
All rights reserved
First published 2004
1 3 5 7 9 10 8 6 4 2

ISBN 92 4 159156 0

Produced for the World Health Organization by
Myriad Editions Limited
6–7 Old Steine, Brighton BN1 1EJ, UK
http://www.MyriadEditions.com

Co-ordinated for Myriad Editions by Candida Lacey
Edited by Jannet King
Design by Corinne Pearlman
Maps and graphics by Isabelle Lewis

WHO Library Cataloguing-in-Publication Data

Gordon, Bruce.
IV. Title: The atlas of children’s health and the environment.

Publications of the World Health Organization can be obtained from:
Marketing and Dissemination, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland
tel: +41 22 791 2476; fax: +41 22 791 4857; email: bookorders@who.int
Requests for permission to reproduce or translate WHO publications,
whether for sale or for noncommercial distribution,
should be addressed to Publications, at the above address
fax: +41 22 791 4806; email: permissions@who.int

The designations employed and the presentation of the material in this publication do not imply the expression of any
opinion whatsoever on the part of the World Health Organization concerning the legal status of any country,
territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines
on maps represent approximate border lines for which there may not yet be full agreement.
The mention of specific companies or of certain manufacturers’ products does not imply that they are endorsed or
recommended by the World Health Organization in preference to others of a similar nature that are not mentioned.
Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.
The World Health Organization does not warrant that the information contained in this publication is complete and
correct and shall not be liable for any damages incurred as a result of its use.
The named authors alone are responsible for the views expressed in this publication.

Printed and bound in Hong Kong
Produced by Phoenix Offset Limited under the supervision of
Bob Cassels, The Hanway Press, London

Acknowledgements 4
About the Authors 6
Foreword by
Dr LEE Jong-wook, Director-General, World Health Organization 7

Part One
Child Health and Poverty
1 The World’s Forgotten Children 8
2 Two Worlds: Rich and Poor 10
3 Traditional Hazards, New Risks 12

Part Two
Global Environmental Issues
4 Water for All: Making it Happen 14
5 Hurry Up in the Toilet: 2.4 Billion are Waiting 16
6 To Fetch a Pail of Water 18
7 Malaria 20
8 Fluoride and Arsenic in Drinking Water 22
9 Indoor Smoke: Breaking Down Respiratory Defences 24
10 Passive Smoking: Children Protest 26
11 Polluted Cities: The Air Children Breathe 28
12 Child Injuries are Preventable 30
13 Child Labour: Growing Up Too Quickly 32
14 Lead: IQ Alert 34
15 Safe Food: Crucial for Child Development 36
16 Poisoning: Hidden Peril for Children 38

Part Three
A Look to the Future
17 Getting the Lead Out 40
18 Healthy Schools: Empowering Children 42
19 Enjoying the Sun Safely 44
20 Climate Change 46

Highs and Lows of Environmental Health 48
WHO Sub-Regions 49
World Data Table 50
Sources 58
Index 64
Contents

Acknowledgements 4
About the Authors 6
Foreword by Dr LEE Jong-wook, Director-General, World Health Organization 7

Part One Child Health and Poverty 8
1 The World's Forgotten Children 8
2 Two Worlds: Rich and Poor 10
3 Traditional Hazards, New Risks 12

Part Two Global Environmental Issues 14
4 Water for All: Making it Happen 14
5 Hurry Up in the Toilet: 2.4 Billion are Waiting 16
6 To Fetch a Pail of Water 18
7 Malaria 20
8 Fluoride and Arsenic in Drinking Water 22
9 Indoor Smoke: Breaking Down Respiratory Defences 24
10 Passive Smoking: Children Protest 26
11 Polluted Cities: The Air Children Breathe 28
12 Child Injuries are Preventable 30
13 Child Labour: Growing Up Too Quickly 32
14 Lead: IQ Alert 34
15 Safe Food: Crucial for Child Development 36
16 Poisoning: Hidden Peril for Children 38

Part Three A Look to the Future 40
17 Getting the Lead Out 40
18 Healthy Schools: Empowering Children 42
19 Enjoying the Sun Safely 44
20 Climate Change 46

Highs and Lows of Environmental Health 48
WHO Sub-Regions 49
World Data Table 50
Sources 58
Index 64
Acknowledgements

We are most grateful to Margaret Chan, Director, Protection of the Human Environment, WHO, for her vision to produce an atlas on children’s health and the environment. Her support, together with that of Kerstin Leitner, Assistant Director-General, Sustainable Development and Healthy Environments, WHO, made this atlas possible.

Special thanks go to the Office of Children’s Health Protection, United States Environmental Protection Agency, for their generous financial contribution towards this atlas, and to Judith Mackay, who contributed a wealth of experience and inspiration.

For their creativity, artistic talent and innovative suggestions in the design and cartography of this atlas, we would like to thank the Myriad Editions team of Candida Lacey, Isabelle Lewis, Jannet King and Corinne Pearlman.

This Atlas could not have been written if not for the rich pool of information already available. We extend our gratitude to colleagues around the world who contributed enthusiastic help and encouragement made this atlas possible. Fotostory photographers and insightful suggestions. Their work and support are integral to this Atlas.

We extend our appreciation for the invaluable input and advice we received from the following organizations for supplying maps:

Malaria in Africa, page 31

The sun’s rays, page 44
Unpublished data from Schmalwieser AW, Institute of Medical Physics and Biostatistics, University of Veterinary Medicine, Vienna, Austria by model calculations described in: Schmalwieser AW et al., Global validation of a forecast model for irradiance of the solar, erythemally effective UV radiation, Journal of Optical Engineering, 2003, 40:3040-3050.

A warming planet, page 46

The publishers are grateful to the following organizations and photographers for permission to reproduce their photographs:

page 8 WHO/H. Bower; 10 Nigel Bruce; 14 WHO/C. Gaggero, 16 WHO/C. Gaggero, 18 WHO/H. Anenden; 19 WHO/P. Virot; 26 WHO; 28 Steve Turner; 30 WHO/H. Anenden; 32 (top) ILO/P. Lissac; 32 (bottom) WHO/C. Gaggero; 34 WHO/C. Gaggero; 36 WHO/A. Waak; 38 Donald Cole, with thanks to Phil Langridan, Mount Sinai School of Medicine and with the permission of Donald Cole, Associate Professor Public Health Sciences, University of Toronto; 42 WHO/C. Gaggero, 43 WHO/T. Kelly; 44 The Cancer Council Victoria; 47 WHO; 48 (left) ILO/P. Lissac; 48 (middle) WHO/C. Gaggero; 48 (right) WHO/C.Gaggero.

The publishers are grateful to the following organizations for supplying maps:

Malaria in Africa, page 31

The sun’s rays, page 44
Unpublished data from Schmalwieser AW, Institute of Medical Physics and Biostatistics, University of Veterinary Medicine, Vienna, Austria by model calculations described in: Schmalwieser AW et al., Global validation of a forecast model for irradiance of the solar, erythemally effective UV radiation, Journal of Optical Engineering, 2003, 40:3040-3050.

A warming planet, page 46

The publishers are grateful to the following organizations and photographers for permission to reproduce their photographs:

page 8 WHO/H. Bower; 10 Nigel Bruce; 14 WHO/C. Gaggero, 16 WHO/C. Gaggero, 18 WHO/H. Anenden; 19 WHO/P. Virot; 26 WHO; 28 Steve Turner; 30 WHO/H. Anenden; 32 (top) ILO/P. Lissac; 32 (bottom) WHO/C. Gaggero; 34 WHO/C. Gaggero; 36 WHO/A. Waak; 38 Donald Cole, with thanks to Phil Langridan, Mount Sinai School of Medicine and with the permission of Donald Cole, Associate Professor Public Health Sciences, University of Toronto; 42 WHO/C. Gaggero, 43 WHO/T. Kelly; 44 The Cancer Council Victoria; 47 WHO; 48 (left) ILO/P. Lissac; 48 (middle) WHO/C. Gaggero; 48 (right) WHO/C.Gaggero.

The publishers are grateful to the following organizations for supplying maps:

Malaria in Africa, page 31

The sun’s rays, page 44
Unpublished data from Schmalwieser AW, Institute of Medical Physics and Biostatistics, University of Veterinary Medicine, Vienna, Austria by model calculations described in: Schmalwieser AW et al., Global validation of a forecast model for irradiance of the solar, erythemally effective UV radiation, Journal of Optical Engineering, 2003, 40:3040-3050.

A warming planet, page 46

The publishers are grateful to the following organizations and photographers for permission to reproduce their photographs:

page 8 WHO/H. Bower; 10 Nigel Bruce; 14 WHO/C. Gaggero, 16 WHO/C. Gaggero, 18 WHO/H. Anenden; 19 WHO/P. Virot; 26 WHO; 28 Steve Turner; 30 WHO/H. Anenden; 32 (top) ILO/P. Lissac; 32 (bottom) WHO/C. Gaggero; 34 WHO/C. Gaggero; 36 WHO/A. Waak; 38 Donald Cole, with thanks to Phil Langridan, Mount Sinai School of Medicine and with the permission of Donald Cole, Associate Professor Public Health Sciences, University of Toronto; 42 WHO/C. Gaggero, 43 WHO/T. Kelly; 44 The Cancer Council Victoria; 47 WHO; 48 (left) ILO/P. Lissac; 48 (middle) WHO/C. Gaggero; 48 (right) WHO/C.Gaggero.

The publishers are grateful to the following organizations for supplying maps:

Malaria in Africa, page 31

The sun’s rays, page 44
Unpublished data from Schmalwieser AW, Institute of Medical Physics and Biostatistics, University of Veterinary Medicine, Vienna, Austria by model calculations described in: Schmalwieser AW et al., Global validation of a forecast model for irradiance of the solar, erythemally effective UV radiation, Journal of Optical Engineering, 2003, 40:3040-3050.

A warming planet, page 46
We are most grateful to Margaret Chan, Director, Protection of the Human Environment, WHO, for her vision to produce an atlas on children’s health and the environment. Her support, together with that of Kerstin Leitner, Assistant Director-General, Sustainable Development and Healthy Environments, WHO, made this atlas possible.

Special thanks go to the Office of Children’s Health Protection, United States Environmental Protection Agency, for their generous financial contribution towards this atlas, and to Judith Mackay, who contributed a wealth of experience and inspiration.

For their creativity, artistic talent and innovative suggestions in the design and cartography of this atlas, we would like to thank the Myriad Editions team of Candida Lacey, Isabelle Lewis, Jannet King and Corinne Pearlman.

This Atlas could not have been written if not for the rich pool of information already available. We extend our gratitude to colleagues around the world who contributed a wealth of information and predictions. Exeter, UK Meteorological Office, 2002.

The publishers are grateful to the following organizations and photographers for permission to reproduce their photographs:

page 8 WHO/H. Bower; 10 Nigel Bruce; 14 WHO/C. Gaggero; 16 WHO/C. Gaggero, 18 WHO/H. Amenden; 19 WHO/P. Virost; 26 WHO, 28 Steve Turner; 30 WHO/H. Amenden; 32 (top) ILO/P. Lissac; 32 (bottom) WHO/C. Gaggero; 34 WHO/C. Gaggero; 36 WHO/A. Waak; 38 Donald Cole, with thanks to Phil Landrigan, Mount Sinai School of Medicine and with the permission of Donald Cole, Associate Professor Public Health Sciences, University of Toronto, 42 WHO/C. Gaggero; 43 WHO/T. Kelly; 44 The Cancer Council Victoria, 47 WHO; 48 (left) ILO/P. Lissac; 48 (middle) WHO/C. Gaggero; 48 (right) WHO/C. Gaggero.

The publishers are grateful to the following organizations for supplying maps:

Malaria in Africa, page 31

The sun’s rays, page 44
Unpublished data from Schmalwieser AW, Institute of Medical Physics and Biostatistics, University of Veterinary Medicine, Vienna, Austria by model calculations described in: Schmalwieser AW et al., Global validation of a forecast model for irradiance of the solar, erythemally effective UV radiation, Journal of Optical Engineering, 2002, 40:3040-3050.

A warming planet, page 46
Every child has the right to live in a healthy, supportive environment – an environment that encourages growth and development, and protects from disease. Many of the world’s children, however, are exposed to hazards in the very places that should be safest – the home, school and community. Considering that their growing bodies are particularly sensitive to environmental threats, the final burden of childhood disease is substantial. Every year, more than three million children die due to unhealthy environments.

The majority of these child deaths are caused by unsafe water, lack of sanitation, indoor air pollution, and mosquitoes bearing malaria. Other environmental hazards include passive smoking, lead and pesticides, road traffic accidents, and global environmental changes.

Persistent poverty aggravates these environmental threats. The children worst affected are those in the developing world, and the enormous burden of ill-health falling on their youngest citizens constrains the social and economic development of these countries.

Children are helpless in the face of environmental risks and, all too frequently, adults do not listen to the voices of children or act upon their most urgent needs. But we must listen. Children are our most precious resource. Together, now is the time to focus our efforts on combating environmental threats to children’s health and to work towards a sustainable and brighter future.

Dr LEE Jong-wook
Director-General
World Health Organization
Geneva
March 2004
Every child has the right to live in a healthy, supportive environment – an environment that encourages growth and development, and protects from disease. Many of the world’s children, however, are exposed to hazards in the very places that should be safest – the home, school and community. Considering that their growing bodies are particularly sensitive to environmental threats, the final burden of childhood disease is substantial. Every year, more than three million children die due to unhealthy environments.

The majority of these child deaths are caused by unsafe water, lack of sanitation, indoor air pollution, and mosquitoes bearing malaria. Other environmental hazards include passive smoking, lead and pesticides, road traffic accidents, and global environmental changes.

Persistent poverty aggravates these environmental threats. The children worst affected are those in the developing world, and the enormous burden of ill-health falling on their youngest citizens constrains the social and economic development of these countries.

Children are helpless in the face of environmental risks and, all too frequently, adults do not listen to the voices of children or act upon their most urgent needs. But we must listen. Children are our most precious resource. Together, now is the time to focus our efforts on combating environmental threats to children’s health and to work towards a sustainable and brighter future.

Dr LEE Jong-wook
Director-General
World Health Organization
Geneva
March 2004