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

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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

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&Schlifers,1987)
    - The used model writes the incidence rate (dependent variable y) based on tree 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

μ – mean value

a_0, p_0 e c_0 – reference categories for age, period and cohort

αa, δp e δc – 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

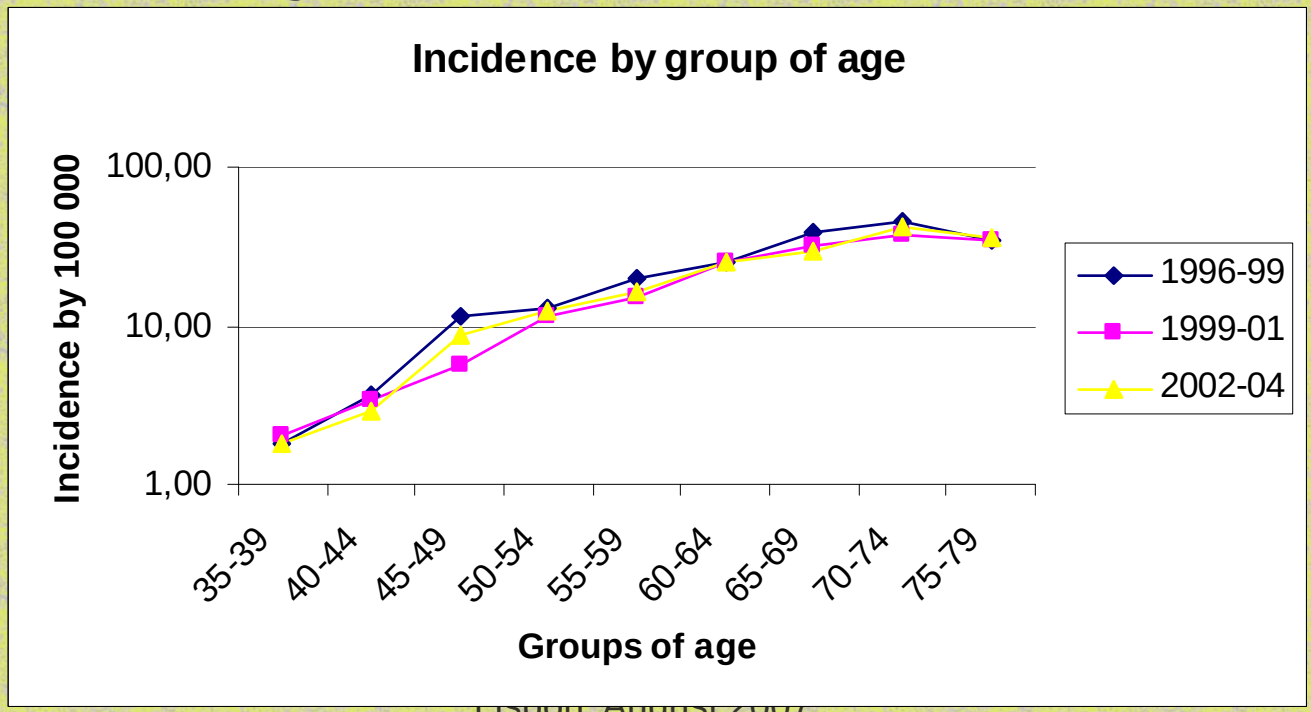
How can we evaluate the needs in radiotherapy for Lisbon and Santarém districts in 2014?

- 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)

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

- **Incidence by malign tumour** (by group of age)

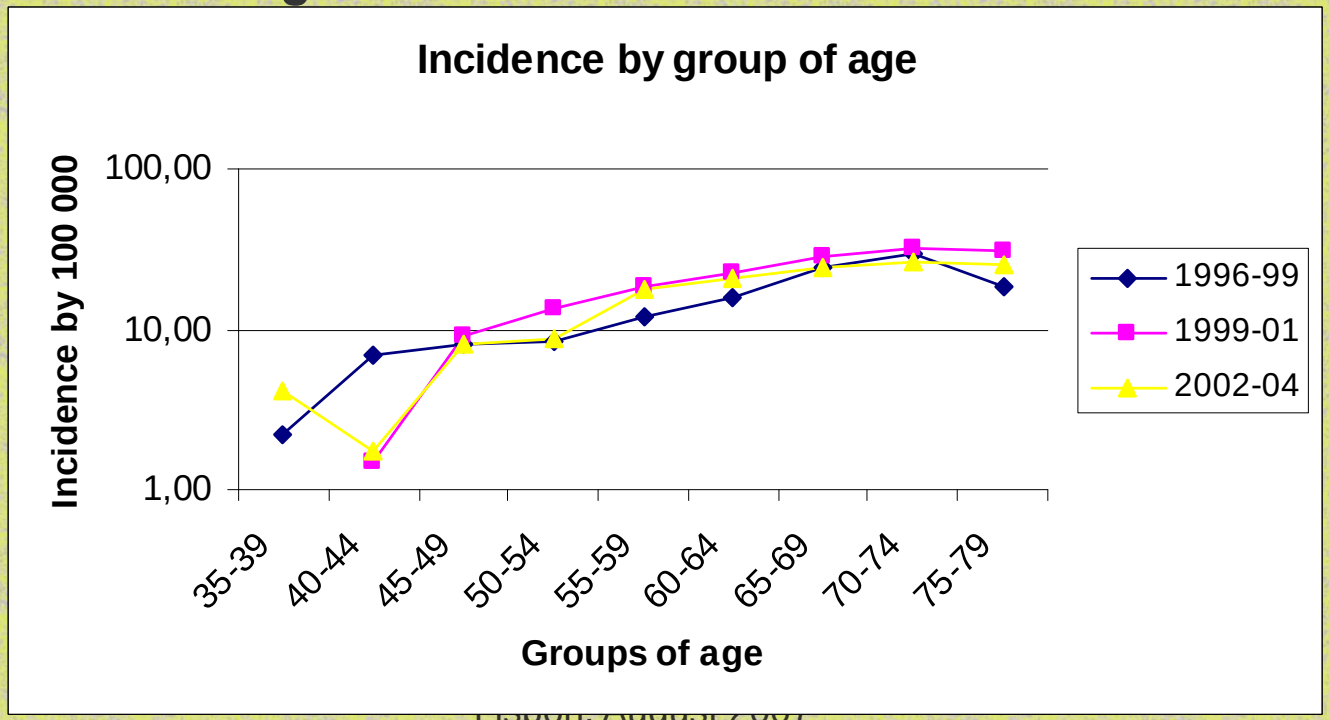
  the lung case – Lisbon



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

- Incidence by malign tumour (by group of age)

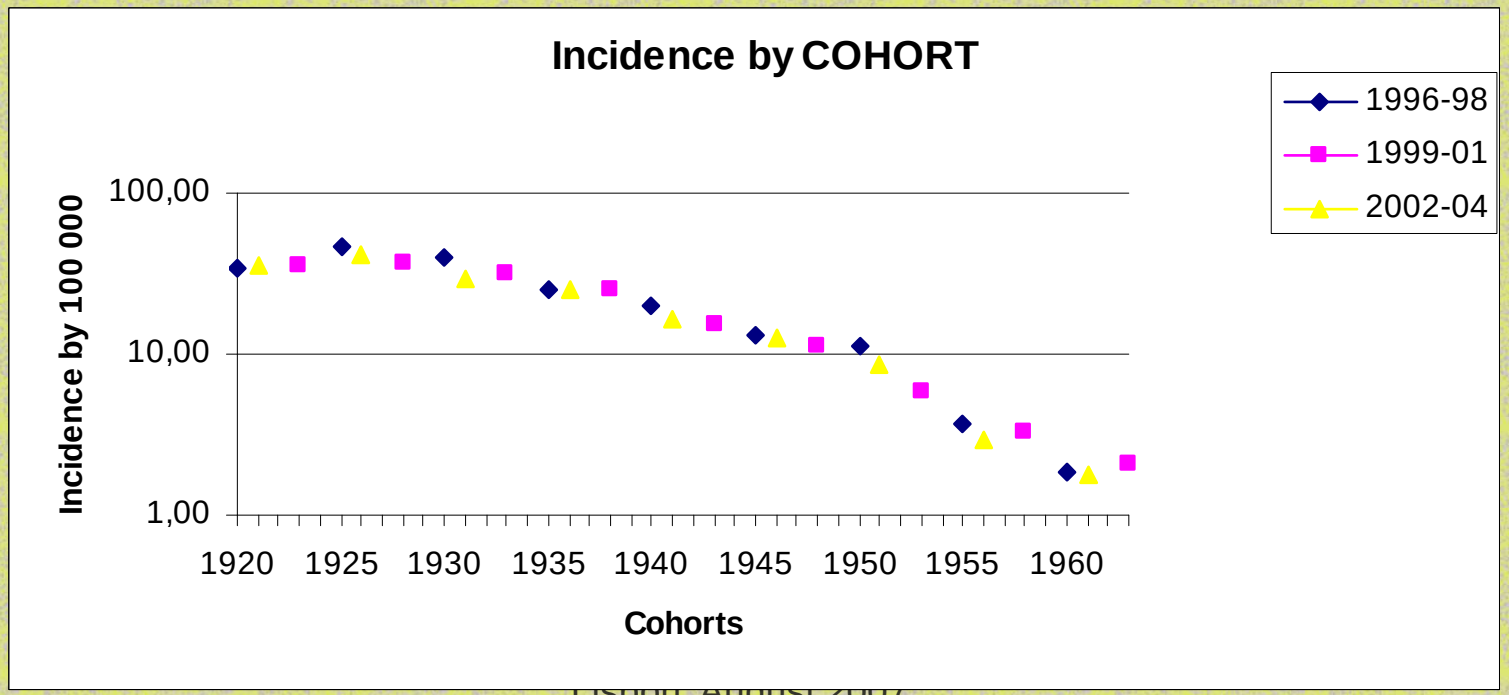
the lung case – Santarém



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

- **Incidence by malign tumour** (by cohort)

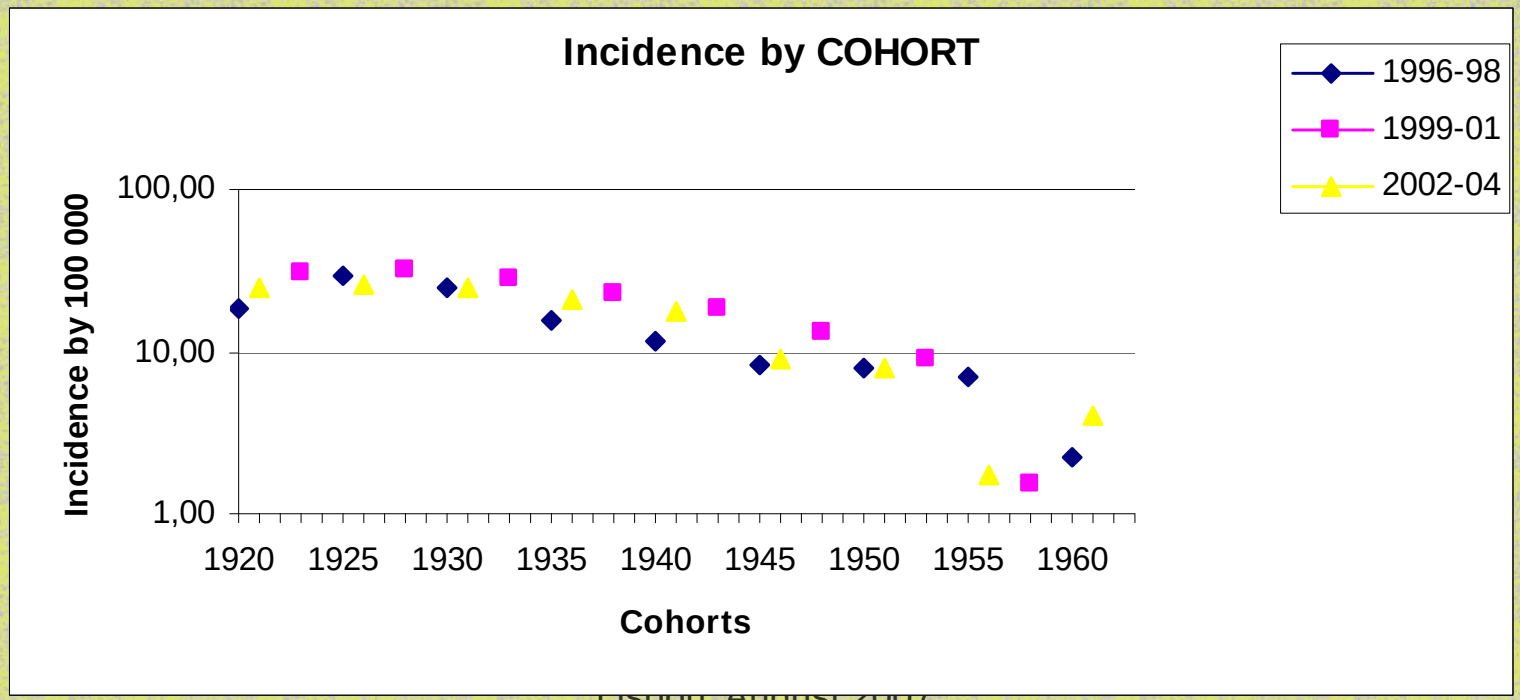
  the lung case – Lisbon



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



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

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

	Year	Tumour Locations						
		Bladder	Colon-Rectal	Stomach	Breast (*)	Skin	Lung	Uterus (*)
Incidence Rate	2005	63,3	98,6	48,9	184,97	56,4	77,3	31,3
	2006	63,7	95,0	49,2	185,1	56,6	74,6	31,5
	2007	64,1	95,7	49,4	158,5	56,9	75,0	25,7
	2008	55,3	83,0	43,4	176,2	50,6	66,5	27,0
	2009	55,6	83,6	43,6	176,4	50,8	66,8	27,1
	2010	55,9	84,1	43,8	176,7	51,1	67,1	27,3
	2011	48,3	70,1	38,5	168,0	45,5	59,6	23,3
	2012	48,7	70,7	38,8	168,3	45,8	60,0	23,5
	2013	49,1	70,5	38,7	167,8	45,7	59,8	23,4
	2014	42,4	59,5	34,2	159,7	40,9	53,5	20,2
	2015	42,8	60,0	34,5	160,0	41,2	53,8	20,3

* Rate relative to the female population

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

- **Incidence by malign tumour** District of Santarém (projections)

	Year	Tumour Loactions						
		Bladder	Colon-Rectal	Stomach	Breast (*)	Skin	Lung	Uterus (*)
Incidence Rate	2005	58,0	75,7	35,3	125,7	71,5	53,9	34,3
	2006	58,0	75,8	35,3	125,7	71,5	53,9	34,3
	2007	58,1	75,8	35,3	125,7	71,6	53,9	34,3
	2008	48,2	68,2	20,4	121,6	62,4	47,3	26,6
	2009	48,3	68,3	20,4	121,6	62,4	47,3	26,6
	2010	48,3	68,3	20,4	121,6	62,4	47,3	26,6
	2011	40,2	61,6	11,8	117,8	54,5	41,6	20,7
	2012	40,3	61,7	11,9	118,0	54,7	41,7	20,8
	2013	40,3	61,7	11,9	118,0	54,7	41,7	20,8
	2014	33,6	55,6	6,8	114,2	47,7	36,5	16,1
	2015	33,7	55,7	6,8	114,3	47,7	36,6	16,1

* Rate relative to the female population

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

- Number of cases (projections) - Lisbon

	Year	Tumour Locations						
		Bladder	Colon-Rectal	Stomach	Breast (*)	Skin	Lung	Uterus (*)
Number of cases	2005	796	1239	615	1258	708	972	213
	2006	806	1203	622	1268	717	944	216
	2007	816	1219	629	1092	725	955	177
	2008	709	1065	556	1222	649	853	187
	2009	718	1079	563	1231	656	862	189
	2010	727	1093	569	1240	664	872	191
	2011	630	913	502	1183	593	777	164
	2012	636	924	507	1189	599	784	166
	2013	643	924	507	1189	599	784	166
	2014	558	782	450	1135	537	703	143
	2015	564	791	454	1141	543	709	145

* Rate relative to the female population

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

- Number of cases (projections) - Santarém

	Year	Tumour Locations						
		Bladder	Colon-Rectal	Stomach	Breast (*)	Skin	Lung	Uterus (*)
Number of cases	2005	160	209	97	186	197	149	51
	2006	161	210	98	186	198	149	51
	2007	161	210	98	187	199	150	51
	2008	134	190	57	181	174	132	40
	2009	135	191	57	182	174	132	40
	2010	135	191	57	183	175	133	40
	2011	113	172	33	177	153	117	31
	2012	113	173	33	177	153	117	31
	2013	113	173	33	177	153	117	31
	2014	94	156	19	172	133	102	24
	2015	94	156	19	172	134	102	24

* - Rate relative to the female population

Evaluation of the Needs of Radiotherapy Services

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

$$Z = Cproj \times \frac{NT7LT_{e96-2004}}{n7LT\_i35-79_{e96-2004}} \times \frac{NT_{e97-99}}{n7LT_{e97-99}}$$

Z= number of cases in 2014

Cproj=value of the projections of the study

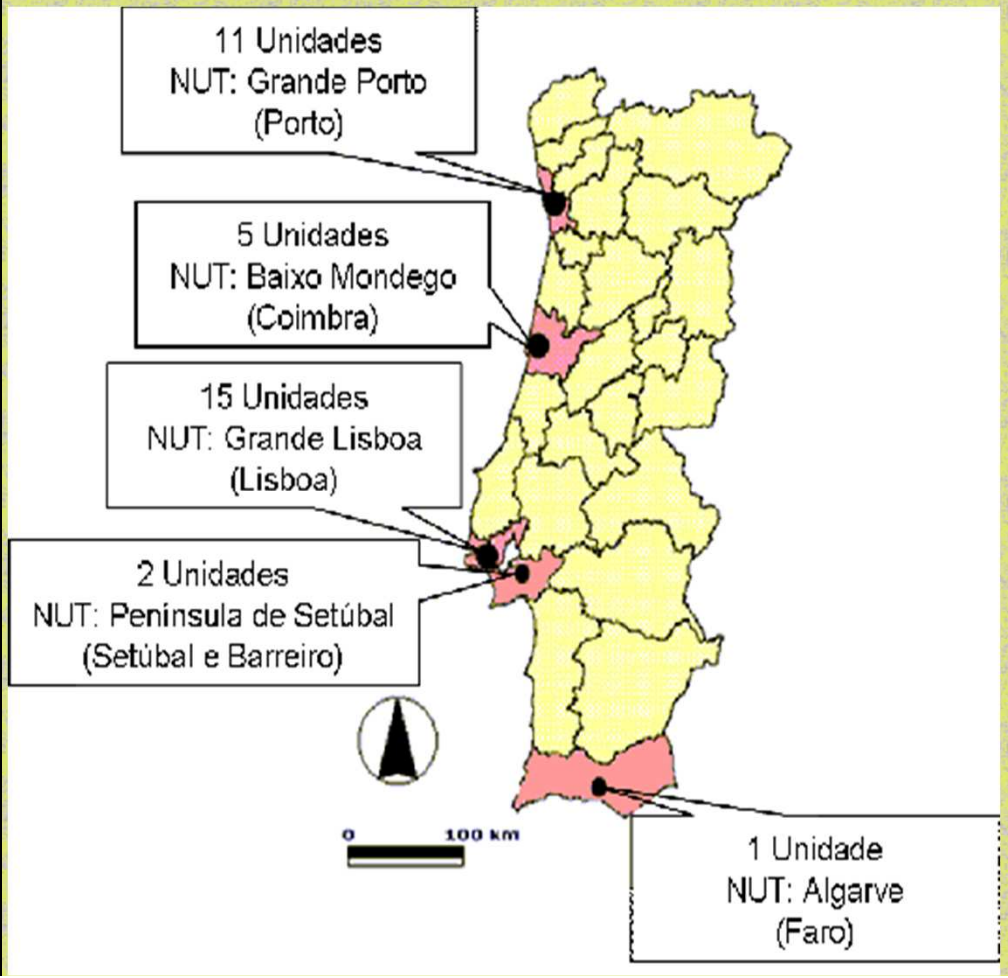
NT7L $_{e96\text{-}2004}$=total number of cases for the 7 tumour localizations in study

n7LT_i35-79 $_{e96\text{-}2004}$=number of cases in the age groups going from 35 to 79 years old for the 7 tumour localizations in study

NT $_{e97\text{-}99}$=total number of cases of the previous study (data from 1997 to 1999)

n7LT $_{e97\text{-}99}$=number of cases for the 7 tumour localizations of the previous study

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



Estudo

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

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.

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.