

# The number and usage of sunbeds in Iceland 1988 and 2005

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## **Abstract**

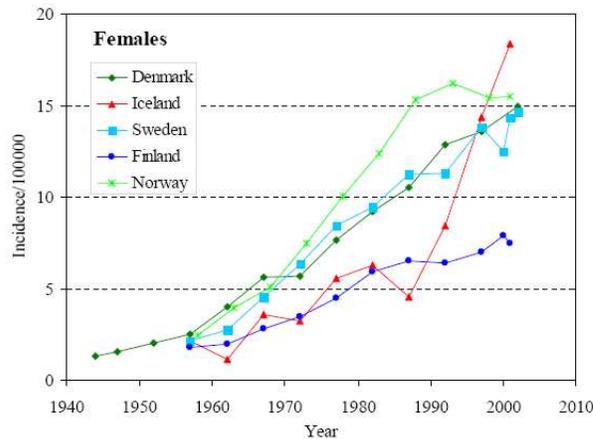
Reliable quantitative information on historic sunbed usage in Iceland is presently of great interest because it is a known risk factor for melanoma which incidence rate has increased rapidly, especially among women.

In this paper, data from two sunbed surveys in the years 1988 and 2005 are presented and discussed. Iceland has a relatively large number of sunbeds. In 1988 more than 1.5 sunbeds were listed per 1000 inhabitants living in the Reykjavik area. In the more recent survey from 2005, more than 1.0 sunbed was listed per 1000 inhabitants living outside the Reykjavik area. The data on sunbeds are supplemented by comparable Swedish data and information obtained in yearly telephone polls on sunbed usage, conducted since 2004. UVR exposure from sunbeds is estimated to be 2-3 tanning sessions per year, per person (all ages).

The data presented have been collected by the Icelandic Radiation Protection Institute in co-operation with the Environment and Food Agency, Capacent-Gallup, the Cancer society, Icelandic dermatologists and the Health directorate.

## **1 Introduction**

Iceland used to have a lower rate of melanoma incidence than other Nordic countries which is as expected from its northern latitude, frequent cloud cover and consequently low natural UV-radiation. The Meteorological Office ([www.vedur.is](http://www.vedur.is)) reported 1268 sunhours per year in 1961-1990 which only gives 3.5 hours of sunshine, per day (and summer night) on average. In recent years it has measured the UV-index, with a maximum value of 4. - However, after a sharp increase in the incidence of melanoma that started in the 1980s, the melanoma incidence is no longer lower for Icelandic women (see *Figure 1*).



*Figure 1* The steadily increasing melanoma incidence per 100,000 in the Nordic countries among women, age standardized according to the WHO-world population, reproduced from reference [1].

There are at least two possible explanations for the above. One is the introduction of modern sunbeds; the other is increase in travel to sunny destinations.

In this paper, previously unpublished data on sunbed numbers and usage is reviewed for the purpose of providing quantifiable information on UVR-doses received by the Icelandic population from sunbeds for the last 20 years. These are shown to be large in comparison to doses in other countries. However, it will also be pointed out, with information on vacations in Spain in 1996 that doses received abroad may also have been significant.

## 2 Sunbed survey in 1988

Modern sunbeds were invented shortly before 1980. In 1979 there were only three sunbed saloons in Reykjavík<sup>1</sup> but their number increased rapidly. In a 1984 meeting<sup>2</sup> in Reykjavik, held to address concerns on sunbeds and skin cancer, there were 25 saloon<sup>3</sup> owners.

*Table 1* Number of services offering cosmetic tanning in Reykjavik.

Reykjavík and neighborhood	1979	1984	1988	2005
No of saloons	3	25	56	28

In the summer of 1988, the Icelandic Radiation Protection Institute (IRPI or Geislavarnir) inspected every sunbed saloon in Reykjavik and some nearby municipalities (Seltjarnarnes, Kópavogur, Garðabær and Hafnarfjörður). The number of locations with sunbeds was 56, 25 of these were tanning saloons with 126 sunbeds, 20 were gyms and swimming halls and 11 were massage parlors, hairdressers and other services with tanning as secondary business<sup>4</sup>. A form was filled out for each sunbed with information on radiation intensity, spectral composition, markings, age of lamps, session times and more [2].

*Table 2* The IRPI survey in 1988. Population data is from Statistics Iceland ([www.hagstofan.is](http://www.hagstofan.is)).

Sunbeds in 1988	No of Sunbeds	Sunbeds in tanning saloons	Population <sup>5</sup> 1 <sup>st</sup> Dec 1988	Sunbeds per 1000 inhabitants
Reykjavik area	207	60.9%	136,431	1.52
Rest of country	-		115,259	-

The average tanning session was 23.2 minutes with standard deviation 4 minutes (information available for 202 out of 207 sunbeds).

With information on how efficiently sunbeds are used, the number of tanning sessions can be calculated. We shall use information on Swedish sunbeds [3], [4] to estimate this figure. It is necessary to distinguish between sunbeds located in tanning saloons and sunbeds located elsewhere (in gyms, swimming halls, beauty parlors etc).

*Table 3* Averages in tanning saloons compared with averages where tanning is not main business.

	Session minutes in tanning saloons	No of beds in tanning saloons	Session minutes in sunbeds elsewhere	No of beds in services elsewhere	Ratio of session doses elsewhere to doses in tanning saloons
Reykjavik 1988	23.1	5.0	23.5	2.6	0.84
Gothenburg 2001	23.6	5.5	21.8	3.1	0.81

Sunbeds in tanning saloons produce larger UVR-doses per tanning session than sunbeds in other places. For the Gothenburg sunbeds, the ratio in the last column of *Table 3* is calculated for 21 sunbeds in tanning saloons versus 38 sunbeds in gyms and swimming halls and 2 in other businesses, from [4] page 11. For the sunbeds in Reykjavik, it is for 124 beds in tanning saloons vs. 59 in gyms and swimming halls and 18 in various other places. Session doses had a standard

<sup>1</sup> Personal communication with owner of one of these saloons.

<sup>2</sup> According to a newspaper article in *Morgunblaðið*, page 50, 27. November 1984.

<sup>3</sup> It is not known if this number includes businesses with tanning as secondary business.

<sup>4</sup> The classification is based on the names of the businesses and is sometimes ambiguous.

deviation of some 26% which gives the 95%-confidence interval as 0.78-0.90. We note this difference in doses, yet in what follows; we treat all tanning sessions as equal.

We expect lamps in tanning saloons to be exchanged more frequently and to be in more daily use, than lamps elsewhere. In the Reykjavik survey, the average age of lamps in tanning saloons was 224 hours (for 114 sunbeds, standard deviation 152 hours). For other places the average was 315 hours (for 59 sunbeds, standard deviation 215 hours).

In Gothenburg, an average number of 2250 tanning sessions was reported for 60 sunbeds in 11 tanning saloons. With each session lasting 23.6 minutes, each sunbed was in average use of 885 hours per year or 10.1% of the time. If sunbeds in tanning saloons in Reykjavik in 1988 were used with this same efficiency, their lamps have been replaced on average two times per year ( $2 \approx 885 / (2 \times 224)$ ) which is reasonable.

Information in Gothenburg was also collected on 113 sunbeds in 36 places other than tanning saloons; the majority of these (as in Reykjavik 1988) were gyms and swimming halls. Those were reported in average use 450 hours per year (calculated from a table on page 6 in [4]) or 5.1% of the time. Sunbeds in tanning saloons were thus used with twice the efficiency of sunbeds in other installations ( $2 \approx 885/450$ ).

Assuming that sunbeds in tanning saloon and sunbeds in other installations were used with the same efficiency in Reykjavik 1988 as in Gothenburg 2001, the number of tanning sessions becomes<sup>6</sup> 2.8 per person in Reykjavik and neighborhood in 1988.

In the 2001 survey for Gothenburg the average reported number of tanning sessions per sunbed was 1600. A total of 300 sunbeds were listed for a population of 471 000 (from Statistics Sweden, [www.scb.se](http://www.scb.se)) which leads to<sup>7</sup> 1.0 tanning session per person, per year. In the Swedish report, reference [4] page 11, the number of tanning sessions is estimated to be 1.4 per year, for individuals of age 16-74 year old, assumed to be 350 000 in Gothenburg.

### 3 Sunbed survey in 2005

In 2005, the Icelandic Radiation Protection Institute conducted another sunbed survey in co-operation with the Environment and food agency ([www.ust.is](http://www.ust.is)) which co-ordinates the work of local health authorities who inspect and issue licenses to all sunbed-saloons.

Sunbeds were listed in 28 locations in the Reykjavik area (see *Table 1*). The total number of sunbed locations in all of Iceland was 87. Tanning saloons were 31 of these.

*Table 4* The IRPI and UST-survey 2005.

Sunbeds in 2005	No of Sunbeds	Sunbeds in tanning saloons	Population 1st Dec 2005	Sunbeds per 1000 inhabitants
Reykjavik area	144	85.4%	177,603	0.81
Rest of country	133	38.3%	121,801	1.09
<b>Total</b>	<b>277</b>	<b>62.8%</b>	<b>299,404</b>	<b>0.93</b>

Sunbeds listed in Reykjavik in 2005 were almost exclusively in tanning saloons (see *Table 4*). There are relatively more sunbeds on the countryside, but less than half of these are in tanning saloons and assuming, as we did in the previous section, that tanning saloons use their sunbeds with twice the efficiency of other places (10% vs. 5%), we find little difference in the estimated number of tanning sessions per person (2% more on the countryside).

For the whole country, 63% of the sunbeds (174 of 277) were in tanning saloons. Using the same efficiency figures as earlier, we estimate the number of tanning sessions to be<sup>8</sup> 1.7 per

<sup>6</sup>  $2.8 \approx (126 \times 885 \times 60 / 23.1 + (207-126) \times 450 \times 60 / 23.5) / 136,431$

<sup>7</sup>  $1.0 \approx 1600 \times 300 / 471\ 000$  or  $1.0 \approx 300 \times (0.33 \times 0.101 + 0.66 \times 0.051) \times 365.25 \times 24 \times 60 / 22/471000$

<sup>8</sup>  $1.7 \approx (0.63 \times 0.101 + 0.37 \times 0.051) \times 365 \times 24 \times 60 / 23.2 \times 0.93 / 1000$

person per year. Here we have assumed that the average sunbed session is still 23.2 minutes which it surely is not. Sunbeds in 2005 were allowed more radiation of type UVB than in 1988 and could deliver more UVR-dose in shorter time. This manifests itself in shorter sunbed sessions.

In the 2005 survey, information on length of tanning sessions was not systematically recorded. It is however known that longer sessions than 20 minutes were now rare while 20 minutes were still the most common (as in 1988). Each tanning saloon typically had one or two so-called ‘turbo-sunbeds’ with shorter sessions, down to 10 minutes. A survey of session times in year 2007 of 44 sunbeds in 6 tanning saloons in nearby municipalities of Reykjavik, gave an average of 17 minutes with a standard deviation of 5 minutes. Sunbeds elsewhere may have had longer session times but hardly longer than 20 minutes.

Deducing that the average session time in 2005 was somewhere between 20 and 17 minutes, the estimated number of tanning sessions must be raised to somewhere between 2.0 and 2.4 per person, per year.

#### 4 User surveys 2004 - 2007

A UV-task group was formed in 2004 by IRPI, the Cancer Society, the Association of Dermatologists and the Health Directorate. On behalf of the group, Capacent-Gallup was enlisted to monitor sunbed usage in Iceland [5].

In March each year 2004-2007, a group of 1350 people, aged 16-75 year old, was randomly selected from the national registry and contacted by telephone. Responses were around 60%, 857 out of 3251 said they used sunbed the previous 12 months, or 26.4%. The ratio of female to male users was 1.6.

In *Table 5* is information on where 835 sunbed users lived. No difference is seen in the proportion of sunbed users in Reykjavik and elsewhere even if there are relatively more sunbeds on the countryside according to *Table 4*. This supports our previous assignment of double efficiency to sunbeds in tanning saloons, most of which are in Reykjavik.

*Table 5* Telephone polls, conducted in spring 2004-2007 among 16-75 year old.

Telephone polls 2004-2007	Responders	Sunbed users	Percents
<b>Age 16-75</b>			
Reykjavik and nearby municipalities	1818	474	26.1%
Rest of country	1354	361	26.7%
<b>Total</b>	<b>3172</b>	<b>835</b>	<b>26.3%</b>

Information was collected from 857 sunbed users on how often they visited sunbeds the previous 12 months (*see Table 6*).

*Table 6* Frequency of sunbed visits by users in 2004-2007.

2004-2007	1-2 times per year	3-5 times per year	6-11 times per year	1-3 times per month	Once a week or more often
<b>Percentage in group</b>	33.4%	26.8%	20.9%	13.9%	5.0%

A simple way of calculating an average from *Table 6* is to assume the following averages for each group: 1.5, 4.0, 8.5, 24 and 78. The average number of visits becomes 10.6. A large uncertainty in this figure comes from assigning a number between 1 and 7 to the frequency of visits of the last group. We have used 1.5 visits per week, but we could also have used 2 which would have given 11.9 as an average.

The 10.6 visits per year for the 26.3% of *Table 5* give 2.8 tanning sessions per year for those who are 16-75 year old. According to Statistics Iceland, these age-groups constitute about

71% of the whole population and thus we get 2.0 tanning sessions per year, per person in the whole population.

## 5 Summary and conclusions

The session numbers in *Table 7* for Iceland are estimated by assuming that sunbeds in Reykjavik 1988 and in Iceland 2005 were used with the same efficiency as in Gothenburg 2001 adjusted for a different proportion of sunbeds in tanning saloons. The estimated number of tanning sessions in Iceland in 2005 gets support from user surveys in 2004-2007. Those surveys can also be compared to two postal surveys made by the Swedish Radiation Protection Institute in 2005 and 2006, each with 2000 participants [6] (see *Table 8*).

*Table 7* Number of sunbeds in Gothenburg and Iceland and estimated number of tanning sessions

	Year	Sun beds no	Population 1 <sup>st</sup> Dec	Beds per person x 1000	Beds in tanning saloons	Average tanning minutes	Sessions per person & per year
<b>Reykjavik</b>	1988	207	136,000	1.5	61%	23.2	2.8
<b>Gothenburg</b>	2001	300	471,000	0.6	33%	22.0	1.0
<b>Iceland</b>	2005	277	298,000	0.9	63%	17-20	2.0-2.4

*Table 8* Sunbed user surveys in Sweden and Iceland.

	Years	Size of survey	Age of group	Ratio of female to male users	Sessions <sup>9</sup> per adult & per year	Percent using sunbeds previous 12 months
<b>Iceland</b>	2004 – 2007	5400	16-75	1.6	2.8	26%
<b>Sweden</b>	2005 – 2006	4000	18-74	2.1	1.2	15%

The surveys use somewhat different year-classes, different mode of contact (telephone vs. post) at different time of year (spring vs. autumn). The difference in sunbed usage is however so great, both in these surveys and when comparing number of sunbeds in Gothenburg 2001 with those in Iceland, that it seems safe to conclude that Icelanders in this century have received more UVR-doses in sunbeds than the Swedes, the amount may be twofold.

In the United Kingdom, Diffey [7] uses a survey from 1996 with 6000 participants to estimate the number of tanning sessions, according to which 7% of the UK population use sunbeds on the average 11 times per year. This amounts to 0.77 tanning sessions per person, per year which is only about one third of the number of sessions we have estimated in Iceland in 1988 – 2005.

Natural UV-radiation is low in Iceland and sunbeds may thus contribute a relatively large part of the total UVR-dose. Exponential increase in traveling by Icelanders may however have added to their exposure to the sun.

In a 1998 publication [8] from Statistics Iceland on Icelandic Tourist Patterns in 1996, page 54, the number of overnight stays of Icelanders in other countries is given as 1,826,100. For a population of 268,927 (middle of year 1996), this amounts to 6.8 days per person. Half (48.6%) of these days were spent in only three countries; Spain, Denmark and the USA. The stays in Spain can be assumed to be mostly solar-vacations for sunbathing and relaxation with each day possibly roughly equivalent to one tanning session. The Spanish days (overnight stays) are 421,700 and amount to 1.6 days per person. This observation indicates that both tanning abroad and tanning in sunbeds may have contributed significantly to the observed increase in the melanoma incidence in Iceland after 1990.

<sup>9</sup> These are sessions per person of the age indicated in the column on the left, i.e. 16-75 year for Iceland.

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