Analysis of the Radiotherapy Expenses 2004.

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The new reimbursement system, introduced in 2001, caused - as expected - a rise in the Belgian Radiotherapy Budget. According to the first estimates for the new coding system made in the years 97-98, it was anticipated that the radiotherapy expenses would double within a very few years following its introduction. Although the budgetary growth did not exceed these predicted estimates, an increase of 20% was observed in 2004. It should be stressed, however, that this rise of 20% was preceded by a year of almost stagnation in the budget (increase of only 3.9%, index included).
As this seems to suggest that the budget fluctuates over the years, it might be more appropriate to evaluate the radiotherapy budget over a longer time span, instead of focusing only on the rise between 2003 and 2004.

On the other hand, one should also evaluate the costs of radiotherapy in the perspective of the total oncology costs and overall health care spending.
Radiation therapy, although a highly technological discipline requiring expensive equipment and personnel, remains a very low-cost treatment within the field of oncology in comparison with other oncological treatments - surgery and systemic therapies -, where the cost of hospitalisation and of expensive drugs dominate the picture.
It is interesting to point out that the pharmaceutical costs are not represented in the departmental or in the global budgetary analyses per speciality. This explains the difficulty to compare the costs between different oncological disciplines and the frequent misconceptions about the amount of costs generated by radiotherapy. Recent data from Sweden, a country with optimal material infrastructure, demonstrate that the proportion of oncology costs allotted to radiotherapy hover around 5-6% (*Norlund, Acta Oncol 2003).*
Furthermore, cancer (affecting one out of two individuals and second cause of death in industrialised countries) consumes only 5% of the global health care budget in neighbouring countries (*Jonsson, Acta Oncol 1996; Koopmanschap, Eur J Cancer 1994).*
As a matter of comparison, the 2004 RIZIV-INAMI budget for the entire radiotherapy (almost 73 million Euro for 32,700 treatments) was inferior to the budget of atorvastatine, the single biggest pharmaceutical spender in Belgium, exceeding 87 million Euro (*Website Federal Government 2006).* Trastuzumab, an antibody recently launched in the adjuvant treatment of breast cancer, was budgeted at 50 million Euro annually for 1500 new breast cancer patients *(Folia Pharmacotherapeutica 2006).*

It can therefore be concluded that radiation therapy is not only a very low cost treatment, but also a cost-effective one, since one out of three cancer patients is cured by radiotherapy.
Nevertheless, the budget rise between 2003 and 2004 has caused some concern at the level of the government, as well as within the radiotherapy community.
The College of Radiotherapy has been appointed by the government through the nomenclature change of 2001, to monitor and give advice for interpretations and future adjustments. During this process of monitoring the new nomenclature, some controversial interpretations were diagnosed and, although they had no major impact on the budget, they were analysed by the College, jointly with the Belgian Professional Union and the Scientific Society in order to publish a more precise interpretation (data 2003-2004).
Furthermore this group initiated a more global analysis of the causes that may underlie the rise in radiotherapy spending. This report documents this initiative.

The different reasons which may explain the increase in radiotherapy spending in the long range can - be it somewhat arbitrarily - be separated out in three major groups (see schematically next page):

1. the growing incidence in cancer patients;
2. the increasing number of patients being treated with radiotherapy;
3. the changing radiotherapy practice.

All three will be discussed and illustrated in more detail, based on the literature and on specific Belgian data.

General structure.

I: Cancer: growing incidence

- increasing cancer incidence
- ageing of the population

II: Radiotherapy: higher uptake of radiotherapy treatments

- improved quality radiotherapy delivery and supportive care → tolerable to a larger population of cancer patients
- shorter palliative treatments → more re-treatment
- equitable access to radiotherapy
- initiation of Multidisciplinary Oncological Consults (MOC's)
- longer survival with more frequent delayed metastatic disease in cancer patient population → more radiotherapy indications

III: Technicity & Therapy: changing radiotherapy practice

- more early diagnosis → more curative treatments
- technological evolution → higher quality through more complexity (IMRT, tomotherapy,...).
- new (combined) therapeutic approaches : such as radiochemotherapy

1. Increasing number of cancer patients

In industrialised countries, ***cancer incidence*** remains on an overall slow but constant rise. In Sweden, the number of new cancer cases increased by 13% between 1990 and 2000 and a further increase by more than 1% a year is expected (*Möller, Acta Oncol 2003*). As a matter of example, the data from the SEER (Surveillance Epidemiology and End Results) database from the USA are shown in figure 1 (data until 2002) and 2 (further evolution until 2005, own reconstruction based on SEER data published yearly in CA: A Cancer Journal for Clinicians).
The sudden increase of cancer incidence in the late eighties as a consequence of more intensive screening programmes, has been followed by a drop off. This may be interpreted as a decrease in cancer incidence, but the most recent data suggest the opposite.
Screening programmes, evolving in parallel with the improvements in diagnostic imaging, allow to make the diagnosis a few years earlier and in a more accurate way. This will shift patients to lower stages, more amenable to curative (and more complex) treatments, without lowering the incidence as such.

Figure 3a gives the Belgian data: the incidence data between 1990 and 2002 are absolute figures, though it should be acknowledged that these are estimates, no hard data. The extrapolation until 2015, suggesting a growth of 28% in cancer incidence, is based on population projections (2005-2010-2015), combined with the cancer incidence (n/100.000) in the 2001 Flanders' cancer registry.
This last estimation only takes the ageing of the population into account, and not the potential increase in actual cancer incidence, leading to an underestimation of the rising absolute data!

Besides environmental factors, this brings us to the other important factor determining the growing cancer incidence in Western societies: the ***ageing of the population***. This factor is indeed difficult to tell apart from the increase in cancer incidence as such.
Moreover, besides the fact that older persons are at increased risk of developing cancer, the more optimised treatments and supportive care developed in recent years makes radiotherapy more tolerable to a larger proportion of the older population, which further adds to the uptake of radiotherapy in the whole population (see also point 2).

2. Increasing number of radiotherapy treatments

As said, the ***improvements in radiotherapy delivery*** (resulting in decreased acute and late side effects) ***and in supportive care during radiotherapy*** have made a larger population amenable to radiotherapy treatments, leading to a more frequent utilisation of radiation therapy, especially in older patients.
This is also true for ***palliative treatments***. Alongside the everlasting efforts to improve the quality of our treatments with curative intent, there is a continuous search for how to limit the burden of palliative treatments for these patients for whom cure can no longer be aimed for. Ample literature evidence in the last decade has converged to the conclusion that single fraction radiotherapy is standard of care for non-complicated bone pain and this is slowly finding its way into clinical practice.
Nevertheless, a slightly higher rate of re-treatment is generally seen after single fractions as compared to fractionated regimes, which might have a small impact on the number of patients irradiated and thus on the radiotherapy budget. On the contrary, other costs - hospitalisation and patient transportation costs - are expected to decrease (*van den Hout, J Natl Cancer Inst 2001*).

An ***equitable access*** to radiotherapy is a prerequisite for optimal radiotherapy uptake. This should however not be an issue in our country, with its sufficient availability of radiotherapy centres.
In other industrialised countries, a trend towards a higher radiotherapy uptake has been noticed during the last decades. In Sweden, for example, the estimated proportion of cancer cases receiving radiotherapy increased from 32% in 1990 to 47% in 2003 (*Möller, Acta Oncologica 2003*). In the Netherlands, the percentage of new cancer patients treated with radiotherapy rose from 45.6 to 48.2% (between 1996 and 1997), and was estimated to further grow by 1% per five years (*Slotman and Leer, Radiother Oncology 2003*).
According to the Australian publication by Delaney et al. (*Delaney, Cancer 2005)* it can be deduced that the indications in favour of radiotherapy will quite probably continue to rise within the coming years (Figure 4). Actually, the data show a current underutilisation (compared to the estimated optimal utilisation) in different industrialised countries for almost all cancer types. On the whole, they calculated that about 52% of all cancer patients should receive external beam radiotherapy as a part of their primary treatment.
Besides these first irradiations, re-irradiations should also be accounted for. Mostly the re-irradiation rate is roughly quoted between 25 and 35% (*Bentzen, Radiother Oncology 2005, Slotman and Leer, Radiother Oncology 2003);* the Australian study came up to 23% of re-irradiations (Figure 5).

Precise figures for Belgium demonstrating the (evolution in) radiotherapy uptake are not available for the last 15 years because of the three thorough modifications of the coding system (nomenclature changes: 1991, 2001 and 2003).
Combining the incidence data obtained from the Belgian Cancer Registration with the figures of the number of delivered treatments (including brachytherapy and re-treatments) (fig. 3a and 3b) allows us to make some kind of assumption about the radiotherapy uptake in our country. Figure 6 shows these results, with and without re-irradiation (based on the simple assumption of 25% re-treatments).

In the Belgian context, the ***initiation of the MOC's*** (Multidisciplinary Oncological Consults) has unquestionably induced a very positive impact on the utilisation of radiation therapy within the global management of the oncological patients.
No hard data on this effect are presently available, but the initiation of the MOC's and the 2003 adjustment of the nomenclature are undoubtedly the two most important causes of the higher radiotherapy spending in 2004.

In smaller oncology departments, these multidisciplinary discussions may have contributed to a better recognition of radiotherapy indications, hence an increase of the referral rate of patients to (external) radiotherapy departments.
Figure 7 shows the evolution in the Belgian radiotherapy budget over the last 13 years.
A steep rise occurs after the introduction of the new reimbursement system (2001-2002, full arrows). A second increase is observed in 2004 (dashed arrows), coinciding with the introduction of the MOC's and the modifications of the coding system (mid 2003).

Some might argue that the evolution in systemic treatments (chemo-, hormono-, cell targeted therapies...) could reduce the indications for radiation therapy, but the opposite is probably more often the case: ***improvements in systemic treatments*** might ultimately translate into a higher (re-)irradiation rate, as a result of a longer survival and a modification of the behaviour of the disease.
One specific example illustrates this: since the administration of induction chemotherapy has become the standard practice in locally advanced non-small cell lung cancer patients, one has observed that - whereas the evolution towards other metastatic disease is averted for a longer period - brain relapses occur more frequently. This leads to an increasing need for palliative cranial irradiations and elicits the question of systematic prophylactic brain irradiation after down staging with induction chemotherapy.

All these factors contribute to a continuous rise in the number of radiotherapy treatments and more specifically to the 16.33 % growth (from 28.131 to 32.725 treatments between 2003 and 2004).

3. changing radiotherapy practice

The change in the treatment modalities of lung cancer patients is one among many other examples showing that radiotherapy practice is constantly evolving and that this is not in spite of, but very often as a consequence of a constantly evolving practice of oncology.
The fact that the advent of secondary prevention by screening programmes has led to the ***earlier detection of tumours***, making these patients candidates for curative, and thus longer and more complex irradiation treatments, has already been discussed (cfr.1. §2).
The latest report from the Swedish Council on Technology Assessment in Health Care mentions that the proportion of patients being treated with curative intent has increased between 1992 and 2001 (*Möller, Acta Oncol 2003*).

As is the case in our neighbouring countries, the new Belgian nomenclature (installed in June 2001 and modified in June 2003) has resulted in a more adequate reimbursement of external beam radiotherapy, opening perspectives to all the Belgian radiotherapy departments for further evolution from a technical and therapeutical point of view.
That this in turn will further encourage the use of ***more complex treatments***, following the evolving state of the art, seems obvious. That explains why a shift towards higher reimbursement categories (i.e. more frequent use of categories 3 and 4) has occurred in recent years (Figure 8).
The changing practice patterns of external beam radiotherapy, i.e. the almost standard adoption of 3D conformal radiotherapy (category 3) in a large number of curative treatments and the more frequent use of IMRT and stereotaxy (category 4) in certain indications (e.g. prostate and head-neck cancer for the former, single brain metastases for the latter), should be seen in this context.

Prostate implantations, on the other hand, are a clear example of how an evolving technology has found its way into the daily clinical practice of brachytherapy. In the new coding system, category 8 has jumped from 479 cases in 2002, to 655 in 2003 and 1108 in 2004.
However, the rising radiotherapy costs (suggested by these figures), should be balanced against the fact that those patients have been shifted away from radical prostatectomy, the mandatory hospital stay and possible other health care costs linked to the surgical procedure.

Conclusion.

Based on the first estimates of the budget of the new coding system, made in the years 97-98, it was expected that the expenses would probably be multiplied by a factor 2 within the very few years following its introduction.
If one considers the budget of 1992 as the normalized reference and corrections are made for the indexation, the 2004 budget is approximately twice that of 1998 (59.635.909 Euros vs. 29.283.262 Euros, i.e. a factor equal to 2,03).

According to this analysis, it can be concluded that radiotherapy, and consequently also its costs, will continuously grow over the coming years. The increasing incidence of cancer, the ageing of the population, the increasingly important role of radiation therapy within the global oncological management, the opportunities related to the improvement in technology and the continuously evolving quality requirements will all contribute to this evolution.

The growth of the radiotherapy budget between 2003 and 2004 has to be seen as one step in this continuous rise. The somewhat greater extent of this particular step should largely be attributed to the initiation of the MOC's together with the adjustment of the nomenclature in 2003, where the increase in indications for radiation therapy is the most important factor due to the growing number of referrals by other specialists and smaller centres following multidisciplinary consult.

Nevertheless, considered in the wider context of oncology and global health care, the costs of radiotherapy remain limited, and this will probably further remain the case, as other cancer treatments are subjected to similar trends, which will translate into even larger increases in health care costs.

In the coming years, the College of Radiotherapy, together with the Belgian Professional Union and the Belgian Scientific Society (ABRO-BVRO) will continue to perform their task of monitoring and analysing the data, to advise about the interpretation and future adjustments of the nomenclature in a joint venture with the Belgian Government in order to offer high quality radiation therapy to our Belgian cancer patients and this within the constraints of an acceptable budget.

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Figures.

Figure 1: USA incidence rates 1992-2002 (ref. http://seer.cancer.gov/)

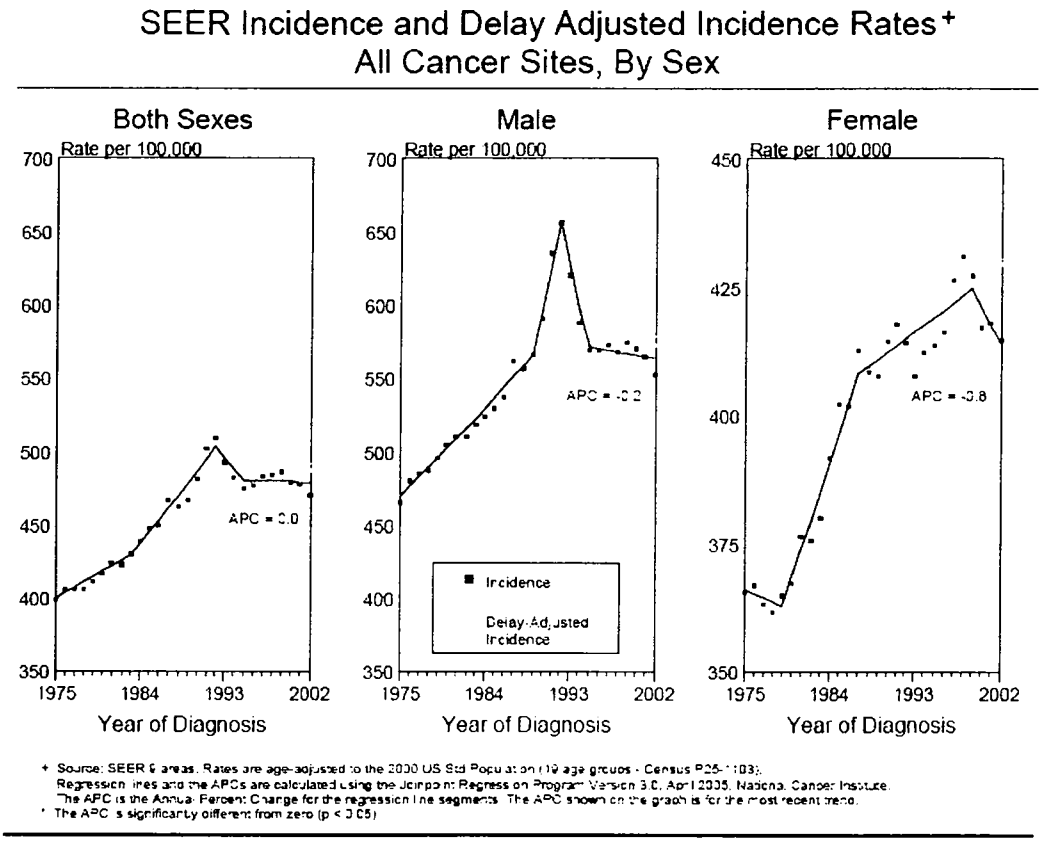


Figure 2: USA incidence rates 1992-2002 (own reconstruction on the basis of SEER Data)

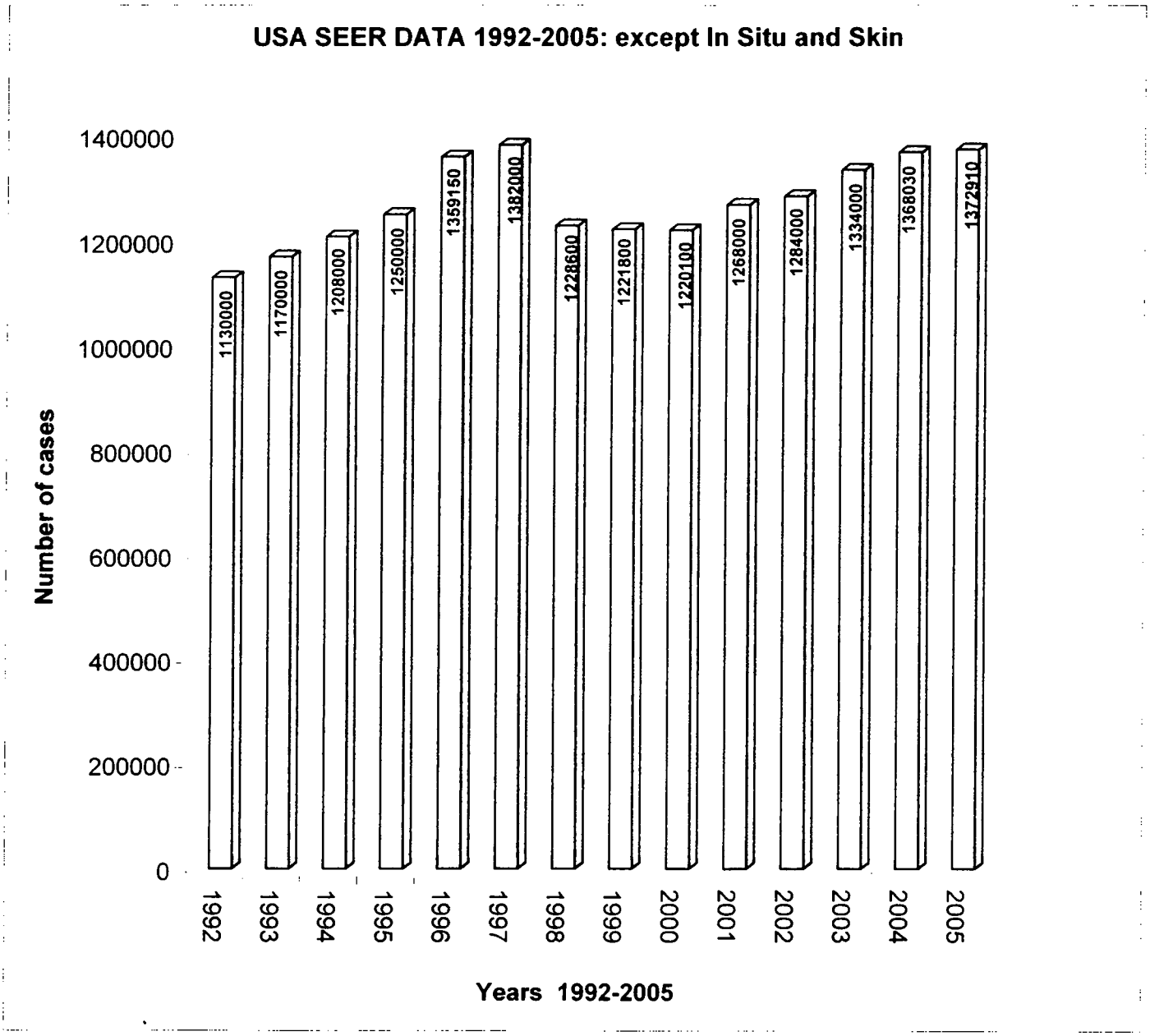
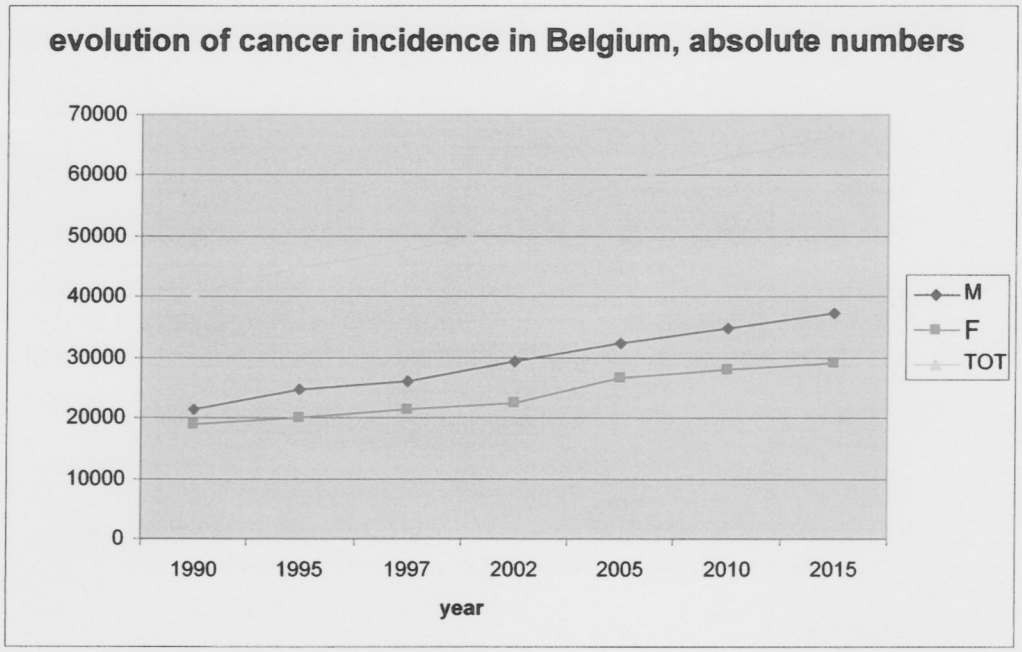


Figure 3a and b: Belgian incidence rates 1990-2005 and extrapolation until 2015 (Ref. Belgian Cancer Registration), evolution in number of radiotherapy treatments.



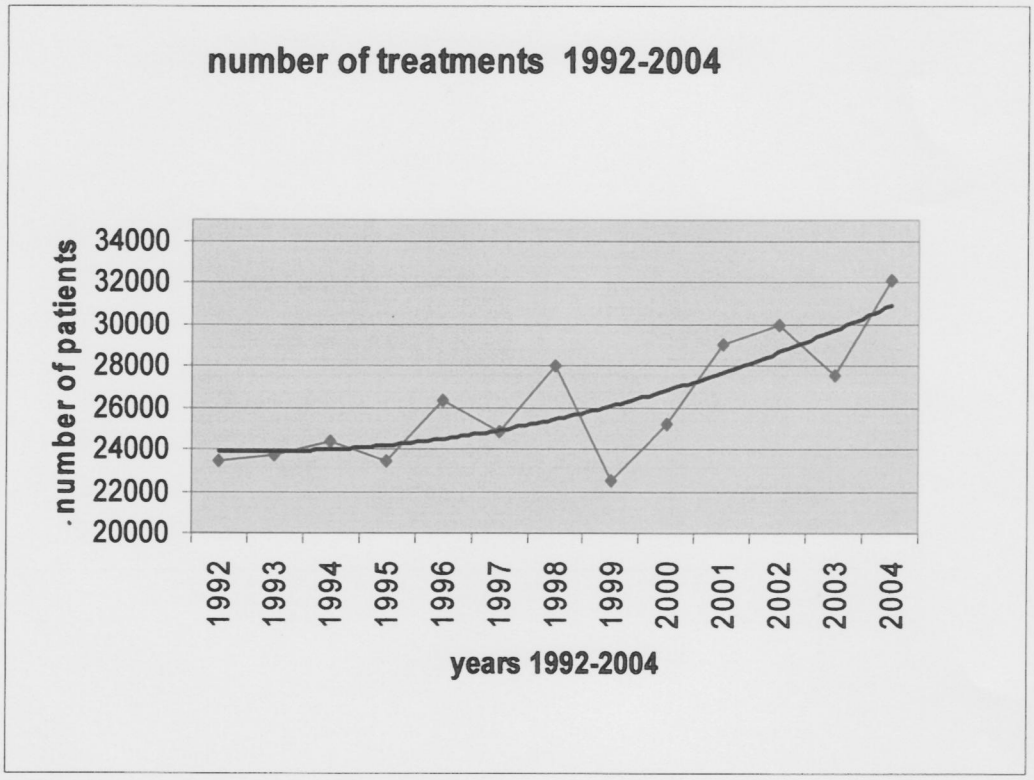


Figure 4: Radiotherapy utilisation (Ref. Delaney et al.)

TABLE 4
Comparison of Optimal with Actual Radiotherapy Utilization Rates

		Actual radiotherapy utilization rates							
			% USA			% Australia			
Cancer site	% Optimal radiotherapy utilization rate	% Sweden National 2001[34]	SEER 1995–2000[32]	ACS[a] 2001[33]	% UK (NYCRIS) 1996[34]	National 1995[35] 2000[36]	NSW 2000[5]	VIC 2000[2] 1993[39]	SA[a] 1990–1994[39]
Breast cancer	83	81	42	44	54	41	71	54	49
Lung cancer	76	71	69	26	-	-	49	44	38
Melanoma	23	23	2	1	-	-	13	-	2
Prostate	60	51	27	41	16	-			44
Kidney	27	62	9	4	9	-	-	-	11
Urinary bladder	58	17	4	3	20	-	-		25
Testis	43	48	40	-	NR	-	-	-	43
Esophagus	80	72	54	-	31	-	-	-	47
Stomach	69	7	15	-	4		-	-	6
Pancreas	57	6	16	-	4	-	-	-	4
Liver	0		3	-	3	-			3
Gall bladder	13	9	14	-	9	-	-		7
Colon	14	6	2	1	2	3	-	-	3
Rectum	61	56	40	41	33	29	-		17
Oral cavity	74	94[b]	NR		-	-			44[c]
Lip	20	22	8	-			-	-	2
Larynx	100	100	75	-			-	-	91
Oropharynx	100	100	70	-			-	-	
Salivary gland	87	60	55				-	-	
Hypopharynx	100	39	74				-	-	
Paranasal sinuses	100	100	NR			-	-	-	-
Nasopharynx	100	100	84	-	-	-	-	-	-
Unknown primary; head & neck	90	NR	-	-	-		-	-	-
Uterus	46	64	22	25	-	-	-	-	26
Cervix	58	82	44	33	-	-	-	-	41
Central nervous system	92	97	54	-	-	-	-	-	52
Lymphoma	65	40	-	-	-	-	-		24
Leukemia	4	8		-			-		6
Myeloma	38	62	-	-	-		-	-	34
All cancers	52	43	24	-	-		-	-	25

NR: Not reported. ACS: American College of Surgeons. SEER: Surveillance, Epidemiology, and End Results database. National Cancer Institute. NYCRIS: Northern and Yorkshire Cancer Registry and Information Service. NSW: the state of New South Wales. VIC: the state of Victoria. SA: the state of South Australia.

[a] First treatment only.

[b] Includes brachytherapy.

[c] Includes salivary glands.

Figure 5: Proportion of re-treatments in radiotherapy (Ref. Delaney et al.)

TABLE 5
Estimated Optimal Number of Courses of Treatment per 1000 Registered Cancers

	Percentage	Total no.
New registered cancers	N/A	1000
Patients requiring radiation	52.3	523
Retreatments	23	120
Total number of courses of radiotherapy required		643

Figure 6: Radiotherapy treatments vs. cancer incidence (Ref. Belgian Cancer Registry)

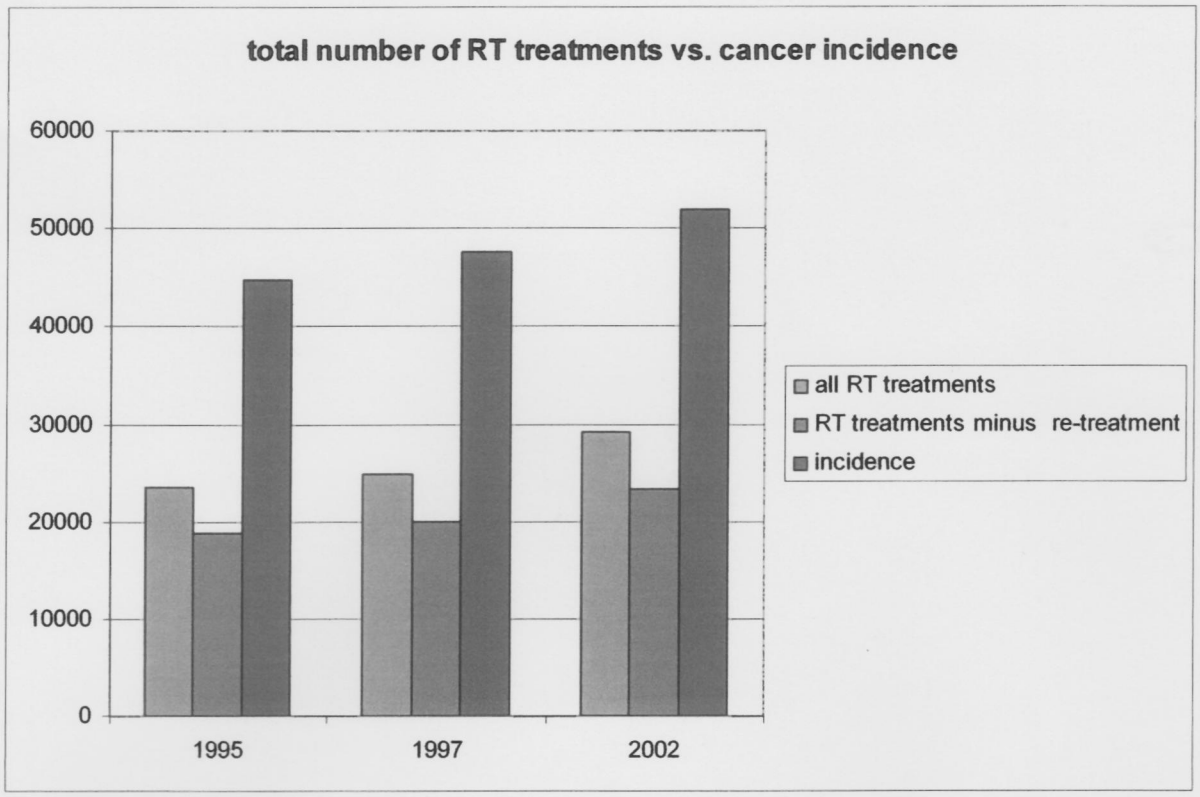


Figure 7: Belgian radiotherapy budget (Ref. RIZIV-INAMI)

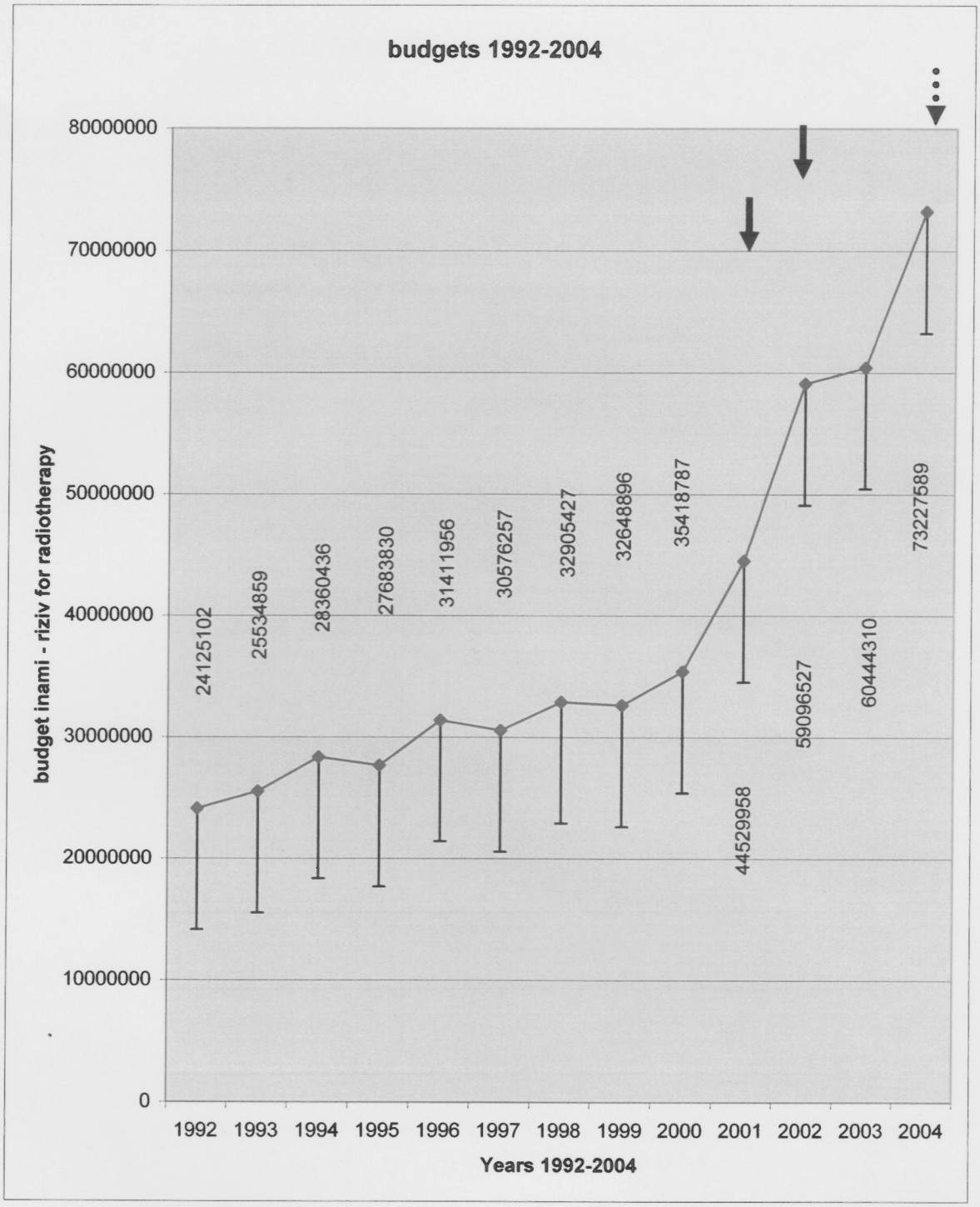


Figure 8: External Beam Radiotherapy: shift in categories (Ref. RIZIV-INAMI)