

Highlights from

PROMOTING ORAL HEALTH The Use of Salt Fluoridation to Prevent Dental Caries



1. A landmark study conducted in 1968 by PAHO, the National Institute of Dental and Craniofacial Research, and the University of Antioquia in Medellín, Colombia established that the use of fluoridated salt could have the same anti-caries properties as fluoridated water. As a fluoride vehicle, salt was shown to be as reliable and convenient as water.
2. According to a PAHO study in Antioquia, Colombia, the average decayed, missing or filled teeth (DMFT) dropped every year of the study in the three communities that received fluoridated salt.
3. Appropriate use of fluoride is the foundation of any strategy to prevent dental caries.
4. Fluoridated salt can reduce the prevalence of dental caries by up to 84%.
5. Just as fluoride is essential to prevent dental caries, education about the use of fluorides is essential to ensure acceptance and continuation of a salt fluoridation program.
6. Implementing and continuing a preventive community-based procedure such as salt fluoridation requires education of not just the public at large, but of health providers, public health officials, elected officials, salt manufacturers, salt plant operators, and members of the mass media.
7. Everyone needs to know what salt fluoridation is and how it works, as

well as the benefits of using it.

8. Using fluoridated salt does not mean that other important dental health procedures should be abandoned.
9. Health care professionals, including but not limited to dentists, physicians, nurses, pharmacists, and health educators should be the primary teachers of other health care providers and of the public.

What Everyone Needs to Know About Fluorides

- Fluoride is a natural element found in the earth land mass and, in varying amounts, in all water.
- Appropriate and continuous use of fluoride is the best method of preventing tooth decay throughout life.
- Fluoride can be used by children, adults, and the elderly.
- Fluoride protects teeth from decay in two ways:
 1. During tooth formation, fluoride is incorporated into the tooth structure, making it more resistant to decay (referred to as systemic fluoride).
 2. After tooth eruption, fluoride remineralizes areas of the tooth that have been demineralized (referred to as topical fluoride).
- The use of fluoridated salt to prevent tooth decay is well-documented by scientific research.
- Fluoridated salt is an equitable public health procedure that benefits all people, regardless of age, socioeconomic status, or access to dental care.
- The use of fluoridated salt saves teeth and cuts dental bills.
- Fluorides are available in a variety of products.

10. Dental professionals' role includes helping to overcome barriers to implementing preventive procedures, such as working with salt manufacturers and processors to ensure fluoridated salt is available in the marketplace.
11. A successful salt fluoridation program includes five major components: salt fluoridation cost-benefit analysis; country

baseline studies to assess

DMFT and exposure to fluoride; epidemiological surveillance systems for salt fluoridation, including biological and chemical monitoring of all fluorides, and quality control; salt-industry assessments; and evaluation and tracking systems to determine the effectiveness of nationwide fluoridation programs.

12. Fluoridated salt should be consumed only in areas where fluoride concentrations are low or moderate. Areas with optimal and high fluoride concentrations will have to be monitored to prevent fluoridated salt from being sold.

13. At any age, an adequate supply of nutrients is necessary to maintain oral health.

14. Early malnutrition affects tooth structure, delays eruption, and increases susceptibility to caries.

15. Information on food consumption and the nutritional status of preschool children is vital for understanding the state of oral health and for determining the effect that the intake of natural fluoride through water or by consuming fluoridated salt can have.

16. The population's salt consumption habits should be taken into account when determining how much fluoride will be added to salt for human consumption. If a great deal of salt is routinely eaten, then less fluoride should be added. If, on the contrary, salt consumption is

minimal, the concentration of fluoride in salt will have to be greater.

17. The total worldwide production of salt—including by solar evaporation of seawater or inland brines, mining underground and surface rock salt deposits, and gathered as brines, mainly by solution mining—was 225 million tons in 2002.

18. Four of the world's top ten salt producers (the United States, Canada, Brazil, and Mexico in descending order) are in the Americas.

19. Salt for direct or indirect consumption by humans or animals accounts for only about 7% of total salt production. Most salt is used as a raw material in the manufacture of other chemicals or products.

20. It is important that a salt fluoridation system be closely tailored to the kind of salt plant in which it will be used, taking into account such factors as the salt process method, the plant's production rate, the types of salt produced and how the salt is to be packaged, and the types of salt to be fluoridated.

21. Studies on dental caries in 12-year-old children have shown that the average regional rate of caries in the Americas dropped from 5.05 in 1987 to 2.41 in 2004 thanks to salt fluoridation programs.

22. Jamaica's salt fluoridation program was highlighted by the Center for Global Development's *Millions Saved: Proven Successes in Global Health* as one of the 17 most relevant public

health initiatives worldwide in recent years. Colombia, Costa Rica, Mexico, Uruguay and other countries have also achieved remarkable reductions of dental caries in their respective populations.

23. Rural areas generally show higher prevalence of dental caries than urban ones, although differences tend to be decreasing.

24. In Costa Rica, the reduction in dental caries between 1988 and 1999 was 70%. This percentage is very significant given the high prevalence of dental caries at the program's beginning.

25. Among the goals set forth by PAHO in 1999 was a 50% reduction in caries prevalence throughout the Region.

DMFT index and percentage reduction in children 12 years of age, selected countries of the Americas, 1980-2004

Sub-region Country	Year (1980s)	DMFT	Year (1990-2000s)	DMFT	Reduction (%)	Annualized reduction (%)
NORTH AMERICA						
Canada ^a	1982	3.2	1990	1.8	43.8	6.94
United States	1986-1987	1.8	1988-1991	1.4	21.8	7.86
Mexico	1988	4.42 ^b	1997-1998	3.11 ^{b,d}	29.6	3.45
	1987	4.60 ^c	2001	2.0 ^{e,d}	45.7	6.55
CENTRAL AMERICA AND PANAMA						
Honduras	1987	7.7	1997	4.0	48.4	6.41
Costa Rica	1988	8.4	1992	4.9	(1988-1992) 42.2	12.82
			1999	2.5	(1988-1999) 72.5	10.61
ANDEAN AREA						
Venezuela	1987	3.67	1997	2.1	42.2	4.13
Colombia	1977-1980	4.8	1998	2.30	52.1	3.70
Bolivia	1981	7.6	1995	4.61	39.3	3.51
SOUTHERN CONE AND NORTHEAST						
Uruguay	1983-1987	8.5 ^j 6.0 ^k	1992 1999	4.2 2.5	(1992-1999) 40.6	7.18
Paraguay	1983	5.9	1999	3.8	35.1	2.66
Brazil	1986	6.66 ^l	1996	3.1	(1986-1996) 54.0	7.47%

Source: Pan American Health Organization

Preface

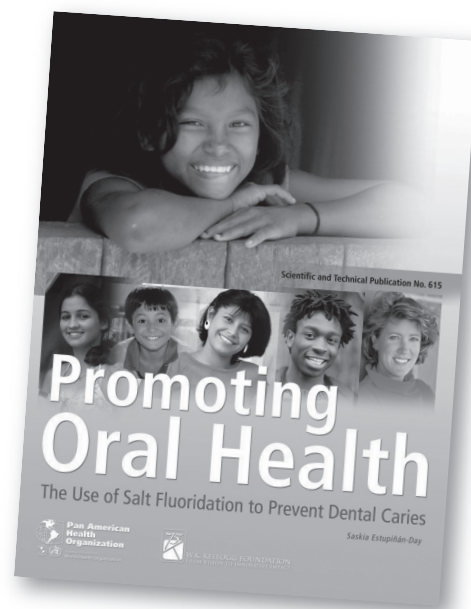
An understanding of the overall development of nations shows that the solution to many of the problems that affect a population's health and, to a large extent, individuals' health cannot rely solely on expanding health care systems. All sectors, interested parties, and disciplines must apply innovative strategies to the solution if people's health—our first and foremost concern—is to be improved in the near term.

The Pan American Health Organization's Regional Oral Health Program has focused on planning and designing oral health strategies and has collaborated with the countries of the Americas to change epidemiological patterns and improve delivery systems for oral health care.

To support those who make or implement national or local oral health policies, we present *Promoting Oral Health: The Use of Salt Fluoridation to Prevent Dental Caries*. This book bears witness to the effectiveness of salt fluoridation for the mass reduction of dental caries in the population. Over time, salt fluoridation has come to be recognized as the most promising—and the most egalitarian—strategy for improving the oral health of millions in the Americas and as the key factor in changing the epidemiological profile of oral health for the Region in a relatively short period of time.

To date, 11 countries in our Region have fluoridated salt programs, and new countries continually strive to launch such programs. We offer this book to all those who are operating salt fluoridation programs or who are considering launching salt fluoridation programs, to those who implement national or local oral health policies, and to the tireless health workers who strive to improve the health of our people.

— **Mirta Roses Periago**
Director
Pan American Health Organization



Foreword

For more than 60 years, the Kellogg Foundation has been a proud supporter of the Pan American Health Organization (PAHO). In collaboration with PAHO, the Foundation has done some of its most lasting and important work in Latin America and the Caribbean. And one of the proudest success stories from this fruitful partnership has been the salt fluoridation project. Because of this effort, millions of people across the region can enjoy healthier, happier, and more productive lives.

Our founder, W.K. Kellogg, was a pragmatic visionary who believed in “applying knowledge to the problems of people.” The salt fluoridation program embodies this principle by combining scientific knowledge with political coordination and grassroots education. Additionally, the project was able to build on the impressive gains in water fluoridation, which resulted from an earlier Kellogg Foundation/PAHO partnership. Yet the salt fluoridation effort was distinct in its ability to deliver oral health benefits to remote locations where no municipal water supplies existed. As is true with most good ideas, the techniques pioneered by this project can be readily adapted by other nations and communities that seek to establish similar oral health programs.

Without question, there is much that can be learned from the history of this remarkable initiative. As we consider the current challenges in public and oral health that face Latin America and the world, we encourage the professionals and lay people who read *Promoting Oral Health: The Use of Salt Fluoridation to Prevent Dental Caries* to apply its lessons in as many ways and places as possible.

— **William C. Richardson, Ph.D.**
President and Chief Executive Officer
W.K. Kellogg Foundation

Introduction

In many countries of the Americas, the high prevalence of dental caries in the population (more than 90% of school-children may be affected) reflects the absence of an oral health strategy targeting the disease. And yet, the scope of this public health problem runs counter to advances many of these countries already have attained in other social indicators and in other aspects of public health.

In 1994, the Pan American Health Organization (PAHO) drafted an initial strategy to implement caries prevention programs in the Region of the Americas that relied on both water and salt fluoridation. The intention was to help create new prevention programs and strengthen existing fluoridation programs. PAHO's Regional Oral Health Program conducted a situation assessment of the countries of the Americas based on the most recent reports on caries prevalence and severity and on the existence of prevention programs. Although water fluoridation had been highly effective, the lack of adequate water distribution systems in the Region, especially in rural areas, made it difficult to implement nationwide water fluoridation programs.

In 1994, the program began to develop a strategy by evaluating experiences of countries that had launched salt fluoridation programs from the mid-1980s to the early 1990s. At that time, Costa Rica, Jamaica, and Mexico had had projects in place for more than five years. In Jamaica, the salt industry had made most of the

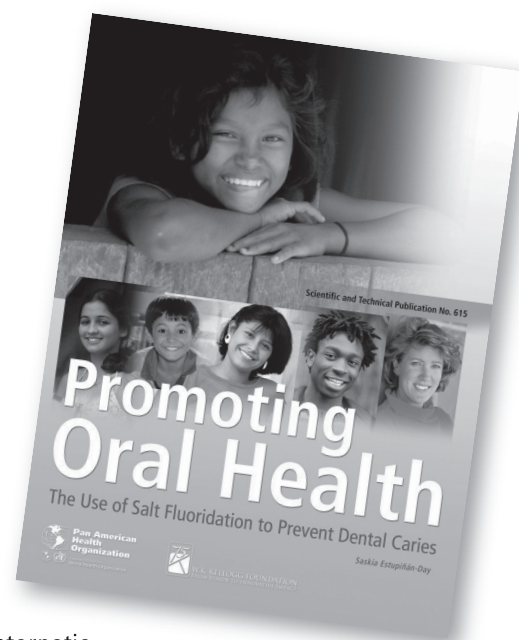
initial investment, whereas in Costa Rica and Mexico, projects had been partially financed by the W. K. Kellogg Foundation; PAHO provided technical support to all three projects. By 1999, other countries had begun their salt fluoridation projects: Peru received financial support from the Kellogg Foundation to launch its national program in 1989; Venezuela and Colombia reported having salt fluoridation programs, but the extent of their coverage could not be determined (it is known that Venezuela's program used lower concentrations of salt than did those in other countries); Ecuador and Bolivia initiated national programs with World Bank assistance; in Uruguay, the salt industry, too, made most of the initial investment. Among salt fluoridation projects that were terminated or did not report results were a pilot program launched at the end of the 1980s by the State University of Rio de Janeiro in five municipalities in the state's northwest.

On the basis of its assessment, the Regional Oral Health Program prepared a plan that set priorities for technical cooperation needs. Initially, the plan identified six countries in which caries were widespread and/or severe, or where salt fluoridation programs were under way and would require limited additional effort. One of PAHO's objectives was that programs be multisectoral and that they include the public sector (health authorities), the private sector (the salt industry), and the financial sector (lending institutions). Also involved were the academic sector, dental associations, and other

international organizations. A select group of epidemiologists, health workers, administrators, and salt production engineers have provided comprehensive technical support since the program began in 1993.

PAHO submitted a request for financial support to the W.K. Kellogg Foundation, which approved a subsidy in 1996 for implementing salt fluoridation programs in Bolivia, the Dominican Republic, Honduras, Nicaragua, Panama, and Venezuela. A year later, Kellogg approved a second subsidy to support programs in Belize and Paraguay. Meanwhile, PAHO continued to provide technical cooperation through its caries prevention projects in El Salvador, Guatemala, and Uruguay and in several Caribbean islands, including Puerto Rico. To date, Mexico and all the Central American and South American countries (except Argentina, Brazil, Chile, and French Guyana) have already begun, are maintaining, or are about to launch salt fluoridation programs.

Today, the Pan American Health Organization works to help countries



advance from a less-than-optimal state of oral health and inadequate or nonexistent oral health policies, to a stage in which oral health improves and sound public health policies prevail. The promotion of fluoridated water or fluoridated salt as a mass prevention measure is a key element of this effort. Currently, salt fluoridation programs offer the best alternative, because they provide greater coverage at lower cost.

This publication has come out of the experience of national salt fluoridation programs and of 12 workshops corresponding to Phase II (first evaluation) of such programs

that were held in Mexico in 1994 and in Jamaica in 1996. The book gives a historical overview of successful salt fluoridation programs; details the components, effectiveness, and benefits of the programs; and offers recommendations to health administrators who are considering establishing such a program in their countries.

We hope that it helps to confirm salt fluoridation as an effective method of preventing dental caries and encourages its application through the world. As programs continue to be developed in the Region, PAHO will share information and knowledge with the public health com-

munity as a way to improve the dental health of the Region's population.

—Dr. Saskia Estupiñan-Day

*Regional Advisor for Oral Health
Pan American Health Organization*



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Salt Fluoridation is Key in Reducing Dental Caries

Washington, D.C., August, 2005 (PAHO)—Salt fluoridation of table salt can reduce the prevalence of dental caries by up to 84 percent, according to a new book published by the Pan American Health Organization (PAHO), *Promoting Oral Health: The Use of Salt Fluoridation to Prevent Dental Caries*.

Salt fluoridation programs over the last decade have placed the countries of the Americas at the leading edge in reducing dental caries, and these programs are now being replicated in other regions. Fluoridation's benefits also translate into savings in dental treatments—up to \$250 per person for every \$1 spent on fluoridation initiatives.

"Dental caries is the most common childhood disease and can be avoided thanks to salt fluoridation," said PAHO's Dr. Saskia Estupiñán-Day, regional advisor on oral health and author of the publication. "We are among the world's leaders on salt fluoridation programs. The Latin American and Caribbean experience is being replicated worldwide. Many countries are seeking our assistance and technical cooperation to implement this greatly beneficial and cost-effective public health strategy."

Studies on dental caries in 12-year-old children have shown that the average regional rate of caries in the Americas dropped from 5.05 in 1987 to just 2.41 in 2004 thanks to salt fluoridation programs. The most notable reduction took place in Jamaica, a country that achieved an 84 percent reduction in childhood dental caries in 1995, thanks to a nationwide salt fluoridation program started in 1987.

Jamaica's program was included in the Center for Global Development's *Millions*

Saved: Proven Successes in Global Health, a book that highlighted the 17 most successful public health initiatives worldwide in recent years. Colombia, Costa Rica, Mexico, Uruguay and other countries have also achieved remarkable reductions of dental caries in their respective populations.

The new PAHO book shows how fluoridation of table salt has proven to be one of the most cost-effective public health interventions in history. It details the history of salt fluoridation and offers an in-depth understanding of the salt industry programs that have been implemented and the know-how for the salt industries, governments, and health professionals still in the developmental phase of salt fluoridation program implementations.

"We have just entered a decisive process of consolidation and protection of our achievement in Latin America as it relates to salt fluoridation," Estupiñán-Day said.

The new book is a step-by-step guide on how to plan, promote, launch, operate, monitor and evaluate salt fluoridation programs. It also provides blueprints for legislation, epidemiological surveillance, and biological monitoring that are necessary for carrying out successful programs.

The book was funded by the Kellogg Foundation, through the Pan American Health and Education Foundation (PAHEF). The Kellogg Foundation has supported salt fluoridation efforts throughout Latin America and the Caribbean as the means to prevent the most common childhood disease.

"It is thanks to the Kellogg Foundation that salt fluoridation programs in Latin America and the Caribbean had such a beneficial impact", said Estupiñán-Day. "This is a per-

fect example of how the financial assistance of a foundation

toward a shared effort to promote and implement global health strategies can turn out to be successful when the private and public sectors work together in such a satisfactory manner."

The book will be launched at a meeting of the World Dental Congress in Montréal, Canada, August 25. Along with Dr. Saskia Estupiñán-Day, a panel of experts will discuss the book and salt fluoridation. The panel will include PAHO's assistant director, Dr. Carissa Etienne; the executive director of the World Dental Federation (FDI), Dr. J.T. Barnard; and senior vice president for Programs of the W. K. Kellogg Foundation, Dr. Anne C. Petersen.

Promoting Oral Health: The Use of Salt Fluoridation to Prevent Dental caries will be available August 25 in English at <http://publications.paho.org>. The Spanish version will be ready by the end of the year.



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Book Launching Panelists

Dr. Johannes Theunis Barnard, FDI World Dental Federation Executive Director

Dr JT Barnard was appointed as Associate Executive Director of the FDI World Dental Federation in 2000. He has been intimately involved in the development of a far-reaching new strategic approach for the FDI, which was approved by the FDI General Assembly at their 2001 meeting. He has been appointed as the Acting Executive Director as from 1 January 2002 and as Executive Director of the FDI as from June 2002.

Barnard obtained the BChD Hons and the MDent degrees at the University of Pretoria in 1983 and 1989 respectively. His interest in management prompted him to obtain certificates in Senior Management and Strategic Management – the latter from the Post Graduate Business School of the University of Stellenbosch.

After a period in private practice in the UK, he followed a career in the SA National Defence Force (SANDF). At the time of his retirement from the SANDF, he held the position of Director: Oral Health Services with the rank of Brigadier General. During his term as Director of oral Health Services of the SANDF, ground-breaking changes had been made including the introduction of a unique payment system to military dentists based on output and results. This approach achieved a dramatic improvement of the oral health of military patients. During this time he was also elected as the Chairman of the FDI's Section of Defence Forces Dental Services.

He was appointed as the Executive Director of the South African Dental Association in 1996. During his term of office, dentistry in South Africa underwent dramatic changes, including the achievement of political unity among the different political groupings of dentists. He played a significant role in the development of a new strategy and the design of a constitution for the newly formed SA Dental Association. Over the period 1996 to 2000, he served on a several Governmental and NGO committees, task teams and forums dealing with dentistry issues. He also served as the Secretary General of the African Regional Organization of the FDI since 1998.

Dr. Saskia Estupiñán-Day, Regional Advisor for Oral Health, Pan American Health Organization (PAHO)

Dr. Saskia Estupiñán-Day, a public health dentist, was appointed as Regional Advisor for Oral Health at the Pan American Health Organization in 1993. Since then, she has worked to develop oral health strategies, implement national programs, and manage international technical cooperation and research projects in the Americas. She has provided technical cooperation throughout the Americas, as well as in Africa, Asia, and Europe to implement cost-effective public health programs, such as salt fluoridation. Most recently, she has promoted the use of atraumatic restorative treatment and the application of cost-effectiveness analysis and policy support to national programs throughout the Americas. During her 30 years of experience, she has been the recipient of many project grants, including from the W. K. Kellogg Foundation, the Inter-American Development Bank, Rotary International, and the International Congress of Oral Implantology.

Dr. Estupiñán-Day is a graduate of Central University of Quito, Ecuador, and of University of California at Los Angeles. She has written and coauthored numerous scientific articles and other publications. She is an associate editor of professional journals and has participated and led scientific and technical sessions in most regions of the world.

Dr. Carissa F. Etienne, Assistant Director of the Pan American Health Organization (PAHO)

Dr. Carissa F. Etienne oversees PAHO's programs for Disease Prevention and Control, Family and Community Health, Sustainable Development and Environmental Health, Technology and Health Services Delivery, and Gender, Ethnicity and Health—PAHO's core programs for providing technical cooperation to its Member States.

A native of Dominica, Etienne has a long career in medicine and public health. She was trained as a general practitioner at the University of the West Indies and graduated with an MBBS in 1976. She also studied community health in developing countries at the London School of Hygiene and Tropical Medicine, where she received the master's degree in 1982.

She began her career with Dominica's Ministry of Health as a medical officer at the Princess Margaret Hospital in 1977 and by the early 1980s was serving on an executive team in charge of planning and implementing an island-wide reorganization and decentralization of health services with emphasis on the primary health care approach.

During the 1990s, she held several key positions in the Ministry of Health, including chief medical officer, designated national epidemiologist, chairman of the National AIDS Committee and coordinator of the National AIDS Program.



Dr. Anne Petersen, Senior Vice President for Programs, W.K. Kellogg Foundation

Dr. Anne C. Petersen, Senior Vice President for programs at the W. K. Kellogg Foundation, is responsible for providing overall leadership, including the development of effective programming strategies, teamwork, policies, philosophies, and organization-wide systems.

A college major in mathematics, Petersen took a position with the National Security Agency (NSA) and interned in computer systems. Her graduate work took place at Johns Hopkins University, where she became interested in statistics reason why she then went to graduate school at the University of Chicago, where she got her PhD in measurement, evaluation and statistical analysis in 1973.

After graduate school, Petersen moved from assistant to associate professor in the University of Chicago's department of psychiatry. Her discovery of psychology and her subsequent research has produced more than a dozen books and nearly 200 articles, with an emphasis on adolescent development and gender issues, including research methods, mental and physical health, and higher education issues.

In 1994, Petersen took a leave from academe to accept a Presidential appointment and Senate confirmation to become deputy director and chief operating officer of the National Science Foundation, then a \$3.6 billion federal research agency with 1,300 employees, near Washington, D.C. in Arlington, Virginia. In this position, she worked closely with the National Science Board, the National Science and Technology Council, White House officials, and senior NSF Management on national science policy.



SALT FLUORIDATION: Success Worth Repeating

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the back)

A new book from the Pan American Health Organization (PAHO) shows how salt fluoridation has proven to be one of the most cost-effective public health interventions in history and shows countries how to implement programs of their own.

Promoting Oral Health: The Use of Salt Fluoridation to Prevent Dental Caries was written by Saskia Estupiñán-

Day, head of PAHO's Oral Health Program. The book traces the history of salt fluoridation, first used in Switzerland in the 1950s and later elsewhere in Europe and the Americas. It explains why the practice is better suited to countries in Latin America and the Caribbean than fluoridation of water.

Experience has shown that putting fluoride in salt can reduce dental caries by as much as 84 percent at a cost of 6 cents per person per year. The practice is extremely cost-effective, saving an average of \$250 per person per year in dental treatment for every \$1 spent. It is also highly equitable, benefiting equally rich and poor, young and old, urban and rural dwellers, those with access to professional dental services and those without.

The book provides step-by-step guidance on how to plan, promote, launch, operate, monitor and evaluate salt fluoridation programs. It discusses in detail how the salt industry operates, including its manufacturing and marketing practices, and shows how to win the industry's cooperation. The book also provides blueprints for legislation, epidemiological surveillance, and biological monitoring that are necessary for carrying out successful programs.

Promoting Oral Health: The Use of Salt Fluoridation to Prevent Dental Caries is available in English and Spanish from <http://publications.paho.org>. The publication was funded by the Kellogg Foundation, which has supported salt fluoridation efforts throughout Latin America and the Caribbean.

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