

# European population dose from radiodiagnostic procedures – early results of Dose Datamed 2

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**Abstract.** The first general survey of Dose Datamed 2 ([www.ddmed.eu](http://www.ddmed.eu)) was carried out in March 2011. Data was requested from 41 countries and 37 of them replied. The results show that it will be possible to get the minimum amount of data from most of the countries (Table 1) for assessing the European collective effective dose from radiodiagnostic examinations. The data from Nordic countries is comprehensive and will be used as a reference material with the data from few other countries for testing the usefulness of the Top 20 method. European guidance for estimating population dose from nuclear medicine examinations is under preparation and has been requested by many countries during the project. Dose Datamed 2 will provide in 2012 an estimate of European population dose from radiodiagnostic procedures and the survey for that is open until the end of November 2011.

**KEYWORDS:** *population dose, collective effective dose*

## INTRODUCTION

At the end of 2004 DG TREN (European Commission, Directorate General for Energy and Transport) launched a project to provide information and develop guidance on the implementation of Article 12 of the Medical Exposure Directive in Member States with regard to medical imaging. This “DOSE DATAMED” study (in the following referred as DOSE DATAMED1 or DDM1) covered ten European countries with national experiences in conducting surveys of dose distributions from medical radiodiagnostic procedures. The guidance developed under the DOSE DATAMED1 project, together with best available survey data from these ten countries around the year 2002, is published by the European Commission as *Radiation Protection 154. European Guidance on Estimating Population Dose from Medical X-ray Procedures* (RP154) (European Commission 2008).

In the invitation to the recent tender No.ENER/D4/181-2010 a follow-up called “Study on European Population Doses From Medical Exposure”, or Dose Datamed 2, was launched. In the invitation, reference was made to the rapid technological development during the last decade and the need for updated comparable data about the doses from medical exposure procedures, in x-ray diagnostics, interventional radiology and nuclear medicine (NM), in the European Union Member States. The availability of such data will facilitate the implementation of radiation protection requirements in the EU Member States as well as the future decision-making on these matters on national and EU level.

The aim of Dose Datamed 2 is to collect available data on the doses from radiodiagnostic procedures in the European Union Member States, including also other European countries, and to facilitate the further implementation of the report RP154. Based on collected information the Dose Datamed 2 will provide an estimate of the doses to patients from radiodiagnostic procedures for the European Union as a whole, taking into account the possible lack of data for specific countries or examinations and the uncertainties in the available data. Any identified trends in the doses from radiodiagnostic procedures in

the Union and in the individual Member States will also be reported. The project organisation is set up to meet these objectives. The project consortium includes partners both from the previous DOSE DATAMED1 project and from those countries who were not involved in the earlier project but have recent experiences in the implementation of report RP154. Furthermore, the project consortium will be supported by a Panel of Scientific Experts, with participants from several other DDM1 countries and the relevant international bodies, and by an observer representing WHO and UNSCEAR. Finally, the collection of information and data will be ensured through national contact persons established in all European countries. The project organization is presented in the Figure 1.

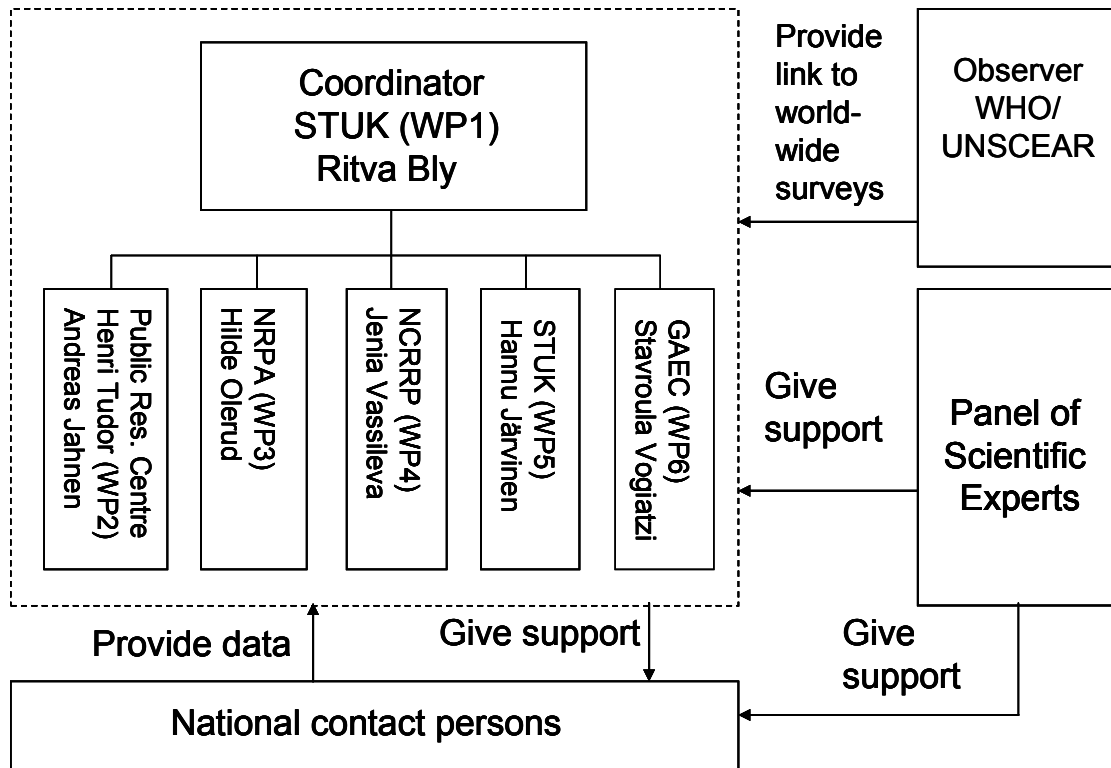


Fig. 1 The project organization of the Dose Datamed 2.

## MATERIAL AND METHODS

The data collection will be carried out by questionnaires. The purpose of the general questions was to survey the national regulatory frameworks and the status of implementation of the requirements for medical dose surveys and population dose estimations. The data was collected on the following topics:

- National legal and regulatory frameworks for determination, recording and collection of medical dose data.
- Background data on healthcare systems related to radiodiagnostic procedures, e.g. numbers of staff and equipment, referral and payment arrangements, etc.
- Availability of national DRLs, their respective values and national guidelines for their implementation.
- Information on any completed national dose surveys and estimations of population doses.

The questionnaires were based on the experiences and information collected within DOSE DATAMED1. Before launching the questionnaires, consensus was sought with the Working Party on Medical Exposures of the Article 31 Group of Experts. Furthermore, the relevant co-operation group of the European radiation protection authorities (HERCA WG6) was consulted. For the distribution of the questionnaires, appropriate ministries and/or radiation protection authorities were contacted. The practical implementation of the questionnaires and the data collection were carried out using internet based questionnaires. The state of the art internet technologies was applied. The first survey was open to 41 invited European countries 1-18 March 2011. A more comprehensive survey for the population dose data is currently open until the end of November 2011.

The purpose of the first general questionnaire was to survey the national regulatory frameworks and the status of implementation of the requirements for medical dose surveys and population dose estimations. The results of the survey will be used to review the status of implementation of national surveys for population dose in each Member State or other European country. For the purpose of systematic evaluation of the results and to enable a continuous follow-up and update of population dose in Europe and the trends in their development, a database for population doses will be established. This database will be available on the same platform as used for the questionnaires.

The following information will be collected until November 2011 for those countries which, on the basis of the results will already have available data from previous national, regional or international studies:

- List of Top 20 procedures in the country, as defined in RP 154 publication.
- List of the five nuclear medicine examinations (NM top 5) with the biggest contribution to the patient doses from nuclear medicine procedures.
- Frequency and effective dose data for the Top 20 procedures, NM top 5 and for all radiodiagnostic procedures.
- Gender and age distribution for the Top 20 and NM top 5 exams.
- Annual collective dose and the per caput (and, if available, per exposed patient) effective dose for:
  - each of the Top 20 and NM top 5 exams,
  - the main groups of procedures, including computed tomography, plain radiography and fluoroscopy, interventional fluoroscopy and nuclear medicine,
  - the medical exposure from radiodiagnostic procedures as a whole.
- Possible national modifications for Top 20 and NM top 5 lists
- Other information regarding the data sources, time of collection of primary data, methodologies used for data collection and processing, estimated uncertainties, etc

Particular attention was paid on population dose determinations of the most challenging techniques: computed tomography and interventional radiology.

## **RESULTS**

The first survey was sent to 41 countries and 37 of them replied. It came out that most of the countries have regulation to collect frequencies of radiodiagnostic procedures (Figure 2). There were also regulations or recommendations to collect population doses except in one country and in one that was under preparation. Intervals to collect numbers of procedures and to estimate population doses varied from one to five years except in Switzerland the period was 10 years.

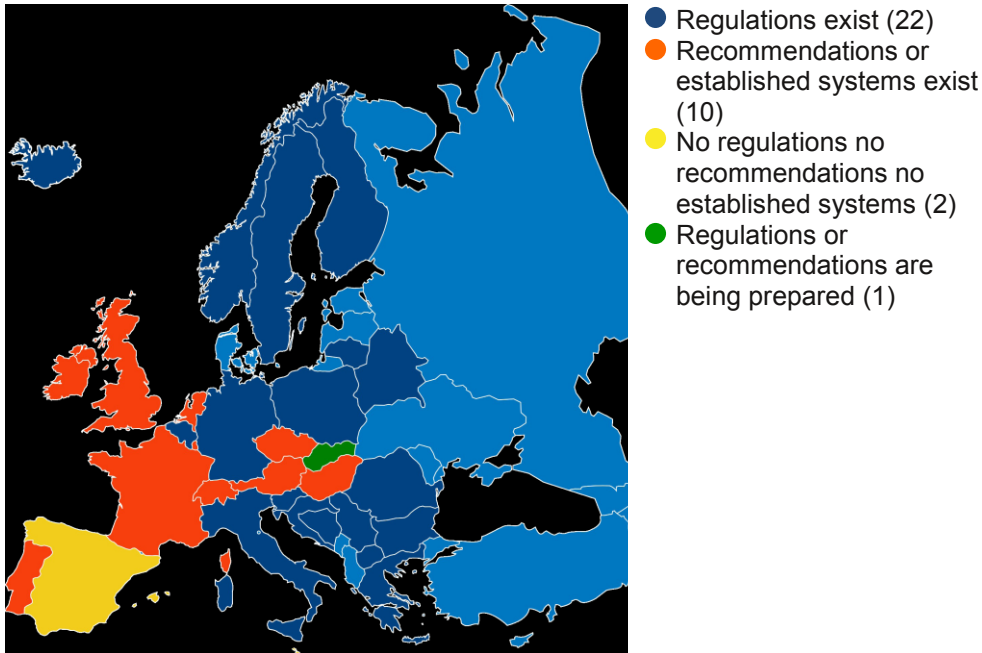


Fig. 2 Answers to the question : “Does laws statute, decree for collection of frequencies exist in your country?”

The source of the national data varies from manual records to digital transfer of data from hospitals’ data bases or health insurance records (Figure 3).

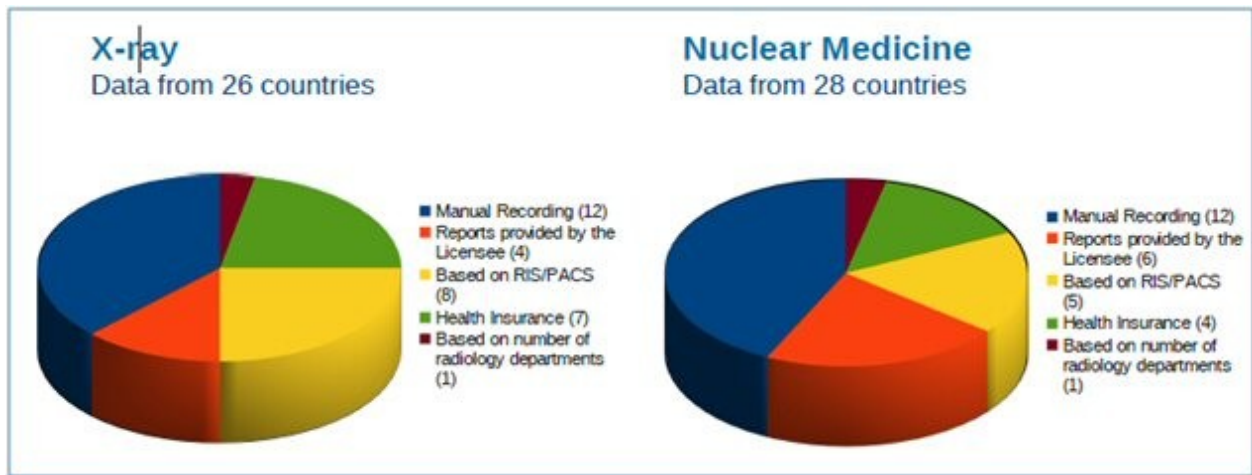


Fig. 3 Distribution of national sources of data.

Most of the countries have frequency and dose data available for estimation of population dose from x-ray procedures by Top 20 method according to the RP 154 (Table 1). Some of the countries have partial data which is either regional or consists of incomplete set of examinations. All five Nordic countries are able to provide Top 20 data. Data for Top 225 or more is available from 16 countries at least partially.

Data Related to RP154	Top 20		Top 70		Top 225		>225	
	Frequency	Dose	Frequency	Dose	Frequency	Dose	Frequency	Dose
Austria	Yes	Yes	Partially	Partially	No	No	No	No
Belgium	Yes	Yes	Partially	Yes	Partially	Yes	Partially	Partially
Bulgaria	Yes	Yes	Partially	Partially	No	No	No	No
Croatia	Yes	No	Yes	No	Partially	No	No	No
Czech Republic	Yes	Yes	Partially	Partially	Partially	Partially	No	No
Denmark	Yes	Yes	Yes	Partially	Yes	No	No	No
Estonia	Yes	No	Partially	No	No	No	No	No
Finland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
France	Yes	Yes	Yes	Yes	Partially	Partially	No	No
Germany	Yes	Yes	Partially	Partially	No	No	No	No
Greece	Partially	Partially	Partially	Partially	No	No	No	No
Hungary	Partially	Partially	No	No	No	No	No	No
Iceland	Yes	Yes	Yes	Yes	Partially	Partially	Partially	Partially
Ireland	Partially	Partially	Partially	Partially	No	No	No	No
Italy	Partially	Partially	No	No	No	No	No	No
Latvia	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Partially
Lithuania	Yes	Yes	No	No	No	No	No	No
Luxembourg	Yes	No	Yes	No	No	No	No	No
Macedonia	Yes	Yes	Partially	Yes	No	No	No	No
Malta	Yes	Yes	Yes	Yes	Yes	Partially	Yes	Partially
Montenegro	Yes	Yes	No	No	No	No	No	No
Netherlands	Partially	Yes	Partially	Partially	Partially	Partially	Partially	Partially
Norway	Yes	Yes	Yes	Partially	Yes	No	No	No
Poland	Partially	Partially	Partially	Partially	No	No	Partially	Partially
Portugal	Partially	No	No	No	No	No	No	No
Republic of Belarus	Yes	Yes	Partially	Partially	Partially	Partially	No	No
Republic of Cyprus	Yes	Yes	Partially	Partially	Partially	Partially	No	No
Romania	Yes	Yes	Partially	Partially	No	No	No	No
Serbia	Yes	Yes	No	No	No	No	No	No
Slovakia	Yes	Yes	Partially	Partially	Partially	Partially	Partially	Partially
Slovenia	Partially	Yes	No	No	No	No	No	No
Spain	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Partially
Sweden	Yes	Yes	No	No	No	No	No	No
Switzerland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ukraine	Partially	Partially	Partially	Partially	No	No	No	No
United Kingdom	Yes	Yes	Yes	Yes	Yes	Yes	No	No

Table. 1 Availability of frequency and dose data of x-ray procedures.

Dose data concerning nuclear medicine examinations is available at least from five most common examinations from 17 countries including four Nordic countries. Frequency data is available from 28 countries.

Population dose for x-ray procedures has not been previously estimated (using effective dose) in one third of the countries. Three countries informed that estimation has been carried out partially. All Nordic countries and seven other countries have participated to the European test use of Top 20 method (Aroua et al. 2010).

## DISCUSSION AND CONCLUSIONS

In the European Union Member States regulations or recommendations to estimate population dose originating from radiodiagnostic procedures exists. two thirds of the countries. The Dose Datamed 2 will provide the first estimation of the population dose from radiodiagnostic procedures in the whole Europe. The results will be available in 2012.

The usefulness of the Top 20 method broadly will be tested in the project and suggestions for improving the method will be given. So far it has come out that for nuclear medicine similar guidelines are needed and that will be also developed in the Dose Datamed 2.

Most comprehensive national data from some countries will be used as a baseline to which Top 20 method will be compared. Also new conversion factors from ICRP 103 (ICRP 2007) will be used and the influence of them on the population dose will be investigated. Early results from Finland show that there is a decrease of 20 % of the population dose from conventional x-ray examinations by using the new conversion factors (Bly et al. 2011).

**Dose Datamed 2 is a two years project financed by the European Commission. The project started in the beginning of 2011.**

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