

**APPROACHES TO ATTRIBUTION
OF DETRIMENTAL HEALTH EFFECTS
TO OCCUPATIONAL
IONIZING RADIATION EXPOSURE
AND THEIR APPLICATION
IN COMPENSATION PROGRAMMES
FOR CANCER**

Edited by
Shengli Niu, Pascal Deboodt and Hajo Zeeb



International
Labour
Office
Geneva



International
Atomic Energy
Agency



World Health
Organization

Occupational
safety and health
series

73

Approaches to attribution
of detrimental health effects
to occupational ionizing radiation exposure
and their application
in compensation programmes for cancer

Occupational Safety and Health Series, No. 73

Approaches to attribution of detrimental health effects to occupational ionizing radiation exposure and their application in compensation programmes for cancer

A practical guide

Edited by
Shengli Niu, Pascal Deboodt and Hajo Zeeb

Jointly prepared by the International Atomic Energy Agency,
the International Labour Organization
and the World Health Organization

International Atomic Energy Agency · Vienna
International Labour Office · Geneva
World Health Organization · Geneva

Copyright © International Labour Organization 2010
First published 2010

Publications of the International Labour Office enjoy copyright under Protocol 2 of the Universal Copyright Convention. Nevertheless, short excerpts from them may be reproduced without authorization, on condition that the source is indicated. For rights of reproduction or translation, application should be made to ILO Publications (Rights and Permissions), International Labour Office, CH-1211 Geneva 22, Switzerland, or by email: pubdroit@ilo.org. The International Labour Office welcomes such applications.

Libraries, institutions and other users registered with reproduction rights organizations may make copies in accordance with the licences issued to them for this purpose. Visit www.ifrro.org to find the reproduction rights organization in your country.

Niu, Shengli; Deboodt, Pascal; Zeeb, Hajo (eds)

Approaches to attribution of detrimental health effects to occupational ionizing radiation exposure and their application in compensation programmes for cancer: A practical guide / edited by Shengli Niu, Pascal Deboodt, Hajo Zeeb; jointly prepared by the International Atomic Energy Agency, the International Labour Organization and the World Health Organization.
Geneva, ILO, 2010 (Occupational Safety and Health Series, No. 73)

ISBN 978-92-2-122413-6 (print)
ISBN 978-92-2-122414-3 (web pdf)

International Labour Office; International Atomic Energy Agency; World Health Organization

guide / ionizing radiation / occupational health / occupational disease / cancer / employment accident benefit

08.11.4

ILO Cataloguing in Publication Data

The designations employed in ILO publications, which are in conformity with United Nations practice, and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of the International Labour Office concerning the legal status of any country, area or territory or of its authorities, or concerning the delimitation of its frontiers.

The responsibility for opinions expressed in signed articles, studies and other contributions rests solely with their authors, and publication does not constitute an endorsement by the International Atomic Energy Agency, the International Labour Office and the World Health Organization of the opinions expressed in them.

Although great care has been taken to maintain the accuracy of information contained in this publication, neither the International Atomic Energy Agency, the International Labour Office, the World Health Organization nor their member States assume any responsibility for consequences which may arise from its use.

Reference to names of firms and commercial products and processes does not imply their endorsement by the International Atomic Energy Agency, the International Labour Office and the World Health Organization, and any failure to mention a particular firm, commercial product or process is not a sign of disapproval.

ILO publications and electronic products can be obtained through major booksellers or ILO local offices in many countries, or direct from ILO Publications, International Labour Office, CH-1211 Geneva 22, Switzerland. Catalogues or lists of new publications are available free of charge from the above address, or by email: pubvente@ilo.org

Visit our website: www.ilo.org/publns

Contents

Foreword	xi
Preface	xiii
Abbreviations	xv
1. Introduction	1
1.1 Background	1
1.2 Objective	3
1.3 Scope	4
1.4 Structure	4
Part A The scientific basis of risk attribution	7
2. Approaches to attributing health effects to occupational radiation exposure	7
2.1 Deterministic effects	7
2.1.1 Background	7
2.1.2 Dependence on cell killing.	8
2.1.3 Threshold dose values for deterministic effects	8
2.2 Stochastic effects	10
2.2.1 Background	10
2.2.2 Assigned share (probability of causation)	11
2.2.3 Uncertainties	12
2.2.4 Estimation of assigned share for cancer	13
2.2.5 Practical examples	14
Part B Risk attribution-based compensation programmes	17
3. Approaches to assessment in risk attribution-based compensation programmes	17
3.1 Attributing deterministic effects	17
3.2 Attributing stochastic effects	18
4. Features of risk attribution-based compensation programmes	20
4.1 Background	20
4.2 General features	20
4.2.1 Establishment of risk attribution-based compensation programmes	20
4.2.2 Population	20
4.2.3 Eligibility	21

4.2.4	Assessment criteria	21
4.2.5	Input data	21
4.2.6	Compensability	22
4.2.7	Settlement options	22
4.2.8	Administration	22
4.2.9	Funding of compensation schemes	23
5.	Conclusions and recommendations	24
Appendix A:	Examples of compensation programmes	25
A.1	The UK Compensation Scheme for Radiation-Linked Diseases	25
A.1.1	Population	25
A.1.2	Eligibility	25
A.1.3	Assessment criteria	26
A.1.4	Input data	27
A.1.5	Compensability	28
A.1.6	The approach to uncertainty.	28
A.1.7	Settlement value.	29
A.1.8	Summary of important features	29
A.2	The US Department of Energy Employees Occupational Illness Compensation Program.	31
A.2.1	Population	31
A.2.2	Eligibility	31
A.2.3	Assessment method	31
A.2.4	Input data	34
A.2.5	Compensability criteria	35
A.2.6	Nature of compensation	35
A.2.7	Summary of important features	35
A.2.8	Other US programmes	36
A.3	The Japanese compensation programme for atomic bomb survivors	37
A.3.1	Population	37
A.3.2	Eligibility	37
A.3.3	Assessment criteria and methods	37
A.3.4	Input data	38
A.3.5	Compensability	40
A.3.6	The approach to uncertainty.	40
A.3.7	Nature of compensation/settlement values	40
A.4	The Russian Federation Compensation Scheme for Radiation-Linked Diseases . .	41
A.4.1	Population	41
A.4.2	Eligibility	42
A.4.3	Assessment criteria	43
A.4.4	Workers Exposed in Special Circumstances	43
A.4.5	Radiation Workers.	45
A.4.6	Input data	48

A.4.7 Compensability	48
A.4.8 Settlement value	48
A.4.9 Summary of important features: Workers Exposed in Special Circumstances	48
A.4.10 Summary of important features: Radiation Workers.	49
A.5 The French compensation programme	50
A.5.1 Origin of the compensation system and its principles	50
A.5.2 Eligibility for diseases associated with ionizing radiation	50
A.5.3 Population concerned	52
A.5.4 Compensation statistics	52
A.5.5 Extension towards attributability	52
A.6 The provisions of the law applicable to workers affected by occupational exposure to ionizing radiation in the Argentine Republic	53
A.6.1 Introduction	53
A.6.2 Legal system of compensation: Normative framework	54
A.6.3 Objectives of the Act on Occupational Risks	54
A.6.4 Compulsory and self-insurance	55
A.6.5 Occupational illnesses and accidents covered.	55
A.6.6 Civil liability	56
A.6.7 Procedural aspects.	56
A.6.8 Applicable nuclear regulatory norms	57
A.6.9 Legal precedent	57
A.6.10 Summary of important features	58
Appendix B: Global average occupational exposure and average radiation dose from natural sources	59
Appendix C: Biological indicators (“biological dosimetry”)	63
C.1 Introduction.	63
C.2 Techniques	63
C.2.1 Dicentric chromosomes	63
C.2.2 Micronuclei	64
C.2.3 PCC (premature chromosome condensation)	65
C.2.4 Reciprocal translocations	66
C.2.5 EPR (electron paramagnetic resonance; = ESR, electron spin resonance)	66
C.2.6 γ -H2AX foci.	67
C.2.7 Comet assay	67
C.3 Conclusions.	68
Appendix D: A quantitative uncertainty analysis approach to estimation of radiation-related risk	69
D.1 Modelling of statistical risk estimates	70
D.2 Correction for random and systematic errors in A-bomb survivor dosimetry	77
D.3 Dependence of risk on dose and dose rate for low-LET radiation	78
D.4 Adjustment for radiation quality	79
D.5 Transfer of ERR from the Japanese to the US population	81

D.6	Modification by epidemiological risk factors	84
D.6.1	General formulation.	84
D.6.2	Breast cancer: Interaction of radiation and age at first full-term pregnancy	84
D.6.3	Lung cancer: Interaction of radiation dose with smoking history	85
D.6.4	Non-melanoma skin carcinoma: Interaction between ionizing and ultraviolet radiation	87
D.6.5	IREP.	88
Appendix E: The ASQRAD software		89
E.1	General presentation of the calculation tool	89
E.2	Example of application	89
E.3	Concluding remarks	92
Contributors to drafting and review		93
References		95
List of tables		
Table 2.1	Projected threshold estimates of the acute absorbed doses for 1 per cent incidences of morbidity and mortality involving adult human organs and tissues after whole-body gamma-ray exposures	9
Table A.1	Assigned share and payment bands in the UK Compensation Scheme for Radiation-Linked Diseases.	28
Table A.2	Male colon cancer: Example of probability of causation (%)	39
Table A.3	PC values for various cancers (dose 50 cGy, ATB 12 years)	39
Table A.4	List of diseases defined as linked to the Chernobyl accident, accident at the production association Mayak (1957) and dumps of radioactive waste products into the Techa River in the Russian Federation	43
Table A.5	Occupational diseases defined as linked to radiation events in the Russian Federation (1999 Chernobyl List)	44
Table A.6	Occupational diseases defined as linked to the Chernobyl accident in the Russian Federation in 1992–97 (1992 Chernobyl List).	45
Table A.7	Occupational diseases defined as linked to the Chernobyl accident	

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/report?reportId=5_22689