Cancer Incidence Projections for Lisbon and Santarém Districts: An Aid to Radiotherapy Services Planning

F. Monsanto, E. Carolino, R. Ramos, A. Cravo Sá, C. Marques Coelho

Lisbon, August 2007
Pre-questions

Will the existing means in Radiotherapy respond to the needs of the potential user population in 2014 for Lisbon and Santarém districts?

1. Number of treatment units?
2. Number of Radiotherapy Technologists?
Assumptions

- **Temporal variations of the dimension and age structure of the populations**
  - Coastal areas / Interior areas
  - Urban areas / Rural areas

- **Temporal variations in the incidence of several types of cancer**
Objectives

- Overall Objectives

Evaluate of the necessities of Radiotherapy for Lisbon and Santarém districts in 2014 and elaboration of proposals that aim the access / use for the potential user population.
Objectives

Specific Objectives

To know the distribution, the dimension and the structure of the population in these districts in the period going from 2000 to 2015.

To know the trends of the hospital morbidity in the period going from 2005 until 2015 in Lisbon and Santarém districts, for the cancer in the bladder, colon-rectal, stomach, breast, skin, lung and uterus.

- Determine the necessities of Radiotherapy units in 2014 for Lisbon and Santarém districts;
- Determine the necessities of Radiotherapy Technologists in 2014 in the same Districts.

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Methods

- **Pre-questions** in the identification of the used methods

1. **Which** indicators allow us to evaluate the needs in radiotherapy for Lisbon and Santarém **districts** in 2014?
2. How can we evaluate the needs in radiotherapy for Lisbon and Santarém **districts** in 2014?
3. How to determine the needs of radiotherapy technologists for Lisbon and Santarém **districts** in 2014?
Which indicators allow us to evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

- Hospital Morbidity by malign tumour and projections for 2014
  - Bladder,
  - Colon-rectal,
  - Stomach,
  - Breast,
  - Skin,
  - Lung and
  - Uterus

- Resident population (demographic evolution from the projections of the resident population by gender and group of age);
Hospital Morbidity by Malign Tumour (1)
(Clinical hospital diagnoses by referring to the groups of homogeneous diagnoses)

- Nine groups of age
- Seven tumour localizations
- Two districts
Hospital Morbidity by Malign Tumour (2)
(Clinical hospital diagnoses for resource to the groups of homogeneous diagnoses)

- Projections of the hospital morbidity for 2014
  - Age-period-cohort modelling for the incidence rate (Clayton & Schlifers, 1987)
    - Application of the method of the maximum likelihood estimation to the regression of Poisson with resource to the statistic software SPSS.
Hospital Morbidity by Malign Tumour (3)

(Clinical hospital diagnoses by referring to the groups of homogeneous diagnoses)

- Projections of the hospital morbidity for 2014

- Age-period-cohort modelling for the incidence rate (Clayton&Schiifers, 1987)

  - The used model writes the incidence rate (dependent variable $y$) based on three components: age categories, period and cohort. To each of these components it is associated one parameter of the model:

  $$Y_{apc} = \mu + \alpha_a (a - a_0) + \delta_p (p - p_0) + \delta_c (c - c_0)$$

  - $Y_{apc}$ – logarithm of the incidence rate in the group of age $a$, period $p$ and cohort $c$
  - $\mu$ – mean value
  - $a_0$, $p_0$ e $c_0$ – reference categories for age, period and cohort
  - $\alpha$, $\delta_p$ e $\delta_c$ – parameterization of the model

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Hospital Morbidity by Malign Tumour (4)
(Clinical hospital diagnoses by referring to the groups of homogeneous diagnoses)

Projections of the hospital morbidity for 2014

- Age-period-cohort modelling for the incidence rate (Clayton & Schlifers, 1987)
- Tendency analysis for each tumour location
- Having into account the found tendencies the projections were made
Hospital Morbidity by Malign Tumour (5)
(Clinical hospital diagnoses by referring to the groups of homogeneous diagnoses)

- Projections of the hospital morbidity for 2014
- Calculation of the number of future cases

\[ Cf = i_{100,000} \times \frac{Nr}{100,000} \]
Resident Population

Demographic evolution from the projections of the resident population according to

- Gender
- Group of age

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How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

- Mean of the diagnoses of the Hospital Morbidity
  
  From the obtained value only 60% are written up;

- Used the indicator: one unit of radiotherapy for
  
  350 patients (National Oncological Plan, 2001)
  500 patients (WHO, 1981)

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How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

- Incidence by malignant tumour (by group of age)
  
  the lung case – Lisbon

![Incidence by group of age](image)
How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

- Incidence by malign tumour (by group of age)

the lung case – Santarém

![Incidence by group of age](image_url)
How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

- Incidence by malign tumour (by cohort)
  the lung case – Lisbon

![Incidence by COHORT](image-url)
How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

Incidence by malign tumour (by cohort)

the lung case – Santarém

Incidence by COHORT

- 1996-98
- 1999-01
- 2002-04
How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

**Incidence by malign tumour** District of Lisbon (projections)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bladder</th>
<th>Colon-Rectal</th>
<th>Stomach</th>
<th>Breast (*)</th>
<th>Skin</th>
<th>Lung</th>
<th>Uterus (*)</th>
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<tbody>
<tr>
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<td>83,6</td>
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<td>43,8</td>
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* Rate relative to the female population

Lisbon, August 2007
How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

**Incidence by malign tumour District of Santarém**

(projections)

<table>
<thead>
<tr>
<th>Year</th>
<th>Incidence Rate</th>
<th>Tumour Locations</th>
</tr>
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<tbody>
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Lisbon, August 2007
How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

Number of cases (projections) - Lisbon

<table>
<thead>
<tr>
<th>Year</th>
<th>Bladder</th>
<th>Colon-Rectal</th>
<th>Stomach</th>
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Evaluation of the Needs of Radiotherapy Services

- Determination of the amount of oncology patients for Lisbon and Santarém districts in 2014

\[ Z = C_{proj} \times \frac{NT_{7LT}^{e96-2004}}{n_{7LT_i35-79}^{e96-2004}} \times \frac{NT_{e97-99}}{n_{7LT}^{e97-99}} \]

- \( Z \) = number of cases in 2014
- \( C_{proj} \) = value of the projections of the study
- \( NT_{7LT}^{e96-2004} \) = total number of cases for the 7 tumour localizations in study
- \( n_{7LT_i35-79}^{e96-2004} \) = number of cases in the age groups going from 35 to 79 years old for the 7 tumour localizations in study
- \( NT_{e97-99} \) = total number of cases of the previous study (data from 1997 to 1999)
- \( n_{7LT}^{e97-99} \) = number of cases for the 7 tumour localizations of the previous study

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Number of radiotherapy units, in accordance with the study, for Lisbon and Santarém districts in 2014.
Conclusions

■ Health Planning
  - Regional inequalities in the access to the health services
  - Individual, economic, social, cultural factors and organizational context

■ Radiotherapy Planning
  - High implementation costs
  - Evaluation of the necessities of radiotherapy for Lisbon and Santarém districts in 2014
  - To estimate the number of radiotherapy technologists based on the number of treatment units

Lisbon, August 2007
Proposals to minimize the future inefficiency of the reduced number of radiotherapy services

- Elaboration of estimative of the needs of radiotherapy in Portugal Continental

- Decentralization

  Planning, financing and monitoring

  - Bigger adequacy of the offer of radiotherapy to the local needs of the potential user populations;
  
  - Bigger coordination between Radiotherapy Services.

Lisbon, August 2007
Proposals to minimize the future inefficiency of the reduced number of radiotherapy services

- Intersectorial and Development Policies
  - Associate social and health policies,
  - Programmes and measures of reorganization of radiotherapy in Portugal;
  - A new organization of the workflow in the radiotherapy services;
  - Formation of the professionals.

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