2050, with the resultant healing of the 'ozone hole'.

Let me conclude by reiterating what I stressed at the beginning of my presentation, prevention is essential—a healthy future for our children will be ensured only through safeguarding the environment. I have outlined some examples of measures that are being undertaken at the international level, but sustained progress can only be made if individuals strive together for concerted action. Governments, the United Nations system, civil society, and the private sector need to work together to foster intersectoral cooperation at all levels to promote safe environments for children, so that we can give them both a healthy childhood and the prospect of a healthy adult life.



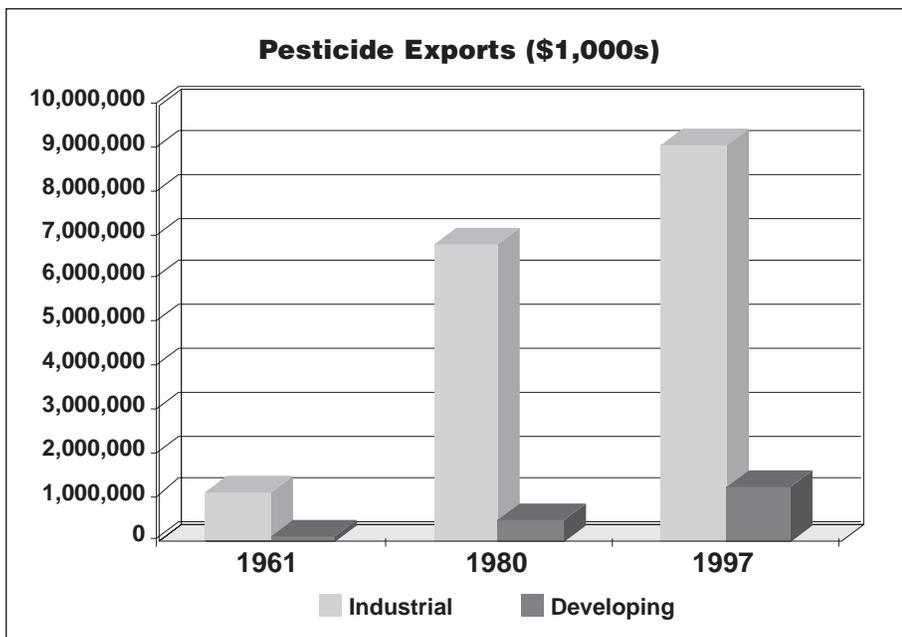
**Chemicals and Pesticides: Risks to Children in a World of Globalized Commerce**

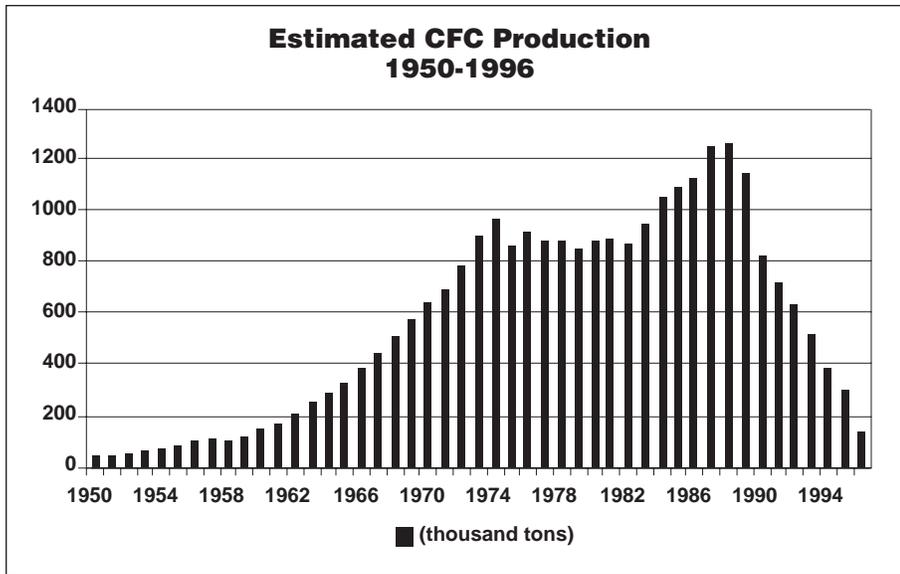
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The hazards to children of most chemicals and pesticides in the environment are unknown. Certain categories of chemicals and pesticides are particularly risky to children. In 1997, there were 75,500 chemicals on the US EPA's inventory of industrial chemicals, but most of these have never been in commerce; there have been an estimated 100,000 chemicals produced worldwide. For the U.S., there are some 15,000 chemicals produced or imported at a rate of at least 10,000 pounds per year and about 2,800 chemicals at a rate of at least a million pounds per year. This latter group is called high production volume chemicals (HPVs). Recent studies

indicate that we know very little even about these HPV chemicals. In 1998, only 7 percent had a complete set of basic screening information called the Screening Inventory Data Set (SIDS) battery. Around 40 percent had no SIDS data at all. For chemicals known to be present in consumer products, only about one-quarter had complete SIDS data. A voluntary effort underway by the chemical industry in the US and globally in cooperation with the OECD should result in availability of screening level data by 2003 for all HPVs. Where the toxicity of chemicals is known, it is possible to classify and label them and there is an international process, the Globally Harmonized System, that is under development. A number of very hazardous chemicals that have been banned or severely restricted in many countries are included in the Rotterdam Convention on Prior Informed Consent. At the same time, new issues are emerging, such as, rising levels of brominated flame retardant chemicals in breast milk and the stain repellent chemical Scotchguard® in people's body.

Children are at greatest risk. In 1993, the US National Research Council found that the EPA was not adequately accounting for children's diets and risks in setting standards for pesticides in food. In response, the EPA changed its methodology for dietary exposure assessment so that it could incorporate available information about children's diets. The EPA also updated a number of test guidelines to generate more information about developmental, neurological, and endocrine effects from pesticides. In 1996, Congress enacted the Food Quality Protection Act (FQPA), which codified several of these new changes. New in FQPA were requirements for cumulative and aggregate risk assessment. Aggregate risk means considering all routes of exposure and uses of a pesticide rather than approving uses one at a time. Cumulative risk means considering all pesticides that may share a common mechanism of action. Another challeng-





ing new provision requires "an additional tenfold margin of safety to protect children." Of particular concern is whether exposure to neurotoxic organophosphate pesticides has an adverse effect on the developing brain of the fetus. Internationally, work is underway to develop consistent approaches for assuring that pesticide standards set under the CODEX are adequately protective of children. Likewise, the OECD is working on the development of internationally harmonized approaches to the assessment of chemicals and pesticides for developmental neurotoxicity.

An endocrine disruptor is defined by the EPA as "an exogenous agent which interferes with the synthesis, secretion, transport, binding action, or elimination of natural hormones in the body which are responsible for homeostasis, reproduction, development, or behavior." Some endocrine disruptors act as sex hormones, either mimicking or blocking estrogen or androgens. Other hormones, such as thyroid hormones, can be involved as well. Since the endocrine system controls very delicate mechanisms of growth and development of the fetus and young child, and because it is so involved in mechanisms having to do with reproduction and a number of disease states, the concern about endocrine disruptors is that they have the potential to be involved with the induction of numerous diseases including developmental abnormalities, cancer, and reproductive problems. The EPA has begun a program to screen and test chemicals for endocrine disruption. Likewise, the OECD is working on a set of internationally harmonized endocrine disruptor tests.

Dioxins and polychlorinated biphenyls (PCBs) are persistent organic pollutants (POPs). PCBs were partially phased out of use in the US in the 1980s, but there is still a significant amount of environmental PCB exposure, especially via consumption of fish from contaminated waters. Dioxins have a

very long half-life in the environment and today are mostly produced as a result of combustion processes. Dioxins and PCBs are classified by the WHO and the US NTP as known or probable carcinogens and are considered by the EPA to be reproductive toxicants. Low-level PCB and dioxin exposure has been found to cause developmental neurotoxicity in children in the US and Europe, and thus there are PCB fish advisories for the fish in the Great Lakes and in several other parts of the US. Generally POPs pass across the placenta to the fetus, and expose children via breast milk. Dioxins and other POPs are included in the Stockholm Convention on Persistent Organic Pollutants, which is pending ratification.

Mercury exposures to children are also important; they recently were reviewed by the American Academy of Pediatrics. Elemental mercury is present in many products, for example, mercury thermometers. Organic mercury (methylmercury) is neurotoxic to the fetus and young child. It is found in fish caught in contaminated waters, and there are local fish advisories in place to limit consumption by children and pregnant women. The UNEP is currently studying mercury as a global pollutant.

Lead exposure is considered the most important environmental illness for children. Lead is absorbed by ingestion or inhalation. At high blood lead levels (BLLs) (>70 mg/dL), lead may cause encephalopathy and death in children. Lead toxicity affects almost every organ system, most importantly, the central nervous system, peripheral nervous system, kidneys, and blood. Low-level lead exposure inhibits both prenatal and postnatal growth, impairs hearing acuity, causes cancer in laboratory animals, and impairs cognition. A number of studies have found that for every increase of 10 to 15 mg/dL BLL, within the range of 5 to 35 mg/dL, there is a lowering of children's mean IQ by 2-4 points. Recent evidence suggests that the effects of early lead exposure can persist.

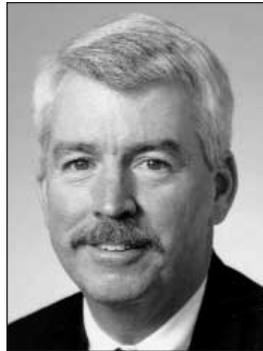
Major sources of lead exposure to children are lead in gasoline and paint, but there are a multitude of other uses, from paints on toys to pottery glazes, that have poisoned children. In the US, seventy percent of the homes built before 1960 are estimated to have lead paint. Most dangerous are the 3.8 million homes with decaying or deteriorating lead paint in which 2 million children under the age of 6 live. World wide, parents who are employed in lead-related industries may bring lead dust home on clothing or expose children by allowing them to visit work sites. The UNEP governing council has decided that countries should eliminate the use of lead in gasoline worldwide and that assis-

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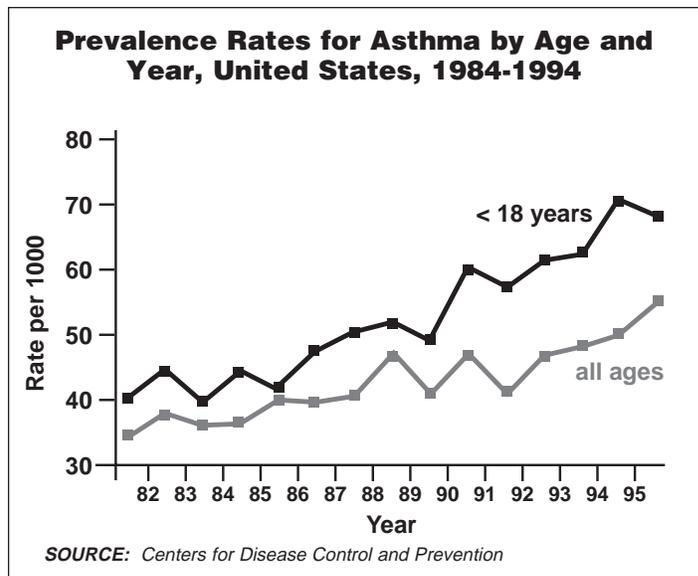
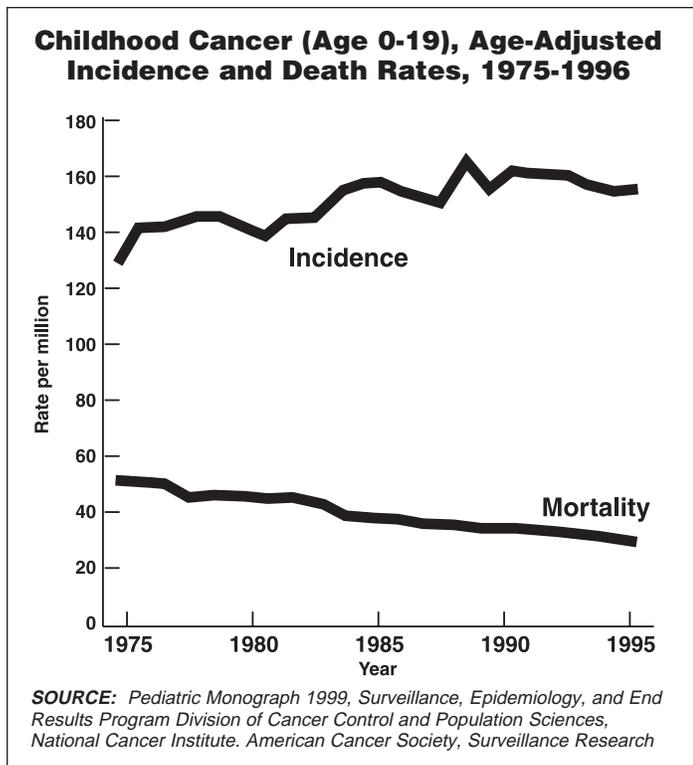
tance should be provided for this. The OECD has adopted a Council Act that recommends discontinuing a multitude of uses that are likely to cause exposures to children.

**The Long-Term Consequences of Early Childhood Exposures to Toxic Chemicals in the Environment**

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Children living in industrialized countries today inhabit a world fundamentally different from that of generations past. The traditional infectious diseases have largely been controlled: smallpox is eradicated, polio is nearly gone, measles is under control, diphtheria and tetanus are rarities, and cholera has virtually disappeared. In the United States, the expected life span of a baby born today is more than two decades longer than that of an infant born at the beginning of the twentieth century. The major diseases confronting children now are chronic and disabling conditions termed the "new pediatric morbidity"—asthma mortality has doubled; leukemia and brain cancer have increased in incidence; neuro-developmental dysfunction is widespread; hypospadias incidence has doubled. Chemical toxicants in the environment as well as poverty, racism, and inequitable access to medical care are factors known and suspected to contribute to causation of these pediatric diseases.



The environment children face today includes hazards that were neither known nor suspected a few decades ago. They are at risk of exposure to over 85,000 synthetic chemicals, most of which have been developed since World War II. In the United States, they are most likely to be exposed to the 15,000 high-production-volume (HPV) chemicals. These chemicals are the most widely dispersed in foods, household products, and pesticides, but less than half of them have been tested for their potential human toxicity. And although children are now recognized to be especially vulnerable to chemicals in the environment, only 7

**The environment children face today includes hazards that were neither known nor suspected a few decades ago.**

percent of these HPV chemicals have been examined for their potential toxicity to children. Children appear uniquely vulnerable to chemical toxicants because of their disproportionately heavy exposures and their inherent biological susceptibility. The protection of children against environmental toxins is a major challenge to modern society.

**Adverse Effects of Sun Exposure in Childhood and Adolescence**

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Exposure to the harmful ultraviolet rays of sunlight in childhood and adolescents plays a major role in the development of skin cancer, the most prevalent form of cancer in man. Skin cancer incidence has been steadily rising in Caucasian popu-

lations worldwide over the past several decades. Several lines of investigation relate current near epidemic rates of skin cancer to changes in sun exposure associated with shifting fashion paradigms, increased recreational travel, and intentional sun seeking behaviors. Childhood sun exposure, especially sunburns, has been linked to the development of skin cancer in adulthood. Moles and freckles that develop in adolescence under the influence of sun exposure are among the strongest predictors of skin cancer. Efforts to prevent skin cancer at the global, community, and personal level are required to address this large and growing problem.

Skin cancer occurs in several forms. The most common skin cancers are pink spots on the surface of the skin arising in the cellular building blocks (keratinocytes) of the skin. These keratinocytic skin cancers occur in two varieties called Basal Cell Carcinoma and Squamous Cell Carcinoma. These skin cancers have a predilection for the more chronically sun exposed areas of the face, arms, and legs. When detected and treated at an early stage they can be readily cured and their cosmetic consequences can be minimized. If allowed to grow to a more advanced stage they can be highly disfiguring and in the case of Squamous Cell Carcinoma, are associated with a significant risk of metastasis (spread to other sites) and death. A less prevalent but increasingly common form of skin cancer is melanoma. Melanoma typically starts as a dark spot on the surface of the skin arising in the pigment cells of the skin called melanocytes. Unless detected in its earlier stages, melanoma is likely to metastasize. Melanoma is

***Skin cancer incidence has been steadily rising in Caucasian populations worldwide over the past several decades.***

the cause of over three quarters of all skin cancer related deaths. Worldwide, all forms of skin cancer have risen dramatically over the past several decades. In the United States, over one million new cases of skin cancer are currently diagnosed annually.

The majority of skin cancers are the result of ultraviolet exposure. Ultraviolet rays constitute a portion of the electromagnetic invisible spectrum of solar radiation. Ultraviolet radiation is typically divided into component parts: UVA (320-400 nanometers), UVB (280-320 nanometers), and UVC (200-280 nanometers). The highly damaging UVC rays of the sun are completely blocked by atmospheric ozone, UVB is partially blocked by ozone, and UVA is impervious to the ozone layer. Both UVB and UVA appear to contribute significantly to the development of skin cancer. UVB rays are primarily responsible for sunburns. UVA rays, which can lead to tanning without sunburn, have also been demonstrated to be harmful to the skin and play a role in the evolution of skin cancer.

It is important to note, that not all skin cancers are sun related. Skin cancers can occur in non sun-exposed areas

including the palms, soles, and parts of the body that are consistently covered with clothing. The causes of these non sun-related skin cancers are thus far not well understood and preventive strategies are lacking. Fortunately, the majority of skin cancers are likely preventable through appropriate sun protection. Efforts toward skin cancer prevention through sun protection have the greatest potential impact when targeted to childhood because: a) childhood sun exposure constitutes a disproportionate percentage of lifetime sun exposure; b) biologically, childhood is also a period in life during which the effects of sun exposure may have the greatest implications for future skin cancer development; and, c) attitudes and behaviors developed in childhood are likely to carry forward into adult life.

The adverse effects of sun on the skin begin to manifest during childhood and adolescence in a variety of ways. Acute excessive sun exposure leads to sunburn and cumulative ultraviolet exposure manifests in a tan. The concept of a 'healthy' tan has been dispelled by the recognition that initiation of the tanning process is prompted by ultraviolet induced cellular damage. Both the tendency to sunburn and ability to tan are genetically determined. The amount of sun exposure required to burn and tan varies among and between people of differing skin color. In general, darker skinned individuals are less susceptible to sunburn and skin cancer. More chronic skin changes related to both sun exposure and skin cancer risk are freckles and moles. Like skin color, the tendency to freckling and moles is largely genetically determined. The actual extent to which freckles and moles develop, however, is strongly correlated with sun exposure. A history of intense sun exposure, sunburn, and the development of freckles are markers of increased risk for all types of skin cancer. Large numbers of moles are an additional important marker of increased risk for the development of melanoma. The development of large (greater than 5mm) clinically atypical moles during adolescence is among the strongest risk factors for development of melanoma. These large atypical moles are often referred to as dysplastic nevi. In addition to their larger size, dysplastic nevi manifest subtle variation in color and often have a fuzzy, indistinct border. Children destined to develop dysplastic nevi often demonstrate moles in unusual anatomic sites such as the scalp and feet at an early age.

Efforts in skin cancer prevention need to focus on limiting ultraviolet exposure at the global, community and personal level. On the global level, stratospheric ozone serves as our primary defense against ultraviolet radiation. While the upward trends in skin cancer incidence antedate the more recent problem of ozone depletion, the effects of ozone depletion are anticipated to significantly exacerbate the problem in the short term future. Through the efforts of the United Nations Environment Program, a concerted multilateral international effort based on the Montreal Protocol has made great progress toward the elimination of ozone depleting substances. With continued and increasingly generalized compliance with a series of international agreements based on the Montreal Protocol, it is hoped that

ozone depletion can be curtailed and the ozone layer permitted to repair itself over the coming century. Much effort and continued public support worldwide are required to ensure the continued success of this important program.

At the community level, public health campaigns have been launched in many countries to improve sun protective behaviors. These efforts focus on the importance of avoidance of intentional sun exposure, seeking shade, wearing appropriate sun protective clothing, and the use of sunscreens. These strategies are all especially relevant to children and adolescents. Policies regarding shade structures in schools and public recreation facilities as well as policies regarding school curricula and dress codes have enormous potential impact. On a personal level, the greatest challenges to skin cancer prevention relate to the prevalent fashion norms that promote tanning and skimpy clothing. This is an especially large obstacle among adolescents who are extremely fashion conscious and eager for social acceptance. While progress is being made on all of these fronts, considerable additional effort is needed.

In summary, we are faced with a large and growing problem of skin cancer. Recognition of the adverse effects of ultraviolet sun exposure in childhood and adolescence needs to inform the development, prioritization, and implementation of strategies to address the problem.

### **Childhood Exposures to Endocrine Disrupters**

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An endocrine gland is one that produces secretions, called hormones, that are distributed in the body by way of the bloodstream. "Hormone" comes from the Greek "to stir up"; a hormone is a product of living cells that circulates and produces a specific effect on the activity of cells remote from its point of origin, especially one exerting a stimulatory effect on a cellular activity. Familiar endocrine organs and their hormones include the beta cells in the pancreas and insulin, the thyroid gland and thyroid hormone, and the adrenal gland and steroid hormones. Synthesis, storage, and release of hormones is tightly regulated through feedback mechanisms

The idea that pollutant chemicals might alter endocrine pathways goes back at least to the 1960s, when pesticide residues caused reproductive failure among pelagic birds. DDT decreased hatchability of their eggs, perhaps by induc-

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ing enzymes that metabolized endogenous estrogens, or by acting as a weak estrogen itself. Recent popular interest in this endocrine disruption

hypothesis appears to have resulted from ecological studies of polluted sites showing plausible effects on endocrine function in exposed wildlife. In addition, in human beings, there are reports of downward secular trends in sperm counts and age at menarche, and the speculation that such changes are caused by exposure to an increasingly polluted environment. While these trends, if they are indeed occurring, may or may not be evidence of increasing effects of pollution, there is evidence supporting the general concept. Compounds like o,p-DDE (a DDT metabolite), other pesticides like methoxychlor and kepone, and industrial chemicals like some PCBs will increase the wet weight of a virgin mouse uterus, which is the classic bioassay for estrogenicity. Besides estrogenicity, other forms of receptor mediated actions have been described for these exogenous compounds. One form of DDE is an anti-androgen, and some pesticides and congeners of PCBs can occupy thyroid hormone receptor.

This paper reviews selected studies in pediatric and reproductive epidemiology in which the environmental exposure and the endocrine outcome have been measured or can be inferred in the same people, and uses a rather narrow definition of "endocrine-related," excluding, for example, data on the results of developmental and IQ tests. Much of this material was prepared by the Committee on Environmental Health of the American Academy of Pediatrics for its Handbook of Environmental Health and for an AAP workshop (proceedings to appear). The potential for PCBs specifically to act as endocrine disrupters at background exposures has been reviewed recently.

### **DDE and duration of lactation in North Carolina and Mexico**

Very high levels of prolactin during pregnancy are accompanied by very high levels of circulating estrogen, which results in increased duct surface area within the breast but usually not in full milk synthesis. Only when estrogen levels fall at term can prolactin act unopposed to promote synthesis. Old style, high dose oral contraceptives given to lactating women were associated with decreased milk volume and perhaps early weaning.

The NC Infant Feeding study began as a 900 child, prospective birth cohort study of children from central NC enrolled between 1978 and 1982. At or near birth, samples of breast milk or colostrum, maternal serum, placenta, and cord blood were collected and later analyzed for PCBs and DDE. DDE is the most stable and persistent of the DDT family of compounds. PCBs are industrial insulating compounds that had become a worldwide pollution problem by the 1970s, and were the first compounds to be banned under the new Toxic Substances Control Act in 1975. The study gathered

information about how the child was fed and when the child was weaned if breast fed. Although the NC study was primarily concerned with the possibility that PCBs and DDE in breast milk might produce detectable toxicity in the breast-fed child, lactation itself was also of concern.

In these data, at what were then background exposures to DDT, the women with the highest 10% or so of levels of DDE breast fed less than 40% as long as women with the lowest levels, unaccompanied by any increase in illness in the children.

In order to replicate the association, we conducted a smaller study in the north central part of Mexico, in a region that had historically used DDT on cotton. The levels in breast milk were several times higher than in NC. If we used data from all the women, we saw a very similar relationship between DDE concentration and weaning. Although the study in Mexico was only of 230 women, for this purpose it was statistically about as powerful as the larger North Carolina study, because so many more of the women had higher levels.

There has not yet been another study specifically addressing this question. In Michigan, following an episode of food contamination with polybrominated biphenyls, women with higher levels in their milk weaned earlier, but they had been advised to do so by health authorities and so the effect could not be interpreted to be due to the chemical. A study done years later among many of the same women failed to find an effect of PBB on weaning, and so it is possible that data on weaning must be gathered close to the time that the events are taking place.

There is a resurgence of interest in DDT for malaria vector control. Unfortunately, the same parts of the world in which malaria is a problem are also places where prolonged breast feeding may be life saving, and the decision poses a public health dilemma.

### **PCBs, hypotonia, and thyroid function**

Between 1978 and 1990, concern about the presence of PCB, DDE, and similar chemical residues in the fat of breast milk led to the founding of several other studies similar to the NC study. Although details differed, all of these studies assembled cohorts of children, followed them from birth, and collected biological samples allowing direct assessment of the child's exposure. Because of the possibility of prenatal effects, all of the studies did some form of neurological evaluation in their newborns. In the two earliest studies, hypotonia at birth was related to pre-natal exposure to PCBs or to a history of consuming PCB contaminated fish. The hypotonia suggested an effect on thyroid hormone. PCBs were known to be toxic to the developing thyroid gland. Subsequently, hypotonia was shown to be accompanied by higher TSH in one study(20) and now there are data from 5 studies. In general, associations between a variety of measures of thyroid hormone status have been weak, inconsis-

tent or absent. The hypothesis has a very reasonable basis in laboratory evidence, though, and is probably worth further innovative study.

### **Sex ratio**

Perhaps because of the reduced redundancy of genetic information on the Y chromosome, the male is the more delicate of the species, with shorter life expectancy at all ages. Theoretically, a toxic exposure during pregnancy might selectively damage males, resulting in a greater ratio at birth of the hardier females. This would not necessarily involve a hormonal mechanism, but studies of sex ratio at birth have been a part of the endocrine disruption discussion. Although there are some data on secular trends, the most relevant data from a toxicological perspective come from Seveso, Italy, where in 1976 a factory exploded, releasing perhaps a kilogram of 2,3,7,8-tetrachlorodibenzo-p-dioxin, one of the most toxic chemicals known. A variety of illnesses have been attributed to this exposure, but a clear pattern of severe toxicity has

not emerged. In 1996, however, Mocarelli observed that, between 1977 and 1984, 48 females but only 26 males were born to the most exposed families. This was a very large effect on a very stable population measure, and has no obvious mechanistic explanation.

It was important to replicate this finding elsewhere. In 1979, a poisoning had occurred in central Taiwan in which about 2000 people became ill after consuming rice bran cooking oil. The oil had been contaminated during manufacture with PCBs; in addition, the PCBs had been heat-degraded and were themselves contaminated with the highly toxic polychlorinated dibenzofurans. These are partially oxidized PCBs that are intermediate in toxicity between PCBs and dioxin, which is the most toxic synthetic chemical known. We had information about the children born in Taiwan after the exposure there to PCBs and PCDFs, and there was clearly more toxicity apparent among the exposed Taiwanese than among the resident of Seveso. We did not, however, see any change in sex ratio there among families we had studied where at least the mother had been exposed. This posed a problem in interpretation until the publication of more detailed data from Seveso showing that the reduction in male births occurred specifically among families where the father was exposed - 50 male offspring and 81 females among the men who had been exposed before age 19. Rather than clarifying the issue, the detailed report noted that the ratio of boys to girls had begun to decrease in the area before the exposure took place in 1976. At this point, the very large departure in the sex ratio of Seveso births remains unexplained, and while it would seem straightforward to replicate in the laboratory, no report is yet available of such an experimental study. To complicate matters, higher levels of PCBs in Michigan fish eaters and higher

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levels of TCDD in US male veterans with exposure to dioxin from Agent Orange are associated with more frequent male births. This is an important question, but further clarification both from the experience of other groups of people with known exposure and a laboratory model will likely be necessary before we understand what is going on.

### Adolescent growth and sexual maturation

When Herman-Giddens published data showing that many girls, especially black girls, had evidence of pubic or auxiliary hair and breast development before age 7 years, it was viewed by many as evidence that puberty was occurring younger than it had been at some unspecified time in the past. Although there is good evidence that age at menarche has been declining in white girls for decades, there were no data on black girls nor on the other stages of puberty to allow estimation of a secular trend. We had been interested in onset of puberty among the children in the NC study, and recontacted 594 of them as they reached adolescence. We assessed height, weight, and stage of pubertal development through annual mail questionnaires. The child or the parent provided the assessment of pubertal stage, using line drawings of the five Tanner stages. These show characteristics of the pubic hair, penis, and scrotum in boys and pubic hair and breast in girls that go from 0 (pre-pubertal) to 5 (adult). There is good evidence that children can report their stage accurately using this instrument. We found that the higher the prenatal exposure to DDE, the taller and heavier the boys were at age 14 years; adjusted means for those with the highest exposures (maternal concentration 4+ ppm fat) were 6.3 cm and 6.9 kg larger than those with the lowest (0-1 ppm) (both  $p < 0.05$  by T test and in multivariate models). There was no effect on the ages at which pubertal stages were attained. Lactational exposures to DDE had no apparent effects; neither did transplacental or lactational exposure to PCBs. Girls with the highest transplacental PCB exposures were heavier for their heights than other girls by 5.4 kg, but the difference was significant only if the analysis was restricted to whites. While there was some evidence that the girls with the highest PCB exposure reached the early stages of puberty sooner, the numbers were small, age at menarche appeared unaffected, and we had no previous hypothesis concerning individual stages of puberty. We concluded that, in our data, prenatal exposures at background levels affect body size at puberty, but not pubertal stage. Since we did not hypothesize different effects for the chemicals in boys and girls, confirmation will be very helpful in interpretation. There are several studies now ongoing that will have the data to allow replication of the NC findings, but none have appeared so far. However, maternal exposure to polybrominated biphenyls during a food contamination episode in Michigan is associated with earlier menarche and Puerto Rican girls with premature the larche had higher serum levels of phthalate plasticizers.

In the poisoning in Taiwan, adolescent males who were exposed in utero to high levels of PCBs/PCDFs had normal progression through the Tanner stages but smaller penises

### Median age at weaning by DDE level in breast milk, NC and Mexico

DDE	Mexico		North Carolina	
	N (%)	Median age (months)	N (%)	Median age (months)
0-2.4	29 (13)	7.5	392 (52)	7.6
2.5-4.9	59 (26)	5.0	282 (38)	6.0
5.0-7.4	66 (29)	3.0	45 (6)	3.5
7.5-9.9	33 (14)	3.5	18 (2)	2.2
10.0-12.4	21 (9)	4.0	9 (1)	2.8
12.5+	21 (9)	3.0	6 (1)	7.7
Total	229	5.0	752	6.2
Median DDE (ppm)		5		2

than controls. This is a complicated effect, not obviously an estrogenic one, and its mechanism is not known. Puberty in girls was unaffected, as far as could be told.

### Summary

What role, if any, environmental chemicals play in morbidity due to endocrine disruption is unclear. Many studies are underway of breast cancer, endometriosis, testicular cancer, and other plausible end-points. Right now, environmental endocrine disruption of humans is much more speculation than demonstrated fact. In 1996, Congress enacted legislation requiring EPA to screen and test chemicals in food and water for estrogenic and possibly other hormonal activity. Most likely such testing would serve to pick out agents for more intense study. It would not replace more traditional tests for general toxicity and carcinogenicity. Chemicals are not now tested specifically for their ability to mimic, disrupt, or otherwise act as hormone agonists or antagonists except on a research basis. However, the detailed studies of general toxicity, carcinogenicity, and reproduction that new chemicals undergo would be likely to identify potent endocrine toxicity.



### Applying the "Precautionary Principle" versus Human Health Risk Assessment to Childhood Exposures

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The scale and complexity of the anthropogenic changes to the environment in the 21st century is unprecedented. The possibility that these changes could cause adverse health effects at the population level in the current generation, as well as in future generations is now a matter of open discussion. Determination of how to limit

environmental public health hazards is critical. Two basic approaches, the Precautionary Principle (PP) and Human Health Risk Assessment (RA), are often pitted against each other as opposite and mutually exclusive ways to control environmental hazards to human health. In fact, they should be seen as complementary and part of a larger body of approaches to risk management. By studying the lessons imbedded in the history of childhood lead poisoning in the United States, it is possible to begin to develop a combined approach which is iterative, open, and more protective of the health of children and future generations than either approach applied exclusively. This talk should be viewed as a "straw man" offered to stimulate active discussion and interdisciplinary cooperation. Our current environmental health challenges are large and complex, and solutions will need to be innovative, interdisciplinary, cooperative and flexible.

**Defining Terms:** Risk assessment (also called quantitative human health risk assessment) is the term used to describe the four part paradigm codified in the 1983 publication by the National Research Council.

This familiar approach of Hazard Identification, Dose-Response Assessment, Exposure Assessment, and Risk Characterization is powerful because it results in a numerical expression of health risk from exposure to a specific environmental toxicant or hazard in a particular population. It has been used successfully to define and set regulatory limits for such exposures as the criteria air pollutants, toxicants in drinking water, and contaminants in food. The process requires definition of the most important adverse health effect(s) possible from a particular exposure, quantification of probable human exposure(s) and determination of a dose response curve usually in experimental animals.

The paradigm was developed first to address carcinogens, but has evolved to include more complex adverse health outcomes such as reproductive and developmental toxicity. Initially standard guidelines considered average lifetime exposures and quantified risk for a standardized adult male usually of a single chemical exposure causing a single adverse health outcome (e.g. benzene and leukemia). Recently efforts have begun to expand the paradigm to accommodate the special vulnerabilities and different exposures of infants and children. In all of its forms, RA is data intensive, time consuming, and requires default assumptions, mathematical modeling and extrapolations which introduce significant scientific uncertainty into the final calculation of risk. Supporters of this approach stress the scientific basis of RA which requires evidence and measures of specific toxicity of a particular toxicant or hazard as well as documentation of human exposure in order to draw conclusions. Detractors of RA suggest it is supportive of industry and the economy at the expense of health and places the burden of proof of harm on the regulators rather than the industries promoting

a potentially hazardous action or product.

The "Precautionary Principle" has been applied for several decades in Europe, but in the 1990s came into sharper focus as it emerged as a component of a number of international environmental agreements and treaties. It has been criticized as being too variable and vague to be a useful policy tool. Efforts are underway to define the PP more precisely. While a definition as widely accepted as the four part paradigm of RA has not yet evolved, four components of the PP have been proposed. These are: 1) for potentially hazardous actions preventive action should be taken in the case of scientific uncertainty; 2) the burden of proof of no harm should rest with the proponents of a proposed action; 3) alternatives to a harmful action should be thoroughly explored; and 4) there should be wide public participation in decision making related to environmental hazard. This

approach contrasts to traditional RA which requires accumulation of scientific evidence that a hazard exists before the exposure and toxicity studies are conducted. Proponents suggest that with human health as the outcome, protection is paramount and waiting for such stringent proofs could result in unnecessary health harms. Rather they suggest that if there is reasonable evidence to suggest that an exposure or action could harm human health, it should be prohibited until such time as scientific study proves that it is not harmful. Detractors of this position argue that such a stance would halt progress and harm human health by slowing technology and economic growth.

The Story of Lead: The history of childhood lead poisoning provides a useful lens through which to examine the relative merits of these two approaches. Using the lessons embedded in the story of lead, we should be able to make public health based decisions which are more protective of both children's health and public health of future generations.

At the turn of the 20th century, lead poisoning was considered an occupational disease of adults. Lead, the noble metal, was used in many ways including as additive to paint, in plumbing, cosmetics, and food containers. The earliest suggestion that children might be differently affected by lead came from reports in the late 1890s of "seasonal colic" in Queensland, Australia where children confined to wooden porches ingested leaded paint chipping from weathered exterior surfaces and developed lead poisoning with a symptom profile different from lead poisoned adults. The few American doctors who came across these reports, considered them to be unique to the tropical climate and social conditions of Queensland and non-applicable to US children. While Australia moved to regulate the lead paint industry as early as 1920, the US allowed increased use of lead in paint. The lone expert giving testimony to Congress in 1910 warning about the dangers of lead oxides in all forms was overwhelmed by prevailing attitudes and beliefs that lead in paint

***It is suggested that if there is reasonable evidence to suggest that an exposure or action could harm human health, it should be prohibited until such time as scientific study proves that it is not harmful.***

was only dangerous to industrial workers and painters using inadequate protective techniques. American efforts centered on developing industrial and workplace interventions to prevent occupational exposures.

In the 1920s, tetraethyl lead was introduced into the environment as a cheap and highly effective antiknock agent for internal combustion engines. Unlike the lead oxides in paint which gained entry to the body only through inhalation or ingestion, the extremely toxic tetraethyl lead also entered efficiently through the skin. A series of incidents with researchers and production workers becoming sick and dying caused the Surgeon General of the United States to place a moratorium on "ethyl" production in 1925 pending the results of a multidisciplinary conference. At the conference, the ethyl producers argued for lifting the moratorium because 1) industrial growth demanded tetraethyl lead

which doubled mileage of cars, 2) progress means inevitable new risk, and 3) careless workers poison themselves. Opponents argued that 1) lack of statistical evidence of harm was not an adequate excuse for government inaction, 2) that

measures of emissions should be gathered, and 3) that lead accumulates in the body slowly and toxicity might not be immediately obvious. These doctors and activists called for a halt to production until further studies could be performed to prove safety and sought to place the burden of proof on the ethyl industry. As a result of this conference, the Surgeon General appointed a panel of seven scientists and doctors to determine whether tetraethyl lead was dangerous giving them seven months to do research and report their findings. The group performed a single case control study of 252 gas station employees and chauffeurs looking for a correlation between use of ethyl gas additives and excessive elevation of blood and stool lead levels. The increased levels in ethyl users were not statistically significant. The panel cautioned that this did not mean there was no danger, but that "longer experience may show that even such slight storage of lead as was observed in these studies may lead eventually in susceptible individuals to recognizable lead poisoning or to chronic degenerative diseases of a less obvious character." (Warren, p 127) Disregarding this warning, the Surgeon General lifted the moratorium and leaded gas became ubiquitous.

During the period of increased use of lead in gas, 1920s through 1950s, doctors in Baltimore and Boston began accumulating case series of lead poisoned children. While cases were still relatively unusual, these physicians were describing increasing numbers of encephalopathic children with very high blood lead levels acquired from chewing lead-painted surfaces. Risk parallels were drawn between levels seen in these children and levels seen in occupationally exposed adults. Lead levels below 80 ug/dL were considered "normal" because lead was a ubiquitous exposure and universally

found at lower levels in people without overt symptoms. The concept that there was a threshold of lead toxicity was widely accepted, and the threshold level was set at the lowest level associated with symptoms of acute poisoning.

From 1950 to 1990 information about the dangers of lead poisoning in children exploded. With the advent of effective chelation treatment beginning in the 1950s, physicians increased screening, and developed treatment and follow-up programs. Data began accumulating on the long-term morbidity of acute lead poisoning in children and a push for removal of lead in paint, still viewed as the most important source of lead exposure in children, began. The "threshold" level for lead toxicity began to fall as the special vulnerabilities of children became appreciated (60 ug/dL in 1060, 30 ug/dL in 1970, 25 ug/dL in 1985, 10 ug/dL in 1991).<sup>i</sup> In this period the differences in absorption, distribution and metabolism of lead in infants and children compared to adults were identified and comprehensively defined. This was also the time during which the long-term, chronic toxicities particularly to the central nervous system were described.

Even during this period, however, there continued to be loud voices arguing that any exposure not resulting in acute poisoning was of no significance. It required the accumulation of a series of independent, prospective cohort studies in the 1970s and 1980s all showing the deficits in IQ and neurobehavioral measures before the early warnings of lead experts were given full credence.

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In the last three decades of the century, lead finally fell to regulation and was banned from gasoline, paint, plumbing, and solder in food containers. In retrospect, we can see that the largest source of exposure to the general population was from leaded gas, while the most common cause of acute poisoning in children was leaded paint. Prohibition of both uses has caused dramatic declines in population lead levels as well as cases of acute poisoning. Today the standard textbooks of pediatrics describe lead as a developmental neurotoxicant which at the population level has adverse effects at blood lead levels of 10 ug/dL or lower. It is known that the fetus and young children are particularly vulnerable because of neurologic and developmental immaturity, increased absorption and excess exposures in these ages groups. The best data suggest that the neurotoxicity of childhood lead exposure is not reversible with treatment. Thus, primary prevention is the stated public health goal and the end of the childhood lead epidemic in the US is achievable in the near future. This is the good news. The sad news is that it took almost a century to gather the data which forced the changes to get to this point.

Lead Lessons: The twists and turns of learning the lead lessons make sense within the historical context. It is not useful to place blame on this or that constituency, but rather to examine the mistakes and unheeded voices for hints

***Lack of proof of harm is not equivalent to proof of safety and should not be the basis of allowing a potentially hazardous exposure or action. "It's better to be safe than sorry-prove safety first." (tetraethyl lead in gas)***

about how we can avoid repeating the same kinds of mistakes with other environmental health hazards. From the story of lead we have learned valuable lessons.

1. Avoiding acute toxicity is necessary but not sufficient to protect public health.

2. Children are not little adults with respect to environmental exposures and will not necessarily be protected by measures designed to protect adults, nor express toxicity in the same way.

3. Sentinel cases (Queensland) should not be dismissed as not applicable, but be considered potential evidence of hazard and further explored.

4. Permitting ubiquitous exposure masks subtle toxicity and increases the time and expense of documenting toxicity.

5. Lack of proof of harm is not equivalent to proof of safety and should not be the basis of allowing a potentially hazardous exposure or action. "It's better to be safe than sorry-prove safety first." (tetraethyl lead in gas)

6. Science is crucial, but it takes time and must be designed to answer the important questions. (epidemiology studies in 70s and 80s)

7. Time is not on our side. (almost 100 years from Queensland reports to documenting complete picture of dangers of lead to child neurodevelopment)

**SUGGESTIONS:** Themes consistent with RA and PP abound in the story of lead. Initially it may seem that the voices of industry were strongly in favor of pronouncing lead "innocent until proven guilty" and would perhaps have advocated for rigid adherence to the RA model. Historically, particularly with tetraethyl lead, this seems to have happened with "lack of evidence of harm" being sufficient to permit widespread use of a new chemical. On the other hand, the public health and activist voices advocated pronouncing tetraethyl lead "guilty until proven innocent" and sought to impose a PP model of no exposure pending scientific evidence of safety. In hindsight, this was the correct stance. By not taking the precautionary path, several generations of children particularly between WWII and the 1980s were exposed chronically to a neurotoxin.

In the realm of chemical exposures, a number of common sense suggestions about when to apply RA and when to apply PP naturally follow from this history. Some of these are listed here. For new chemicals of human origin, lead teaches us that PP is the wisest course. Toxicity from acute exposure, chronic exposure and exposure during critical developmental periods should be determined in the most vulnerable populations. Protecting the health and fitness of children should always be a high priority. Evaluation of toxicity to the critical systems which define population health and fitness such as neuropsychologic, reproductive/endocrine, and immunological should be completed before widespread exposure is permitted. The nature of the new chemical should also be considered, and a higher

degree of precaution should be applied to persistent or highly potent chemicals. Finally, it is important to weigh the potential value of a new chemical designed for a specific purpose compared to the adverse health effects. Non-essential use chemicals (either uses unrelated to basic health and survival, or uses for which alternatives already exist) should have very high standards of precaution attached to their commercialization and dissemination.

For already established anthropogenic exposures known to be acutely toxic above a threshold level, lead teaches us to investigate the possibility of chronic toxicity, particularly in vulnerable populations before assuming the acute toxicity threshold applies to all types of exposures and all adverse health outcomes. Many of the pesticides which have undergone re-evaluation under the Food Quality Protection Act have been found to be dangerous to infants and children well

below levels that produce acute toxicity and uses are being reduced or eliminated as a result.ii This is an example of how iterative RA can result in the actions which decrease or eliminate exposures, similar to the iterative

lowering of the toxic lead level from 1960 to 1991.

In some cases in which an exposure is either "natural" (such as fluoride in water or radon in air) or has both natural and anthropogenic sources (such as methyl mercury in fish), a RA approach may be critical in determining maximum safe exposures and the need for mitigation and source reduction. To accomplish this, however, comprehensive exposure and toxicity studies must be available to the risk analyst.

Finally, the reason for exposures or the mechanism of exposures may drive the action toward PP or RA. Unnecessary or difficult to control exposure might best be eliminated consistent with PP. Drift from aerial spraying of pesticides close to schools, parks or residential areas, for example, is impossible to control. While it might be possible to calculate a maximum amount of "safe" drift, define buffer zones, and monitor properties to assure aerial applicators are in compliance with regulations, the variability of wind, topography, vegetation, property lines and surface obstructions make excess drift into occupied areas more likely than not. A precautionary approach would be to eliminate this source of exposure in favor of an alternative with much less likelihood of toxic exposure to children.

**Conclusions:** The number of synthetic chemicals developed since 1950 is estimated to be about 80,000, with 15,000 produced in quantities over 10,000 pounds per year and 2,800 produced in quantities over 1 million pounds per year. Fewer than 50% of the so called "high production volume" (HPV) chemicals have been tested for human toxicity and less than 10% for developmental toxicity. One important lesson from lead is that "time is not on our side" if we approach even the 2800 HPVs in the same deliberate fashion as we did lead. We cannot and should not wait for

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scientific proof of harm before minimizing or eliminating potentially dangerous exposures to populations of infants and children.

There is ample reason for hope. Many of the "mistakes" in the lead story need not be repeated. The unique vulnerabilities of infants and children are now a matter of standard teaching and becoming incorporated into law and regulatory approaches. Subtle, subclinical and chronic toxicities are increasingly recognized and attempts are being made to protect against them. Information transfer is instantaneous and widely distributed globally so

researchers and stakeholders alike share information. The debate between using RA or PP as the default position is healthy and positive and should continue and be enlarged. Including voices from experts and lay people, policy makers and philosophers, industrialists and environmentalists, youth and the elderly will improve the odds of finding creative, workable solutions to the challenging environmental health problems we face at this unique time in history. If we are to protect the health of our species, we must certainly protect our children first.

**One important lesson from lead is that "time is not on our side" if we approach even the 2800 HPVs in the same deliberate fashion as we did lead. We cannot and should not wait for scientific proof of harm before minimizing or eliminating potentially dangerous exposures to populations of infants and children.**



**Childhood Development and Environmental Neurotoxicants**

Dr. Michael Shannon, Pediatric Environmental Health Center, Children's Hospital, Harvard Medical School

Increasing pollution of the environment over the last three decades has had clear and incontrovertible effects on

human health. While many health effects have been beneficial, most of the recent changes in the health status of the world's citizens indicate a worsening of overall health. For many environmental toxicants, children appear to have both greater exposure and more injury compared with adults. Moreover, because their organs are still undergoing development and maturation during exposure to environmental pollutants, children are more likely to have injuries with lifelong impact.

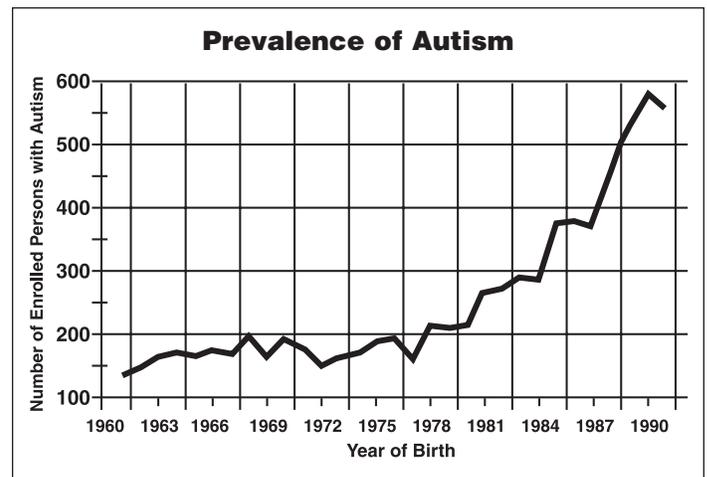
Among all the organs potentially injured when children are exposed to environmental toxicants, it is the central nervous system that is most vulnerable. Children develop the brain that will serve them for the rest of their lives during the first six years of life. Consequently, exposure to environmental neurotoxicants during this period can produce permanent neurodevelopmental sequelae. Equally important, whereas the adult brain has a natural "barrier" to prevent many dangerous substances from entering the brain (the so-called blood brain barrier), this barrier is underdeveloped in children, resulting in greater entry of drugs and neurotoxicants. This physiologic difference between children and adults explains why children who are exposed to lead or mercury have been shown to develop overt symptoms of brain injury at lower degrees of exposure than adults.

There are many environmental neurotoxicants known to have significant and enduring effects on the brain of chil-

dren, producing permanent injury. Most important and best characterized of these agents are lead, mercury, pesticides, and polychlorinated biphenyls (manganese is another neurotoxicant of growing importance, being attributed both to developmental effects on children and Parkinson's disease in adults). For each of these neurotoxicants, rigorous scientific data have shown that children can develop cognitive impairments, social/behavioral disturbances (e.g., hyperactivity, aggression and delinquency) and learning disabilities.

There is powerful evidence that the exposure of children to environmental neurotoxicants is having powerful societal effects. According to recent estimates, as many as 17% of American children have a neurodevelopmental disorder, an unprecedented rate. For two illnesses, autism and attention deficit-hyperactivity disorder (ADHD) there is evidence that the incidence has risen more than 10-fold in the last few decades.

The progressive pollution of our planet has had these and other clear effects on the health of children. Accompanying this are substantial economic costs; the US Environmental Protection Agency has estimated that every IQ point lost as



### **Mercury**

- **A ubiquitous metal**
- **Multiple sources**
  - Industry
    - \* Coal combustion
    - \* Mining
  - Diet
    - \* Fish consumption
- **Worldwide emissions are substantial**

#### **The Scope of Mercury Pollution**

- An estimated 60,000 US children are born to women with excess levels of mercury in their bodies
- The environment is currently so polluted that pregnant women would avoid eating certain fish, e.g., swordfish, mackerel (consumption of tuna should also be limited)

a result of lead poisoning carries a cost of approximately (US)\$9600. Given the global burden associated with increases in the number of children with developmental impairments, there is worldwide urgency for additional research that determines the full scope and the consequences of exposure to environmental neurotoxicants. Only after such data are obtained can methods and priorities for intervention be established. Until complete epidemiologic data are obtained, however, a precautionary approach for limiting children's exposure to neurotoxicants is needed.

***There are many environmental neurotoxicants known to have significant and enduring effects on the brain of children, producing permanent injury.***

### **The Impact of Armed Conflict on Children**

Mr. Olara Otunnu, USG for Children in Armed Conflict

I apologize for the fact that I couldn't be with you earlier in the day. At present, within the United Nations, I'm charged with the task of a relatively new role, a role which is about three or four years old, which is to ensure the protection, the rights, the well-being of children who are caught up in situations of conflict. The background to this mandate was the realization some years back, that clearly among the most vulnerable children in the whole world are children who are caught up in situations of conflict. And yet, this was not receiving the kind of focus and systematic attention that it deserved. That is the reason why the United Nations commissioned Mrs. Graca Michel to do a special report entitled *The Impact of Armed Conflict on Children*.

When we speak of the impact of conflict on children, what

are we talking about? We certainly are talking about displaced children, the largest number of displaced persons in the world, within their countries, as well as across borders, are children. We are talking about the trauma that children inherit even when the guns have gone silent. We are talking about children who were maimed and orphaned. Very, very important are the health community and the medical community. I try as much as possible to actually visit situations of conflict to see for myself what is happening, to raise the profile of the issue on the ground as well as internationally, to engage the parties in conflict directly and press them to make commitments that they won't attack schools and hospitals. That they won't lay landmines and won't recruit the children, that they'll release the kids that are abducted. Very specific commitments that relate to the well being of children. That they'll stop fighting to allow for immunizations against polio and measles. Very specific things that need to be done. And of course, in the context of post conflicts, when war has ended, we have been working to make sure that those who design programs for reconstruction and healing will place children central in their preoccupations. Because without the rehabilitation of children, without giving hope to the young people, children and youth, they can become the spoilers of any peace process in any country. Afghanistan to Kosovo to Sierra Leone. So it is very important that we address their needs, their health, their education, their hopes, and make them part of the force for reconstruction and for progress within society.

What are some of the health related issues that one sees in situations of conflict. Certainly the problem of access, that in so many situations, women and children are in distress, cut off and isolated from access. Problems of security, I mentioned earlier attacks on hospitals, but also security for medical personnel, who are often in danger from one side or the other. The issue of the destruction, and after conflict, the rehabilitation of health facilities, especially community health centers, which are the first to go and the most important to rehabilitate. I mentioned earlier the problem of trauma, the psychological trauma, that remains with young people for a long time. If you can imagine the fact, in Colombia, war has gone on now for forty years. That Angola, which I'll be visiting in a couple of weeks, is almost thirty years of war without stop. Afghanistan, more than twenty years of war. Generations of children have been subjected to this and the trauma that they inherit. Invariably, the health of the child and the mother deteriorate dramatically: infant mortality, maternal death at times of births, the problems of immunization, and the issue of HIV aids. What we're beginning to see is a correlation between the spread of war and spread of HIV aids, in many cases deliberately by the fighting groups as a tool of warfare. Landmines, and the harvest of handicap as a result of that in a place like Afghanistan or Angola, in so many places, so many handicapped children and youth because atrocities and because of landmines. And the incidents of malnutrition—because of lack of access, because the land is not being tilled, and because people are grouped in situations where they cannot produce their own foods. So

these are some of the issues that directly affect the health and the well being of children.

What do I ask of you as a particularly privileged, very important medical and health community? I ask five things of you in the context of our work. Quite often, even when war has ended, we do not have a clear sense, a medical map, of the health and the health situation of children and women in that country. And we need very badly what you may call a medical rapid assessment team. That in a very quick way, could give a sense of the situation, the magnitude of the need, and the nature of the needs so that reactions can then be organized as quickly and effectively as possible. And secondly, of course, the capacity to respond, the capacity to intervene, both in terms of emergency and in terms of relief. This often involves not only local people, but very importantly, support from outside. Thirdly, as I mentioned earlier, among the very first casualties of war are the destruction, the dilapidation of community health centers, and their rehabilitation, immediately, when possible, in the middle or aftermath of war is very important. And this often involves both local capacity and resources but also outside support. Fourth, the importance of effective public health education. In my view, a health education that is focused on the local community, bringing together the mothers, the children, the teachers, and having a community of public health

education, is the most effective way of transforming the health of women and children, especially in rural areas. And finally, it is so important that we organize and facilitate exchanges among communities of medical and health experts. Hospital to hospital, a hospital in this country with a hospital in Sri Lanka, or in Sierra Leone. Expertise, maybe technical assistance. We can facilitate these exchanges, that can empower local communities to do more and prevent them from reinventing the wheel and doing what you already know so well out here. I remember being so struck when I visited Sierra Leone, where the entire society is traumatized. And there was only one trained psychiatrist in the entire country. In Afghanistan, I think I was told similar—maybe two trained psychiatrists at the time of the war, and I don't doubt that today. And that begins to give you a sense of both the need and probable capacity and how exchanges and solidarity can help to reinforce the capacity of local health personnel, who are the one on the front line.

Well, I very much look forward to working closely with you to develop maybe some of these possible threads of collaboration and cooperation. But I count on your support and your role in transforming the current situation and improving the well being, the protection of the rights of children who are unfortunate to be caught up in situations of protracted war. Your role is very important.

**The Health and Well-Being of Children as Guarantees for the Future**

Dr. Hanifa Mezoui  
 Chief, NGO Section, U.N. DESA



The United Nations Secretary General, Kofi Annan once observed that, "Tomorrow's world may be influenced by science and technology, but more than anything, it is already taking shape in the bodies and minds of our children."

With the future of human-kind at stake, wouldn't it, then, seem obvious that safeguarding the health and well being of our children would be of paramount concern to all of society? Unfortunately, for all too many of today's children the passage to healthy, productive adulthood is fraught with hazards of every kind, a great many of them easily traceable to adult action or inaction. Societies in every corner of the globe engage in practices that threaten healthy growth and development. It is not that we don't value good health. The international community has established health as a right that is closely related to and dependant on a number of internationally agreed human rights instruments. In fact, over time, a number of these instruments have affirmed the individual's right to health. For example, The Universal Declaration states that, "Everyone has the right to a standard of living adequate for the health of himself and his family

including food, clothing, housing, and medical care and necessary social services."

The International Covenant on Economic, Social and Cultural Rights also stresses, "The right of everyone to the enjoyment of the highest attainable standard of physical and mental health." Similar acknowledgement of health as a basic human right can be found in the International Convention on the Elimination of all Forms of Racial Discrimination against Women (CEDAW) and The Convention on the Rights of the Child.

The World Health Organization defines health as, "a state of physical, mental and social well being and not merely the absence of disease or infirmity." Under this definition, achieving "health" will require much more than the provision of appropriate medical therapies. Establishing an ongoing "state" of health must entail both the treatment of illness and the creation of an enabling environment for the universal enjoyment of the right to health.

Needless to say, millions of people throughout the world are unable to exercise this basic right. Chief among the disenfranchised are the world's children. They are relatively powerless economically; there are only a few societies whose young people have discretionary incomes of any significance. Although practically every area of government policy affects children in some way, directly or indirectly, children do not have the vote, therefore, specifically "child-centered" decision-making tends to be rare. Socially, children are totally dependant on the good sense, good will or good offices of adults. Biologically, children are the most vulnerable members of the population. Their still developing

minds and bodies are especially susceptible to environmental influences. Here, I am not speaking of the many pollutants in the physical environment, but of the totality of conditions in which young people grow and develop. The consequences of an unsafe, unhealthy environment may be immediate, as attested to by the growing body of environmental pediatric literature, or they may lie latent, manifesting themselves only later in life.

Threats to child health can range from exposure to airborne secondhand tobacco smoke to the practice of child marriage or exposure to direct or indirect mental or physical violence and abuse. Therefore, securing a safe, healthy environment for the young organism to develop must be an equally broad-based, multi-faceted effort calling for the active participation of every segment of the adult society. Many of the causes of ill health fall outside the health sector

itself. Poverty, for example is a major factor in sustaining a state of chronic ill health, not only in the individual but also throughout entire populations. Persistent ill health, in turn, inevitably produces poverty. How the child develops will determine what he or she

will contribute to society. Illness leads to loss of earning power and instead of being a self-sufficient, productive member of society; the sufferer becomes a financial burden and drain on the resources of the family, the community and the State. Moreover, a significant body of research shows a strong correlation between the health of a nation's people and its overall social, economic and political stability and development. This is why the United Nations system has adopted the overall strategy of attacking poverty on several fronts at once. All with the aim of mainstreaming health issues and linking them with good governance and social and economic development policy. For example, the World Bank and the IMF have proposed a strategy to provide debt relief to the 41 Heavily Indebted Poor Countries in return for government commitment to poverty reforms, particularly in the area of basic health care and education for the poor.

Sometimes the problem has to be tackled on the ground as in the case of Bangladesh, where the effect of poverty, environmental factors and ill health intersect to produce an emergency of staggering proportion. Out of a total population of 125 million, an estimated 35 to 70 million people in Bangladesh are exposed to arsenic poisoning from contaminated drinking water...one person in every ten of the total population runs the risk of developing a variety of cancers and others diseases...approximately 20,000 deaths a year are being attributed to arsenic poisoning!

From the time that arsenic contamination was identified as a threat to the people of Bangladesh, a number of specialized agencies and institutions of the United Nations have been

part of the rapid response effort, providing technical expertise and financial support to emergency mitigation measures. This coordinated inter-agency effort has brought together the specialized resources of UN bodies as diverse as the International Labour Organization, The United Nations Industrial Organization, The Food and Agriculture Organization, United Nations University, The United Nations Environment Programme and the International Atomic Energy Agency. The situation in Bangladesh could never be successfully addressed in isolation either as a purely environmental problem or one of public health. After all, environmental problems are by their very nature social problems.

Often traditional values and beliefs that influence behavior may have to be changed. Similarly, age-old patterns of social functioning may have to be rearranged to accommodate a new

reality. This is often the special province of civil society and NGO's. These organizations for the people and of the people are usually the best placed to advocate behavior modification and help bring about social change. A multi-sectoral approach is rapidly becoming the

trademark of non-governmental initiatives in the health field where the complexity of the issues involved require all the diversity of experience and expertise to be found in the NGO community.

Nearly two years ago, at the close of the 20th century, the United Nations convened a meeting that brought together the heads of State and Government and other national leaders from 191 countries to identify areas of common concern for the betterment of the world's people in the 21st century.

The document that resulted from that Millennium Summit is a declaration of the political will of 147 of the world's leaders to achieve certain objectives in seven areas considered vital to the future well being of humankind. The areas identified for concerned action were: Peace, Security and Disarmament; Development and Poverty Eradication; Protecting Our Common Environment; Human Rights, Democracy and Good Governance, Protecting the Vulnerable, meeting the Special Needs of Africa and Strengthening the United Nations. These issues are all interconnected and, I am sure you will notice, fundamental to achieving the ultimate goal of "health for all"

The Secretary-General readily acknowledges that meeting the challenges of the 21st century are well beyond the capability of any one entity. We must all act together—national governments, international organizations, members of civil society, and representatives of the private sector and assume the collective responsibility for the generations of tomorrow by safeguarding the physical, mental and emotional health and well being of the children of today.

***Under this definition, achieving "health" will require much more than the provision of appropriate medical therapies. Establishing an ongoing "state" of health must entail both the treatment of illness and the creation of an enabling environment for the universal enjoyment of the right to health.***

## **The Role of Water, Sanitation and Hygiene Interventions in Children's Health**

Ms. Vanessa Tobin  
Chief, Water and Sanitation  
Division, UNICEF



I'd like to address not just problems that we are aware of: water supply; sanitation; lack of access to services; but also some of the emerging problems of water quality issues.

The lack of affordable, clean water exerts immediate and long-term adverse impacts on children's survival, growth, and development. Biological contamination still has to be considered the number one water quality problem in developing countries. More than two million children are still dying each year of diarrhea that's mainly caused by consuming unsafe water and food. The single most important source of this, obviously, is human contamination. However, other water quality problems prevailing or emerging in many parts of the world involve pollution by certain human-induced or naturally occurring chemicals such as pesticides, nitrates, arsenic and fluoride.

What I'd like to do is highlight some of these problems for you and what the situation still is and the work that still needs to be done.

Arsenic, fluorides, nitrates are emerging problems that need to be closely monitored. UNICEF has now joined hands with WHO to launch a water quality initiative to start monitoring water and sanitation in every country. I would like to outline some of the overall health benefits from water and sanitation interventions if programs are well designed and then look at what the remaining problems are that need to be addressed if we are going to reach the Millennium Development Goals for water and sanitation. Some of the major lessons learned can quickly be reviewed in light of that.

Major child killers are still diarrhea, acute respiratory infections, malaria—where environmental factors are contributing significantly. Looking in terms of respiratory infections and diarrheal diseases in children under five by region, sub-Saharan Africa is still the region that requires the most attention. The burden of disease due to selected risk factors shows that water and sanitation are only second to malnutrition, and one must bear in mind that malnutrition is exacerbated, obviously, by the number of episodes of illness that the child will suffer from—which is also due to environmental factors.

Parasitic infections including hookworm, roundworm, and whipworm impede the ability of school age children to learn and cause their absenteeism from school. A study that was conducted in West Africa shows school absenteeism is a result of such infections. We know that human excreta is the number one pollutant for causing childhood diarrheal diseases, and is also associated with more than two million deaths each year.

Emerging problems that we really need to be monitoring

very closely are: arsenic, now, is not only in Bangladesh; it's been found in Canada, Chile, China, Cambodia, Myanmar. A recent round table held in Bangkok where indicated that more than fifteen countries now are reporting arsenic problems but as identified by our previous speaker, the major problem is in Bangladesh, where more than thirty percent of the wells are contaminated at the present time with arsenic levels above fifty parts per billion.

We know the chronic health effects in terms of the eventual death due to cancer; starting obviously with pigmentation. A number of studies are being conducted looking at also the reproductive health factors.

Fluoride is another problem that has to be closely monitored. In India and China, it's a significant problem, and it's emerging also in Africa. Monitoring water quality in terms of fluorides and the remedial measures that have to be taken is something of great concern to both UNICEF and WHO. The health effects go beyond dental fluorosis. These are slides that show skeletal fluorosis, severe and permanent bone and joint deformations as a result of fluoride contamination.

Nitrates is another factor that will need to be closely followed. The major source is from fertilizers. Also, it's an indicator of human waste and animal waste. The problem has been shown to emerge in Africa, where nitrogen levels were 6 to 8 times the WHO levels, in the USA, Europe, and in the Middle East. The benefits of water and sanitation interventions, if well-designed, have already been proven in terms of their ability to reduce under-5 mortality rates. There is improvement of cognitive performance of children whose treatment for illness was combined with effective sanitary measures. Educational achievement rose when children were treated for diseases resulting from poor water and sanitation.

The scale of the problem remains enormous. We still have more than one billion people who do not have access to clean water. The problem of emerging water quality will put that number even higher. Morbidity rates are on the rise, mortality reduced significantly in the past ten years as a result of controlling diarrheal diseases, but morbidity did not decrease.

What to do? Medical treatment obviously isn't enough, prevention is crucial. Reducing and developing the right type of water and sanitation programs can make an impact, can focus on water quality, and can focus also on the health consequences resulting from well-designed interventions. It is important to go beyond tertiary prevention of disease to preventing the disease itself in terms of increasing host resistance and reducing the chance of illness; and then going back to the inhibiting of illness in the first place, the cultivating and upholding of health standards, which is obviously where

**More than two million children are still dying each year of diarrhea that's mainly caused by consuming unsafe water and food. The single most important source of this, obviously, is human contamination.**

much more effort and attention is needed. Really, in terms of our programs, that combination of software with hardware is crucial, and we have to aim at hygiene improvement, and focus on families and schools; simple and effective messages that can really make a difference.

We've been very much promoting low-cost technologies, even in terms of arsenic mitigation efforts in Bangladesh, which range in terms of cost. But even the low-cost technologies can be implemented quickly, and that's what's happening at the present time. Our interventions focus on water quality, quantity, sanitation, and very much on access to services, hygiene promotion, not just on diarrheal disease reduction, but other water related disease reduction. This will make a difference, and so will addressing the necessary policy and capacity building to bring about those changes.

### **Environmental Effects on Cancer in Girls and Women**

Dr. Devra Davis, Heinz School of  
Public Policy Management,  
Carnegie Mellon University



In my remarks today, I'm going to talk principally about cancer in women and young girls and the case for the precautionary principle. I want to make it clear that there's a lot that we don't know about cancer in women and young girls. But we do know some things. We build buildings and bridges and roads so that they can withstand threats which we hope they never encounter. And the same thing has to be done when we create our societies today. We have to build in more safety factors and err on the side of being safe, rather than sorry.

We know the importance of female literacy. And we know that if we can improve the ability of women to read, we will have opportunities for sustainable development. We know that female literacy, where it has been achieved, reduces population growth, improves child survival, increases women's employment and empowerment, promotes sustainable agriculture, and reduces inefficiencies in energy. All that can be achieved by educating women. I start with this as the basics. We have to do whatever we can to promote female literacy. And that is the most important thing that we can do, as a matter of policy across the board.

Now I want to turn to some of the issues concerning cancer, and what we DO know about the determinants of health. Health comes from many different things. In fact, it is not often

thought of by the minister making decisions, but the decision to invest in energy technology, the decision to invest in a certain form of transport, the decision to promote certain types of industry, or what goes on with respect to health practices broadly, all of those things are really public health decisions. If you're investing in a coal fire power plant, if you are investing in promoting the use of wood burning stoves, that is going to have an effect on the pollution which women and girls are going to be exposed to in the household. So all of these things become important, and need to be looked into what their health component is.

With respect to cancer, what we know is that the environment looks like a pretty likely cause of some forms of cancer. Now I want to explain that the environment cannot possibly cause all forms of cancer. But here's why we think its involved in breast cancer. Migrants who move from one country to the next tend to develop the cancer risks of the country to which they are moving. Adopted children, we know, have a cancer risk that's closer to that of their adopted parents than to their biological parents.

One of the most interesting studies has been done in the Scandinavian countries with identical twins. Now identical twins are genetically identical by definition. They come from the same egg. But, they only get the same type of cancer about half the time. Now that's telling you something rather profound—if they're genetically identical, but they only get the same cancer about half the time, then something else is going on to explain why cancer is developing in those twins. We also know that workers consistently have higher rates of cancer than people who work in other jobs.

In 1950, one in 20 women got breast cancer in this country. The rate of breast cancer has changed dramatically in a very short amount of time. So that while, when I was born, one in 20 women got breast cancer, today, the rate is closer to one in eight in the United States. And that is not explained by changes in genes, although we know that changes in age of marrying and age of children may be involved, the women who got cancers were the mothers of baby boomers. They, on average had more children, and they had them earlier in life. Women who are having their children now, later in life, are developing more breast cancer. Part of the reason maybe that delay in child bearing. But that doesn't explain all of what goes on for breast cancer. And all of the women that get breast cancer today have no known risk factors.

We know fewer than one in 10 cases of breast cancer today arises in women who were born with genetic defects. In fact, we think the number is more like one in 20. This is from the National Cancer Institute. So what does that mean? That means that most women today who get breast cancer are born with healthy genes and something happens to give

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them the disease. Now we think that part of what goes on here is related to the total lifetime exposure to hormones. The earlier in life a girl gets her period, the later in life a woman enters menopause, the greater the risk of breast cancer. Radiation has clearly been shown to cause increase in a breast cancer, particularly when young girls are exposed to radiation. Their risk of breast cancer is clearly elevated. So we know from the Hiroshima survivors that young girls who got radiated during that bombing have a much higher risk of developing breast cancer later on, than women who were age 50 during the bombing. Radiation, particularly to the young breast, increases the risk of breast cancer. We know that family history is important. Early onset of menstruation is important, having a late or no pregnancy increases the risk of breast cancer. Alcohol has been shown to be estrogenic. And the more alcohol a woman drinks, the greater her risk of breast cancer. Lack of exercise also increases the amount of estrogen circulating in a woman's body. And we know now that all of these things combined can contribute to the risk of breast cancer.

Scientists have been doing work on environmental chemicals that can also affect hormones and have identified a number of these. But the human epidemiologic studies in this area are very confusing. And that's because some of them have looked at women after they have breast cancer and measured residues in their body fat of certain pesticides after they have breast cancer and have not found any difference in those that have breast cancer and those who do not. But the important question is that we don't know what really went on before birth, and early in life.

Early childhood exposures are also important for breast cancer. The total lifetime exposure to hormones explains most of the risk factors that we've identified. So we're looking now for the other factors that might also be associated with this. Some prenatal conditions have shown to increase the risk of breast cancer. Those who are born with a higher birth weight, will when they become adults, have a higher risk of breast cancer. Women who were born prematurely, before week 33, will also have a higher risk of breast cancer. And what we know about the prenatal environment of the premature baby girl, is that at week 33, the mother has a surge of hormones. So again, higher hormonal exposure early in life increases the risk of breast cancer.

Females who are fraternal twins with a boy twin also have a higher risk of breast cancer. This may be because mothers of twins have more of everything circulating, including more hormones, and a baby girl who is with a baby boy twin will get a higher dose of exposure to those growth promoting hormones. In addition, girls who are born to mothers who are alcoholics will have a higher rate of breast cancer and we know, again, that alcoholics have a higher rate of hormones

circulating free in their bodies. In fact, men who are alcoholics often tend to develop breasts. We know that alcohol itself is estrogenic.

We put all these things together and it tells us that the prenatal environment of the young girl may be an important contributor to breast cancer. There was and is an unexplained increase in premature breast growth in Puerto Rico; there are also reports of premature breast growth occurring much more frequently in African American young girls in the US. And no one really knows what could be causing this, and there are even debates over the extent to which this is occurring. But one study done in Puerto Rico looked at residues of plastics in the blood in these girls and found a significantly elevated amount of certain types of plastics in the blood of girls who had premature breast growths. Another report has come out recently showing that the levels measured in women in the US

of childbearing ages are highest in women who are in their 20s-40s; we don't know why and we don't know where these plastics are coming from and frankly, we don't know what this means.

One of the issues today is that among African American young women, there is a suggestion that the use of hair products is implicated

in the early development of breasts. A lot of hair products commonly used in the African American community contains hormones. Some of them are labeled many of them are not, and none of them are regulated for this.

We don't have an explanation for racial differences between blacks and whites. We know that there's a higher incidence of breast cancer in young African American women. There is a lower incidence in older African American women. There's premature breast growth and there is a higher death rate, and we really don't understand these differences. Again, they certainly are not genetic. We know that, because the genetic differences between blacks and whites is less than the genetic difference between blacks in the United States and blacks in Africa. Whatever is going on here is going to be some social, cultural, broadly conceived environmental factor. Perhaps hair products are a factor we really have to look at more closely.

Among the policies to reduce breast cancer would be to promote workplace safety and the right to know. The UN has actually played a very important role here, with the international treaty to phase out persistent organic pollutants, and providing information on export policy. All of these things are very important, and we must work to preserve those rights now because one of the consequences of globalization has been exporting materials banned in one country to others. So that's something we have to pay attention to. And again, the UN and the work of the ministers has really been helpful to seeing that we have track and have public information on hazards globally.

***Health comes from many different things. In fact, it is not often thought of by the minister making decisions, but the decision to invest in energy technology, the decision to invest in a certain form of transport, the decision to promote certain types of industry, or what goes on with respect to health practices broadly, all of those things are really public health decisions.***

## CHERNOBYL UPDATE



### **Opening Remarks**

H. E. Mr. Valeriy Kuchinsky,  
Permanent Representative of  
Ukraine to the United Nations

I have the honor to speak at the second day of the Eleventh International Conference "Health and Environment: Global Partners for Global Solutions". I wish to thank the World Information

Transfer and its President Dr. Christine Durbak for organizing this Conference, which for the past decade has served as an important international forum for communicating information and increasing public knowledge about the interrelation between the human health and the health of the environment.

Our meeting today is held in a special context—on 26 April the world is reminded of the worst technological catastrophe in human history—the explosion of the nuclear reactor at the Chernobyl nuclear power plant, which occurred in 1986 on the territory of Ukraine.

Sixteen years after the Chernobyl accident, its medical, economic, environmental, psychological and social impact continues to be a fact of life for millions of people in Ukraine, Belarus and the Russian Federation. Most dramatically, children living in the affected areas in the three countries were and remain the most direct and fragile victims of the Chernobyl tragedy. As we gather today on the eve of the Special Session of the United Nations General Assembly on Children, compassion and solidarity with those children should inspire a greater determination on the part of the international community to support the ongoing efforts aimed at alleviating the sufferings of the Chernobyl children and giving them chance for the future.

It is our hope that today's deliberations at this Conference, in the context of the commemoration of the 16th anniversary of the Chernobyl disaster, will further contribute to raising world public awareness of the persistent implications of the tragedy for the affected population, especially, for children, and will help build a stronger global partnership for addressing a complicated cluster of problems, triggered by the Chernobyl accident.



### **Evaluation of the Consequences of Chernobyl Catastrophe for the Health of Ukrainian Population**

Report by H. E. Dr. Vitaliy  
Moskalenko, MD, Ph. D.,  
Minister of Health of Ukraine

#### **Contamination of the territory of Europe with Cesium-137 after the accident at Chernobyl Nuclear Power Plant)**

On April 26, 1986 due to an accident at 4th power unit of Chernobyl Nuclear Power Plant, the largest man-caused radiological and ecological disaster in the world (according to the international rating scale) occurred in the northern part of Ukraine in the city of Prypiat located 140 km from Kiev, the capital of Ukraine.

This accident led to a significant contamination of the environment, and due to the global trans-border impact on the population and nature it was named the "Chernobyl Catastrophe". The explosion at the 4-th reactor was the equivalent of 500 Hiroshima A-bombs. The aggregated economic losses of Ukraine exceeded US\$ 200 billion.

Since the explosion, Ukraine fulfilled its international obligations—the Chernobyl Power Plant was closed on December 15, 2000 by the Decree of Leonid Kuchma, President of Ukraine. The plant is no longer threatening the world, but Ukraine will continue overcoming the consequences of this catastrophe for a long time.

By the levels of soil contamination with radioactive isotopes and by the radiation doses of the population, the territory sur-

rounding the station was divided in the following zones:

- Contamination of 30-kilometers zone with Cesium-137. A 30-kilometer alienation zone, from which the population was evacuated and resettled in 1986;
- Criteria of contamination and permissible radiation exposure
  - zone of unconditional (mandatory) resettlement, where the dose of human irradiation could exceed 5 milizverts (0.5 Rem) per year over the dose received by an individual before the catastrophe;
  - zone of guaranteed voluntary resettlement, where the dose of irradiation could exceed 1 milizvert (0.1 Rem) per year over the dose received before the catastrophe;
  - zone of increased radiological control, where the dose of irradiation could exceed 0.5 milizvert (0.05 Rem) per year over the dose received by an individual before the catastrophe.

These criteria were recognized in the Concept of Residence of Inhabitants on the Territories with Increased Radiation Contamination Levels Due to Chernobyl Catastrophe (approved by the parliament on February 27, 1991); in the law of Ukraine, "On the legal regime of the territory that experienced radioactive contamination due to the Chernobyl catastrophe" as of February 27, 1991.

On March 29, 1990, Presidium of Verkhovna Rada of Ukrainian Soviet Socialist Republic passed a Decree, which announced April 26 as the 'Day of Chernobyl Tragedy'.

Ukraine undertakes sustainable efforts to provide social support to people affected by the Chernobyl tragedy. In his Address to the Parliament "Ukraine": Path to the 21st Century: Strategy for Economic and Social Development in 2000-2004", President Kuchma said that social protection of people affected

by Chernobyl catastrophe is the priority of state policy to overcome the consequences of disaster.

**Groups and total number of people affected by Chernobyl catastrophe:** The law "On the status and social protection of people affected by Chernobyl catastrophe" determined the status of Chernobyl victims who are subdivided into two groups:

- Participators of rescue works to overcome consequences of the disaster (A group of primary registration);
- Victims of Chernobyl catastrophe (groups of primary registration), including:
  - Individuals evacuated and resettled from the radioactively contaminated territories group of primary registration);
  - Individuals, who reside at the radioactively contaminated territories (group of primary registration);
  - Children born from parents who were affected (group of primary registration).

The total number of people affected by the Chernobyl Nuclear Power Plant accident was 3 million people, including 223 thousand rescue workers in 1986-1987; 62 thousand rescue workers in 1988-1990; 81 thousand evacuated and resettled individuals. Around 1.5 million people residing in the radioactively contaminated territories. Among victims there are over 1 million children (including those with irradiated thyroid gland). 90 thousand people became disabled due to diseases caused by the consequences of the accident.

The laws of Ukraine establish the level of health care and social protection; envisage a long-term monitoring of the health status and keeping of the State Registry of Affected; recommend the indices of the dose load criteria; determine the procedures for recreation and rehabilitation of the affected people.

The institutes of Medical Radiology named after S.P. Grigoriev, of Endocrinology and Metabolism, and of Pediatrics, Obstetrics and Gynecology have the assignment to develop scientific grounds to overcome the consequences of the disaster.

**Scientific Center of Radiation Medicine at AMS of Ukraine:** Scientific Center of Radiation Medicine at the Academy of Medical Sciences of Ukraine is the head institution to resolve health problems of Chernobyl

Due to the Chernobyl catastrophe, the total area of 38 thousand square kilometers (5% of Ukrainian territory) was contaminated with Cesium-137 with a density over 1 curie (Ci) per square kilometer. Over 3 million people used to live on this territory before (almost 6% of the total population).

**Irradiation of thyroid gland with radioiodine of children of the first age group:** Based on the result of thyroid dosage screening,

	1985	1990	1995	2000
Birth Rate	15.0	12.7	9.6	7.8
Death Rate	12.1	12.1	15.4	14.8
Natural Growth	2.9	0.6	-5.8	-7.0

**Life Expectancy at Birth and at Age 65 in 1989-2000 (years)**

	Life Expectancy at Birth	Life Expectancy at Age 65
1989	70.98	14.96
1990	70.54	14.76
1991	69.68	14.42
1992	69.08	14.27
1993	68.32	13.80
1994	67.70	13.66
1995	66.86	13.58
1996	67.17	13.67
1997	67.76	13.78
1998	68.61	14.02
1999	68.18	13.91
2000	67.86	13.80

children received irradiation of thyroid gland within the limits of 0.5-100 Gray even on the territory beyond the Cesium-137 radioactive contamination zone on the level of 1 Ci/squ.km.

Medical observation over the health status of those affected is being implemented since 1986, when the Ministry of Health organized a direct dosimetric checkup of the level of irradiation of thyroid gland and observation of the health status of rescue workers and those affected.

**State Registry of Affected People:** Based on the results of the comprehensive medical examination of the affected people, in 1987 specialists started to create the database of National Registry of People Affected by Chernobyl Catastrophe that contains information about 1.5 million people and records about the irradiation dose for more than 96 thousand rescue workers.

Results of 16 years long medical monitoring of the health status of the Chernobyl rescue workers and those affected by the catastrophe, as well as of long-term research activities undertaken by the institutes of AMS and MoH of Ukraine demonstrate that despite the trends of demographic decline, which are common for Ukraine, and of an increasing rates of morbidity and spread of diseases, certain specific differences in the health status of the affected people were identified.

Of course, individuals who were children and teenagers in 1986 and experienced irradiation of thyroid gland, were singled out in the priority observation group (most of them were evacuated in 1986 from the cities of Prypiat and Chernobyl, or live in 30-kilometers zone, in Chernigov, Kiev and Zhytomyr oblasts and in Kiev city); this group also includes rescue workers.

**Incidence of thyroid gland cancer among children at the moment of accident:** The most significant changes in health status occur among people, who were children and teenagers in 1986 and received irradiation of thyroid gland with radioiodine in April-June 1986.

According to the Institute of Endocrinology and Metabolism at the AMS of Ukraine, less than 10 children a year fell sick with thyroid cancer prior to the catastrophe. A sharp growth of patients began in 1989-1990, first of all in Chernigov oblast, Kiev city and Kiev oblast; slightly less-in Zhytomyr, Cherkassy

and Rivne oblasts. Starting from 1990 Ukraine experienced an obvious increase in morbidity of thyroid cancer among children under 15 years, compared to 1981-1985.

**Number of people operated on thyroid gland cancer in the child age:** Between 1986 and 2001, over 2000 patients were operated on for cancer; at the moment of the accident they were 0 to 18 years old. Over 1300 operated patients were children.

**Incidence of thyroid gland cancer among children born after the accident:** At the same time, only 30 cases of thyroid cancer were identified among children, who were born after the accident, that is beginning from 1987 when the radioiodine was not active.

**Thyroid gland morbidity in the regions of Ukraine among children born after the accident:** It was found out that an intensive growth of this pathology was observed in six regions of Ukraine, that were most of all contaminated with iodine radioisotopes (Kiev, Chernigov, Zhytomyr, Rivne, Cherkassy and Kiev city). Over 60% of thyroid cancer cases among children were registered in these regions. If general morbidity of Ukrainian children (0-14 years at the moment of accident) during 1986-2001 was 0.8 cases per 100 thousand children, then in the above region this index was 1.8-3 cases per 100 thousand children. The increase takes place mainly among children who were not older than 4 years in 1986.

**Incidence of thyroid gland cancer among teenagers at the moment of accident:** A similar dynamics of growth in thyroid cancer morbidity was observed among teenagers (15-18 years at the moment of accident). However, the rate of growth here is slightly lower than among children. In 1986-2001, over 500 such patients were registered in Ukraine.

Radiation as the cause of the development of this disease is confirmed by the data about a clearly manifested additional thyroid cancer morbidity compared to a spontaneous level among children, the dose of thyroid cancer irradiation of whom at the time of the accident exceeded 1 Gray. Analysis of medical statistics, demography and dosimetry suggests a high probability that the morbidity would reach its peak in 2002-2006.

**Ukrainian-American Cohort Study project:** This data is confirmed by the data of a joint Ukrainian-American project of long-term research of thyroid cancer morbidity among children with the determined doses of thyroid gland irradiation. The project envisages 20 years long observation over the cohort of 34 thousand people, 27% of whom have doses over 10 ziverts, 26%—from 3 to 10 ziverts, and 47%—from 0 to 3 ziverts.

The screening observations helped to identify 44 patients with thyroid cancer, who were operated at the Institute of Endocrinology and Metabolism at the AMS of Ukraine. High incidence was observed among the cohort members—1 case per 300 examined people, and in Naroditsky rayon of Zhytomyr oblast (zone of unconditional resettlement)—1 case per 100 examined people.

Most cases were registered among the cohort members with a high dose of thyroid gland irradiation—24 cases after the first screening and 4 cases—after the second one.

In addition to cancer, 23 cases of benign tumors were identi-

**Life Expectancy at Birth by Sex (years)**

	Total Population	Males	Females
1985-1986	71	66	74
1989-1990	71	66	75
1992-1993	69	64	74
1993-1994	68	63	73
1994-1995	67	62	73
1999-2000	68	63	74
2026	68	68	77

fied (nodular struma) and single cases of thyroiditis, which were not yet developed in the irradiated cohort.

**Sex split of patients with thyroid gland cancer depending on the age at the time of accident:** It was found out that with the intrauterine irradiation of the thyroid gland, the thyroid gland cancer has a similar development pattern among boys and girls, but the higher a child's age at the moment of irradiation, the higher is the probability of cancer development in females.

**Histologic types of thyroid gland tumors:** Research of pathohistologic material of eradicated tumors confirmed that by histology type, 83-97% of them were papillary carcinomas, and 3-17%—follicular carcinomas. The second largest population group affected by the Chernobyl catastrophe were rescue workers, or individuals who directly participated in rescue operations on the industrial area and at the territory of 30-kilometers zone. They are subdivided into several groups by the boundary irradiation doses.

**Radiation doses among rescue workers:** 237 individuals who participated in rescue works in the first hours and days after the accident fell ill of the acute radiation disease (ARD); for 145 of them this diagnosis was confirmed in 1989; for 92 of them ARD diagnosis was not confirmed due to the lack of reliable data of medical examination at an early stage.

**Levels of morbidity among people with acute radiation syndrome:** During first 3 months after irradiation 28 patients with ARD died due to the combination of lethal radiation and non-radiation lesions. 14 more people died within a few years after the accident.

**Caption card:** The cause of death was an acute cardiac insufficiency (38,5%) and oncological pathology (23,1%). Today practically all individuals who survived from acute radiation disease are disabled.

**Radiation pathology of skin among rescue workers:** Almost 1/3 of individuals who survived from ARD are suffering from late radiation lesions of skin of different levels—from easy clinical forms of chronic radiation dermatitis to hard conditions with late trophic ulcers.

**Radiation cataracts among the rescue workers:** The number of radiation posterocapsular (retrobulbular) cataracts has grown.

Radiation cataracts were found in 82% of patients with acute radiation disease; in 30%—with ARD of II degree and in 5% with ARD of I degree.

**The frequency of occurrence of eyesight pathology among the rescue workers:** Vascular pathology of the eye fundus and maculodystrophy rank next to eye lens changes. Individuals who survived from ARD are included in the group for priority medical supervision. Scientific Center of Radiation Medicine at the AMS of Ukraine performs their clinical registration.

**Children born of persons with acute radiation diseases:** Individuals who suffered acute radiation diseases since the accident have born 26 children, that remain under constant medical supervision by specialists of the Scientific Center for Radiation Medicine. Most of the children, since the first year of life, have frequently suffered from respiratory diseases. Among the 6-7 year olds, none is completely healthy. The assessment of their immune status convincingly shows increased occurrence of deviations of the immune parameters from normal.

According to the epidemiological research of the Scientific Center of Radiation Medicine at the AMS of Ukraine, among rescue workers of 1986, who had the radiation dose over 250 miliziverts, it was established that the irradiation dose determined the development of different diseases of thyroid gland, vegeto-vascular dystonia, hypertension, ischemic cardiac disease, cerebral-vascular lesions, digestive apparatus, urogenital system diseases, tumors and mental disorders.

**Mielodisplasia among the population affected by radiation:** A significant number of cases of myelodysplastic syndrome has been registered, which requires a special study.

**The spread of diseases among the rescue workers and adult population of Ukraine:** The health condition of the entire group of rescue workers shows a tendency towards worsening. According to the results of annual medical examinations, the number of persons diagnosed with different diseases grew by 3.5 times compared to 1998 and has reached almost 93%. According to research data of the Scientific Center for Radiation Medicine of the Academy of Medical Sciences of Ukraine, the morbidity among the rescue workers is above the corresponding indicators for adult non-irradiated population and other groups of primary registration. This is due to the illnesses of endocrine, nervous, blood circulation, digestive tract, respiratory, bone and muscular systems and of the underlying tissues. Their levels are by 1.2-1.5 times higher than similar indicators for non-exposed population and than those for other groups of primary registration. These tendencies define the structure of rescue workers morbidity, which for ten years included illnesses of respiratory, blood circulation, nervous and digestive systems, and only now diseases of nervous system have held the fourth position.

**The occurrence of malignant tumors among rescue workers:** On the whole, the occurrence of malignant tumors among the rescue workers is the highest, constantly grows, and since 1995 has been exceeding similar indicators characteristic to respective age groups of population of Ukraine. In 2001, incidence of malignant tumors among rescue workers was 38 cases per 10

thousands of affected people, while in other respective age groups it was 34-35 per 10 thousand people. In 1986-1987 thyroid cancer incidence among rescue workers was by 4-5 times higher than in other respective age groups.

**The levels of occurrence of illnesses and the spread of endocrine pathology among the rescue workers:** Incidence of chronic thyroiditis among rescue workers in 1992-1995 was 25 cases per 10 thousand of the respective group; among evacuated people—13-24 per 10 thousand people, while in 2001 the general incidence of thyroiditis and hypothyroidism among affected people was 34 cases per 10 thousand people; among rescue workers—47 cases and among evacuated people—32 cases per 10 thousand people. Currently the trends of growth of thyroid gland cancer incidence among rescue workers are being observed.

**The levels of occurrence of illnesses and the spread of nervous system diseases among the rescue workers:** In 1986-1987, occurrence of nervous system diseases among rescue workers was two two times higher than among rescue workers of 1988-1990, and occurrence of mental disorders was five times higher. Incidence of nervous and mental disorders among rescue workers irradiated with the doses over 250 miliziverts is higher compared to the doses lower than 250 miliziverts.

**Chromosome aberrations among the rescue workers:** Chromosome aberrations in blood cells are the evidence of the impact of radiation. The ongoing deterioration of health condition of the rescue workers of the consequences of the accident requires constant attention of medical staff in terms of providing timely and high quality clinic treatment, assigning relevant therapy and rehabilitation measures wherever the disease surfaced, taking preventive measures in case of functional anomalies in the organs and systems of patients.

The health condition of the evacuees and the adult population at large that continues to live on contaminated territories shows negative tendencies. However, the morbidity structure and spread do not differ significantly from the general population of Ukraine. That structure is mostly defined by the changes in the demographic structure due to the resettlement of the young out of the contaminated territories and other medical and sanitary factors.

**Analysis of the state of health of the affected children:** The number of children under constant medical supervision is almost 500,000 (20% of the overall number of affected).

**The scope of coverage of the affected children by medical examinations, the number of diagnosed:** The health conditions of children affected by the Chernobyl catastrophe is also characterized by a tendency towards deterioration. Since 1987, the ratio of sick has increased by 3.5 times and in 2001 stood at 77%. Since the accident, the general occurrence of illnesses among children grew threefold. Today each affected child usually has two diagnosed diseases. Even during recent 5 years this growth rate was 36%. The largest changes are observed among children with irradiated thyroid gland.

**Percentage of healthy children among the population exposed to**

**Generation Structure and Potential Support Ratio in 1989 and in 1998**

Generations	1989	1998
<b>Generation structure, %:</b>		
Children	38.0	36.6
Parents	36.1	35.8
Grandparents	25.9	27.6
<b>Number of potential supporters per 100 supportees:</b>		
Children/Parents	105	102
Parents/Grandparents	139	130

*a high dose of radiation of the thyroid gland:* Today, only 4% are healthy among the children who were exposed to radiation dose of the thyroid gland of 2 Gy. Among those exposed to a radiation dose of the thyroid gland above 3 Gy, there is an apparent "dose-effect" dependency in terms of the development of chronic autoimmune thyroiditis. Such children most frequently suffer secondary immunodeficiency, functional vascular tone and mineral metabolism disorders.

*Child leukemia and lymphoma:* The occurrence of leukemia among children has a sporadic nature and does not differ from the general nationwide tendencies. For instance, a study of the impact of the combination of radiation and non-radiation Chernobyl disaster factors on the hematosis system from 1986 to 2001 did not identify any extra cases of oncohematologic diseases among children and teenagers, who reside on the radiation contaminated territories of Ukraine. At the same time there is an increase in complicated cases of leukemia, first of all among young girls.

*Chromosome aberrations among irradiated children:* A study of lymphocytes of children exposed to radiation (in the most contaminated regions) implemented by Scientific Center of Radiation Medicine at AMS of Ukraine in the first five years after the accident revealed chromosome aberrations, which then became the main ground to undertake an additional resettlement of families with children.

A long-term tension of the immune system among healthy children under the conditions of a permanent impact of small doses of ionized radiation leads to a quick failure of the protection system of a child organism to adapt and is a cause of a permanent growth of the number of children with different immune disorders thyroid autoimmune pathology and risk factor of tumor development.

As to the primary occurrence of illnesses, over the years of registration it grew threefold and by 29% since 1993. The major growth accounts for respiratory, endocrine and genitourinary systems diseases.

Almost the entire network of medical institutions has been employed for providing medical assistance to the victims, from regional clinics to scientific and research institutes. There has also been created a system for the establishment of "the cause and consequence linkage" and for the registration of disability and mortality among the victims.

*Structure of categories of work disability as a result of the Chernobyl accident:* Among all the categories of the affected population, 90 thousand people have work disability as a result of the Chernobyl catastrophe. Most of them are disabled as invalids of the II category. The proportion of the initially recognized disabled in 10 thousand of the relevant population group has been decreasing in the past few years (in 1997–50, 2000–34, in 2001–30 individuals). The initial register of disabled mostly consists of "rescue operation workers".

Among the causes of work disability the diseases of the blood circulation system rank first, tumors (malignant tumors) rank second, followed by nervous system diseases.

*Mortality rate among the rescue operation workers and general population of Ukraine:* The rates of mortality among the victims have increased in recent years in all groups that were initially monitored. The mortality among rescue workers is also increasing. However, the natural aging of recovery operation workers for the past 16 years should also be taken into account.

*Mortality among evacuated people and those who reside on the radiation contaminated territories:* From the point of view of age structure of the adult population that live on the radiation contaminated territories, the mortality rates in this group are the highest compared to other groups of affected people and of those who were not exposed to radiation, though it is lower than mortality rate of not irradiated rural population with which it can be compared.

*Major causes and mortality rates among adult groups of the affected population:* The structure of mortality rates among the adult victims remained unchanged in the years after the accident in comparison with that of the unexposed population. Deaths from the diseases of the blood circulation system rank first, malignant tumors rank second, traumas and poisoning rank fourth, respiratory diseases rank fifth.

The causes of death among the rescue operation workers differ from the general population mortality structure. Here the malignant tumors rank third, yielding to traumas and poisoning, which now rank second, digestive system diseases rank fourth.

Constant medical supervision, application of appropriate diagnostic and treatment methods contributed to the decline in the rates of child mortality as well as in the absolute number of cases.

Changes in the health condition, causes of the work disability and mortality among the affected population are etiologically heterogeneous. The major pathogenic factor is a combined effect of ionizing radiation and psychological stress, changes in living conditions as a result of the accident and its consequences, aggravated by the social and economic difficulties in the society. These factors are mutually reinforcing and play a part in the significant deterioration of neuropsychological and psychosomatic health of the victims.

International cooperation represents a key element in the activities aimed at minimization of the consequences of the Chernobyl catastrophe, which provides an opportunity to study the consequences of the accident, to draw attention and engage assistance of the international community for resolving a number of complex problems, associated with the accident.

Health institutions take an active part in numerous international projects related to the studies of the effects of the Chernobyl catastrophe on the health of the population. These projects are initiated by the International Federation of Red Cross and Red Crescent Societies, UNESCO, Sasakawa Memorial Health Foundation, World Health Organization, United States State Department.

#### *Directions for future studies and international cooperation:*

1-The priority task for further studies of the health of the Chernobyl victims is the implementation of the joint projects, proposed by the United Nations, in particular, the improvement of quality of health care services; which envisages the implementation of an integrated, comprehensive approach to basic health care services in the public health system (first of all, in rural areas which suffered the most);

2-creation of the base to provide primary health care to infants and children who live on the radiation contaminated areas; improvement of the diagnostics base.

3-scientific studies in the priority health care issues, such as health care for rescue workers, registered growth of breast cancer incidence; growth of thyroid cancer morbidity among adult population; treatment and further service provision to the thyroid gland cancer patients; radiation consequences for the development of intrauterine diseases.

4-support to the activities to determine the actual radiation exposure level for rescue workers and population, and involvement of such groups to this study, who do not have primary estimates of exposure (in particular, to clarify radiation exposure for the increased risk groups).

5-the continuation of the studies on the prevention of thyroid cancer in order to give people an opportunity to live a long and healthy life, especially for people who were younger than 18 at the moment of accident and to ensure that they will receive a relevant health care in case of disease development;

6-to continue development and implementation of the measures aimed at compensating for the deficit of iodine as a step to prevent numerous disorders in the health of the affected population, in particular, children.

#### **Conclusion**

It is necessary to integrate and coordinate Ukrainian efforts with other affected countries, as well as with UN, WHO, IAEA to develop, generalize and introduce scientifically grounded, efficient technologies to diagnose, treat and rehabilitate people affected by Chernobyl accident.

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### **Chernobyl—16 Years After**

Statement by Mr. Kenzo Oshima,  
UN Under Secretary General for Humanitarian Affairs  
Presented by Carolyn McAskie,  
Deputy to the Under Secretary General

I am representing the Under Secretary General, Mr. Kenzo Oshima, as he carries also the title of United Nations Coordinator of International Cooperation on Chernobyl. He is very dedicated to the cause and has recently come back from a visit to the three affected countries. Unfortunately, he is in

Geneva today and is therefore unable to join you. I would also like to thank from the beginning WIT, the World Information Transfer, as well as the governments of Jamaica and Ukraine and the organizing committee for convening this very important eleventh international conference.

As was pointed out at the beginning with a moment of silence, today marks the sixteenth anniversary of the loss of life associated with the Chernobyl disaster. Not many events in human history are easily and universally recognizable by just one word. Chernobyl is one such event. However, few people realize the multitude of problems which this one word encompasses and the level of suffering and insecurity and fear still linked to this event and its aftermath. Chernobyl also has another distinction. No other natural or technological disaster has had such staying power. Sixteen years ago, a routine early morning safety experiment at a nuclear power station in a remote corner of the Ukraine went terribly wrong. Yet, to this day hundreds of thousands of people continue to live in the shadow of this catastrophe, never quite sure if they or their children are safe, if the land that they live on and the food they eat are clean, and if the health, even, of their yet-to-be-born progeny will be free of this invisible and presumed presence. Because it's not just the effect on those living, but it's the generational affect that we must also monitor and be aware of. The three countries which are the hardest hit by this catastrophe-Belarus, the Russian Federation, and Ukraine-have been shouldering the major burden of helping their citizens during all these years. They have been doing this while at the same time trying to build the foundations of newly independent democratic states and a market economy. Ukraine, which has the Chernobyl plant sitting on its territory, and Belarus, which was hit with 70% of the fallout, have been spending on average 6-7% of their annual budgets for related activities. The international committee has not been idle throughout these years either.

Much has been done to ensure that the likelihood of such a tragedy repeating itself is greatly reduced. The significant body of research has been produced on the various aspects of the catastrophe. On the effects of radioactive fallout on people's lives, the International Voluntary Movement has taken very close to heart the plight of the children of Chernobyl...Donors have pledged up to \$750 million in total for the construction of a safe and long-term shelter to encase the dead reactor. And after all sixteen years have passed, indeed on the face of it, Chernobyl seems to have been taken care of-not to say, forgotten. And that, my friends, is a large part of the problem.

Few stop to think that one doesn't just switch off a nuclear plant. It takes years to take it offline-secure the fuel, decommission, and dismantle. And that's just for the plant. What about the people who live in areas that are still covered in red and orange on most maps of the region showing cesium and strontium contamination? What about a country that has no nuclear power plants of its own at all and yet has 25% of its territory heavily contaminated for the next few thousand years. There are those who argue that the situation in areas affected by Chernobyl is no worse than in areas that are considered clean. Granted, the economic situation is not encouraging in any event, but there is no denying that people who live in areas affected by the fallout of Chernobyl are subject to a double impact of a depressed economic situation and of radiation contamination. Indeed, for

many of those in the villages and settlements directly affected by the accident, the needs are as acute as ever.

This was confirmed fifteen years after the accident when a United Nations international team of experts came back with an assessment report, *The Human Consequences of the Chernobyl Nuclear Accident*, and a strategy for recovery for the people who are still trapped in what we can only describe as a downward spiral of living conditions. Why a fresh needs assessment of Chernobyl, then, fifteen years after the accident?

Firstly, the world needs to know as much as possible about the effects—not only immediate but also long-term of such accidents. We need to be better prepared should there be, heaven forbid, a next time. Secondly, Chernobyl is an issue which can foster wide-ranging cooperation within the international community among individuals, communities, and governments. And most importantly, thirdly, the international community must not turn its back on the people and governments of the three most affected countries.

After a decade and a half of involvement and assistance, the international community must not withdraw now when there are still outstanding needs. The objective of the assessment, therefore, was precisely to obtain credible information on the current conditions in which people affected by the Chernobyl accident are living, fifteen years after the explosion and to make recommendations on how best to address their needs now and into the future. In the first fifteen years and certainly ever since Chernobyl was first brought to the United Nations in 1990, four years after the accident, the efforts of the international community and of the national governments were to a large extent of an emergency nature: to make the reactor safe, to resettle the population in immediate danger, to deliver humanitarian assistance to those in urgent need, and to explore the best means, to address longer-term issues through pilot projects and research. This first stage is clearly over.

Over the course of fifteen years, the nature of the problem has evolved. Recognizing this, a change of direction was considered necessary and a new process was initiated whereby the role played by UNDP, UNICEF, and other more developmental agencies would be more prominent. What we are now attempting to do is to put the human being squarely in the center of our efforts. This strategy can be described as a paradigm shift away from the policies and practices of the past fifteen years. The key elements of this strategy include a shift from humanitarian assistance to a longer-term developmental approach, to the empowerment of individuals in communities, to targeted assistance to the most affected people in communities, and an overall policy of promoting a return to normalcy. In short, we want to encourage an increase in assistance by making it more effective, forward-looking, and more focused. There is a clear understanding among the authorities of Belarus, the Russian Federation, and Ukraine, that this shift in the focus of international cooperation would best be achieved through a nationally driven process of change in their own policies and programs towards more focused assistance to the victims of the disaster and the creation of domestic conditions for sustainable economic activity. In practical terms, this strategy could focus on such areas as village-level businesses, credit cooperatives, health and life-style education, primary healthcare, psychological

rehabilitation, economic recovery and development, safe water supply, integrated youth services. The successful preparation and implementation of activities in these and other areas of which there are many, will require the attainment of a consensus among all the principle actors involved in the Chernobyl issue. This consensus can only be based on the close collaboration of the UN with the NGO movement, and other organizations such as the Red Cross, and on renewed donor interest and participation, in the UN's new efforts to assist the populations affected by the Chernobyl disaster. It will not be an easy task to revitalize this interest.

Donor activity and interest have markedly declined since the generosity demonstrated in the context of the new shelter for the destroyed reactor. While very welcome and certainly acutely needed, the new shelter cannot be regarded as the be-all and end-all of international Chernobyl efforts. We cannot and must not forget the human dimension of the Chernobyl problem. Perhaps the best hope for the populations affected is that the international community may be moved to action by a healthy combination of compassion and enlightened self-interest.

Today, there are close to 400 nuclear reactors in operation around the world. Experts consider that the possibility of a major accident is very small, but as reminded by Dr. Durbak our Chairman in her opening comments, the threat can never be non-existent. Future designs will no doubt be safer, but even the best designs can never assure absolute safety from accident or attack. We are patient, we are determined, but we must also be creative; and we must work closely with the three governments, donors, non-governmental organizations, all international actors, and will seek partnerships in order to keep the focus on affected people.

We must not turn our back on the people of Chernobyl with the job half-done. The task may be difficult, but we must remain optimistic.

*Continued on page 36*



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*We have not inherited the world from our forefathers...we have borrowed it from our children.* -Kashmiri Proverb

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## CHERNOBYL UPDATE *(continued from page 34)*

### Chernobyl—16 Years After

Statement by Mr. Jacob Simonsen, UNDP Deputy Regional Director for Europe and Commonwealth of Independent States



First of all, thanks for the invitation for this special session on the commemoration of the 16 years after Chernobyl. I'm here today, filling in for my regional director, Mr. Kalman Mizsei, who, besides being the director for Europe and the Commonwealth of Independent States, is also the deputy coordinator of international cooperation for Chernobyl.

Anniversaries like this, and 16 years after the event, obviously bring back memories of shock, of compassion, and of the suffering of the population. Disbelief that the devastation of this magnitude could occur, and the realization of the danger which has, and will continue to emanate from an intangible, so-called enemy. But such commemorations force us to look back and assess what has been done to alleviate the consequences. Until recently, the main accent was on emergency medication efforts, and immediate humanitarian assistance, as is logical. Massive tasks aimed at containing the spillover of radiation and the fall-out, cleanup, as well as meeting the immediate needs of those affected, necessitated priority attention. However, as time passes, with those tasks attended to, the need to address the human dimension has come to the forefront.

In light of this, and, as mentioned by Carolyn McAskie, a special, multi-disciplinary mission took place in the three most affected countries: Belarus, the Russian Federation, and Ukraine last year. The report of that mission, which was commissioned by UNDP, UNICEF, with the support of the UN, OCHA, and the World Health Organization, confirmed the need to shift from this humanitarian assistance phase, to a longer term developmental phase. And furthermore, as a recognition of this

need for shift, the secretary-general of the United Nations designated Mr. Calma Mitze as the deputy coordinator for international cooperation for Chernobyl.

What is the vision of UNDP in this case? The vision is in implementing the recommendations that are shared and supported by the three national governments, and other involved agencies of the United Nations. First and foremost, is the necessity to review and adapt policies and practices which were adopted during the emergency phase, and orienting those policies and practices toward serving the long-term sustainable development goals. For example, cost-efficiency review of those policies could bring about a better use of the scarce resources available at time of economic transition, and could, also hopefully, help mobilizing additional fund. Secondly, policy will go hand-in-hand with other practical steps. The report that I mentioned before suggests specific project concepts targeting, health, environment, and socio-economic development. These concepts aim at employment and income generation at the local and regional levels at improving the primary healthcare system, providing for additional psychological rehabilitation capacities, ensuring safe water supply and agricultural activities, etc., etc.

As a consequence of this report, the first set of project outlines has already been elaborated and had been presented to donors, following the recent visit by Mr. Oshima, the UN coordinator of International Cooperation on Chernobyl, to the three most affected countries. In order to facilitate the implementation of this vision, a very concrete roadmap of the next six months has been agreed upon, including additional measures as convening national dialogue workshops, work with the media outreach, etc. And special emphasis during that period is put on the work up further detailing these presented project outlines and insuring donor engagement through the financing of these projects.

It is our hope that by implementing this new approach, and mobilizing additional external support, we would contribute to the creation of a situation where the affected people in this area are able to break the vicious circle of the socio-economic and psychological downward spiral, and take their future in their own hands. We also hope to see Chernobyl recovery efforts harmonically correlating with the overall process of meeting the development challenges nationwide in these three countries.



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Margaret Mead

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