United Nations Scientific Committee on the Effects of Atomic Radiation

UNEP

UNSCEAR's Global Survey of Medical Exposure

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UNSCEAR secretariat, Austria

X Congreso Regional Latinoamericano IRPA de Protección y Seguridad Radiológica

"Radioprotección: Nuevos Desafíos para un Mundo en Evolución"

UNSCEAR's mandate

- Established by UN General Assembly (GA) resolution in 1955
- Assess levels, effects & risks of ionizing radiation
- Disseminate findings to UN GA, scientific community & public
- Scientists from 27 UN Member States
- Other states & organizations provide relevant data
- Holds annual sessions in Vienna
- UNEP arranges secretariat and provides support

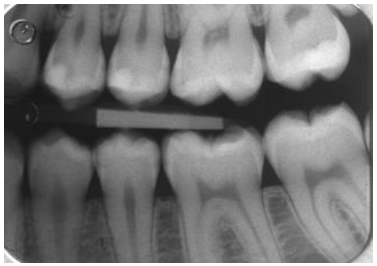
UNSCEAR assessments on level and effects

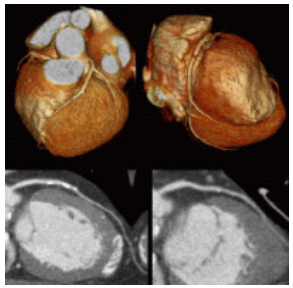
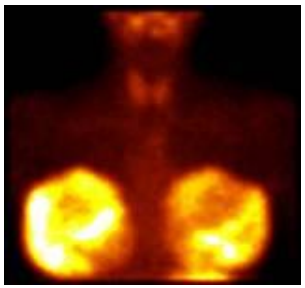
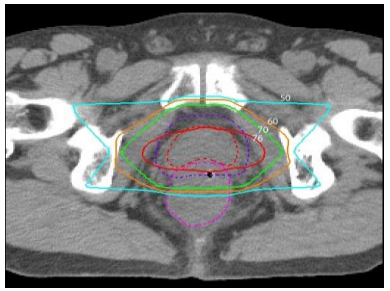
UNSCEAR's surveys

- global estimates of level of exposure and frequency, with break-downs by medical procedure, age, sex, health care level, and country;
- trends in practice (including those relatively fast-changing);
- supporting related information on equipment and staffing levels.

Medical exposures categories

- Diagnostic radiology
  - Plain radiography, fluoroscopy, CT and DEXA
  - Image guided interventional procedures
- Nuclear medicine
  - Gamma camera, PET/CT and NM treatments
- Radiation therapy
  - External beam therapy and brachytherapy



Historical milestones

- UNSCEAR 1958 Report:
  - Medical radiation dose data only from few countries
- UNSCEAR 1962 Report:
  - Annual frequency data from 20 countries
- UNSCEAR 1982 Report:
  - First survey together with WHO including data on availability of diagnostic radiology equipment
- UNSCEAR 1988 Report:
  - First global estimate of medical exposures
- UNSCEAR 1993, 2000 and 2008 Reports:
  - Collective effective dose
- UNSCEAR 2014 survey
  - Online platform (**www.survey.unscear.org**)

Source of information

- Considers:
  - Former UNSCEAR Reports
  - UNSCEAR Global Surveys (medical, occupational and public exposures)
  - Reports of national authorities submitted to the UNSCEAR secretariat
  - Scientific (Peer Review) literature

- Does not consider “grey” literature (e.g. conference proceedings)

Limited size for X-ray sample of national data

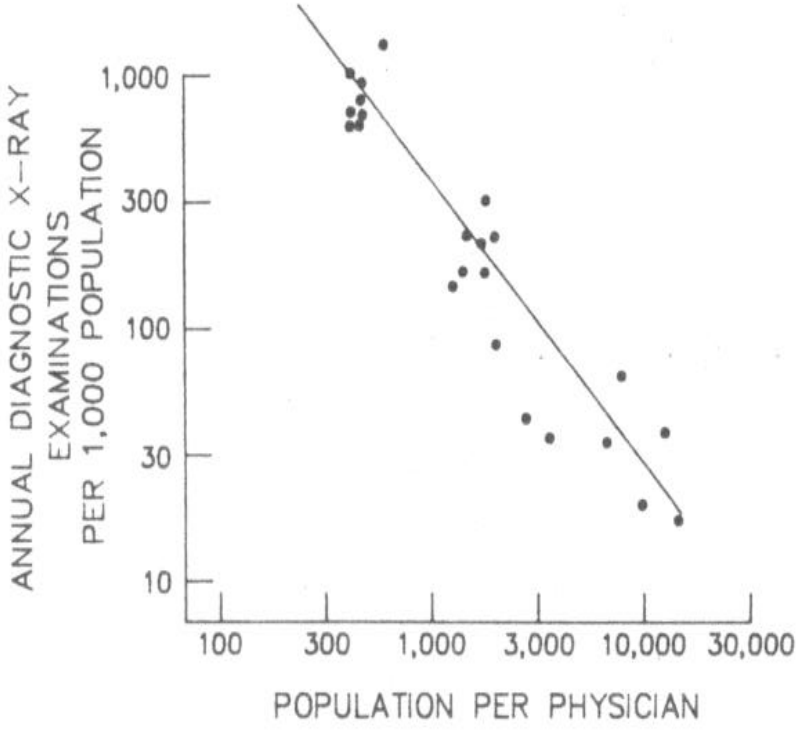
Year	Population sample (%)	World population (millions)
1988	69	5,000
1993	59	5,290
2000	46	5,800
2008	11	6,446

Shrimpton: Present UNSCEAR model for global extrapolation from a limited sample of national data, Vienna, 3 March 2015

Health Care Levels (HCL) classification

Analytical model to extrapolate to a global level of medical radiological exposure

- Estimating the frequency of medical radiation usage on a worldwide basis
- Number of physicians per population correlates with the number of medical radiological devices and procedures
- Grouping of countries by health care systems / levels



[Mettler et al.: Analytical Modelling of Worldwide Medical Radiation Use. Health Physics. 52(2):133-141, 1987]

Population dose estimation

- ***E (Effective dose)*** is used for expressing stochastic risk to radiation workers and to whole population
  - Given by: $E = \sum_T w_T H_T$

    where equivalent dose to tissue or organ, H_T, is weighted by dimensionless tissue weighting factor w_T.

- Effective dose concept applies only to dose levels in radiology and nuclear medicine and is NOT appropriate to assess dose levels in radiation therapy.

Population dose estimation

- ***S (Collective effective dose)*** is summation, over all types of examinations, of mean effective dose (E_e) for specific examination type multiplied by number of examinations (n_e)
  - Given by: $S = \sum E_e n_e$
  - n_e = number of annual frequencies (expressed as number of examinations per 1,000 population)

- "It is possible…to use effective dose and even collective dose for medical diagnostic exposure as long as this is done only for comparative purposes and for the same or similar patient populations, and it would require additional considerations or significant corrections if we try to use them to compare with other populations." [UNSCEAR 2000]

UNSCEAR's strategy to improve data collection

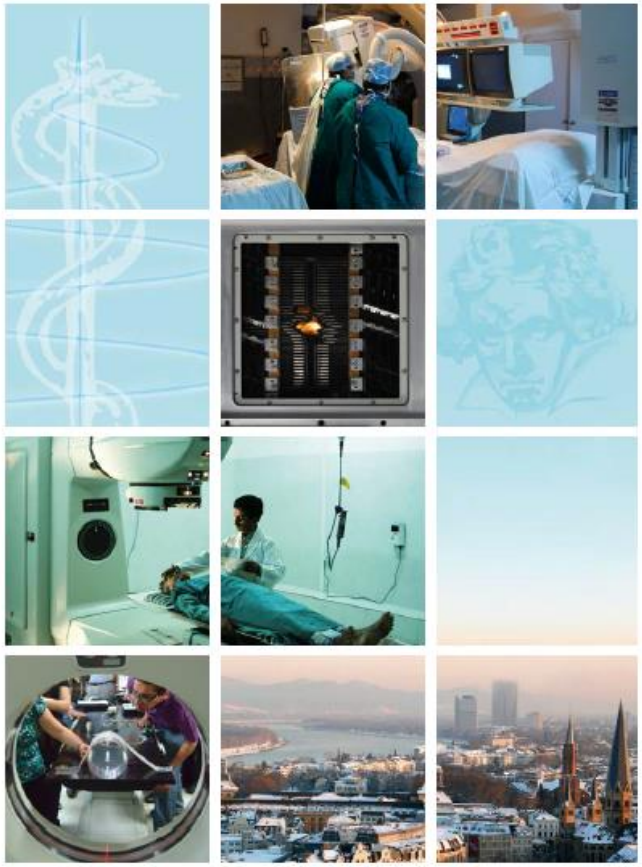
- Very poor response from countries of **health care level II - IV**;
- **Complexity on patient age and sex** distribution might have hindered submission of other important data and information;
- Confusion due to different interpretations of **dosimetric approaches**;
- Lack of clarity affects **quality and consistency of data** submitted;
- UNSCEAR's **HCL classification** doesn't allow comparison with other public health issues;
- **Language** difficulties to interpret requested information;
- **Long** verification and **publishing process** within the UN.

UNSCEAR's strategy to improve data collection

Major elements of the strategy:

(i) use existing mechanisms to obtain data from **IAEA and WHO**;
(ii) standardize the survey taxonomy and terminology (user manual);
(iii) focus on most significant examinations and procedures in terms of their contribution to population dose (top examinations);
(iv) collect patients' age and sex distributions information separately for selected countries (own questionnaire sheet);
(v) adopt World Bank approach used by WHO to allow comparison with other public health issues (WHO' World Health Statistic);
(vi) establish standing expert group on medical exposure (EGME);
(vii) use national contact persons to coordinate data collection (NCP);
(viii) develop electronic solution for data collection;
(ix) review health care level methodology for better extrapolation and to consider uncertainties.

The Bonn Call for Action (December 2012)



BONN CALL FOR ACTION

10 Actions to Improve Radiation Protection in Medicine in the Next Decade

IAEA

World Health Organization

06

Increase availability of improved global information on medical exposures and occupational exposures in medicine

- Improve collection of dose data and trends on medical exposures globally, and especially in low- and middle-income countries, by fostering international co-operation;
- Improve data collection on occupational exposures in medicine globally, also focussing on corresponding radiation protection measures taken in practice;
- Make the data available as a tool for quality management and for trend analysis, decision making and resource allocation.

UNSCEAR's strategy to improve data collection

Major elements of the strategy:

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(ii) standardize the survey taxonomy and terminology (**user manual**);
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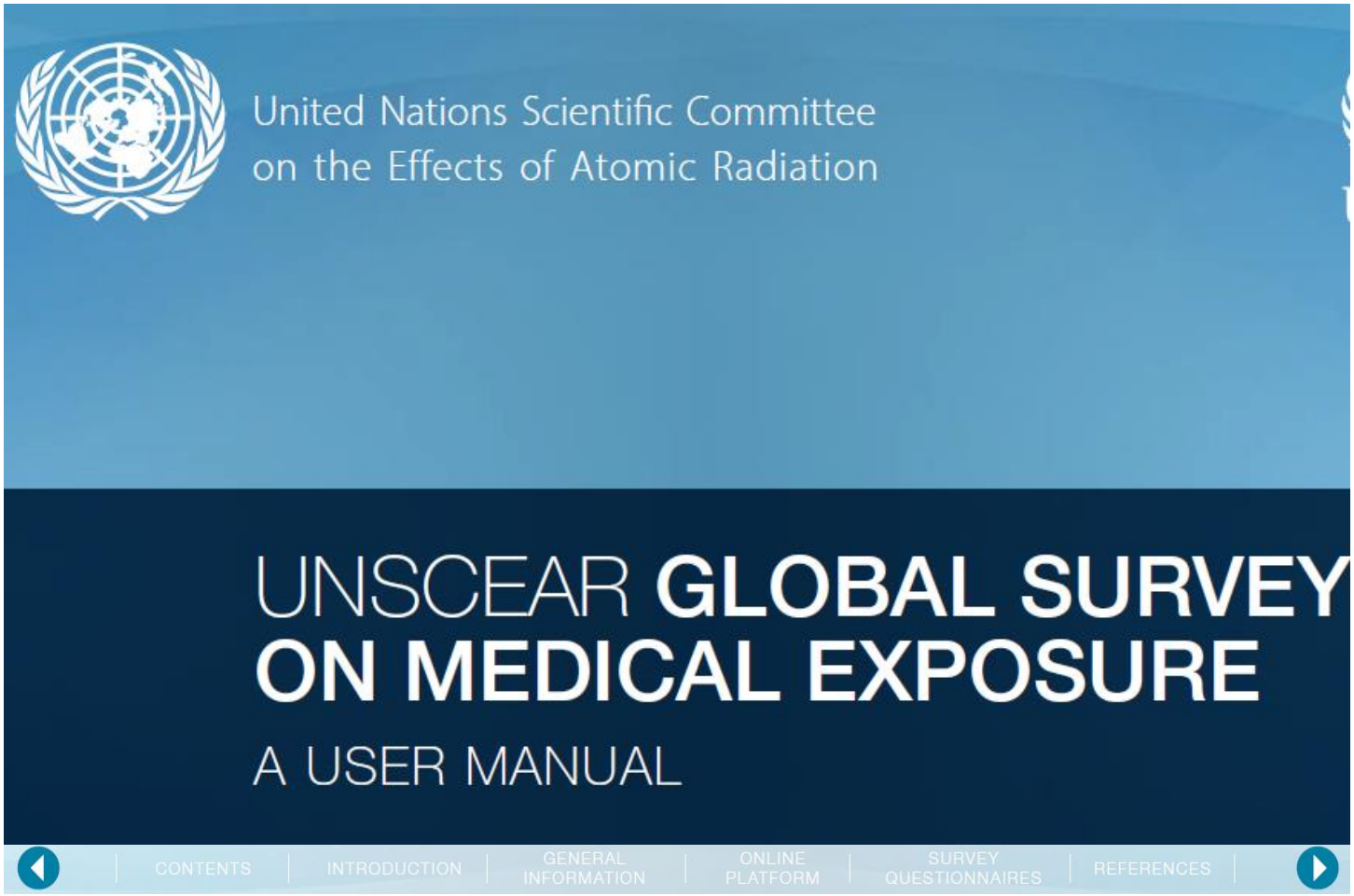

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UNSCEAR's strategy to improve data collection

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Age and sex distribution of patients undergoing radiological examinations (optional)

Modality category	Examination category	?	Number of treatments per age [y] group and sex																													
		0-1		2-4		0-4		5-9		10-14		0-14		15-19		20-24		25-29		30-34		35-39		15-39		40-44		45-49		50-54		55-59		60-64
		male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male
Projectional radiography (without contrast media)	Head (skull & facial bones)																															
	Head (soft tissue)																															
	Neck (cervical spine)																															
	Neck (soft tissue)																															
	Chest (thoracic spine)																															
	Chest/Thorax (lungs PA & LAT)																															
	Chest (shoulder girdle & ribs)																															
	Mammography																															
	Mammography (screening)																															
	Lumbar spine																															
	Lumbo-sacral joint only																															
	Abdomen																															
	Pelvis & hips (bone)																															
	Pelvis (soft tissue)																															
	Limbs and joints																															
	Whole spine (trunk)																															
	Skeletal survey (head & trunk)																															
	Dental intraoral																															
	Dental panoramic																															
	Other (please specify)																															
	Other (please specify)																															
Radiography and fluoroscopy (mostly with contrast media)	Gastrointestinal tract (barium studies)																															
	Gastrointestinal tract (defecography)																															
	Bilary tract (cholangiography)																															
	Bilary tract (ERCP)																															
	Bilary tract (cholecystography)																															
	Uro-genital tract (IVU)																															
	Uro-genital tract (kidney, bladder & urethra)																															
	Myelography																															
	Arthrography																															
	Cerebral angiography																															
	Cardiac angiography																															
	Thoracic angiography																															
	Abdominal angiography																															
	Pelvic angiography																															
	Peripheral angiography																															
	Lymphangiography																															
	Other (please specify)																															
	Other (please specify)																															

Staff & Devices RD | Freq. & Dose RD (GovermentHosp) | Freq. & Dose RD (Private Hosp)) | Age & Sex RD | Sheet1

unscear.org

UNSCEAR's strategy to improve data collection

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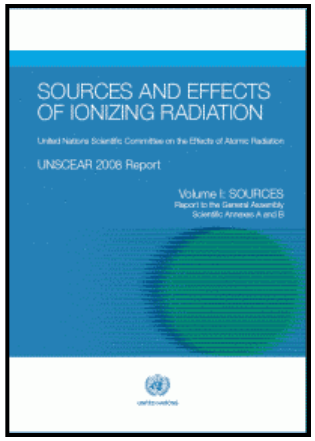
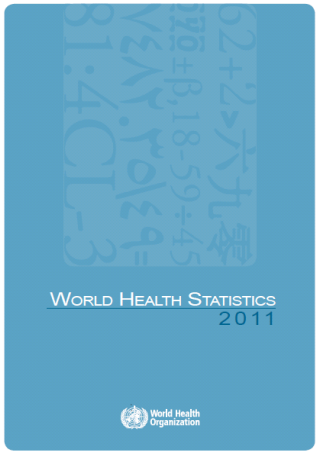
UNSCEAR's model to global estimate medical exposures

HCL I : > 1000 physicians / 1 Mil. population
HCL II : 334 and 1000 physicians / 1 Mil. population
HCL III : 100 and 333 physicians / 1 Mil. population
HCL IV : < 100 physicians / 1 Mil. population



World Bank Classification (WHO' World Health Statistic)

High income = $12000 or more
Upper middle income = $4000 – 12000
Lower middle income = $1000 – 4000
Low income = $1000 or less



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UNSCEAR's strategy to improve data collection

- **Expert Group of Medical Exposure (EGME):**
  - Support the UNSCEAR secretariat in conducting the medical survey
    - Develpment of the questionnaires
    - Technical matters (e.g. extrapolation and uncertainty)
    - Quality check of the submitted data
  - Three subgroups for the data validation were agreed:
    - Radiology (Diagnostic and interventional)
    - Nuclear Medicine
    - Radiation Therapy

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UNSCEAR's strategy to improve data collection

- **National Contact Persons (NCPs) are responsible to:**
  - Coordinate the data collection on country level;
  - Cooperate with technical experts to fill in questionnaires;
  - Correspond with UNSCEAR in case of difficulties;
  - Submit data officially to UNSCEAR secretariat;
  - Approve additional material as valued supporting information; and
  - Foster involvement from Member States by raising awareness of the UNSCEAR surveys.

- **National Contact Persons (NCPs)** are nominated via official channels to guarantee their authority and to ensure that the collected data are scientifically objective!

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survey.unscear.org

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UNSCEAR Global Survey

On Medical Radiation Usage and Exposure from 2006 onwards

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), established by the United Nations General Assembly in 1955 to assess and report levels and effects of all sources of ionizing radiation conducts regular Global Surveys of Medical Radiation Usage and Exposure.

This online platform is to support governments and international organizations to provide national and regional data on the use of radiation in medical diagnosis and treatment for the UNSCEAR Global Survey on Medical Radiation Usage and Exposure from 2006 onwards.

National Contact Persons (NCPs) are invited to register here to be able to access the protected area before they can download the questionnaires for official data submission. Additional national experts can be registered to support the NCPs. All contributions will be acknowledged by UNSCEAR in the relevant report to the UN General Assembly.

UNSCEAR is grateful to the (World Health Organization) for establishing arrangements for cooperation which resulted in developing a common medical questionnaire for this survey and to the (European Commission) for permitting the use of the outcomes of the (DoseDataMed II project).

Please read further instructions, background information and help if you are interested in using this platform.

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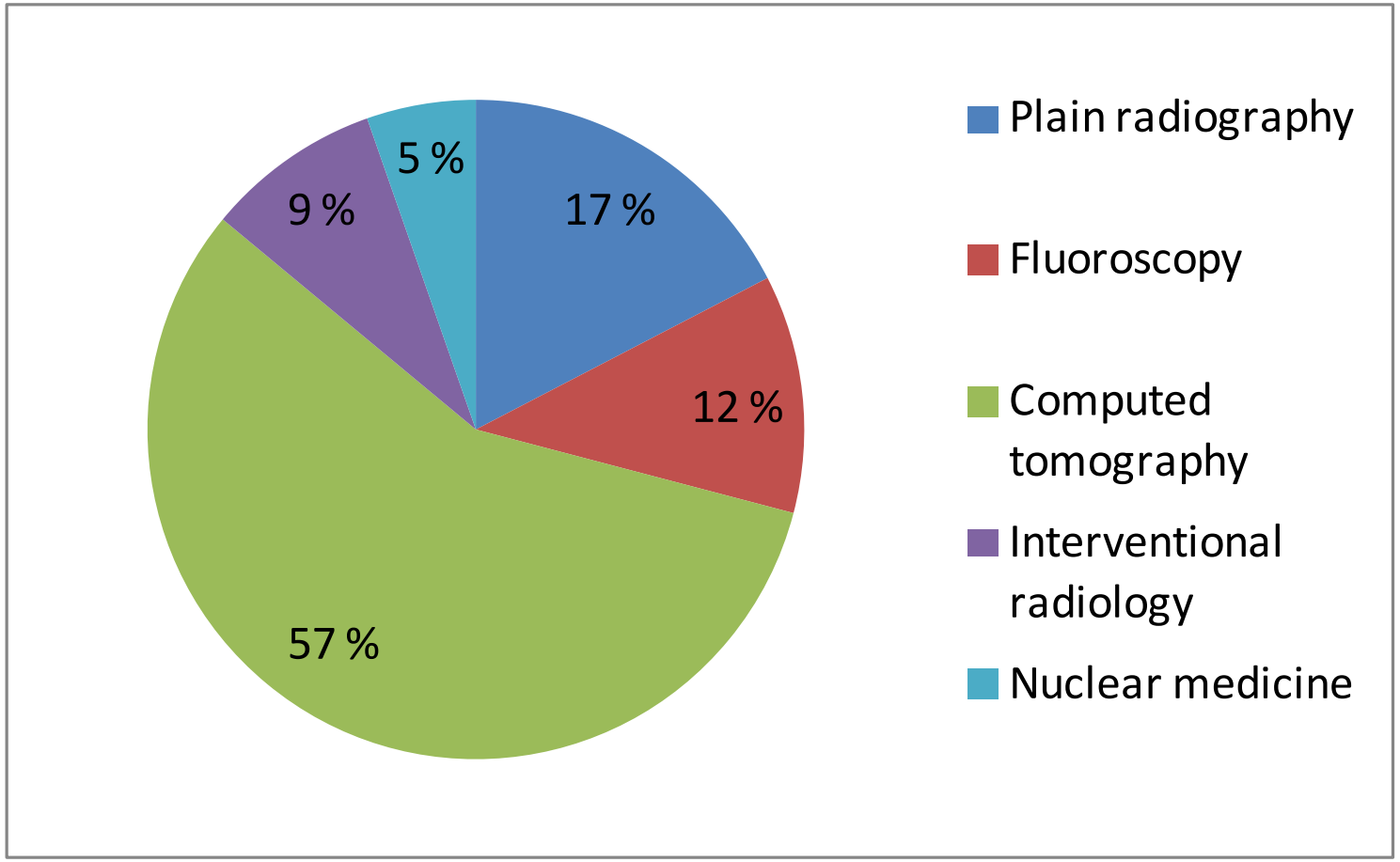
Contribution of RD/IR and NM to the collective effective dose for EU Member States



[RP 180. Medical Radiation Exposure of the European Population, 2014]

Conclusion

- The new UNSCEAR improvement strategy aims to increase the numbers of countries providing data by facilitating the collection process and providing a long term archive.
- Due to the new estimation model taking health economic factors into account and an increased participation a better estimation of the global medical exposure is expected.
- The nomination of NCPs is crucial to establish a solid network to provide accurate data to UNSCEAR.
- The collaboration with International Organizations (e.g. IAEA, WHO, FORO) and professional societies (e.g. IRPA, IOMP, ISR) is essential to profit from existing experiences and to avoid duplication of efforts.

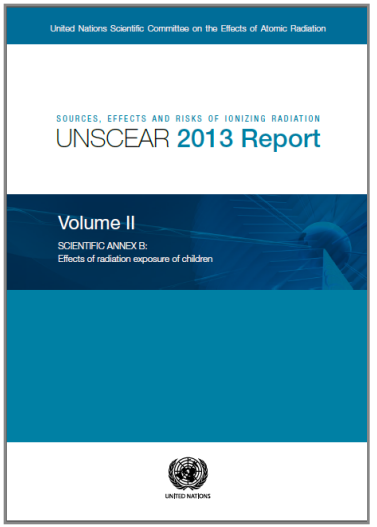
UNSCEAR's publications

Printed version can be ordered from

https://unp.un.org

Electronic version for free download

www.unscear.org



Muchas gracias por su atención!