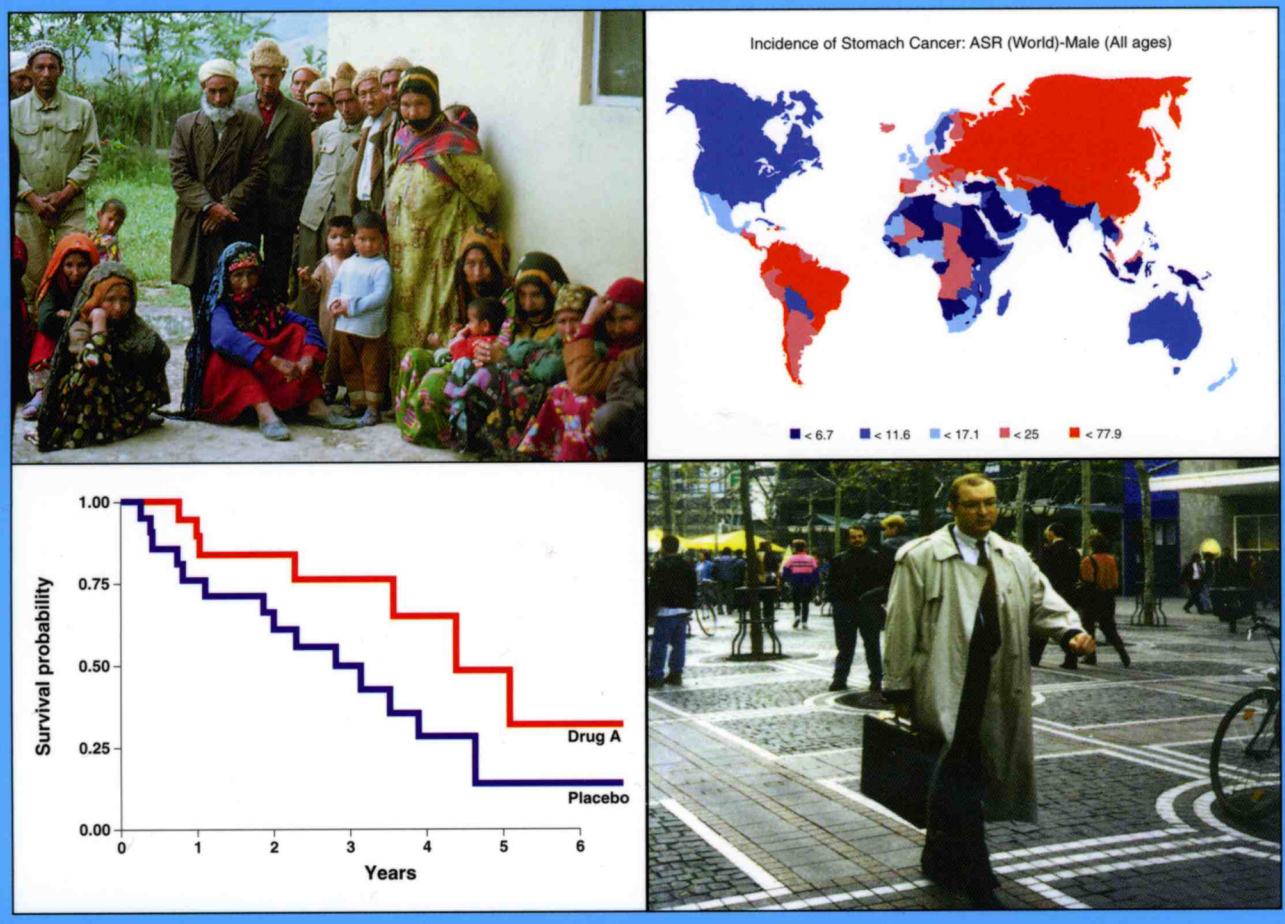
International Agency for Research on Cancer
World Health Organization

Cancer Epidemiology: Principles and Methods



Isabel dos Santos Silva

Cancer Epidemiology: Principles and Methods

International Agency for Research on Cancer

The International Agency for Research on Cancer (IARC) was established in 1965 by the World Health Assembly, as an independently financed organization within the framework of the World Health Organization. The headquarters of the Agency are at Lyon, France.

The Agency conducts a programme of research concentrating particularly on the epidemiology of cancer and the study of potential carcinogens in the human environment. Its field studies are supplemented by biological and chemical research carried out in the Agency's laboratories in Lyon, and, through collaborative research agreements, in national research institutions in many countries. The Agency also conducts a programme for the education and training of personnel for cancer research.

The publications of the Agency are intended to contribute to the dissemination of authoritative information on different aspects of cancer research. Information about IARC publications and how to order them is also available via the Internet at: **http://www.iarc.fr/**

WORLD HEALTH ORGANIZATION
INTERNATIONAL AGENCY FOR RESEARCH ON CANCER

Cancer Epidemiology: Principles and Methods

By
Isabel dos Santos Silva

International Agency for Research on Cancer
Lyon, France
1999

Published by the International Agency for Research on Cancer,
150 cours Albert Thomas, 69372 Lyon cédex 08, France

Distributed by IARCPress (fax: +33 04 72 73 83 02; E-mail: press@iarc.fr)
and by the World Health Organization Distribution and Sales, CH-1211
Geneva 27 (fax: +41 22 791 4857)

IARC Library Cataloguing in Publication Data

dos Santos Silva, I.
Cancer epidemiology: principles and methods / Isabel dos Santos Silva

1. Neoplasms – epidemiology I. Title

ISBN 92 832 0405 0 (NLM Classification W1)

Contents

Foreword

Within the IARC programme of training courses, high priority is given to courses on cancer epidemiology, particularly in countries of the developing world. Population-based epidemiological studies are the only reliable source on the occurrence and outcome of cancer and form the basis of any national or regional cancer control programme. Over the years, the International Agency for Research on Cancer has been faced with the problem of selecting an appropriate textbook for its courses. To resolve this difficulty, we decided to publish a textbook suitable for the course faculty and the non-initiated reader. Isabel dos Santos Silva, from the London School of Hygiene and Tropical Medicine, a prominent epidemiologist with extensive teaching experience, has accomplished this task admirably, in close consultation with external experts and an IARC Advisory Board (see below).

We hope that this textbook will guide students and health professionals wishing to understand the basic principles and methods used in cancer epidemiology.

P. Kleihues
Director, IARC

IARC Advisory Board

Nubia Muñoz
D. Maxwell Parkin
Jacques Estève
Paolo Boffetta

About this book

This book is addressed primarily to medical and public health students, clinicians, health professionals and all those seeking to understand the principles and methods used in cancer epidemiology. Its aim is not to convert the readers into epidemiological experts but to make them competent in the use of basic epidemiological tools and capable of exercising critical judgement when assessing results reported by others.

The book is designed to provide an easy understanding of the basic concepts and methods through the use of illustrative examples, often using real research data. It was my intention to ensure that the material would be accessible to everyone new to the field. Knowledge of statistics is indispensable to the proper conduct, analysis and interpretation of epidemiological studies. Thus, statistical concepts (and formulae) are also presented but the emphasis is on the interpretation of the data rather than on the actual calculations.

The book is divided into 18 chapters. The first six introduce the basic principles of epidemiology and statistics. Chapters 7–13 deal in more depth with each of the study designs and interpretation of their findings. Chapters 14 and 15 cover more complex statistical concepts and can be omitted at a first reading. Chapter 16 deals with methodological issues in cancer prevention, including primary prevention, early detection (screening activities) and tertiary prevention. Chapter 17 reviews the role of cancer registries in cancer epidemiology and prevention. Finally, Chapter 18 discusses logistic issues and practical considerations that should be taken into account in the design, planning and conduct of any type of epidemiological research.

Few, if any, of the ideas and concepts in this book are original. Many of them derive from my own teaching experience at the London School of Hygiene and Tropical Medicine and, in particular, to my role as the organizer of the School's intensive course in epidemiology and medical statistics. I am deeply indebted to many colleagues and students with whom I have worked over the past years for all I have learnt from them. It would be impossible for me to name all who, in one way or another, helped me to write this book—I can only hope that they are aware of my appreciation. I am, however, particularly grateful for the help of my colleagues (and good friends) Bianca De Stavola and Esa Läärä for the long hours they spent reading earlier drafts and for their helpful comments, suggestions and stimulating discussions—I certainly learnt a lot from

them! I would also like to thank IARC for giving me the opportunity to write this book and, in particular, the members of the editorial committee (Drs Jacques Estève, Nubia Muñoz, Max Parkin and Paolo Boffetta), Dr. Rengaswami Sankaranarayanan and Dr. Martyn Plummer, for their suggestions and comments in the earlier stages of the project. I am also grateful for all the support and encouragement given by my colleagues at the London School of Hygiene and Tropical Medicine and, in particular, to the thoughtful comments on earlier versions of various chapters provided by Professor Peter Smith, Dr Noreen Maconochie and Dr Punam Mangtani. I also wish to thank Ms Maria Quigley and Mr. Craig Higgins for giving permission to include some of their teaching examples in Chapter 14. Part of the material presented in Chapters 6 and 12 was initially developed as teaching material for our intensive course in collaboration with Dr Maconochie and Mr Jerry Wheeler—the stimulating discussions we had at that time and the feedback received from our students were very helpful in shaping those chapters. Lastly, I would like to thank Dr John Cheney and Ms Helis Miido for all their editorial assistance.

Isabel dos Santos Silva