WORKING FOR A HEALTHY FUTURE

IOM Research Project: P937/3
May 2011

Health, socio-economic and environmental aspects of possible amendments to the EU Directive on the protection of workers from the risks related to exposure to carcinogens and mutagens at work

Trichloroethylene

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SUMMARY

Workplace exposure to trichloroethylene (TCE) is associated with increased risks of Kidney cancer, liver and biliary cancer and non-Hodgkin's Lymphoma (NHL). TCE has been classified as a group 2a carcinogen (Probably carcinogenic to humans) carcinogen by IARC and as a Category 2 carcinogen in the EU under the classification and labelling legislation[1]. This report considers the likely health, socioeconomic and environmental impacts associated with possible changes to the Carcinogens Directive, in particular, the establishment of an EU-wide OEL for TCE of 10 ppm or 50 ppm (50 or 273 mg/m^3).

The main use of TCE is as an intermediate for the synthesis of CFC substitutes (75%), in metal cleaning and in the adhesives industry. Its use in metal cleaning has declined sharply and its use in the adhesives industry is very small. TCE consumption in solvent applications is expected be about a quarter of 1996 levels by the end of 2010. This is largely due to implementation of the Solvents Emissions Directive. The annual production of TCE in the EU is well under 100,000 ktonnes.

We estimate that in 2006 approximately 74,000 workers in the EU were potentially exposed to TCE with most exposed workers being involved in the manufacture of fabricated metal products including machinery and transport equipment or the manufacture of furniture. In these industries, about 28% of workers are exposed to more than 10 ppm and about 2% are exposed are to more than 50 ppm. The estimated overall weighted geometric mean (GM) exposure across all countries and industries is 4.6 ppm with a GSD of 3.7.

We estimate that in 2010 in the EU there will be about 34 deaths from liver cancer and a similar number of registrations that might be attributable to past exposure to TCE, which corresponds to about 0.071% of all liver cancer deaths amongst the exposed workers. There will also be about 13 deaths from kidney cancer and about 31 registrations, accounting for 0.046% of all kidney cancer deaths amongst the exposed workers. There will be about 12 deaths from NHL and 28 registrations accounting for 0.054% of all NHL deaths amongst exposed workers. If no specific actions are taken to reduce exposure to TCE, based on the assumption that current employment and exposure levels are maintained, the predicted numbers of cancer deaths in 2060 attributable to TCE would be 21, 15 and 7 for cancers of the liver and kidney and NHL respectively. The corresponding numbers of registrations are 18, 29 and 15. The relative reduction in incidence differs for each of the cancers because of differences in the trends of background incidence (the incidence of kidney cancer is increasing as is the incidence of liver cancer to a lesser degree) and also to differences in the period of latency between exposure and the onset of disease. The predicted Years of Life Lost (YLLs) and Disability Adjusted Life Years (DALYs) are expected to decrease for all three cancers from a combined 866 YLLs and 904 DALYs in 2010 falling to 515 YLLs and 544 DALYs in 2060.

The introduction of an OEL of 50 ppm is not predicted to lead to any significant health benefit relative to the baseline scenario. The impact would be to reduce the number of

[1] Available at: http://monographs.iarc.fr/ENG/Classification/ClassificationsAlphaOrder.pdf

liver cancer deaths and registrations in 2060 attributable to TCE from current levels to 25 and 22 respectively, the number of kidney cancer deaths and registrations to 15 and 30 respectively and the number of NHL deaths and registrations to 10 and 20 respectively. The predicted loss of life expectancy attributable to these cancers in 2060 would be 603 YLLs and 636 DALYs.

The introduction of an OEL of 10 ppm is predicted to reduce the number of liver cancer deaths and registrations in 2060 attributable to TCE from current levels to 10 and 9 respectively, the number of kidney cancer deaths and registrations to 14 and 27 respectively and the number of NHL deaths and registrations to 4 and 8 respectively. The predicted loss of life expectancy attributable to these cancers in 2060 would be 328 YLLs and 353 DALYs.

The total net health benefits from setting an OEL at 10 ppm are estimated to be between €1,118m and €430m for the period of 2010-2069, whereas there would be no significant health benefit in setting an OEL of 50 ppm.

Given that the current GM exposure to TCE is 4.6 ppm, it is anticipated that the majority of employers will be able to comply with an OEL of 50ppm (with around 4% of workers potentially affected above this OEL). There may be more workers affected with an OEL of 10 ppm (with around 28% of workers potentially affected above this OEL).

However, since under the Solvents Emissions Directive (SED) those firms using solvents that are covered by the SED (i.e. not just TCE) above 1 tonne per year are required to install and use a closed system. This is also reinforced by a voluntary industry agreement (Charter for the safe use of Trichloroethylene in metal cleaning) whereby TCE will not be sold to those without an installed closed system. Therefore it is possible that the main costs of compliance with an OEL (i.e. the use of closed systems) may already have been incurred by industries affected.

Given the interactions with the SED, it is difficult to provide a good estimate of the number of firms affected, but it is possible to examine costs per firm affected. The capital cost of installing closed systems (estimated to be between €58k-135k per enterprise, which is appropriately €6k per year).

Therefore the cost to comply with an OEL of 10 ppm (or 50ppm) is unlikely to be significant for large businesses but for SMEs, the majority of affected enterprises, it could represent a substantial proportion of their operating surplus, which could potentially lead to some business closures. Many businesses, however, may be able to switch to use of an alternative substance or pass on the additional costs by charging more for their products. The macroeconomic, social and environmental impacts of introducing an OEL of 10 ppm are not predicted to be significant (relative to the baseline scenario).

1 PROBLEM DEFINITION

1.1 OUTLINE OF THE INVESTIGATION

Workplace exposure to trichloroethylene (TCE) is associated with increased risks of Kidney cancer, liver and biliary cancer and non-Hodgkin's Lymphoma (NHL). TCE has been classified as a group 2a carcinogen (Probably carcinogenic to humans) carcinogen by IARC and as a Category 2 carcinogen in the EU under the classification and labelling legislation[2]. TCE is therefore already regulated as a carcinogen throughout the EU.

The key objectives of the present study are to the to identify the technical feasibility and the socioeconomic, health and environmental impacts associated with the establishment of an EU-wide OEL for TCE of 10 ppm or 50 ppm (50 or 273 mg/m^3).

1.2 OELS/EXPOSURE CONTROL

Existing national occupational exposure limits (OELs) in EU Member States are presented in Table 1.1. OELs from countries outside the EU are also presented for information. An OEL of 50 ppm (Time Weighted Average (TWA)) can be considered as the most common value across the EU and beyond. As can be seen in Table 1.1, the 8 hour TWA OELs vary from around 10 ppm to 100 ppm.

Table 1.1 Occupational Exposure Limits in Various Member States and selected countries outside the EU

Country	OEL (TWA) [1]	STEL[2]
Austria	50 ppm	250 ppm
Belgium	50 ppm	100 ppm
Denmark	10 ppm	20 ppm
France	75 ppm	200 ppm
Germany	30 ppm	120 ppm
Hungary	270 *mg/m^3* [50ppm]	540 *mg/m^3*
Italy	50 ppm	100 ppm
The Netherlands	35 ppm	100 ppm
Poland	50 *mg/m^3* [9.3ppm]	400 *mg/m^3*
Spain	50 ppm	100 ppm
Sweden	10 ppm	25 ppm
United Kingdom	100 ppm	150 ppm
Canada – Quebec	50 ppm	200 ppm
Japan	50 ppm	-
Switzerland	50 ppm	100 ppm
USA - OSHA	100 ppm	200 ppm

[1] OEL (TWA): Occupational Exposure Limit (Time Weighted Average): 8 hours per day.
[2] STEL: Short Term Exposure Limit (15 minutes).

[2] Available at: http://monographs.iarc.fr/ENG/Classification/ClassificationsAlphaOrder.pdf

Source: http://www.dguv.de/bgia/en/gestis/limit_values/index.jsp, RRS (Defra 2005) and http://www.eurochlor.org/qandatrienglish

In 2008 the Scientific Committee for OELs (SCOEL) issued a recommendation for an OEL on trichloroethylene at a level of 10 ppm TWA and 30 ppm STEL. This recommendation was submitted to a public consultation. These values can be met by the use of closed surface cleaning equipment (von Grote, 2003). Communication with stakeholders has indicated that one of the major TCE producers in Europe and its affiliated companies has introduced an internal exposure limit of 5 ppm.

For the purposes of this report we have chosen 10 and 50 ppm (50 and 273 mg/m^3) as "typical" OELs.

1.3 DESCRIPTION OF DIFFERENT USES

1.3.1 Manufacture

There are three processes that can be used to manufacture trichloroethylene: oxychlorination of ethylene, ethylene dichloride or other chlorinated C2-hydrocarbons; non-catalytic chlorination of ethylene dichloride or other chlorinated C2 hydrocarbons and catalytic hydrogenation of perchloroethylene.

The risk assessment report (RAR)[3] for TCE indicated that there were four producers in the early 2000s, and that the production capacity at a typical plant ranges from 1,000 to 50,000 tonnes per year. According to the environmental risk assessment strategy (RSS) for TCE[4], one producer stopped production of trichloroethylene in 2006. Stakeholder information indicates that a further manufacturer ceased production in 2009. Although there are currently only two companies in the EU manufacturing TCE, there are other companies who act as suppliers in the EU.

Stakeholders have indicated that total TCE production in Europe reduced by more than 50% between 1985 and 2007 and will have been further reduced due to the closure of a manufacturing plant in 2009. The environmental risk reduction strategy indicates that EU production was around 100,000 tonnes in 2003[4]. Table 1.2 below provides details of the sales of trichloroethylene for use as a solvent (i.e. not as an intermediate) in Western Europe between 1996 and 2004.

Table 1.2 Sales for Trichloroethylene manufactured in Western Europe for use as a solvent

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sales (kt)	101	93	85	79	74	63	52	38	33

[3] EU Risk Assessment Report on Trichloroethylene. Vol 31, 2004. Publication EUR 21057 EN. Available at: http://ecb.jrc.ec.europa.eu/documents/Existing-Chemicals/RISK_ASSESSMENT/REPORT/trichloroethylenereport018.pdf

[4] DEFRA (2005) Risk Reduction Strategy and Analysis of the Advantages and Drawbacks for Tetrachlorotheylene. Available at: http://www.defra.gov.uk/environment/quality/chemicals/documents/report-tetra060203.pdf

1.3.2 Uses

According to the environmental RRS, trichloroethylene is mainly used as an intermediate for the synthesis of CFC substitutes, in metal cleaning and in the adhesives industry. The change in the relative importance of each use over the period 1996 to 2003 is detailed in Table 1.3 below. Note that this table includes trichloroethylene imported into Europe as well as that which is manufactured in the EU.

Table 1.3 Uses of Trichloroethylene sold into the EU Market in 1996 and 2003

Use	Percentage of Sales, 1996	Percentage of Sales, 2003
Metal degreasing in vapour degreasers	52%	28%
Adhesives	6%	3%
Consumer uses	4%	0%
Others	2%	2%
Feedstock (intermediate)	37%	67%
Total	100% (approx. 122,000 tonnes)	100% (approx. 96,000 tonnes)

Table 1.3 shows that use of trichloroethylene in adhesives and in other uses are comparatively low. Consumer use is no longer permitted because of the classification of trichloroethylene as a Category 2 carcinogen[5] under Directive 67/548/EEC.

More recent stakeholder information (2010) indicates that approximately 75% of total TCE production is used in intermediate applications. TCE use as a solvent continues to decline and in 2007 solvent use accounted for approximately 25% of TCE production in the EU. Additional reductions in the use of TCE in solvent applications and a shift towards intermediate use are anticipated due to ongoing substitution of TCE by alternative products and technologies and the conversion to closed systems in surface cleaning to minimise solvent emissions and therefore reduce solvent consumption. These trends are the result of stringent requirements under the Solvents Emissions Directive (SED), anticipation of REACH and a voluntary industry commitment through the European Chlorinated Solvent Association (ESCA)[6]. The SED and the voluntary commitment are driving companies to use TCE for surface cleaning only in closed systems. REACH will reinforce the use of closed systems as the only registered use for surface cleaning. By the end of 2010 TCE consumption in solvent applications is expected to drop an additional 50% from 2007 levels.

Other minor uses of TCE include the production and use of adhesives containing TCE, ceramic production, wool scouring, asphalt testing, as a heat transfer fluid and in the production of some pharmaceutical products.

[5] Category 1 and 2 carcinogens and mutagens are prohibited from consumer use according to the REACH regulation (Annex XVII)
[6] Available at: http://www.eurochlor.org/upload/documents/document282.pdf

The introduction of a Community-wide OEL for trichloroethylene could potentially have implications for the following life-cycle stages:

- Production of trichloroethylene;
- Use in metal degreasing;
- Use in adhesives;
- Use as a feedstock/intermediate; and
- Other uses.

Based on the results of the RAR[7], use in metal degreasing was considered to be of most concern regarding exposure of workers to trichloroethylene. Given this and the significantly greater use in this sector than in other sectors, metal degreasing is the focus for the assessment of impacts.

Also as set in the exposure assessments in Section 2, there is not expected to be a need to assess other uses other than metal degreasing as these uses (e.g. intermediates, adhesives) are already well controlled and deemed low risk. Therefore there are not expected to be benefits of introducing an OEL for uses other than metal degreasing.

1.4 RISKS TO HUMAN HEALTH

1.4.1 Introduction

Short term exposure to high concentrations of TCE may cause headaches, lung irritation, dizziness, poor coordination and difficulty concentrating. Longer periods of exposure may cause nerve, kidney and liver damage. Three types of cancer have been identified due to long periods of exposure to trichloroethylene:

- Liver and biliary cancer;
- Kidney cancer; and
- Non-Hodgkin's lymphoma.

1.4.2 Summary of the available epidemiological literature on risk

A large number of cohort and case-control studies have evaluated the association between TCE exposure in occupations involving use of TCE as a dry cleaning agent and as a metal degreasant (in aerospace, cardboard and other industries) and incidence of and/or mortality from kidney and liver cancers and non-Hodgkin's lymphoma (NHL). The risk estimates obtained through case-control studies are generally higher than the risks from cohort studies. There is often no adjustment for confounders such as smoking, alcohol consumption and other lifestyle factors. Many of

[7] EU Risk Assessment Report on Trichloroethylene. Vol 31, 2004. Publication EUR 21057 EN. Available at: http://ecb.jrc.ec.europa.eu/documents/Existing-Chemicals/RISK_ASSESSMENT/REPORT/trichloroethylenereport018.pdf

the studies also have difficulty in separating TCE exposure from exposures to other organic solvents including tetrachloroethylene.

Wartenberg *et al.* (2000) evaluate many of these studies, including 20 cohort and 40 case-control studies, dividing the cohort studies into three tiers based on the specificity of the exposure information. Tier 1 studies were those which provide the best characterisation of TCE exposure through the use of biomarkers and job-exposure matrices, Tier II studies included those that evaluated mortality in cohorts using job titles and other general information to assess TCE exposure and Tier III were those relating to dry cleaning and laundry workers, where exposures were assessed on job title only. The combined risk of kidney cancer was elevated in Tier 1 studies for incidence (Standardised Incidence Rate (SIR) = 1.7, 95% CI 1.1, 2.7) and mortality (Standardised Mortality Rate (SMR) = 1.2, 95% CI 0.8, 1.7) despite the lack of association reported by the authors of most of the individual studies. The SIR for Tier II studies was 3.7 (95% CI 1.7, 8.1) based on only 1 study. The Tier III incidence was 0.9 (95% CI 0.7, 1.2) and mortality was 2.3 (95%CI 1.5, 3.5). Across the Tier 1 studies, for *primary* liver cancer an average SIR of 1.9 (95%CI=1.0, 3.4) and an average SMR of 1.7 (95%CI=0.2, 16.2) were obtained. For liver and biliary tract cancer combined, a SIR of 1.1 (95% CI 0.3, 4.8) and SMR of 1.1 (95% CI 0.7, 1.7) was reported. The combined results for Tier II studies was a relative risk for primary liver cancer of 2.0 (95% CI 1.3, 3.3) and, for liver and biliary tract cancer combined, an RR of 1.3 (95% CI, 1.0, 1.8). Tier III studies gave more ambiguous findings with increased incidence of primary liver cancer (average RR = 3.3, 95% CI 1.6, 6.90) and liver and biliary tract cancer combined (RR = 1.8, 95% CI 1.1, 2.9) but no increased mortality for liver and biliary cancer combined (RR = 0.7, 95% CI of 0.4, 1.3). Evidence of excess incidence for NHL was also found in the Tier 1 studies (SMR=1.5, 95%CI=0.9, 2.3) and Tier III studies (SIR=1.4, 95% CI 0.8, 2.6) but not for Tier II studies (SIR=0.9 (95% CI 0.6, 1.4).

In another meta-analysis reported by Alexander *et al* (2007), incidence of and mortality from liver cancer in workers exposed to TCE was assessed across 14 occupational cohort studies. Ecologic studies of TCE in drinking water and studies of dry cleaners and laundry workers (included as Tier III studies in Wartenberg *et al (*2000)) were excluded due to exposure assessment limitations and use of proportional mortality rates (PMR) that limits the ability to make causal links. In contrast to the meta-analysis from Wartenberg *et al*., (2000), studies were divided into 2 Groups, although Group I studies were again those that provided the most accurate estimate of TCE exposure through biomonitoring. For liver and biliary tract cancer, the combined summary relative-risk estimate (SRRE) for all 15 studies was slightly elevated (RR=1.08; 95% CI, 0.91, 1.29). For Group I studies only (n=9) the combined SRRE was reported as 1.14 (95% CI, 0.93, 1.39) with five studies reporting an elevated SRRE (1.37, 95% CI 1.04, 1.79) for primary liver cancer and four studies for biliary tract cancer (SRRE = 1.35, 95% CI 1.03, 1.78). For the Group II studies, the combined SRREs for primary liver cancer and liver and biliary tract cancer were not elevated (0.87, 95% CI 0.55, 1.38). In the TCE-exposed sub-cohort of Group I studies, a combined SRRE of 1.30 (95% CI of 1.09, 1.55) was reported for liver and biliary tract cancer; this was slightly stronger but less precise for primary liver cancer only (SRRE=1.41, 95% CI 1.06, 1.87).

A more recent meta-analysis regarding NHL of 14 cohort and four case-control studies of workers exposed to TCE estimated a summary RR of 1.29 (95%CI=1.00, 1.66) from the cohort studies that had more detailed information on TCE-exposure (Mandel *et al*,

2006). For the studies (n=7) that identified a specific TCE-exposed sub-cohort the SRR was 1.59 (95%CI=1.21-2.08). No significant dose-response relationship was found.

A study of dry cleaners found an elevated risk for kidney cancer of 1.41 (0.46, 3.30) (Ruder *et al.,* 2001).

1.4.3 Choice of risk estimates to assess health impact

Not all of the studies of workers potentially exposed to TCE give estimates for the three cancer sites (kidney, liver and biliary and NHL) and there is a wide variation in the risk estimates from individual studies. In addition because the inclusion criteria vary between the meta-analyses the summary measures also vary. For this reason a pragmatic choice of risk estimates has been selected to ensure that there is consistent gradation in risk estimates across the high, medium and low exposure categories as follows: Kidney cancer: high 1.7 (95% CI 1.1, 2.7) (Wartenberg *et al.* 2000), medium (1.41 95%CI 0.46, 3.30) (Ruder *et al*,), low 1.3 (95%CI 0.9, 1.7) (Wartenberg *et al.* 2000); Liver and biliary cancer: high 1.9 (95%CI 1, 3.4) (Wartenberg *et al.* 2000, liver cancer estimate), medium 1.8 (95%CI 1.1,2.9) (Wartenberg *et al.* 2000), low 0.9 (95%CI 0.5,1.9) (Wartenberg *et al.* 2000); NHL: high 1.5 (95%CI 0.9,2.3) (Wartenberg *et al.* 2000), medium 1.4 (95%CI 0.7,2.8) (Wartenberg *et al.* 2000), low 0.9 (95%CI 0.6, 1.4) (Wartenberg *et al.* 2000).

2 BASELINE SCENARIOS

2.1 STRUCTURE OF THE SECTOR

The introduction of an OEL for trichloroethylene within firms using the substance for metal degreasing could have significant implications for this use because of the possible risks of exposure within metal degreasing and the amount of trichloroethylene that is used in this process.

According to the environmental RRS[8], the metal finishing sector (understood to encompass metal degreasing, metal coating, metal plating, etc.) in the UK comprises a large number of small companies, with a high proportion having fewer than 20 workers. In addition, the surface cleaning sector, also covering a wide range of operations, is generally not well defined, with companies having very different sizes.

Consultation with ECSA indicated that the structure of the metal degreasing sector was unknown to them.

Data from Eurostat indicates that in 2006 there were some 141,858 enterprises engaged in 'treatment and coating of metals', within the 'manufacture of fabricated metal products, except machinery and equipment' (NACE code DJ 28.51)[9]. The

[8] DEFRA (2005) Risk Reduction Strategy and Analysis of the Advantages and Drawbacks for Tetrachlorotheylene. Available at: http://www.defra.gov.uk/environment/quality/chemicals/documents/report-tetra060203.pdf

[9] Available at: http://epp.eurostat.ec.europa.eu/

Eurostat data is broken down by member state and the data for 2006 is presented in Table 2.1.

It is recognised that this NACE code does not exclusively refer to the metal degreasing sector, but it is considered likely to be the most representative data available. The treatment and coating of metals includes:

- plating and anodising of metals;
- heat treatment of metals;
- deburring, sandblasting, tumbling, cleaning of metals;
- colouring, engraving of metals;
- non-metallic coating of metals;
- plasticising, enamelling, lacquering etc; and
- hardening and buffing of metals.

This code excludes:

- activities of farriers;
- printing onto metals;
- metal coating of plastics;
- rolling precious metals onto base metals or other metals; and
- 'while-you-wait' engraving services.

Table 2.1 Enterprises in the EU engaged in treatment and coating of metals, within the manufacture of fabricated metal products, except machinery and equipment

Member State	Number of Enterprises 2006
Austria	740
Belgium	2,582
Bulgaria	1,337
Cyprus	136
Czech Republic	8,436
Denmark	2,795
Estonia	230
Finland	1,909
France	12,472
Germany	14,975
Greece	1,784
Hungary	4,104
Ireland	98
Italy	33,121
Latvia	149
Lithuania	179
Luxembourg	69
Malta	No data
Netherlands	3,890
Poland	14,831
Portugal	4,834
Romania	900
Slovakia	524
Slovenia	2,032
Spain	8,774
Sweden	7,136
United Kingdom	13,821
EU27	141,858

Source: Eurostat classification of economic activities - NACE Rev.1.1: DJ 285 - Treatment of coating of metals; general mechanical engineering. Number of Enterprises

On the basis of the Eurostat data there are a significant number of firms (“enterprises”) active in the metals cleaning sector. The Eurostat data cannot tell us whether these firms use trichloroethylene; however, since trichloroethylene is an effective and widely used solvent for the cleaning of metals, as a worst case it could be assumed that all of the enterprises use trichloroethylene.

Member States with the largest number of firms are Italy, Germany, Poland, UK and France each with greater than 12,000 firms and accounting for 89,220 of the 143,196 in the EU 27 + Norway (c 62% of the total). Spain, Czech Republic, Sweden, Portugal and Hungary each have more than 4,000 firms accounting for 33,284 firms (c.23% of the total); Netherlands, Denmark, Belgium, Slovenia, Finland, Greece, Norway and Bulgaria each have more than 1,000 firms accounting for 17,667 firms (12% of the total). The remaining Member States with fewer that 1,000 firms make up 3,025 firms (2% of the total).

Eurostat also provides data on the financial measures for this activity group which are useful for the later analysis in this section. As mentioned above Eurostat data are not available on the use of particular products or substances for a specific activity.

2.2 PREVALENCE OF TRICHLOROETHYLENE EXPOSURE IN EU

The prevalence of exposure to TCE was estimated based on the Finnish CAREX estimate of 2007, The Spanish CAREX estimate of 2004 and the Italian CAREX estimate of 2000 – 2003 (Mirabelli and Kauppinen, 2005). The proportion of workers in each industry who are exposed was taken from each of these three CAREX estimate and the average proportion exposed across all three countries calculated for each industry.

The number of workers employed in each industry in 2006 was, where possible, obtained from the EUROSTAT database[10], which provides numbers exposed at the level of two or three digit NACE code. If information from 2006 was unavailable, it was substituted with information from 2005 or recorded as being unavailable. Where the numbers of workers employed is not available from the EUROSTAT database, this information was obtained form the Labour Force Survey[11]. The Labour Force Survey only provides information at NACE section level, which incorporates a number of two digit NACE codes. The number of exposed workers in each industry in each country, including Finland, Spain and Italy, was estimated by multiplying the number of workers employed in each industry in each country in 2006 by the average proportion of exposed workers.

Several of the low exposure industries from the 1975 classification (Table 2.3 below) no longer have any TCE exposure according to the CAREX updates. These industries are NACE 15, 16, 18, 19 and 26. It appears likely that TCE has been replaced by alternative solvents in these industries since the mid 1990's. We have assumed that workers in industries in which exposures have historically been attributed to dry cleaning work (NACE 17, 92, 93, and 95) do not currently have any exposure. Beginning in the 1950s TCE was replaced by tetrachloroethylene in dry cleaning and there is no longer any use of TCE in dry cleaning in the EU[12]. The Finnish 2007 CAREX update has attributed some exposure to TCE to use in dry cleaning but we

[10] Available at: http://epp.eurostat.ec.europa.eu/
[11] Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/
[12] EU Risk Assessment Report on Trichloroethylene. Vol 31, 2004. Publication EUR 21057 EN. Available at: http://ecb.jrc.ec.europa.eu/documents/Existing-Chemicals/RISK_ASSESSMENT/REPORT/trichloroethylenereport018.pdf

could not find any evidence of a resurgence in TCE use in the dry cleaning industry and industries in which exposures would have been attributed to dry cleaning were assumed to have no exposure to TCE. Exposures in NACE O (Other community, social and personal service activities) are to workers in the sewage and refuse disposal industry.

The estimated exposure prevalence for the EU member states based on 2006 employment data is shown in Table 2.2. It is estimated that approximately 74,000 workers in the EU are potentially exposed to TCE.

The estimated number of male and female employees in each industry group in each EU member state is also shown in Appendix 8.1. These estimates were obtained by applying the average male to female employee ratio for the industry group for each country to the total number of employees. Male to female employee ratios were calculated with data from the Labour Force Survey. Managers, salespeople and office clerks were excluded from these calculations as they were assumed to be unexposed.

Table 2.2 Number of workers exposed to trichloroethylene by country and NACE code

	NACE code														
Country	**21**	**22**	**24**	**25**	**28**	**29**	**30**	**31**	**34**	**35**	**36**	**73**	**80**	**O**	**Total**
Austria	5	5	48	53	215	187	6	28	169	58	506	5	22	125	1432
Belgium	4	7	124	51	204	101	5	18	240	48	274	6	37	103	1222
Bulgaria	3	3	46	45	125	161	11	22	14	58	397	0	21	86	994
Cyprus	0	0	3	2	11	2	0	0	1	1	28	0	2	12	65
Czech Republic	6	9	74	161	501	376	57	116	574	111	775	6	28	110	2902
Denmark	2	7	53	39	142	144	6	24	33	40	298	6	21	109	925
Estonia	1	1	5	10	39	13	2	6	11	15	137	0	6	23	268
Finland	32	6	32	29	138	134	2	18	34	55	156	6	50	140	832
France	24	38	489	439	1288	703	43	151	1365	757	1637	38	176	736	7884
Germany	43	73	814	720	2367	2430	216	519	4286	711	2665	85	206	1330	16463
Greece	2	6	32	22	121	52	NK[1]	8	15	71	NK	8	30	87	455
Hungary	5	7	57	78	224	158	49	69	261	41	358	6	31	110	1454
Ireland	1	3	44	19	39	27	71	8	20	19	NK	2	13	67	332
Italy	0	33	355	382	2123	1305	81	185	847	553	3336	0	0	0	9200
Latvia	0	2	8	9	29	17	1	4	6	28	163	1	9	34	310
Lithuania	1	2	11	18	55	25	2	7	6	37	329	1	13	43	550
Luxembourg	NK	NK	2	12	13	5	0	NK	NK	NK	3	NK	1	4	41
Malta	NK	NK	NK	NK	NK	NK	NK	NK	NK	NK	NK	NK	1	4	5
Netherlands	7	16	113	62	295	206	29	17	115	128	424	30	53	198	1695
Poland	13	19	192	286	833	477	35	107	613	363	2372	4	112	359	5786
Portugal	4	7	NK	49	265	110	NK	25	NK	54	663	1	31	98	1306
Romania	5	7	87	89	308	238	24	84	319	308	1225	21	41	163	2919
Slovakia	2	2	23	40	104	104	8	46	148	37	202	4	16	53	789
Slovenia	2	2	25	26	102	62	4	15	45	14	172	2	7	27	506
Spain	0	31	248	228	1127	445	27	88	807	296	1975	13	105	630	6021
Sweden	12	10	77	54	255	270	24	25	438	113	545	NK	48	154	2025
United Kingdom	22	66	381	396	998	640	139	125	910	751	1935	93	251	989	7695
Total	**196**	**364**	**3343**	**3320**	**11924**	**8393**	**840**	**1713**	**11277**	**4666**	**20577**	**337**	**1331**	**5791**	**74073**

[1] NK=Not Known

Classification of Industries by Exposure Level

Industries in which exposure to TCE occurred in approximately 1975 have been classified as high, medium, low or background exposure based on an evaluation of the peer-reviewed literature, information from industry and expert judgement. The industries, grouped by NACE code, were identified from the CAREX data and stakeholder information. The exposure classification by industry is presented in Table 2.3.

Table 2.3 Classification of industries by exposure level in 1975

Industry	NACE (rev 1.1)	Classification
Beverage industries	15	Low
Tobacco industry	16	Low
Manufacture of textiles	17	Low
Manufacture of wearing apparel, except footwear	18	Medium
Manufacture of leather and products of leather or of its substitutes	19	Low
Manufacture of pulp, paper and paper products	21	Low
Printing, publishing and reproduction of recorded media	22	Medium
Manufacture of chemicals and chemical products	24	Medium
Manufacture of rubber and plastic products	25	Medium
Manufacture of glass and other glass products	26.1	Low
Manufacture of other non-metallic mineral products	26	Low
Manufacture of fabricated metal products, except machinery and equipment	28	High
Manufacture of machinery except electrical	29	High
Manufacture of office machinery and computers	30	Medium
Manufacture of electrical machinery, apparatus, appliances and supplies	31	Medium
Manufacture of transport equipment	34	High
Manufacture of other transport equipment	35	High
Manufacture of furniture: manufacturing nec	36	Medium
Research and scientific institutes	73	Low
Education services	80	Low

Industry	NACE (rev 1.1)	Classification
Sanitary and similar services	90	Low
Recreational and cultural services	92	Low
Personal and household services	93	Medium
Private households with employed persons	95	Medium

2.3 LEVEL OF EXPOSURE TO TRICHLOROETHYLENE

2.3.1 Estimation of exposure levels

The available scientific literature was reviewed for occupational personal exposure data for trichloroethylene. Only exposure information from 1980 onwards was considered. No exposure data for TCE was available for recent years. The main sources of exposure information were as follows. The RAR presents occupational exposures incurred during manufacturing of TCE and its use as an intermediate in the UK over the period 1991-1994.[13] A paper published in the US, which looked at the causes of exposure to trichloroethylene in US industry, carried out a systematic literature review and reported TCE exposure measurements by industry (Bakke *et al.*, 2007). A study of the exposure of Danish workers in industry over the period 1947 – 1989 was reported by Raaschou-Nielsen *et al* (2002). A study into the reduction of occupational exposure to perchloroethylene and trichloroethylene over the last 30 years summarises TCE exposure measurements associated with degreasing from 1942 until 2000 (von Grote *et al*, 2003). Finally, a study of shoe manufacturing in Northern Portugal reports TCE measurements in the finishing department.

Information was extracted from the RAR and papers and is reported in Table 2.4 below by NACE code. A fuller description of the data and source is given in the in Appendix 8.2.

[13] EU Risk Assessment Report on Trichloroethylene. Vol 31, 2004. Publication EUR 21057 EN. Available at: http://ecb.jrc.ec.europa.eu/documents/Existing-Chemicals/RISK_ASSESSMENT/REPORT/trichloroethylenereport018.pdf

Table 2.4 Summary of occupational exposure data for trichloroethylene

NACE	Description	Country			Exposure (ppm)				
			Year(s)	No.	Min	Max	AM	GM	GSD
19.3	Shoe manufacturing	Portugal	1999	100				18	27
			1999	80				18	20
			1999	150				33	69
22	Printing	Denmark	1980-89	12			6.3	3.5	2.9
24	Manufacture of chemicals (Manufacture of TCE)	UK	1991-94	584		49		0.6	
		UK	1991-94	171		128		0.5	
		UK	1991-94	837		128		0.6	
		UK	1991-94	298		590		1.3	
24	Manufacture of chemicals (TCE used as intermediate)	UK	1991-94	162		11.5	0.2		
		UK	1991-94	7		1.5	0.3		
		UK	1991-94	57		1.6	0.2		
		UK	1991-94	34		2.7	0.2		
28, 29	Manufacture of fabricated metal products	Denmark	1980-89	371			13.0	5.0	4.5
28	Manufacture of fabricated metal products, except machinery and equipment	UK	1988	29			5.1		
29	Manufacture of machinery and equipment nec	US	1984	18	0.3	26	85	22	6.9
		US	1984	12	2.2	274	86	30	8.4
		US	1990	2	4.5	5.2	4.9		
		US	1986	3	107	137	120	120	1.1
		US	1986	18	20	89	38	36	1.3
		US	1980	1	0.6				
30	Manufacture of electrical and optical equipment	US	1980	28	0.1	27	2.7	0.7	4.6
		US	1980	49	0.038	40	2.5	0.7	4.6
		US	1993	4	0.04	0.04			
31	Manufacture of electrical equipment and apparatus nec	US	1990	6	0.01	11	4.1	1	14
32	Manufacture of radio, television and communication equipment and apparatus	Denmark	1980-89	24			7.8	0.7	7.3
34	Manufacture of motor vehicles, trailers and semi-trailers	US	1982	2	0.3	1.1	0.7		
35/3	Manufacture of	US	1982	1	4.1				

NACE	Description	Country	Year(s)	No.	Exposure (ppm) Min	Max	AM	GM	GSD
	transport equipment								
		US	1982	29	0.2	39	5.7	2.2	4
36.2	Manufacture of jewellery and related articles	US	1988	8	15	33	25	24	1.3
93	Dry-cleaning shops	Denmark	1980-89	2			4.1	2.0	6.2

2.3.2 Development of metal degreasing machines

There are five types of metal degreasing machines progressing from type I machines which are highly emissive open-top machines developed in the early 1950s, to type V machines which are closed-loop one-working chamber machines with closed loop drying and recycling systems with refrigeration cooling, developed in the late 1980s. In Germany, Austria and Switzerland conversion to closed systems (Type V), regardless of the volume of TCE used has already taken place (stakeholder information). A summary of occupational exposure data for the use of TCE in degreasing is shown in Table 2.5.

Table 2.5 Summary of occupational exposure data for trichloroethylene for degreasing

Country	Year(s)	No.	Exposure (ppm) Min	Max	AM	GM	GSD	90th %ile	95th %ile
US	1980	1	0.6						
US	1981	2	0.8	1.7	1.2				
US	1982	2	0.3	1.1	0.7				
US	1982	1	4.1						
US	1982	29	0.2	39	5.7	2.2	4		
US	1983	4	<0.004	25	7.8	0.2	136		
US	1983	4	<0.004	25	7.8	0.2	136		
US	1984	18	0.3	26	85	22	6.9		
US	1984	12	2.2	274	86	30	8.4		
US	1986	3	107	137	120	120	1.1		
US	1986	18	20	89	38	36	1.3		
UK	1988	29			5.1				
US	1988	8	15	33	25	24	1.3		
US	1990	2	4.5	5.2	4.9				
US	1990	6	0.01	11	4.1	1	14		
Denmark	1980-89	371			13.0	5.0	4.5		
Denmark	1980-89	24			7.8	0.7	7.3		
Denmark	1980-89	45			32.6	11.2	6.4		
Denmark	1980-89	23			0.9	0.6	2.4		
Denmark	1980-89	371			13				
Denmark	1980-89	45			32.6	11.2	6.4		
Denmark	1980-89	23			0.9	0.6	2.4		
Germany	1990-95	14			7.6			56.3	109.6
Germany	1990-95	23			4.1			52.2	104.8
Germany	1990-95	159			10			44.3	67.4

			Exposure (ppm)						
Country	**Year(s)**	**No.**	**Min**	**Max**	**AM**	**GM**	**GSD**	**90th %ile**	**95th %ile**
Germany	1990-95	30			44.6[1]			131.7	168.9
Australia	1997[2]	5			8.8				

[1] Median
[2] No date given, year of publication reported

Stakeholder information indicates that the introduction of automated closed systems and solvent substitution has resulted in the estimated exposure dropping to below 10 ppm.

The RAR gives the following data (from monitoring or modelling) as exposure estimates used for the purposes of risk characterisation (Table 2.6).

Table 2.6 Exposure estimates from the EU RAR[14]

Description	**Source**	**8 hr TWA (ppm)**	**Short term**
Manufacturing and recycling	Industry	10	Short term peaks - potential for high peaks - cannot quantify
Metal degreasing	HSE/published/industry	50	500
Adhesives (manufacture) – with LEV	EASE	10-20	
Adhesives (manufacture) - without LEV	EASE	100-400	
Adhesives (use)	N/A	Wide use, controls uncertain - not quantifiable	
Manufacture of HCFC 133a and HFC 134a	Industry	11.5	

However, it is well known that the EASE model[15] overestimates exposure (Creely *et al*, 2005) and values estimated using it should be treated with caution.

Exposure estimates for various occupational groups are provided by the Finnish Job-Exposure Matrix (FINJEM) which is a database which summarises data from the Finnish occupational exposure measurements supplemented by professional judgement (Kauppinen, 2001). The FINJEM exposure estimates are arithmetic rather than geometric means. All occupational groups for which there was an exposure (occupations in smelting, metallurgical and foundry work not elsewhere classified (nec) turners, toolmakers and machine-tool setters, machine and engine mechanics, metal plating and coating work, assemblers and other machine and metalware occupations, electronics and telecommunications workmen, electrical and electronic equipment assemblers) are estimated to have an exposure of 5 ppm since 1985. FINJEM

[14] EU Risk Assessment Report on Trichloroethylene. Vol 31, 2004. Publication EUR 21057 EN. Available at: http://ecb.jrc.ec.europa.eu/documents/Existing-Chemicals/RISK_ASSESSMENT/REPORT/trichloroethylenereport018.pdf
[15] Estimation and Assessment of Substance Exposure model can be used to predict workplace exposures.

estimates that exposures in the rubber industry have been at or near 0 ppm since 1984 indicating that exposures in the rubber industry are now at low to background levels.

Due to the limited availability of exposure data for TCE it is not feasible to determine whether there are systematic differences in exposure between countries within the EU.

We have selected exposure measurements from the data presented in Table 2.4, Table 2.5 and Table 2.6 that are expected to be most representative of EU TCE exposure levels for each medium and high exposure industry in 2010. These are summarised in Table 2.7. Several of the industries that were classified as medium or high exposure based on 1975 exposure levels are no longer considered medium to high exposure due to decreased usage of TCE. NACE 17, 18, 25, 93 and 95 are no longer considered medium exposure industries and current typical exposure levels for these industries were not identified. In the past, exposures in NACE 17, 18, 93 and 95 occurred due to the use of TCE in dry cleaning but TCE has now been replaced by other solvents including tetrachloroethylene in this application. Exposure to TCE in NACE 25 (Manufacture of rubber and plastic products) has occurred due to the use of rubber adhesives that contain TCE. This use is infrequent and average exposure levels are now expected to be low.

The only available exposure estimate for the printing industry (NACE 22) is from a Danish study in the 1980s. Creely *et al*., (2007) analysed temporal trends in exposure in 38 published datasets of long-term trends in aerosol exposure and found that, over time, exposures typically reduced by 5 to 10% per year. The median decrease in exposure level seen by Creely *et al.,* (2007) was 7% per year. We have assumed that the estimated GM of 3.5 ppm for the printing industry is relevant to 1985 and we have estimated a 2010 exposure level of 0.6 ppm based on an estimated decrease in exposure of 7% per year. We have assumed that the GSD has remained constant at 2.9.

For the chemical manufacturing industry (NACE 24) an exposure estimate from the early 1990's based on 837 workers in both process operation and maintenance tasks at a UK chemical manufacturing plant has been selected as the most representative estimate. We have assumed that the estimated GM of 0.6 ppm is relevant to 1992 exposure levels and we have estimated a 2010 exposure level of 0.2 ppm based on an estimated decrease in exposure of 7% per year. No estimated GSD was available and we have assumed a GSD of 3 as occupational exposure data is typically log normally distributed with GSDs typically around 3.

In industries in which exposure arises due to the use of TCE in metal degreasing (NACE 28, 29, 30, 31, 34, 35 and 36), German exposure measurements from the 1990s are likely to be representative of current exposure levels across the EU. Following the implementation of the German emission legislation 2.BImSchV in 1986 (and a revision in 1990), type V closed system metal degreasing machines have been required in Germany since the early 1990s. Stakeholder information has indicated that by the beginning of 2011 type V closed system metal degreasing machines will be in use across the EU and exposures levels across the EU will be similar to those seen in Germany since the 1990s. The average exposure level from 159 measurements taken in Germany between 1990 and 1995 was 10 ppm. The GM or GSD are not available. A GSD of 3 was assumed. To estimate the GM from the arithmetic mean of 10 ppm

exposure distributions were simulated with Monte Carlo simulation in @Risk using different geometric means. Ten thousand data points were generated per simulation. A distribution with a GM of 5.5 ppm and a GSD of 3 was found to have an arithmetic mean of 10 ppm. We have selected 5.5 ppm as a reasonable estimate of GM exposure during metal degreasing in the EU.

Table 2.7 Estimated current 2010 trichloroethylene levels for medium and high exposure industries

NACE Code	Industry	Estimated Geometric Mean (ppm)	Estimated Geometric Standard Deviation
22	Printing, publishing and reproduction of recorded media	0.6	2.9
24	Manufacture of chemicals and chemical products	0.2	3
28	Manufacture of fabricated metal products, except machinery and equipment	5.5	3
29	Manufacture of machinery except electrical	5.5	3
30	Manufacture of office machinery and computers	5.5	3
31	Manufacture of electrical machinery, apparatus, appliances and supplies	5.5	3
34	Manufacture of transport equipment	5.5	3
35	Manufacture of other transport equipment	5.5	3
36	Manufacture of furniture; manufacturing nec	5.5	3

We have assumed that the exposures presented for high exposure groups in Table 2.3 are typical of exposures throughout the EU. The overall weighted GM and GSD was estimated across all medium high exposure industries across the EU using @Risk © (Palisade Corporation, New York). Exposures were simulated using the GM and GSD for each industry. The number of values each country contributed was weighted according to the number of workers exposed in that industry.

The estimated overall weighted GM exposure across all countries and industries is 4.6 with a GSD of 3.7

The exposure distribution for the EU was simulated using Monte Carlo simulation. The distributions for each high exposure industry were based on the GMs and GSDs presented in Table 2.7 and the overall distribution across all industries was based on a GM of 4.6 and a GSD of 3.7. The percentage of workers who are expected to be exposed above the typical OEL (10 ppm and 50 ppm) was estimated with the simulated distributions (Table 2.8).

Table 2.8 Estimated percentage of workers exposed above the typical EU OELs (10 and 50 ppm)

Industry		Estimated percentage of workers exposed above 10 ppm (%)	Estimated percentage of workers exposed above 50 ppm (%)
22	Printing, publishing and reproduction of recorded media	<1	0
24	Manufacture of chemicals and chemical products	<1	0
28	Manufacture of fabricated metal products, except machinery and equipment	29	2
29	Manufacture of machinery except electrical	29	2
30	Manufacture of office machinery and computers	29	2
31	Manufacture of electrical machinery, apparatus, appliances and supplies	29	2
34	Manufacture of transport equipment	29	2
35	Manufacture of other transport equipment	29	2
36	Manufacture of furniture; manufacturing nec	29	2
OVERALL (All high exposure industries)		28	4

2.3.3 Temporal change in exposure

The available scientific literature was reviewed for historic TCE occupational exposure data. Although the results of numerous studies have been reported in the literature (see summary Tables 5, 6 and A2), only one study has looked at the average annual decrease in exposure. Raaschou-Nielsen *et al.,* (2002) demonstrated an average annual decrease in TCE exposure of 4% from 1947 to 1964 and 15% between 1964 and 1989. Since the conversion to closed systems is mostly complete, it is likely that the annual decrease since 1989 has been less than 15%. For current exposures, a percentage decline in exposure of 7% has been assumed based on the findings of the Creely *et al* (2007) study mentioned above.

Von Grote *et al.,* (2003) has shown that in Germany the combined effect of technological innovation and stricter legislation led to significantly reduced airborne concentrations of TCE. The authors concluded that with the long-term near-range concentration for type Va (closed machines, without vacuum technology) was below 5 ppm and that for type Vb machines (closed machines, with vacuum technology) was below 2 ppm. It is expected that at the start of 2011, once the SED and voluntary industry commitment are fully implemented, similar levels can be achieved in other EU countries.

2.4 HEALTH IMPACT FROM CURRENT EXPOSURES

2.4.1 Background data

The occupational cancers associated with trichloroethylene exposure are shown in Table 2.9, along with a summary of the information used in the health impact assessment.

Table 2.9 Occupational cancers associated with exposure to trichloroethylene

Cancer site	**Liver and biliary tract**		**Kidney**		**NHL**	
ICD-10 code	C22		C64		C82-C85	
IARC group for carcinogen	2A		2A		2A	
Strength of evidence for cancer site [1]	Suggestive		Suggestive		Suggestive	
Latency assumption	10-50 yrs		10-50 yrs		0-20 yrs	
Source of forecast numbers - deaths	Eurostat, 2006		Eurostat, 2006		Eurostat, 2006	
Source of forecast numbers - registrations	GLOBOCAN[16], 2002		GLOBOCAN, 2002		GLOBOCAN, 2002	
Exposure levels	Relative Risk (RR)	Source of RR	Relative Risk (RR)	Source of RR	Relative Risk (RR)	Source of RR
"High"	1.9 (1-3.4)	Wartenberg *et al.* (2000), liver cancer estimate	1.7 (1.1-2.7)	Wartenberg *et al.* (2000)	1.5 (0.9-2.3)	Wartenberg *et al.* (2000)
"Medium"	1.8 (1.1-2.9)	Wartenberg *et al.* (2000)	1.41 (0.46-3.30)	Ruder *et al.* (2001)	1.4 (0.7-2.8)	Wartenberg *et al.* (2000)
"Low"	0.9 (0.5-1.9) (set to 1)	Wartenberg *et al.* (2000)	1.3 (0.9-1.7)	Wartenberg *et al.* (2000)	0.9 (0.6-1.4) (set to 1)	Wartenberg *et al.* (2000)

[1] Based on Siemiatycki *et al,* 2004

2.4.2 Exposed numbers and exposure levels

Industry sectors, their NACE codes and classifications to High/Medium/Low/Background exposure as applicable for the mid 1970's are given in Table 2.3 in the previous section on the exposure. The estimated average exposure level (GM) and measure of variability (GSD) across NACE industries used are 4.6 ppm and a geometric standard deviation of 3.7 in 2010.

We present data for a "baseline" trend scenario which for all industries assumes a 7% annual decline in exposure levels and standard change in employed numbers up to the 2021-30 estimation interval and constant levels thereafter.

[16] IARC, GLOBOCAN database, available at: http://www-dep.iarc.fr/globocan/database.htm

2.4.3 Forecast cancer numbers

Separate estimates for total numbers of deaths for kidney and liver cancer by age band are available from EUROSTAT for the 27 countries of the EU, for 2006. Deaths for NHL were estimated by applying deaths from NHL (ICD10 codes C82-C85) for Great Britain (2005) as a proportion of deaths from ICD10 codes C81-C96 to the C81-C96 data by country from Eurostat. Total numbers of registrations are available for all three cancers from GLOBOCAN for 2002. The forecast numbers of deaths and registrations by country used to estimate attributable numbers are in Appendix 8.3.

2.4.4 Results

The cancer deaths and registrations attributed to occupational exposure to trichloroethylene for the baseline scenario are presented per year for the target years given and are based on the working age cohort of currently (2006) exposed workers. Attributable fractions and numbers of deaths and registrations, and Years of Life Lost (YLLs), Years Lived with Disability (YLDs) and Disability Adjusted Life Years (DALYs), are estimated.

As the exposure data suggests that exposure declines over time, a dynamic baseline scenario has been used.

A summary of the results for liver cancer, kidney cancer and non-Hodgkin's lymphoma for the total EU is in Table 2.10 below.

Table 2.10 Results for the baseline forecast scenario, total EU (27 countries), men plus women

Scenario	**All scenarios**		**Baseline (trend) scenario (1) - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.**			
EU Total	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Numbers ever exposed	291,882	299,942	310,620	315,914	319,370	321,932
Proportion of the population exposed	0.081%	0.079%	0.080%	0.080%	0.081%	0.084%
Liver cancer						
Attributable Fraction	0.071%	0.066%	0.058%	0.047%	0.035%	0.025%
Attributable deaths	34	37	38	35	28	21
Attributable registrations	34	36	37	33	25	18
'Avoided' cancers						
YLLs	481	509	506	437	331	243
DALYs	490	519	516	445	338	247
Kidney cancer						
Attributable Fraction	0.046%	0.042%	0.038%	0.034%	0.031%	0.030%
Attributable deaths	13	14	14	15	15	15
Attributable registrations	31	32	33	32	30	29
'Avoided' cancers						
YLLs	189	196	196	188	179	174
DALYs	216	224	223	215	205	198

Scenario	All scenarios		Baseline (trend) scenario (1) - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.			
EU Total	2010	2020	2030	2040	2050	2060
NHL						
Numbers ever exposed	213,655	216,910	220,378	221,459	221,459	221,459
Proportion of the population exposed	0.054%	0.053%	0.054%	0.055%	0.057%	0.059%
Attributable Fraction	0.042%	0.033%	0.023%	0.016%	0.017%	0.017%
Attributable deaths	12	10	8	6	7	7
Attributable registrations 'Avoided' cancers	28	24	19	14	15	15
YLLs	196	167	127	92	96	98
DALYs	198	169	129	94	97	99

The attributable deaths in the EU 2010 from previous trichloroethylene exposures were relatively small: 34 for liver cancer, 13 for kidney cancer and 12 for NHL. The estimated deaths and cancer registrations decrease steadily over the following 50 years for liver cancer and NHL so that by 2060 there are only 21 liver cancer deaths and 7 NHL deaths from trichloroethylene exposure predicted to occur. The estimated deaths from kidney cancer remain fairly constant over the 50 years with 15 deaths expected to occur in 2060. The corresponding estimated attributable fraction for all three cancers are expected to decrease between 2010 and 2060, with expected decreases from 0.07% in 2010 to 0.03% in 2060 for liver cancer, 0.05% in 2010 to 0.03% in 2060 for kidney cancer and 0.04% in 2010 to 0.02% in 2060 for NHL. DALYs also are predicted to decrease over the 50 year period – from 490 years for liver cancer in 2010 to 247 years in 2060, 216 years in 2010 to 198 years in 2060 for kidney cancer and 198 years in 2010 to 99 years in 2060 for NHL.

2.5 POSSIBLE COSTS ASSOCIATED WITH NOT MODIFYING THE DIRECTTIVE

2.5.1 Health impacts – possible costs under the baseline scenario

Introduction

The health data (cancer registrations and Years of Life Lost - 'YLL') for the baseline in which there are no further modifications to the Carcinogens Directive are shown in section 2.4 of this report. These data show that there are predicted to be a significant number of cancer registrations and YLLs from liver, kidney and non-hodgkins lymphoma (NHL) resulting from predicted future exposure to trichloroethylene. There is predicted to be a decline in registrations and YLLs over time as a result of predicted exposure reduction owing to implementation of existing and ongoing risk management measures across the EU.

Method in brief

Using the health data (cancer registrations and YLL), it is possible to monetise the costs under the baseline by estimating the:

- Life years lost – This is calculated by using the YLL and multiplying this by a valuation of the Value of Life Year Lost (VLYL). This gives a value for the time (in years) lost as a result of premature death.
- Cost of Illness (COI) –This is a monetary cost of the time spent with cancer. In this study, a unit COI estimate is multiplied by the number of cancer registrations, give a total value for COI. (COI is often the main market-based approach in relation to health impact[17]). COI includes the direct and indirect costs of cancer but not the intangible costs (see below).
- Willingness to Pay (WTP) to avoid cancer – WTP in this study is used as an alternative method (high cost scenario) based on publically available, peer reviewed studies on what people would be willing to pay to avoid having cancer. This includes various intangible costs (such as disfigurement, functional limitations, pain and fear) and includes the costs associated with life years lost.

The cost variables used in this study are presented in Table 2.11 in 2010 prices. For the purposes of this study, valuations are increased by 2% each year in the future in part to present costs in real terms (i.e. adjusting for inflation in prices) and to reflect the increasing value society attaches to its health (as economic growth typically increases over a long period of time)[18].

Table 2.11 Summary of cost variables used in this study (€2010 prices)

Cost/benefit elements	Low scenario	High scenario
VLYL - Each year lost	€ 50,393	€ 0 (note 1)
COI or WTP - Unit cost (per cancer registration)	€ 49,302 (COI)	€ 1,793,776 (WTP)

(Note 1) – By using WTP (€1.8m) in the high scenario instead of COI, the WTP can include the costs of premature death and therefore there was a risk of double counting benefits if VLYL costs were included.

All costs and benefits over time in this study are discounted using a 4% discount rate as recommended by the European Commission's Impact Guidelines[19]. In order to assess the effect that discounting has on the results ('sensitivity analysis), we have also presented estimates that take into consideration a declining discount rate for impacts occurring after 30 years and no discounting.

The health data shown in section 2.4 are 'snap-shots' (i.e. an estimation for the initial year of a ten year period) of the number of cancer registrations, deaths, YLLs in future years at 10 year intervals. In calculating the costs associated with these effects, each 'snap-shot' result is multiplied by 10 in order to derive an estimate for the whole assessment time period (for example, 2020 results are multiplied by 10 to give results over the period 2020-2029). This assumes that each snap-shot year is representative of the following 10 years.

[17] Source: European Chemicals Agency: http://echa.europa.eu/
[18] This is consistent with some other European Commission studies and is standard practice for air quality under the Clean Air for Europe (CAFE) programme.
[19] European Commission impact Assessment Guidelines (Jan 2009) - http://ec.europa.eu/governance/impact/commission_guidelines/docs/iag_2009_en.pdf

The method to valuing health benefits is explained in more detail in the method paper titled *"Valuing health benefits – Method paper".*

Results

The health costs under the baseline scenario are presented in Table 2.12. Health-related costs are predicted to decline over time and are predominately the result of historical exposure. As set out in Section 2.4, the numbers of cancer registrations and YLLs are estimated to decline over time, accounted for by risk management measures (RMMs) already implemented during trichloroethylene manufacture and end use over the past 10-20 years. These include, for example, increased prevalence of enclosed cleaning systems, replacement of use in textile ("dry") cleaning and other small uses.

The introduction of an EU-wide OEL is not expected to have a significant impact in the short term given that the largest Member States already have a national OEL in place (although the stringency of the OELs varies by Member State). Table 2.12 sets out the ranges of health costs for each representative decade. The ranges are based on the high and low cost scenarios (see Table 2.11). The results are also illustrated in Figure 2.1.

Table 2.12 Health costs – baseline scenario – 2010 to 2070 (Present Value – 2010 €m prices)

Costs by Gender (€m)	**2010-2019**	**2020-2029**	**2030-2039**	**2040-2049**	**2050-2059**	**2060-2069**	**Total**
Female	105 to 360	86 to 291	68 to 228	50 to 172	37 to 133	26 to 103	105 to 1,287
Male	337 to 1,187	282 to 993	224 to 792	164 to 596	118 to 455	85 to 347	1,210 to 4,370
Total	442 to 1,547	368 to 1,284	292 to 1,020	214 to 767	155 to 589	111 to 450	1,582 to 5,657

Notes:
- All costs are presented in present value using a discount rate of 4%. The low range is based on low estimates for costs of illness and life years lost. The upper range of costs relate to WTP estimates to avoid having cancer, which include intangible costs associated with having cancer.
- Totals may not match to sums of females and male costs due to underlying small differences in raw data and rounding to whole number

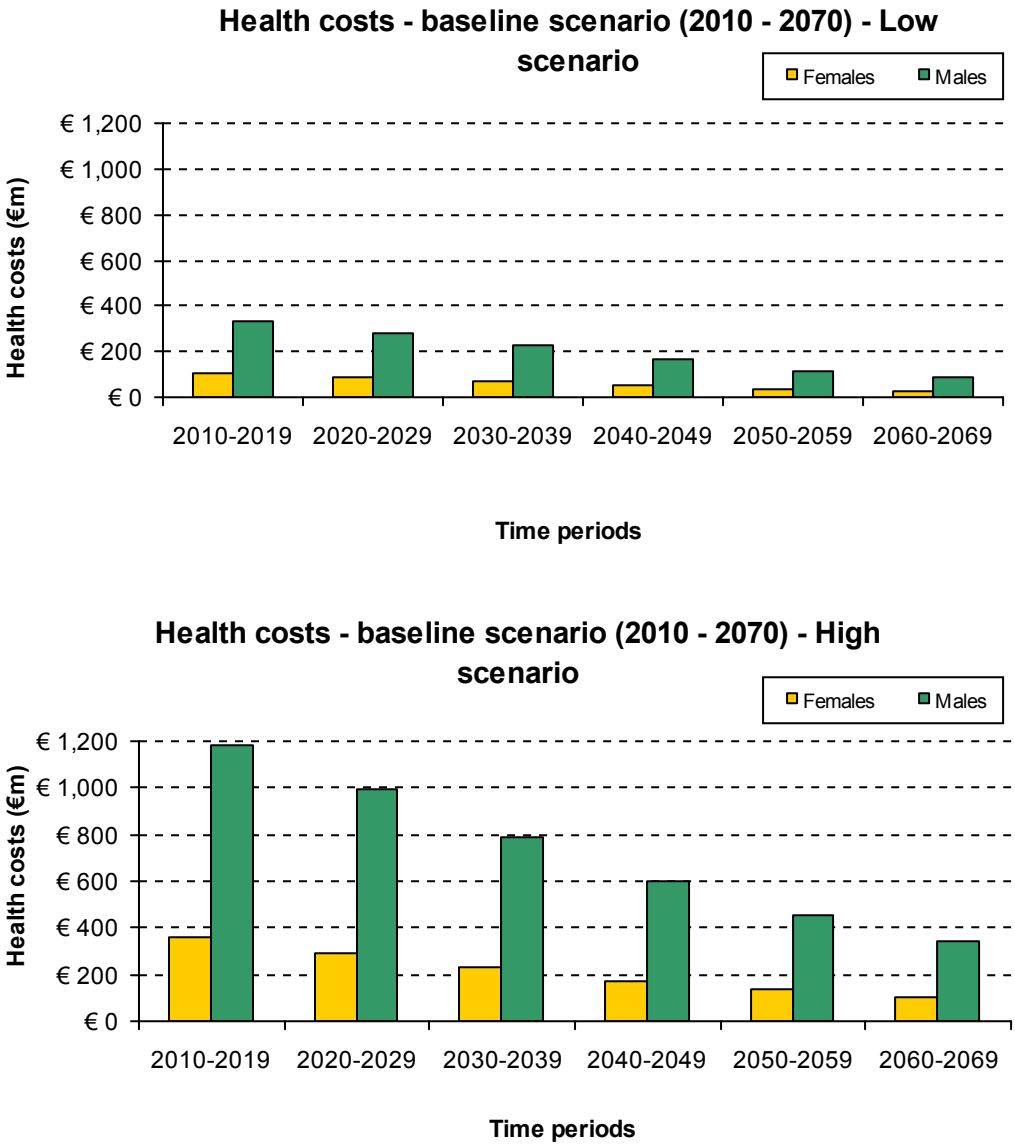

Figure 2.1 Health costs – baseline scenario – 2010 to 2070 (Present Value – 2010 €m prices)

These costs will affect Member States differently depending upon the overall number of workers within affected industry groups, existing RMMs and the proportion of males and females within these groups. Figure 2.2 shows that France, Germany and Italy are predicted to have relatively high health costs. The industrial sectors estimated to be most affected under the baseline are the sectors manufacturing metal products, transport equipment and furniture (all assumed to relate to use of the substance in metal degreasing). There are also notable impacts in the manufacture of motor vehicles and manufacture of machinery. This is shown in Figure 2.3.

Detailed tables are included in the Appendix 8.4.

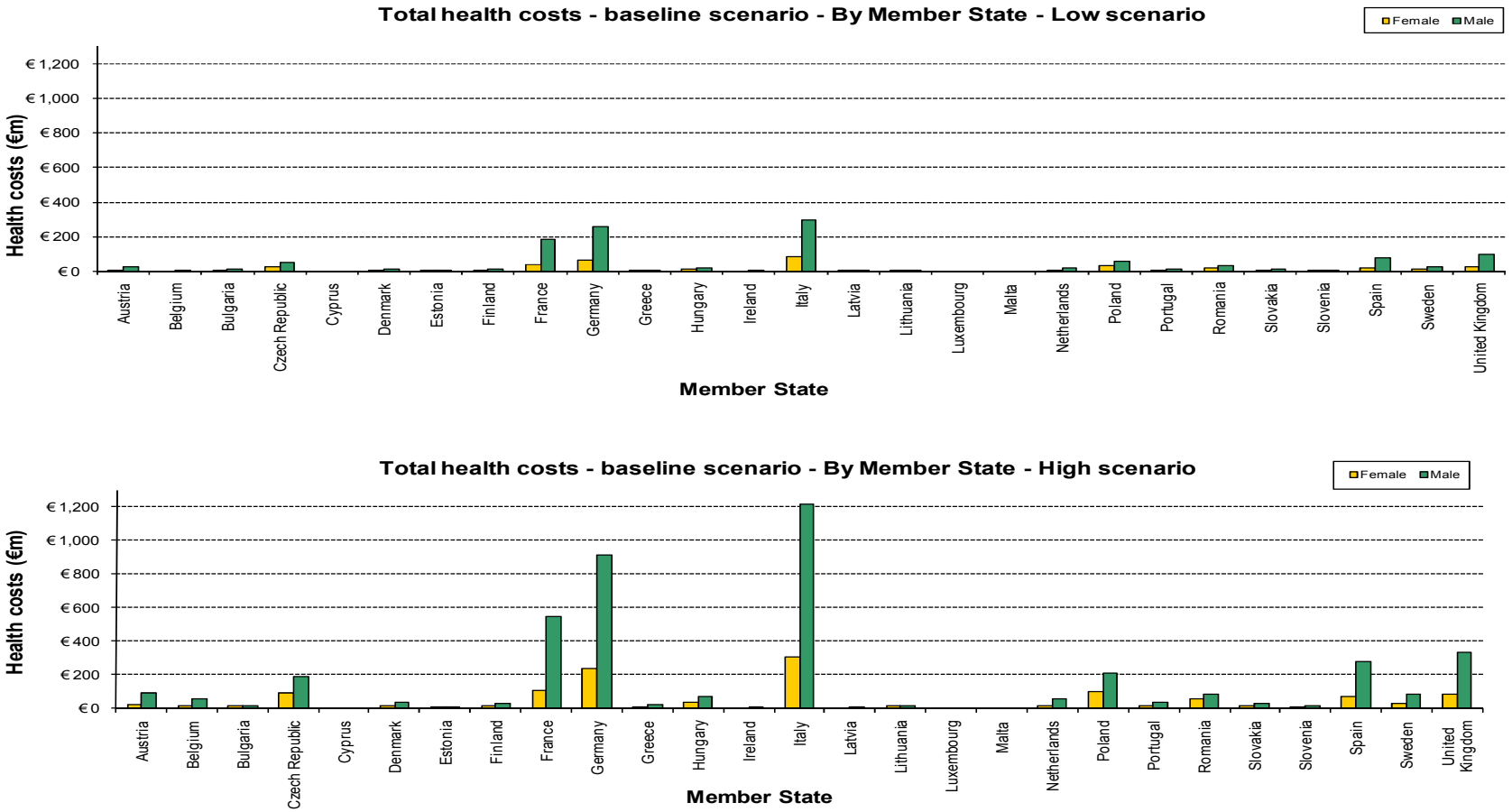

Figure 2.2 Total health costs – baseline scenario – By Member State (Present Value – 2010 €m prices)

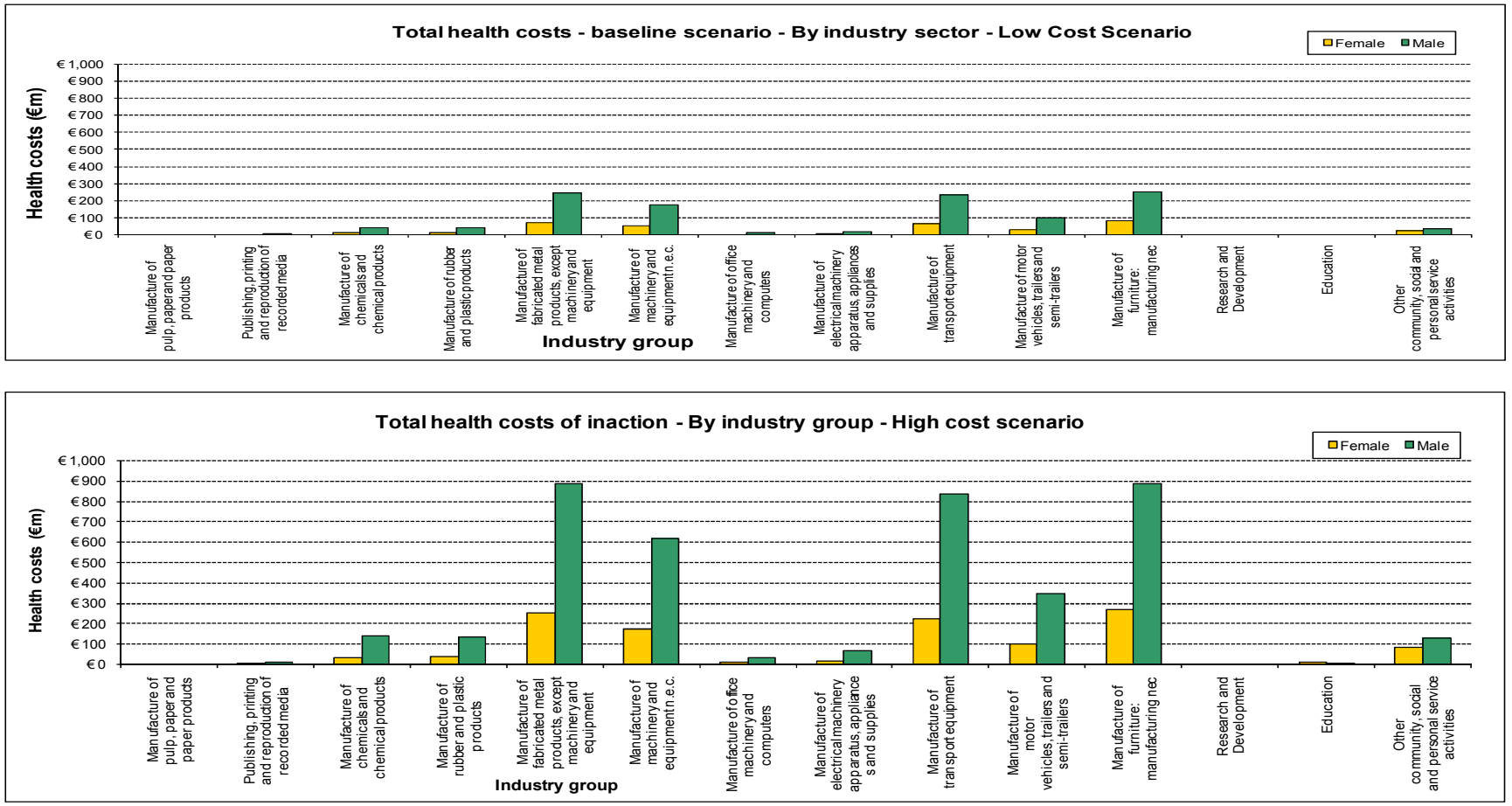

Figure 2.3 Total health costs – baseline scenario – by industry group (Present Value – 2010 €m prices)[20]

[20] Charts exclude industries for which zero costs are estimated.

In order to present all socio-economic costs and benefits consistently in present value terms, all future costs and benefits have been discounted. The primary approach was to apply the European Commission IA recommended 4% discount rate. Since most health impacts occur over a long period of time relative to costs, the impacts of discounting are significant.

In Figure 2.4, the effects of different discount rates on the overall results are shown, indicating that the impacts of discounting become more pronounced the further in the future that the impact occurs.

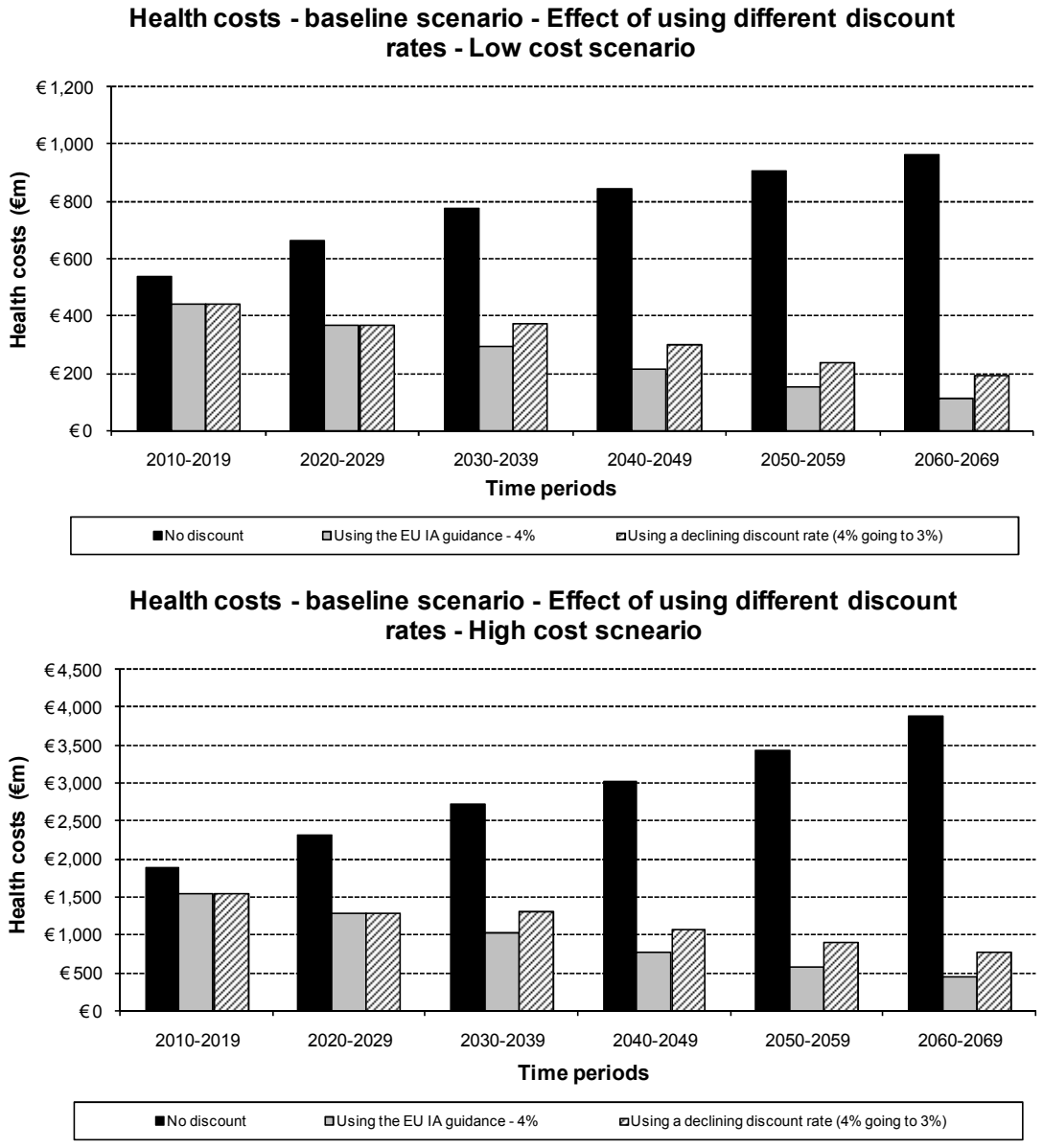

Figure 2.4 Impacts of discounting

3 POLICY OPTIONS

3.1 DESCRIPTION OF MEASURES

3.1.1 Existing exposure controls in the sector

The solvent emissions directive

The use of trichloroethylene (and of other solvents[21]) in metal degreasing is regulated by the solvent emissions directive (SED)[22]. The objective of the SED is to reduce the direct and indirect effects on the environment and on human health of emissions (mainly to air) of volatile organic compounds.

According to the environmental risk reduction strategy for trichloroethylene (RRS)[23], the main measure available to reduce emissions of trichloroethylene, to below the emission limits imposed by the SED, is to implement closed systems for degreasing where open systems were in place. Indeed, the review of available documentation, as well as consultation with ECSA (the main EU trade association representing the substance) for this report did not identify specific technical measures that could be used to achieve compliance with OELs, other than the use of closed systems.

Although the emission limits set out in the SED are environmental targets, it is anticipated they are still of relevance for OELs. These emission limits have to be complied with at a site level in terms of emissions in waste gases (as opposed to a workshop/process level) whereas OELs have to be complied with in the direct environment of the process, i.e. in each hall or workshop where a process involving trichloroethylene is carried out.

The emission limit values under the SED are 2 mg/m^3 where the mass flow is over 10g/h and 20 mg/m^3 where the mass flow is less than 10g/h. These correspond to around 3.7ppm and 0.4ppm, respectively. These are lower than the most common OEL (50ppm 8-hour TWA) and also lower than the value of 10ppm proposed by the SCOEL.

With regard to the use of trichloroethylene in the surface cleaning sector, different options are set out in the directive that would apply to this use:

- For consumption of the solvent (in this case trichloroethylene) above 1 tonne per annum, compliance with emission limits.
- Application of a ‘reduction scheme’, in which emissions of the solvent (in this case trichloroethylene) can be reduced by other means, but achieving

[21] Volatile organic compound (VOC) and organic solvent are defined in Council Directive 1999/13/EC

[22] Council Directive 1999/13/EC of 11 March 1999 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations.

[23] DEFRA (2005) Risk Reduction Strategy and Analysis of the Advantages and Drawbacks for Tetrachlorotheylene. Available at: http://www.defra.gov.uk/environment/quality/chemicals/documents/report-tetra060203.pdf

an equivalent level of emission to that which would have been achieved if the emission limits were applied.

Given the classification of trichloroethylene as 'may cause cancer' (R45), the SED also requires that use should be substituted within 'the shortest possible time'[24, 25] .

Table 3.1 summarises the main requirements of the SED for trichloroethylene in the metal degreasing sector.

Table 3.1 Main Requirements of SED that apply to trichloroethylene used in surface cleaning

Requirement	Details for Trichloroethylene
Threshold for inclusion	1 tonne per year
Emission limits (waste gases)	2 mg/Nm^3 (20 mg/Nm^3 where mass flow < 10g/h)
Substitution of solvents	Substitute trichloroethylene within the "shortest possible time"

Consultation with metal degreasing companies was undertaken for the environmental RRS for trichloroethylene[26]. From this consultation three possible routes to comply with the above requirements were suggested:

1. substitution with alternative solvents that are not classified as CMRs;
2. reducing solvent consumption to below 1 t/yr to fall out of the scope of the Directive; or
3. reducing emissions to below the 2 mg/m^3 level.

The first two compliance options were considered to be the preferred options across the sector. This may partly explains the sharp decrease in the overall sales of trichloroethylene as a solvent over recent years (see Table 1.2).

Whilst the SED does not specify averaging periods for the limit values for emissions to air in the workplace, an emission limit of 20 mg/m^3 is equivalent to less than 5 ppm, half of the OEL recommended by the SCOEL and well below most of the national OELs presented in Table 1.1. During communication with ECSA for this study, they did not

[24] This also applies to substances labelled R46 (may cause heritable genetic damage), R49 (may cause cancer by inhalation), R60 (may impair fertility) and R61 (may cause harm to the unborn child).

[25] According to Article 7(1) of the Directive: "The Commission shall ensure that an exchange of information between Member States and the activities concerned on the use of organic substances and their potential substitutes takes place. It shall consider the questions of: fitness for use, potential effects on human health and occupational exposure in particular; potential effects on the environment, and the economic consequences, in particular, the costs and benefits of the options available, with a view to providing guidance on the use of substances and techniques which have the least potential effects on air, water, soil, ecosystems and human health. Following the exchange of information, the Commission shall publish guidance for each activity."

[26] DEFRA (2005) Risk Reduction Strategy and Analysis of the Advantages and Drawbacks for Tetrachlorotheylene. Available at: http://www.defra.gov.uk/environment/quality/chemicals/documents/report-tetra060203.pdf

indicate specific additional risk reduction measures would be used to comply with a national OEL. It is assumed that when compliance with the SED emission limit values is met through use of closed degreasing systems that this, in general, also allows the national OELs to be met[27].

3.1.2 Additional actions needed to comply with a Community-wide OEL

The requirements of the SED for metal degreasing and the ECSA charter (the latter applicable from the end of 2010) would be expected to be sufficient to allow an EU - wide OEL to be met, if set at the most commonly applied adopted value of 50 ppm 8-hour TWA. However, there may be some metal cleaning installations that fall outside the scope of the SED and which do not apply closed systems that allow an OEL of 10 ppm (as proposed by the SCOEL) to be met. It is assumed that such companies would be required to implement closed systems in order to comply with such an OEL or to use alternative cleaning solvents to trichloroethylene.

3.2 LEVEL OF PROTECTION ACHIEVED (OELS)

Companies covered by the solvent emissions directive

We have not gathered detailed data on compliance with national OELs for trichloroethylene. In the absence of this we have assumed that the use of enclosed vapour degreasing allows industry to comply with existing national OELs. This seems to be corroborated through consultation with ECSA (Personal Communication for this study) who did not identify the use of equipment other than closed systems to specifically reduce exposure of workers.

Companies not covered by the solvent emissions directive

For companies using less than 1 tonne of trichloroethylene per year, there is no requirement under the SED to comply with emission limit values or to substitute trichloroethylene. Nevertheless, OELs still apply to such companies (as does the obligation under Article 4 of the Carcinogens Directive to replace the substance where technically feasible). As stated above, the use of closed degreasing systems is understood to be the main means of complying with the SED emission limit values and assumed also to allow compliance with national OELs. We assume therefore that closed vapour degreasing systems would be required by companies that do not have to comply with SED in order to comply with a Community-wide OEL for trichloroethylene.

In practice, it may be the case that companies using trichloroethylene for metal degreasing will already use closed vapour degreasing systems, or will do so in the near future. This results in part from to the recent introduction of an industry agreement, signed by all European manufacturers of trichloroethylene. This 'Charter for the safe use of Trichloroethylene in metal cleaning' commits the signatories to phase out sales of trichloroethylene for open metal-cleaning systems by 31 December 2010[28]. According to the charter, only end-users customers that have signed, as a pre-

[27] Personal communication with ECSA, July 2009.
[28] Available at: http://www.eurochlor.org/qandatrienglish (accessed August 2009) and personal communication with ECSA, July 2009

condition of purchase, a declaration of conformity stating that they use trichloroethylene in closed systems[29], will be permitted to purchase trichloroethylene from European suppliers.

Conclusions on existing exposure controls

It appears that using trichloroethylene in closed vapour degreasing systems is the main risk reduction measure available to the metal degreasing sector. The application of the SED has promoted the use of vapour degreasing systems in order to comply with the emission limits set in the Directive, for those companies consuming over 1 tonne of trichloroethylene per year. We understand (from limited consultation) that these closed systems also allow reduction of emissions to the workplace to levels that are below the national OELs.

For companies outside of the scope of the SED because of their low trichloroethylene consumption, closed systems seem likely to be implemented in Europe as a result of the voluntary industry agreement (Charter for the safe use of Trichloroethylene in metal cleaning). This agreement is expected to be implemented such that sales of trichloroethylene for open metal-cleaning systems will be phased out by the end of 2010.

It is also worth noting that users of trichloroethylene can be subject to the SED even with a low consumption of trichloroethylene (below 1 tonne per annum) where they also consume other solvents that are subject to the SED, with a total consumption of solvents above 1 tonne per annum. Therefore, it is understood that there would be some companies complying with the SED (and therefore potentially implementing a closed vapour degreasing system) even where consumption of trichloroethylene is below 1 tonne per annum.

Assuming that the above requirements for implementation of closed systems apply, the only cases where introduction of an EU-wide OEL would be expected to lead to additional requirements (after 2011) would be:

- Where users of trichloroethylene in metal degreasing purchase the substance from suppliers that are not signatories to the ECSA charter (e.g. those which purchase from manufacturers outside the EU).
- If some of the closed systems are less effective than others, they may only allow certain national OELs to be met (e.g. 50ppm 8h TWA). It is assumed

[29] Closed systems as defined in European Standard EN 12921-4 (Machines for surface cleaning and pretreatment of industrial items using liquids or vapours - Part 4: Safety of machines using halogenated solvents), including: (1) Sealed Systems (Type I) in which there is no direct connection between any volume containing a halogenated solvent and the outside environment during normal operation. (2) Collection Chamber Systems (Type Ia) which consist of a collection chamber and one or more process chambers with doors, one door sealing the collection chamber from the process chamber(s), the other from the outside environment. (3) Single Chamber Systems (Type 1b) which consist of a chamber which is used for both processing items and collecting halogenated solvent vapours for recovery. (4) Enclosed Systems (Type II) which consist of a chamber which is used for both processing items and collecting halogenated solvent vapours for recovery.

that less effective systems may not necessarily allow a more stringent OEL (e.g. 10ppm 8h TWA) to be met.

4 ANALYSIS OF IMPACTS

4.1 HEALTH IMPACTS FROM CHANGES TO THE EU DIRECTIVE

4.1.1 Health information

We present data for two "intervention" scenarios as described in Table 4.1 below, compared to the baseline trend scenario described in section 2.4.1.

For trichloroethylene, OELs of 10 and 50 ppm (50 and 273 mg/m^3) are to be tested. Kidney and liver cancer and NHL numbers will therefore be estimated given full compliance[30] to these OELs. Baseline for all industries assumes a 7% annual decline in exposure levels based on the estimate for NACE 22 printing industries (Creely *et al.,* 2007) and standard change in employed numbers up to the 2021-30 estimation interval and constant levels thereafter.

Table 4.1 Baseline and intervention scenarios

Carcinogen **Intervention scenarios**[1]	**Trichloroethylene**
Baseline (trend) scenario (1)	Linear employment and exposure level trends assumed to 2021-30, constant thereafter.
Intervention scenario (2)	Full compliance for OEL = 50 ppm (273 mg/m^3)
Intervention scenario (3)	Full compliance for OEL = 10 ppm (50 mg/m^3)

[1] All intervention scenarios are estimated as change to (1) the baseline scenario

Results for the baseline scenario (1) and intervention scenarios (2) and (3) compared to the baseline scenario are in Figure 4.1 (for attributable registrations), Figure 4.2 (for attributable fractions) and Figure 4.3 (for DALYs) for liver cancer, Figure 4.4, Figure 4.5 and Figure 4.6 for kidney cancer and Figure 4.7, Figure 4.8 and Figure 4.9 for NHL for men plus women for the total EU (27 countries). A summary of the results for kidney and liver cancer and NHL for the total EU is in Table 4.2 below. Due to cancer latency, no effect is seen from interventions in 2010 until 2030.

Introducing full compliance with the trial OELs in 2010 will avoid cancers occurring but only from 2040 onwards for kidney and liver cancers (Figure 4.1 and Figure 4.2 for liver cancer and Figure 4.4 and Figure 4.5 for kidney cancer), and from 2020 onwards for NHL (Figure 4.7 and Figure 4.8). Introducing the higher OEL (50 ppm) in 2010 has no impact on reducing attributable cancers compared to assuming a continuing 7% downward trend in exposure levels to 2021-30 (Figure 4.1, Figure 4.4 and Figure 4.7 suggest more cancers result than under the baseline scenario; this is because we assume 99% rather than 100% compliance to the OEL, with approaching 100% compliance attributable numbers are as for the baseline, see Table 4.2). Introducing

[30] Full compliance is assumed in the intervention scenarios; however, due to modelling restrictions full compliance is modelled as 99% compliance.

the OEL of 10 ppm would avoid 10 liver and 2 kidney cancers by 2060 and 12 cases of NHL by 2030 (earlier due to its shorter latency; 'avoided' NHLs are lower from 2040 as the effect of the continuing baseline 7% decline in exposure levels has more effect).

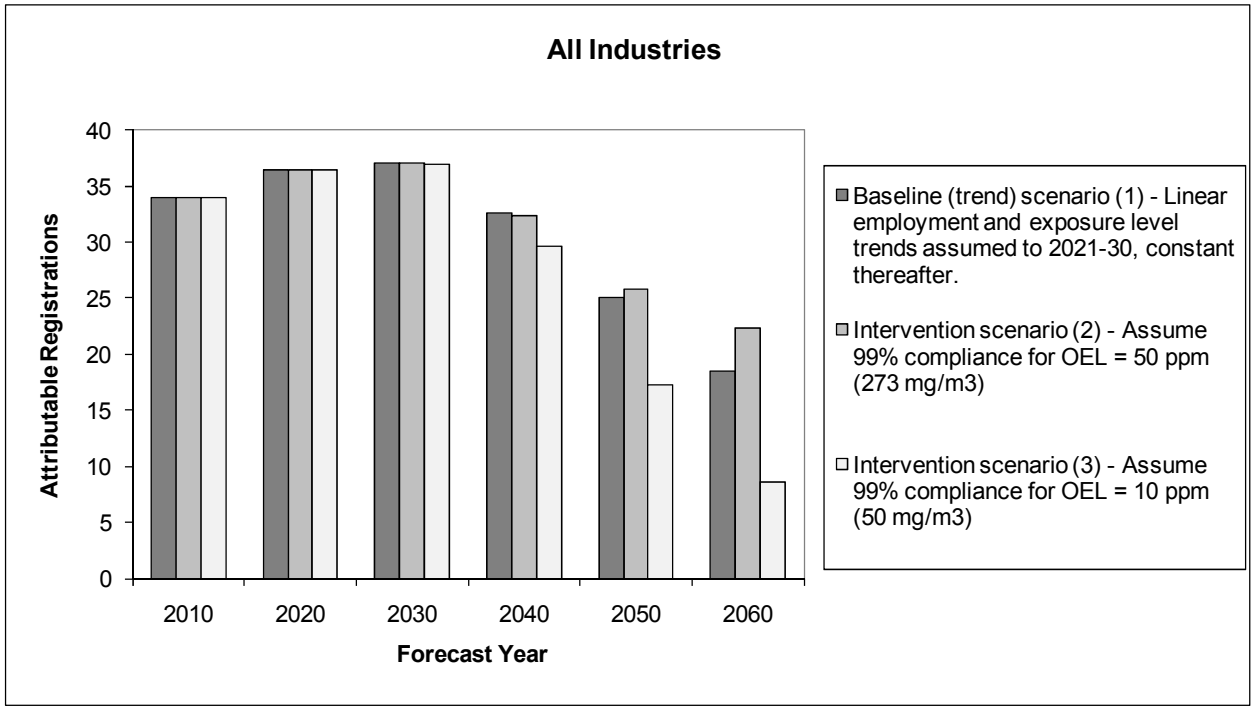

Figure 4.1 Results for intervention scenarios compared to the baseline trend scenario (1) – Occupation Attributable cancer registrations, Liver cancer, men plus women

Figure 4.1 shows the numbers of registrations for liver cancer attributable to trichloroethylene exposure are expected to decrease for all four scenarios over the next 50 years.

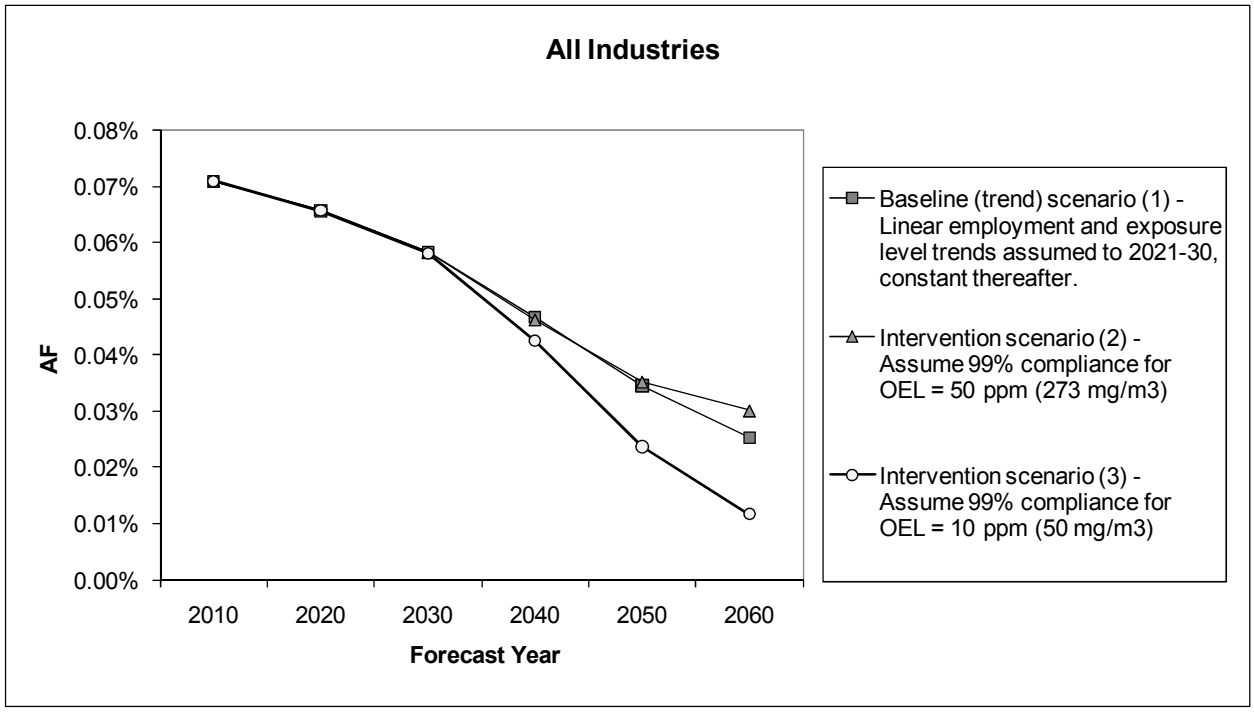

Figure 4.2 Occupation Attributable Fractions, Liver cancer

Figure 4.2 shows that in addition to the number of liver cancer registrations the attributable fraction also decreases over the period up to 2060. By 2060 it is predicted that less than 0.04% of all liver cancer could be attributed to trichloroethylene, regardless of which scenario is followed.

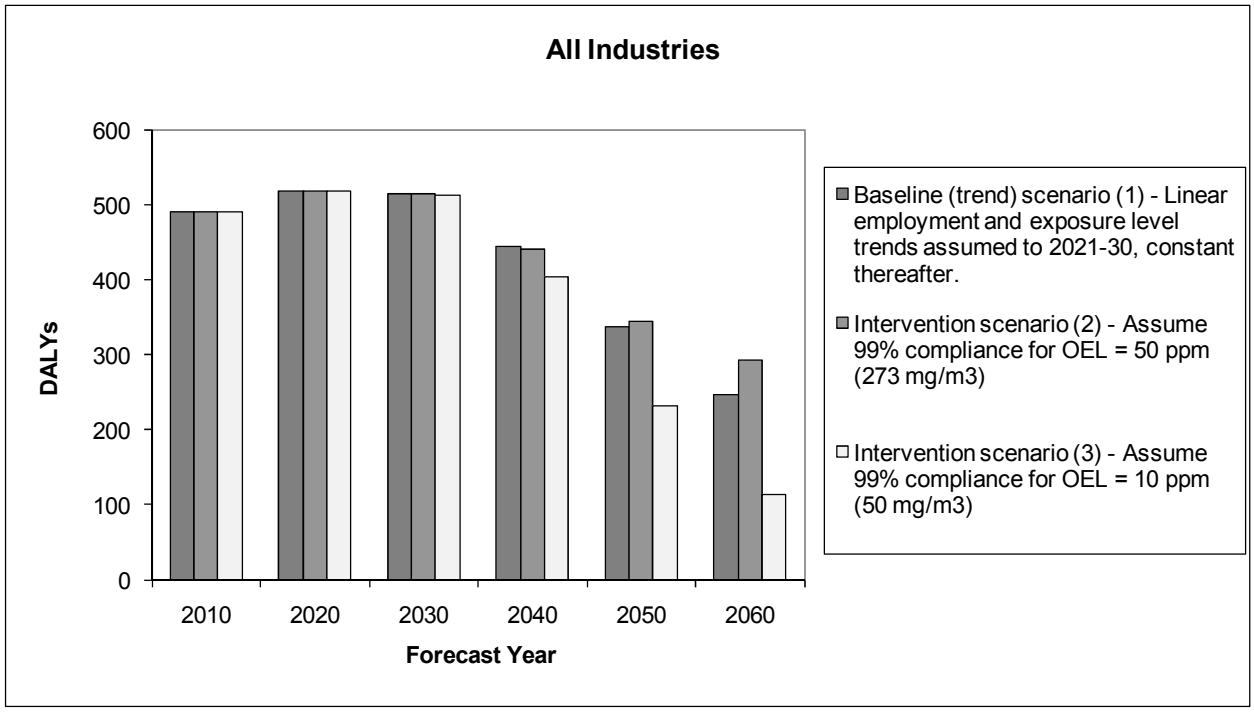

Figure 4.3 Occupation Attributable DALYs, Liver cancer

Additionally, the estimated DALYs are predicted to decrease from just under 500 years in 2010 to less than 300 years in 2060 for all three scenarios (Figure 4.3).

Data for kidney cancer follows a similar pattern to that for liver cancer and these data are shown in Figure 4.4, Figure 4.5 and Figure 4.6.

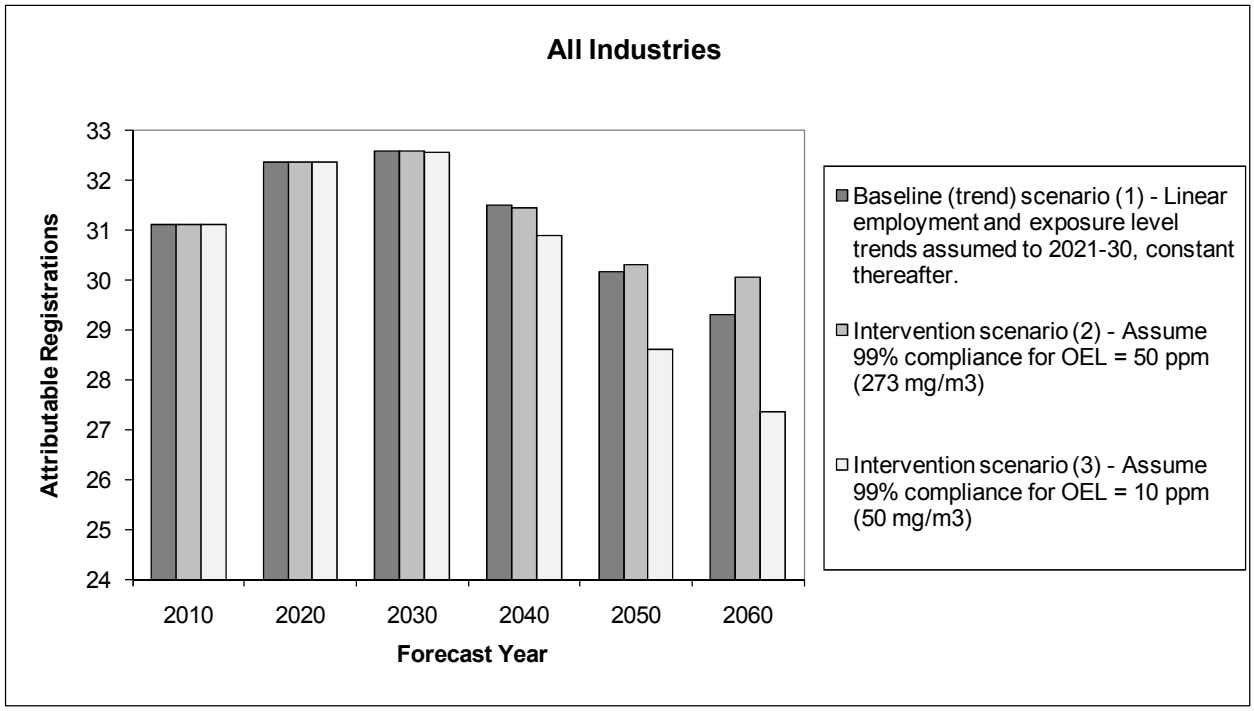

Figure 4.4 Results for intervention scenarios compared to the baseline trend scenario (1) – Occupation Attributable cancer registrations, Kidney cancer, men plus women

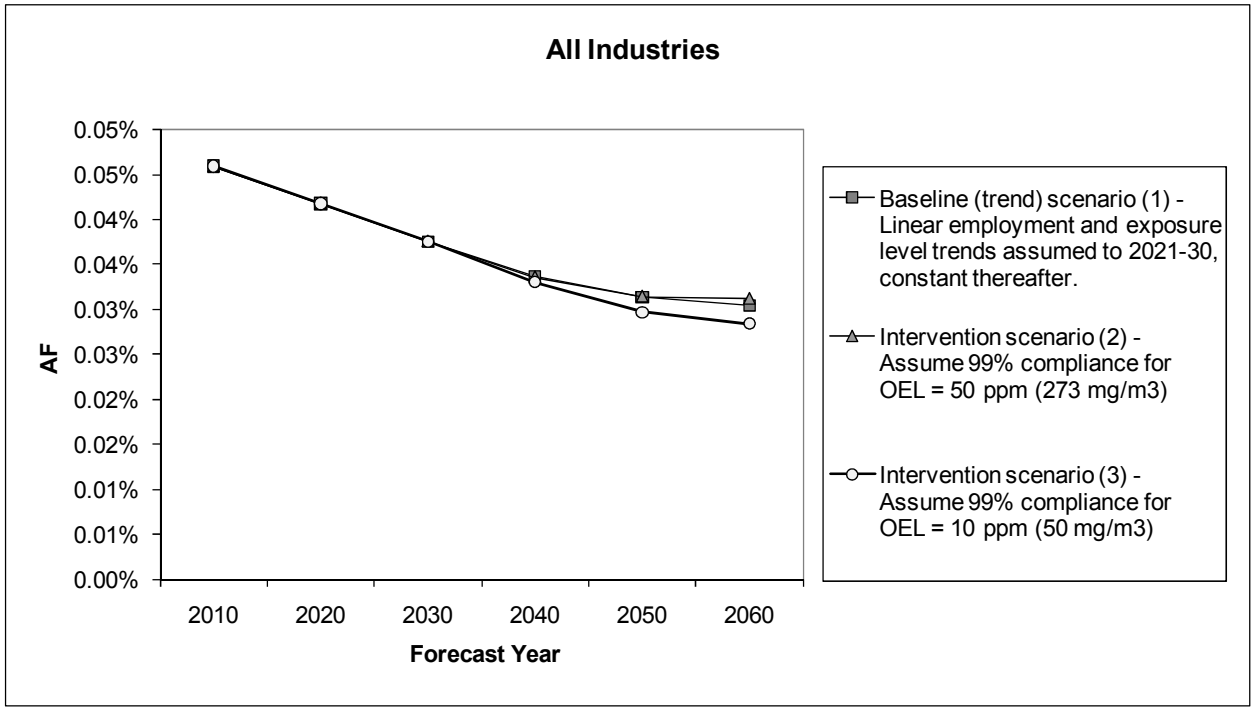

Figure 4.5 Occupation Attributable Fractions, Kidney cancer

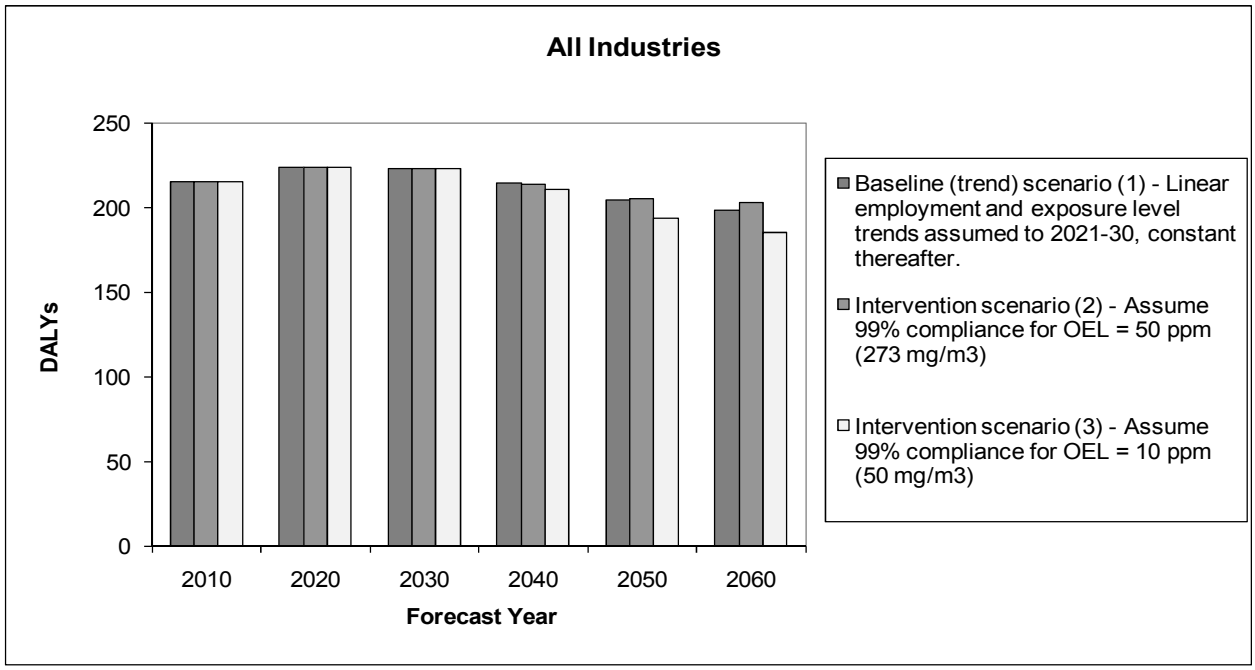

Figure 4.6 Occupation Attributable DALYs, Kidney cancer

Data for NHL follow a different pattern to that for liver and kidney cancer. These data are shown in Figure 4.7, Figure 4.8 and Figure 4.9.

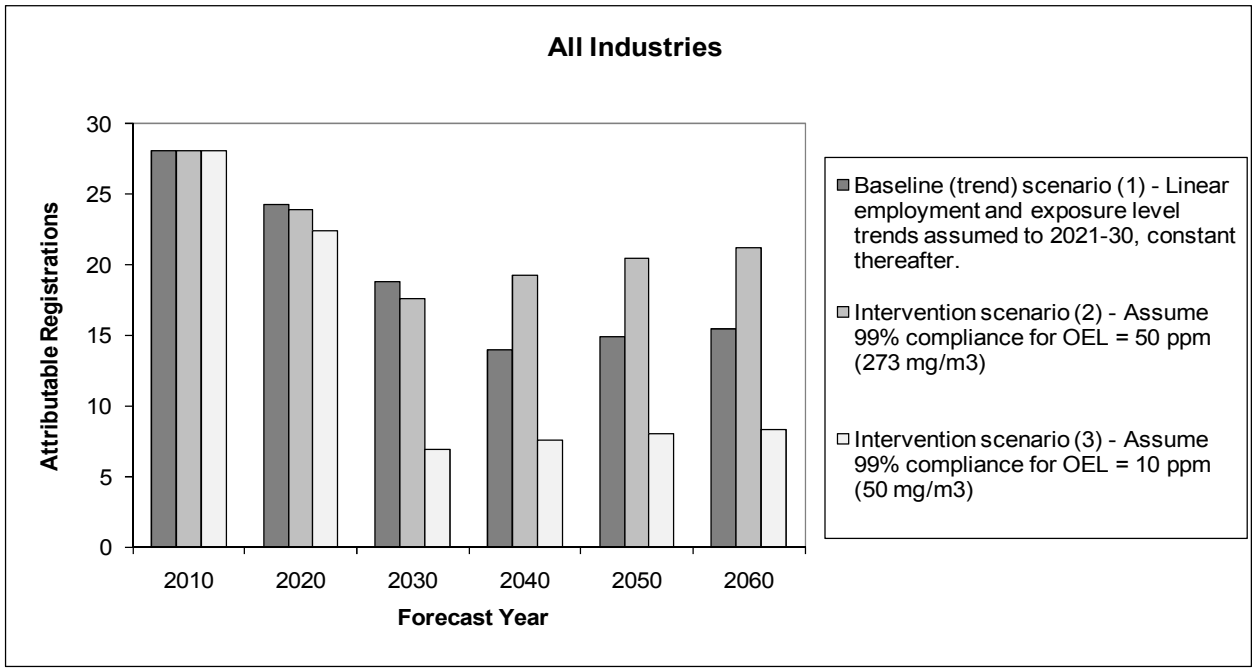

Figure 4.7 Results for intervention scenarios compared to the baseline trend scenario (1) – Occupation Attributable cancer registrations, NHL, men plus women

Figure 4.7 shows that the number of attributable registrations for NHL is expected to decrease between 2010 and 2030 and then increase slightly from 2040 to 2060 for all three scenarios. The attributable fractions and DALYs in Figure 4.8 and Figure 4.9, respectively, show the same pattern as the attributable registrations for NHL.

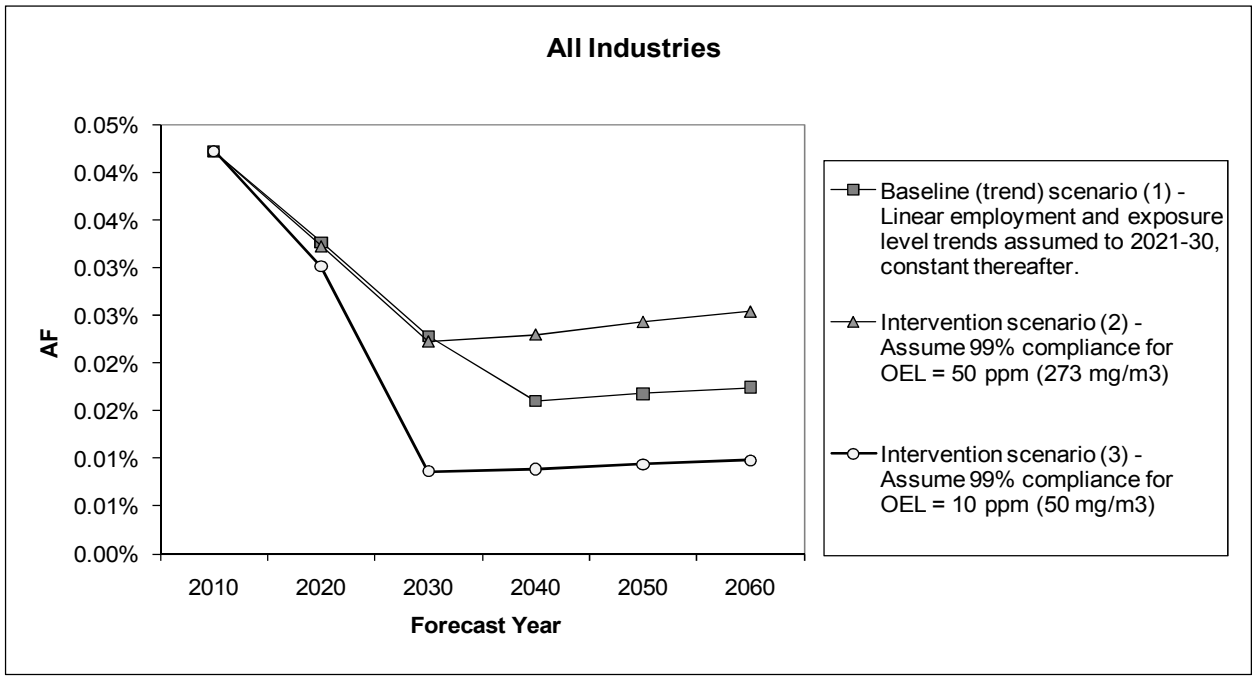

Figure 4.8 Occupation Attributable Fractions, NHL

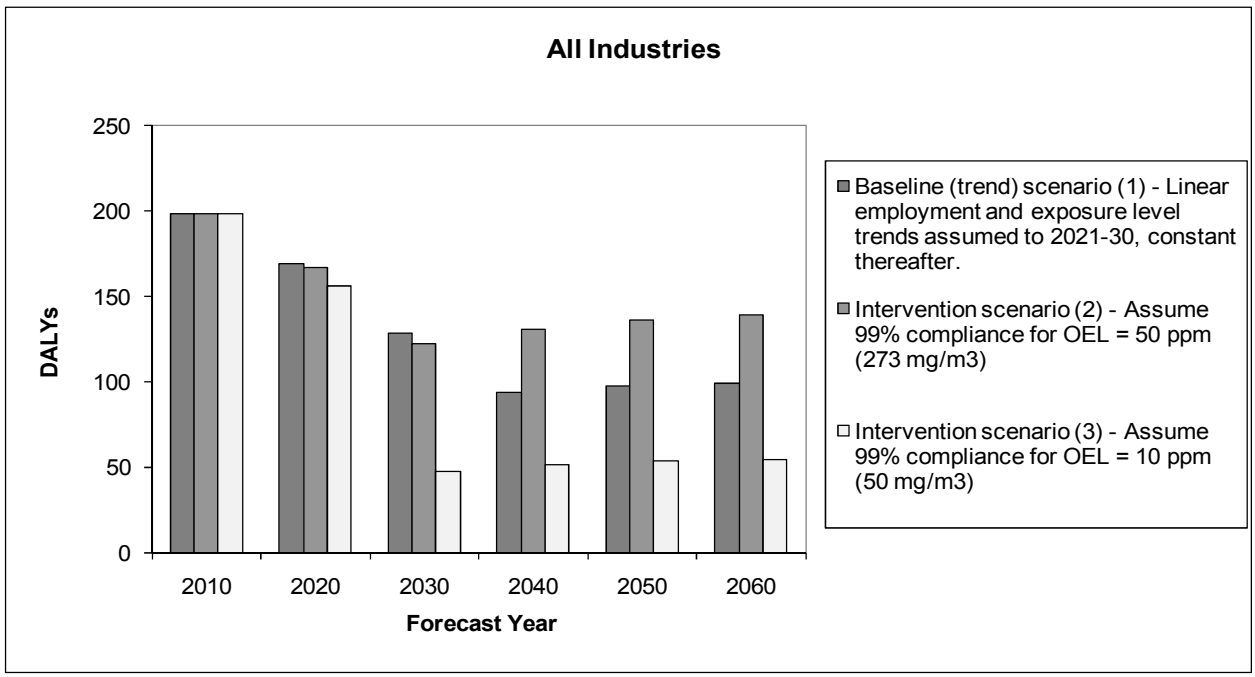

Figure 4.9 Occupation Attributable DALYs, NHL

Table 4.2 summarises the data shown in the previous figures. The data for the first two time periods (2010, 2020) are identical for all scenarios, and then the data for the two interventions are shown in the next two groups of four columns (2030-2060). Attributable deaths for all three types of cancer decrease from 59 deaths in 2010 to 51 deaths in 2060 for scenario 2 (full compliance with OEL of 50 ppm) and 28 deaths in 2060 for scenario 3 (full compliance with OEL of 10 ppm).

In Table 8.5.1 in Appendix 8.5 are the estimated proportions exposed above the OELs to be tested, as estimated under the baseline trend scenario (1). Under the alternative change scenarios they behave as determined by the scenarios.

Full results are given in Appendix 8.5 for men plus women by country and by industry. Estimates of numbers of cancer registrations 'avoided' in each of the forecast target years from 2030 onwards relative to the baseline scenario can be obtained by subtraction. Data for men and women separately, and by industry within country, are available in supplementary spreadsheets (*TCE Report data.xls*), if required.

Table 4.2 Results for the intervention scenarios, total EU (27 countries), men plus women

Scenario	All scenarios		Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m^3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m^3)			
EU Total	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Numbers ever exposed	291,882	299,942	310,620	315,914	319,370	321,932	310,620	315,914	319,370	321,932
Proportion of the population exposed	0.081%	0.079%	0.080%	0.080%	0.081%	0.084%	0.080%	0.080%	0.081%	0.084%
Liver cancer										
Attributable Fraction	0.071%	0.066%	0.058%	0.046%	0.035%	0.030%	0.058%	0.043%	0.024%	0.012%
Attributable deaths	34	37	38	35	28	25	38	32	19	10
Attributable registrations	34	36	37	32	26	22	37	30	17	9
'Avoided' cancers			0	0	0	0	0	3	8	10
YLLs	481	509	506	433	338	288	504	397	227	112
DALYs	490	519	515	441	345	294	514	405	232	114
Kidney cancer										
Attributable Fraction	0.046%	0.042%	0.038%	0.034%	0.031%	0.031%	0.038%	0.033%	0.030%	0.028%
Attributable deaths	13	14	14	15	15	15	14	14	14	14
Attributable registrations	31	32	33	31	30	30	33	31	29	27
'Avoided' cancers			0	0	0	0	0	1	2	2
YLLs	189	196	196	187	180	178	196	184	170	162
DALYs	216	224	223	214	205	203	223	210	194	185
NHL										
Numbers ever exposed	213,655	216,910	220,378	221,459	221,459	221,459	220,378	221,459	221,459	221,459
Proportion of the population exposed	0.054%	0.053%	0.054%	0.055%	0.057%	0.059%	0.054%	0.055%	0.057%	0.059%
Attributable	0.042%	0.032%	0.022%	0.023%	0.024%	0.025%	0.009%	0.009%	0.009%	0.010%

Scenario	All scenarios		Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m^3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m^3)			
EU Total	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Fraction										
Attributable deaths	12	10	8	9	10	11	3	4	4	4
Attributable registrations	28	24	18	19	20	21	7	8	8	8
'Avoided' cancers			1	0	0	0	12	6	7	7
YLLs	196	165	120	128	134	137	47	50	53	54
DALYs	198	167	122	130	136	139	48	51	53	54

4.1.2 Monetised health benefits

The possible health benefits (i.e. avoided healthcare costs and effects of having cancer) for the introduction of an EU-wide OEL at 50 ppm and 10 ppm are shown in Table 4.3. The change in cancer impacts over the first 30 years (2010-2040) are predominately the result of chronic impacts from past (historical) exposure as well as short term acute impacts that are predicted to continue to occur in the future (these are relatively small).

There is estimated to be a greater benefit to introducing a more stringent OEL of 10 ppm. The impacts of introducing an OEL at 50 ppm are estimated to have no affect as there is already estimated to be a reduction below 50 ppm under the baseline scenario. The results are also illustrated in Figure 4.10.

Table 4.3 Health benefits of intervention over time (Present Value – 2010 €m prices)

Costs by Gender (€m)	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069	Totals
Intervention option 2 - Introduce OEL= 50ppm in 2010, 1% remain exposed above limit							
Female	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
Male	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
Total	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0	0 to 0
Intervention option 3 - Introduce OEL= 10ppm in 2010, 1% remain exposed above limit							
Female	0 to 0	1 to 7	7 to 31	5 to 19	8 to 25	7 to 23	28 to 105
Male	0 to 0	4 to 16	20 to 90	17 to 60	25 to 81	25 to 78	90 to 325
Total	0 to 0	5 to 23	27 to 121	22 to 79	33 to 106	32 to 101	118 to 430

Notes:

- All costs are presented in present value using a discount rate of 4%

- Totals may not match to sums of females and male costs due to underlying small differences in raw data and rounding to nearest million

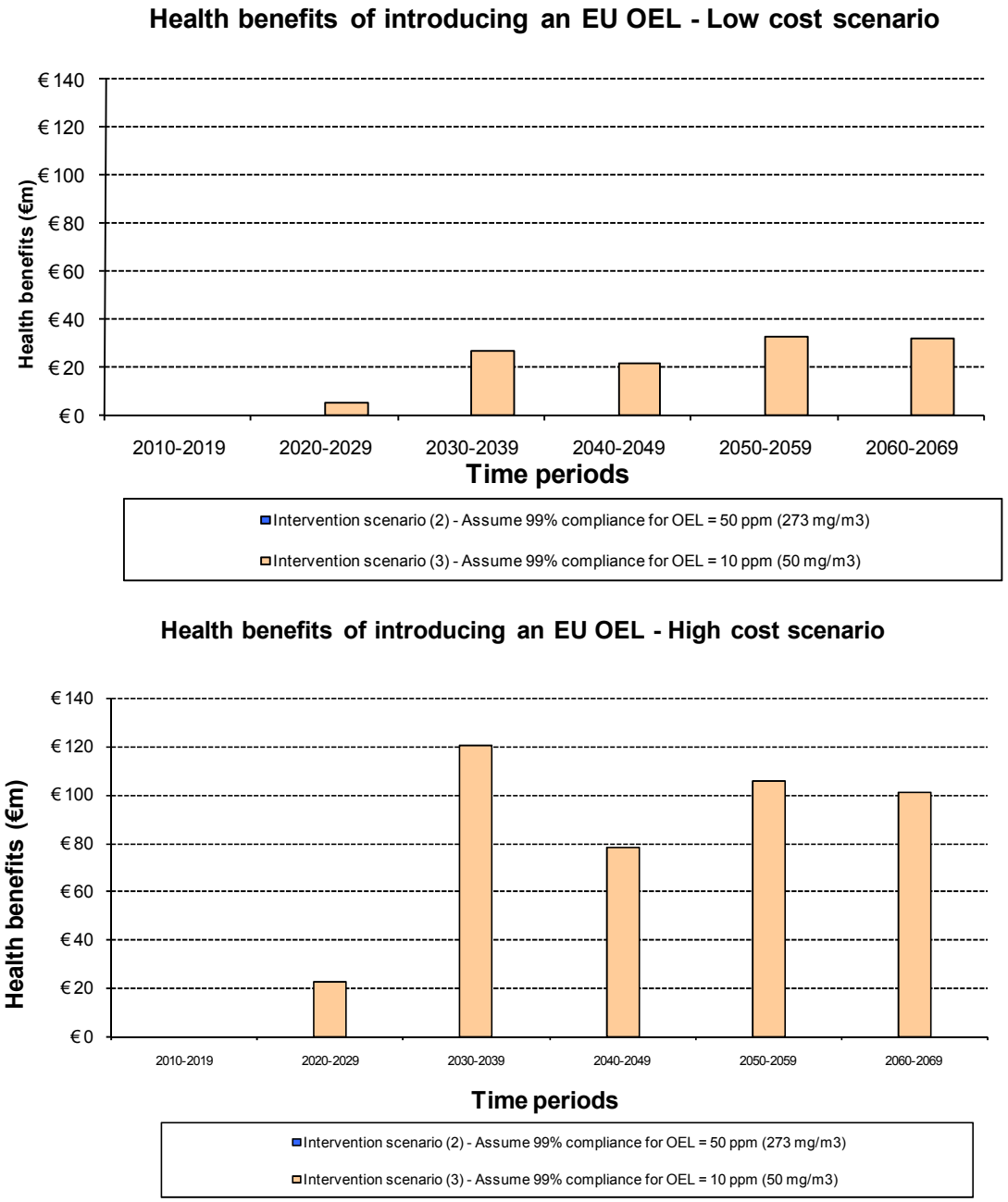

Figure 4.10 Health benefits over time of introducing an EU wide OEL (Present Value – 2010 €m prices)

These benefits will affect Member States differently depending upon the overall number of workers within affected industry groups, existing risk management measures (RMMs) and the proportion of males and females within these groups. The total benefits by Member State are shown in Figure 4.11 (low scenario) and Figure 4.12 (high scenario), where the Czech Republic, France, Germany, Italy, Poland, Spain and

the UK are predicted to particularly benefit from a possible 10pmm OEL assuming close to full compliance (99%) with the OEL[31].

The monetised benefits of a revised OEL for trichloroethylene are likely to affect men more than women given the industrial sectors most exposed to trichloroethylene. The following industrial sectors related to metal degreasing are estimated to benefit from a revised OEL (and close to full compliance):

- Manufacture of fabricated metal products, except machinery and equipment (NACE 28).
- Manufacture of machinery except electrical (NACE 29).
- Manufacture of office machinery and computers (NACE 30).
- Manufacture of electrical machinery, apparatus, appliances and supplies (NACE 31).
- Manufacture of transport equipment (NACE 34).
- Manufacture of other transport equipment (NACE 35).
- Manufacture of furniture; manufacturing nec (not elsewhere classified) - (NACE 36).

This estimated health benefits in these sectors are shown in Figure 4.13 (low scenario) and Figure 4.14 (high scenario).

The Member State and industry groups that are predicted to benefit most from a revised OEL also vary at a gender level. This analysis is presented in the Appendix 8.6.

[31] The assumption of full compliance is a standard assumption used in EU Impact Assessments.

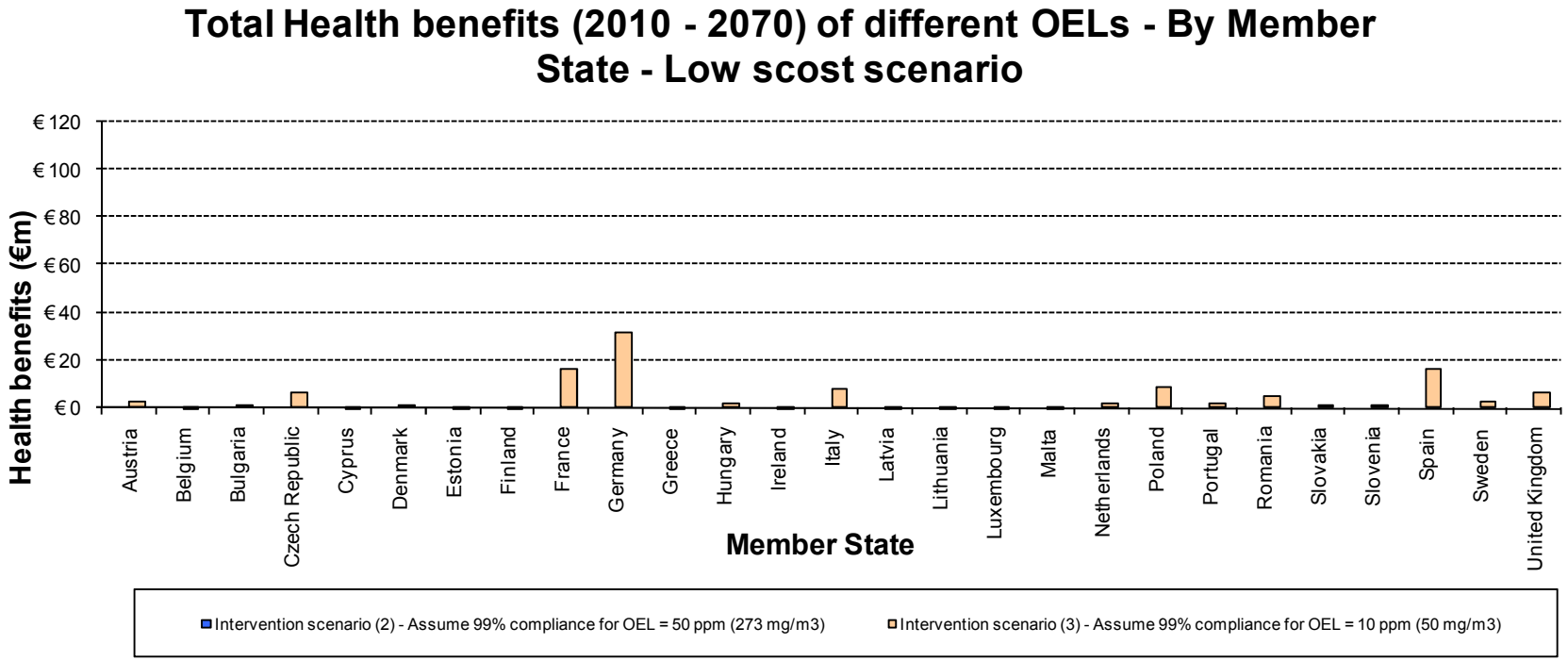

Figure 4.11 Total health benefits of introducing an EU wide OEL – By Member State – Low Scenario (Present Value – 2010 €m prices)

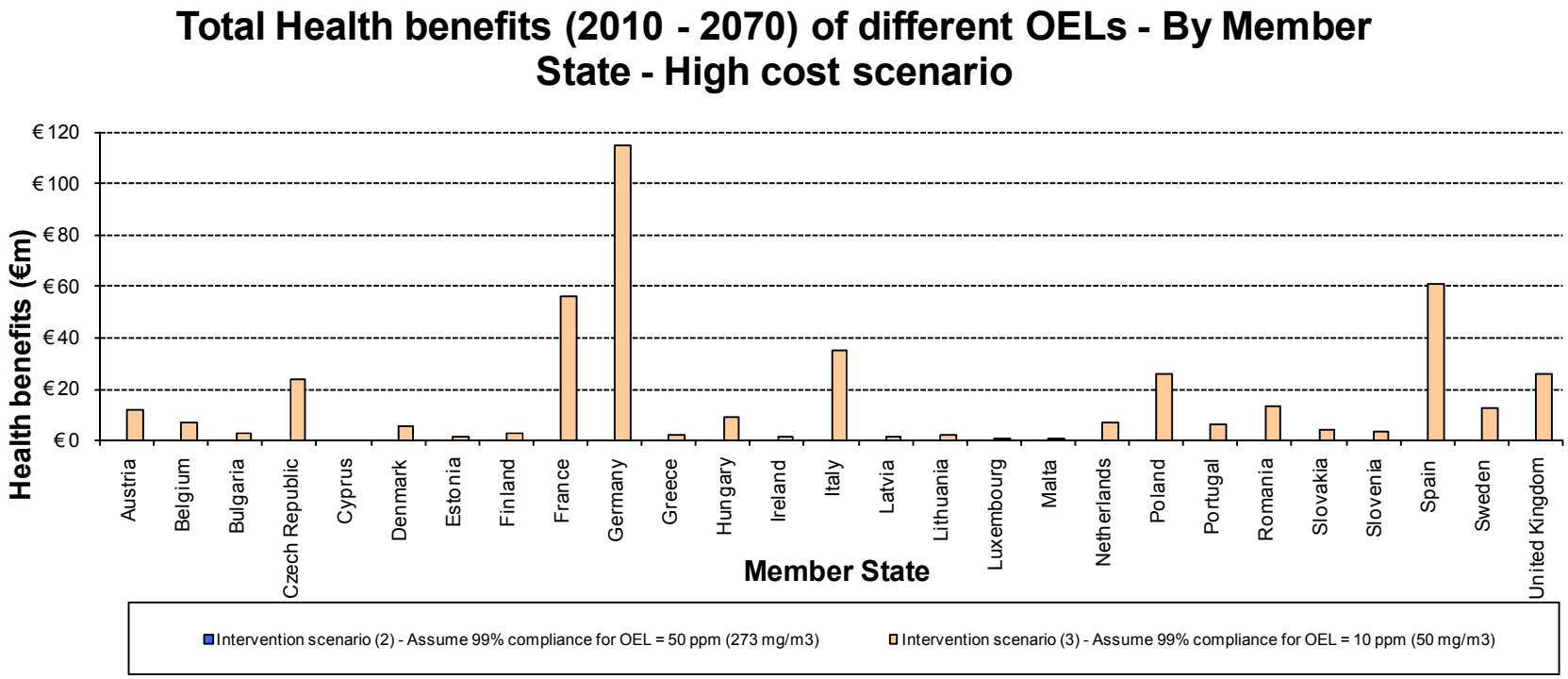

Figure 4.12 Total health benefits of introducing an EU wide OEL – By Member State – High Scenario (Present Value – 2010 €m prices)

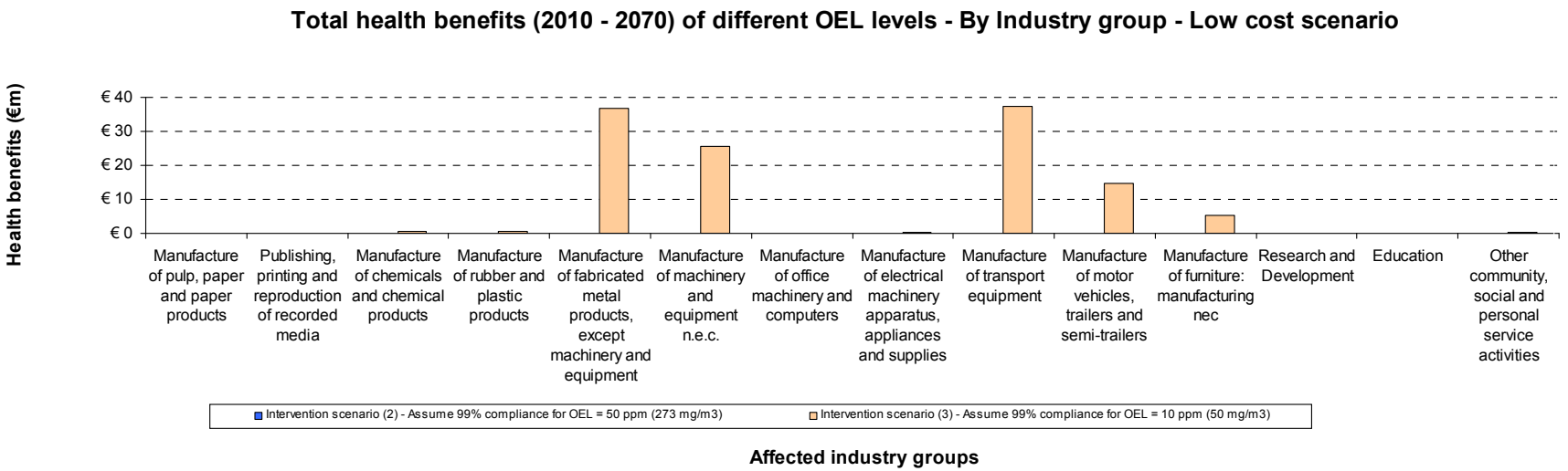

Figure 4.13 Total health benefits of introducing an EU wide OEL – By Industry Group – Low Scenario (Present Value – 2010 €m prices)

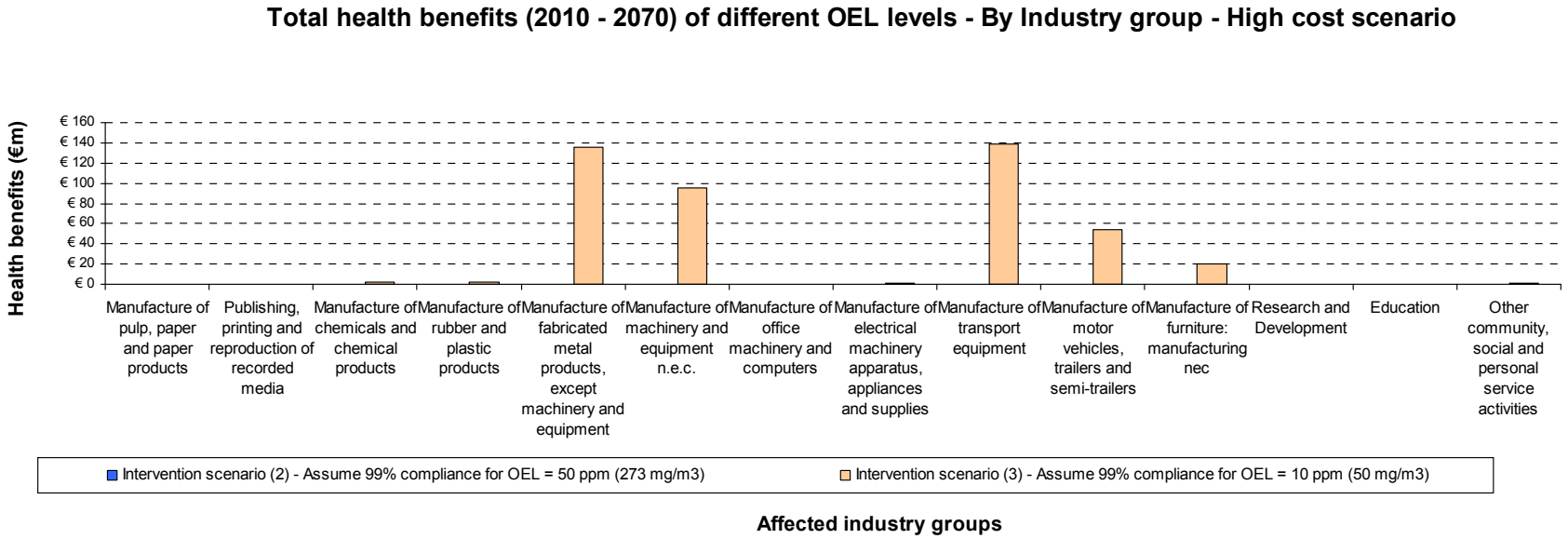

Figure 4.14 Total health benefits of introducing an EU wide OEL – By Industry Group – High Scenario (Present Value – 2010 €m prices)

As with the baseline scenario, in order to present all costs and benefits consistently in present value, it is necessary to discount all future costs and benefits. This was done using the IA guidelines recommended 4% discount rate. Since most health impacts occur over a long period of time relative to costs, the impacts of discounting are significant. As a means of sensitivity testing, different discount rates are also used. There are not expected to be any health benefits from the introduction of an OEL at 50ppm so there are no affects from the use of different discount rates. However, the overall impact of discounting can be seen in Figure 4.16 for introducing an OEL of 10ppm.

Detailed tables are included in the Appendix 8.7, with results presented using different discount rates.

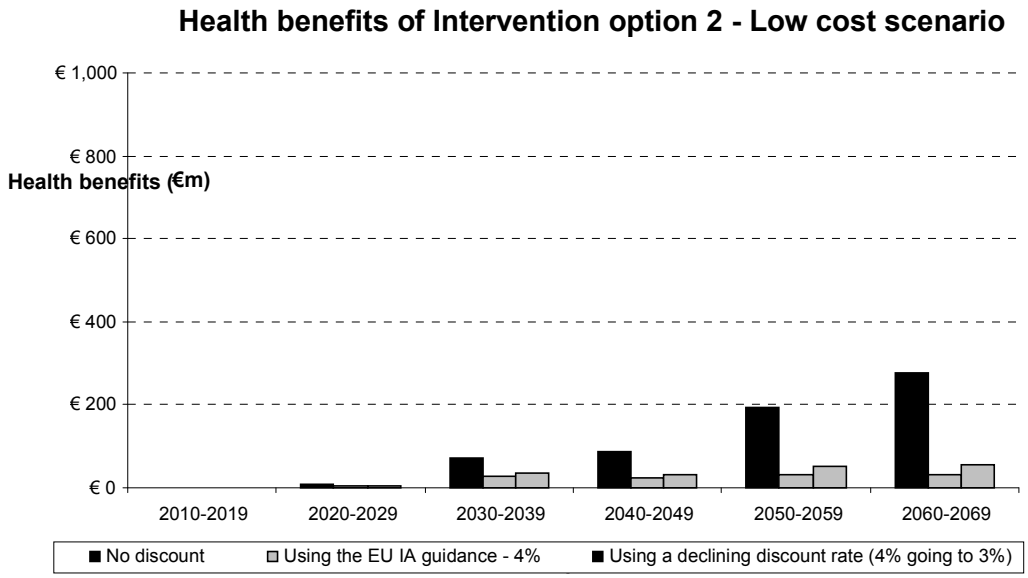

Figure 4.15 Impacts of discounting – Introducing an OEL of 10ppm

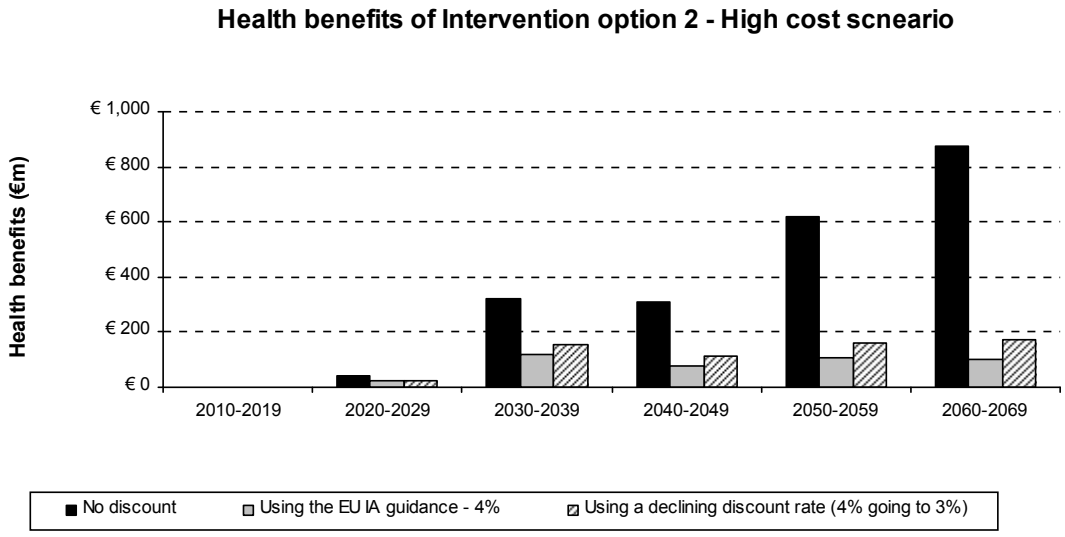

Figure 4.16 Impacts of discounting – Introducing an OEL of 10ppm

A limitation is that the benefits of any RMMs undertaken post 2040 will not be included in this study, since the benefits of these measures to reduce occupational exposure in 2040-2070 are unlikely to be realised until after 2070 (due to the lag period) which is not estimated in this study.

4.2 ECONOMIC IMPACTS

4.2.1 Operating costs and conduct of business

Compliance costs

A regulatory impact assessment[32] estimated the cost of compliance with the Solvent Emission Directive (SED) by using a closed vapour degreasing system. In particular, it estimated that the additional capital cost of a closed system for a small consumer of trichloroethylene (1-5 tonnes per annum (tpa)) as £30k (1999 prices). We consider this to be the most relevant (and recent) publicly available data source since it also considers net annual operating costs[33] (in which savings are estimated as a result of a more efficient consumption of trichloroethylene using a closed system and the cost of additional monitoring).

Table 4.4 shows the estimated cost of compliance using a closed system which has been updated into 2009 prices (€). The costs of meeting an OEL at 10 ppm for firms using less than 1 tpa of trichloroethylene are likely to be closer to the annualised costs

[32] DETR (1999) Regulatory and Environmental Impact Assessment for the Implementation of the EC Solvent Emissions Directive

[33] Based on communications with closed system manufacturers (25/09/09) it is estimated that all machines require a full service once a year; twice if heavily used. The cost of a full service is estimated to be 1.5 man days for a technician.

shown for small firms (€6,384). To avoid giving a false sense of accuracy we estimate the costs are likely to be around €6k per year.

Table 4.4 Cost of compliance (closed system)

	Small firm (1-5 tpa)	Medium firm (5-10 tpa)	Large firm (>10 tpa)
Average Annualised Cost per firm (£ 1999 prices)	£3,300	£5,200	£6,500
Average Annualised Cost per firm (€ 2009 prices)	€6,384	€10,060	€12,575

Source: (Regulatory Impact Assessment, Defra,1999)
Note: Prices were converted from £ to € using a 1999 exchange rate of 1.52 - http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html
Prices were inflated from 1999 prices to 2009 prices using EuroStat Harmonised Index of Consumer Prices (HICP) - http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/data/database

It is not possible to accurately estimate how many firms use less than 1 tpa of trichloroethylene, and therefore which may need to install a closed system. That is because we know little about trichloroethylene consumption at an installation/site level. This is further complicated since some firms may be using less than 1 tpa of trichloroethylene but may still be regulated under the SED as they may use other solvents that are covered by the SED with a combined tonnage totalling over 1 tpa.
In Table 2.2 it was estimated that around 63,000 workers might have high expose to TCE. It was also estimated that around 4% of these workers may be exposed to TCE above an OEL of 50ppm and 28% of workers exposed above an OEL of 10ppm.

Using Eurostat data, on the average distribution of workers by employee size (e.g. 81% of firms are thought to employee between 1-9 workers), it is tentatively estimated (given the complicated interactions with the SED) that the number of firms requiring closed systems, could be around 400 for an OEL of 50ppm and around 3,000 firms for an OEL of 10ppm. This is shown below in Table 4.5.

Table 4.5 Number of firms potentially affected by a possible EU wide OEL

Size of Enterprise by number of employees:	Distribution (%)	Workers affected		Number of firms affected	
		10PPM	50PPM	10PPM	50PPM
Between 1 & 9	81%	14,293	2,042	2,859	408
Between 10 & 19	11%	1,999	286	133	19
Between 20 & 49	6%	998	143	40	6
Between 50 and 250	2%	356	51	2	0
Greater than 250	0.1%	21	3	0	0
Total		17,667	2,524	3,034	433

Based on an annualised cost of closed systems (€6k per firm) it is estimated that the total costs of compliance over the period 2010-69 could be up to €61m for an OEL of 50ppm and up to €428m for an OEL of 10ppm. This is shown in Table 4.6.

Table 4.6 Estimate of the total costs of closed systems (2010 € prices)

Possible OEL	Estimate of the number of firms affected	Annual cost of compliance	Total annual cost (€m)	Total cost of compliance over the period 2010-69 (€m)
10ppm	3,034	€ 6,000	€ 18.2	€ 428
50ppm	433	€ 6,000	€ 2.6	€ 61

Note: Total costs over the period 2010-69 have been discounted using a discount rate of 4%

Conduct of employers

If companies install closed systems, it is unlikely this will result in a need to increase regulation and monitoring the conduct of employees. In fact, the use of a closed system may result in less regulation of workers due to risks of exposure being easier to control. Obviously there should already be close monitoring of worker exposure given the classification of trichloroethylene.

Potential for closure of companies

For those metal degreasers already using a closed system and already subject to a national OEL (see Table 1.1) there are not expected to be any significant change in costs. For those firms already using a closed system, but not subject to a national OEL, the additional cost of monitoring, reporting and verifying compliance is not considered to be sufficiently high to result in firms closing down (see the administrative costs section below).

For those firms using less than 1 tpa that would need to install a closed system in order to meet an OEL of 10 ppm, there is a significant cost to consider. The estimated annualised cost of €6k per machine (which includes operating and monitoring costs plus capital costs apportioned over the lifetime of the closed system) is significant but may not necessarily trigger a decision to close production. However, the upfront capital cost (i.e. not annualised over its lifetime) of a closed system (every 10-15 years[34]) is estimated to be in the region of €58k (2009 prices[35]) to €135k[36]. This is likely to be a significant cost for this sector which may potentially result in the closure of some companies. Based on communications with manufacturers, uptake of these smaller closed system units has not been as high as was previously estimated to occur as a result of the SED. It has also been suggested that some companies have closed rather than investing in a closed system.

[34] Based on communications with closed system manufacturers (25/09/09).
[35] Based on an estimate of £30k in 1999 prices from the Defra Regulatory impact assessment (1999)
[36] This is based on cost estimates provided by manufacturers of closed systems during telephone interviews (25/09/09). The costs were estimated to be €95-135k based on the most popular size for users using less than 1tpa.

In order to be able to put the capital cost into perspective, it is useful to understand the profitability of firms in the metal degreasing sector as a means of understanding how significant the cost of compliance might be. Using the average annual operating surplus from Eurostat for the treatment and coatings of metals sector (DJ28.5) as a proxy for the metal degreasing sector we can compare the initial capital cost against the operating surplus to understand whether firms (on average) are likely to be able to afford to invest in a closed system or might instead opt to close the business or at least the metal degreasing elements of their business.

Table 4.7 shows the average operating surplus for firms with different numbers of employees. The average operating surplus increases with increasing number of employees (see Table 4.7). Table 4.7 also shows the percentage of capital cost (€58k for low cost and €135k for high cost) as a proportion of average operating surplus.

Table 4.7 Average operating surplus per enterprise size

Size of Enterprise by number of employees:	Average operating surplus	Capital cost / operating surplus (%)	
		Low cost of capital	High cost of capital
Between 1 and 9	€ 42,405	137%	318%
Between 10 and 19	€ 178,223	33%	76%
Between 20 and 49	€ 329,637	18%	41%
Between 50 and 250	€ 1,166,024	5%	12%
Greater than 250	€ 4,299,412	1%	3%

Source: Eurostat classification of economic activities - NACE Rev.1.1: DJ 285 - Treatment of coating of metals; general mechanical engineering. Summary of average Operating Surplus (Euros) per enterprise by Size of Enterprise (number of Employees)
Note: Operating surplus is a measure of profitability of the enterprise prior to payment of interest and tax (i.e. pre-tax profit income).

As indicated in Table 4.7, the costs of capital as a percentage of annual profits are fairly small for those employing more than 250 people. However, the costs of capital as a percentage of annual profits are very significant for those employing fewer than 50 people. For those firms employing fewer than 10 people, the cost of capital is – on average – more than one year's profit. For affected small and medium sized enterprises (i.e. SMEs that do not have a closed system) it will potentially be very difficult to finance investing in a closed system using profits and, given the size of capital required, it may also be difficult for them to get access to finance from the market at a good interest rate. Therefore for affected SMEs, the costs could be considered high enough to force these companies to shut down. It is possible that some of these firms might be able to pass through additional costs by charging higher prices for their final products, especially because the OEL should be applied consistently across the EU. This should create a level playing field for firms across the EU and reduce competitiveness distortions created by differences in OELs across the EU.

Information from the environmental RRS[37] suggests that it may also be possible for some firms to substitute trichloroethylene in order to avoid the costs of a closed

[37] DEFRA (2005) Risk Reduction Strategy and Analysis of the Advantages and Drawbacks for Tetrachlorotheylene. Available at: http://www.defra.gov.uk/environment/quality/chemicals/documents/report-tetra060203.pdf

system. Some possible substitutes include; tetrachloroethylene, n-propyl bromide, methylene chloride or bromochloromethane (though it is noted that some of these substances are now subject to increased regulatory controls and there may thus be other adverse effects associated with their use). It may also be possible to change the degreasing process although this is less likely. Trichloroethylene is principally used for hot vapor degreasing of metal components. This is only one of many methods employed to clean metal. Alternatives include other hydrocarbon solvents, aqueous formulations and water blasting or soft blasting (shot blasting using a relatively soft medium such as limestone) [38].

Potential impacts for specific types of companies

Whilst the introduction of an EU-wide OEL for trichloroethylene would not specifically target companies of a particular size, it is considered likely that a greater proportion of those that do not already have closed systems in place that would allow such an OEL to be met are likely to be small companies, in particular those using less than 1 tonne per year. As indicated in Table 4.10, SMEs make up a large proportion of the treatment of coating of metal sector (NACE Code v1.1 DJ 28.5) although this does not necessarily mean only small firms would be affected (since large firms may only use small quantities).

Administrative costs to employers and public authorities

The following table (Table 4.8) describes the administrative burden to employers already subject to the Carcinogens Directive but will now incur costs of introducing an EU wide OEL on to Annex III.

Table 4.8 Administrative burdens to employers

Type of administrative cost	Relevant article(s)	Type of cost	Significance
1. Change in practice to use closed systems when using the substance.	5 – Prevention and reduction of exposure	These costs are already estimated in the cost of compliance section - This will only affect those firms that do not have or use closed systems	Estimated elsewhere

[38] Information from - Risk Reduction Strategy and Analysis of Advantages and Drawbacks for Trichloroethylene Defra (2005) (Report prepared by AMEC Environment & Infrastructure UK Ltd UK Ltd).

Type of administrative cost	Relevant article(s)	Type of cost	Significance
2. Develop/update health and safety and best practice guidance for: ○ Minimising use and exposure to workers to the substance ○ Redesign work processes and engineering controls to avoid/minimise release of carcinogens or mutagens ○ Hygiene measures, in particular regular cleaning of floors, walls and other surfaces ○ Information for workers ○ Warnings and safety signs ○ Drawing up plans to deal with emergencies likely to result in abnormally high exposure	5 – Prevention and reduction of exposure 7 – Unforeseen exposure 8 – Foreseeable exposure 9 – Access to risk areas 10 – Hygiene and individual protection	Firms will already have been required to develop/update health and safety and best practice guidance. The guidance and procedures may be required to be updated as control measures may change in light of a more stringent OEL. Some firms may need to redesign work practices to minimise exposure to workers and the number of workers exposed. The costs of implementing controls on exposure (such as LEV or PPE) are already estimated in the costs of compliance section.	Low
3. Additional costs of training new and existing staff in line with requirements of the Directive 4. Additional costs of making information available to employees 5. Consultation with employees on compliance with the Directive	11 – Information and training of workers 12 – Information for workers 13 – Consultation and participation with workers	Firms will already have been required to ensure training and adequate aware of risks and control measures to reduce/minimise exposure. Largely one-off cost if the revised OEL requires a change in control measures/working practice.	Low

Note: Readers should consult the Directive for the official wording around specific requirements. This table provides only a summary of what are perceived to be the most significant administrative requirements of the Directive. Grading of the significance of impacts is subjective and is based on professional judgement.

The following table (Table 4.9) describes the administrative burden to competent authorities already enforcing the Carcinogens Directive but will now incur costs of introducing an EU wide OEL on to Annex III.

Table 4.9 Administrative burdens to Competent Authorities

Type of administrative cost	Relevant article(s)	Type of cost	Significance
1. Communication with the Commission on provisions in national law to enforce the revised OEL. 2. Time and costs of implementing revised OEL into national law (consultation process)	19 – Notifying the commission 20 – Repeal	Largely one-off cost of transposing the revised OEL into national law	Low - Medium (one-off cost)

Note: Readers should consult the Directive for the official wording around specific requirements. This table provides only a summary of what are perceived to be the most significant administrative requirements of the Directive. Grading of the significance of impacts is subjective and is based on professional judgement.

Third countries

There is not expected to be any significant impacts on countries outside of the EU. There are already national OELs in place in several Member States as well as regulation such as the SED and the voluntary industry agreement (Charter for the safe use of Trichloroethylene in metal cleaning) which affect all EU Member States, meaning that any firms using trichloroethylene above 1 tpa should already have closed systems in place. It is also possible for some firms to substitute trichloroethylene in order to avoid the costs of a closed system (for firms using less than 1 tpa).

However, given that the costs of installing a closed system are likely to be prohibitive for some smaller firms (based on the above comparison with average operating surplus); there is the potential that some products would cease to be produced in the EU. This production could potentially be relocated to third countries outside the EU.

An EU-wide OEL could, however, be expected to increase the dissemination of improved technologies and production methods. It is possible that increased sales (demand) could, in the long-run, bring down the overall cost of closed systems with manufacturers of closed systems able to benefit from economies of scale in production and better R&D developments in closed systems once there is sufficient demand to warrant investment of more funds in production and research.

4.2.2 Impact on innovation and research

There have already been noticeable changes within the metal degreasing industry as a result of concerns related to trichloroethylene and other solvents through the SED and the voluntary industry agreement (Charter for the safe use of Trichloroethylene in metal cleaning). These include increased use of closed systems, as well as use of alternative solvents. As such, there has already been significant development of new production methods and technologies.

The average expenditure per firm on R&D in the treatment and coatings of metals sector (NACE code v1.1 - DJ28.5) based on data from Eurostat, is less than €1000 per

year with the overall number of employees working in R&D fairly low (1,539 out of a sector total of just over 1.1million).

Also, given that any changes required to comply with an OEL will most likely affect smaller companies (or at least those using smaller quantities of trichloroethylene), these companies are likely to adopt techniques that are already being applied within other parts of the industry, rather than investing time and resources in new alternative technologies.

4.2.3 Macroeconomic impact

The metal greasing industry is included within the treatment and coatings of metals sector (NACE code v1.1 - DJ28.5) but it is not known what proportion of the sector the metal greasing industry comprises. The treatment and coatings of metals sector spent approximately €63bn in 2006 on goods and services within the EU economy. This is small compared to the total value of goods and services in the manufacturing sector of €5trillion in 2006. Given this and also that users of trichloroethylene consuming more than 1 tpa should already be using a closed system and therefore largely unaffected, (especially if they already have to comply with monitoring, reporting and verification requirements for a national OEL), it is very unlikely that the costs of compliance would be large enough collectively to cause significant macroeconomic impacts. It is also possible that some firms will substitute trichloroethylene or use an alternative process for metal degreasing. Therefore, there may only be a small redistribution of goods and services bought (i.e. to those firms producing the alternative substance rather than trichloroethylene) rather than any significant change in overall gross output.

4.3 SOCIAL IMPACTS

4.3.1 Employment and labour markets

The treatment and coatings of metals sector (NACE code v1.1 - DJ28.5) employed around 1.1 million people in 2006. There was a steady growth in 2003-2006 of around 2% with the largest growth seen in Eastern Europe. The largest employment levels were in Italy (254,144), Germany (192,314), France (141,939) and the UK (117,992) in 2006. Eurostat EU-27 level data indicates that, in 2006, the sector was dominated by firms employing fewer than 10 people, accounting for 81% of all enterprises; firms employing fewer than 20 people accounted for 92% of the sector. This is shown in Table 4.10.

Table 4.10 Breakdown of enterprises by employee size (year: 2006)

Size of Enterprise by number of employees:	EU 27 level employment (numbers)	Percentage (%)
Between 1 and 9	114,639	81%
Between 10 and 19	16,031	11%
Between 20 and 49	8,007	6%
Between 50 and 250	2,852	2%
Greater than 250	170	0%

Source: Eurostat classification of economic activities - NACE Rev.1.1: DJ 285 - Treatment of coating of metals; general mechanical engineering. Number of Enterprises by Size of Enterprise (number of Employees)

The data indicate that the majority of the sector is made up of SMEs (firms with fewer than 50 employees make up 98% of total firms in the sector). It is not possible to make a direct correlation between the sizes of firms using less than 1 tpa of trichloroethylene and the likely size of firms, since it is likely that both large and small employers use less than 1 tpa of trichloroethylene. It would be reasonable to assume that given the majority of the wider sector (DJ28.5) is composed of firms with fewer than 20 workers, the metal degreasing firms that would incur compliance costs (i.e. those that use <1tpa and do not currently have closed systems) will have fewer than 20 workers. Table 4.7 showed that these smaller firms were most vulnerable to the capital cost of a closed system and may opt to close down or switch to an alternative substance or process (if it is technically feasible to do so). If they do decide to close down there is potential for some increased levels of unemployment in Italy, Germany, Poland and the UK in particular (these countries have the most employers with numbers of employees between 1 and 9). SMEs can comprise a variety of skilled, semi-skilled and unskilled labour and therefore the length of any unemployment may largely depend on current external macroeconomic conditions rather than the skills of affected workers.

The use of closed vapour degreasing systems should not affect the skills required by metal degreasing workers. Training costs are expected to be minimal. Maintenance could be undertaken by technicians of closed system manufacturers, otherwise training might be required to ensure risks of exposure are correctly managed. Depending on the frequency of use, maintenance is likely to be required once or twice a year (at a cost of 1.5 days for a technician) [33]. Since the closed system reduces risks of human exposure in a way that should not inhibit production, there should also be improvements in working conditions.

4.3.2 Changes in end products

There should not be any changes in end products since it would still be possible to use trichloroethylene and comply with an EU-wide OEL by using a closed system. There are alternatives available for some metal degreasing applications, which would be technically feasible, implying that there would not be any significant changes in end products.

4.4 ENVIRONMENTAL IMPACTS

The EU risk assessment for trichloroethylene[39] concluded that there was a need to limit the risks to the environment associated with use of the substance in metal cleaning. However, as detailed in the environmental risk reduction strategy, once the implications of the Solvent Emissions Directive are taken into account (as of 2007), it was concluded that there would be no need for further limiting the environmental risks in this area. Nonetheless, if certain companies are required to install closed systems when using trichloroethylene (i.e. a certain proportion of generally smaller consumers of the substance); there could be a reduction in overall emissions of trichloroethylene to the environment. Likewise, if introduction of an EU-wide OEL were to lead to substitution of trichloroethylene using alternative degreasing agents, there would be a

[39] EU Risk Assessment Report on Trichloroethylene. Vol 31, 2004. Publication EUR 21057 EN. Available at: http://ecb.jrc.ec.europa.eu/documents/Existing-Chemicals/RISK_ASSESSMENT/REPORT/trichloroethylenereport018.pdf

reduction in emissions to the environment. This could potentially be offset, however, by increased emissions of the replacement substance(s).

5 COMPARISON OF OPTIONS

The main identified impacts of introducing an OEL of 10 or 50 ppm are shown in the tables below relative to the baseline scenario.

Table 5.1 Comparison of health impacts by option (Present Value – 2010 €m prices)

Baseline scenario – National OELs		Introduce EU wide OEL=50ppm		Introduce EU wide OEL=10ppm	
Health costs	**Health benefits**	**Health costs**	**Health benefits**	**Health costs**	**Health benefits**
As set out in section 2.5, the costs of cancer (kidney, liver and NHL) over the period 2010-70 is estimated to be: - Females: €105m to €1,287m - Males: €1,210 m to €4,370m - Total: €1,582m to €5,657m This range takes into consideration tangible costs (e.g. lost income, lost output from reduced productivity, medical costs, life years lost) and intangible costs (e.g. emotional and physical suffering from having cancer).	It is assumed that exposures fall by 7% per year in the future continuing the historical trend in reduced exposure. Therefore there is expected to be avoided health costs going forward in the absence of further regulatory intervention.	There is not expected to be a reduction in health costs relative to the baseline scenario.	There are not expected to be any health benefits since the estimated geometric mean exposure is already 5.5ppm at an EU level and taking into consideration there is already declining exposure assumed under the baseline scenario.	There is expected to be a reduction in health costs relative to the baseline scenario. This is shown as a benefit (see right).	There is expected to be more significant health benefits of introducing an OEL at 10ppm, which is also the SCOEL recommended TWA, than at 50ppm due to the additional reduction in exposure. The total health benefit is estimated to be between €118-430m (male and female) over the whole period of 2010-2070. Health benefits post 2070 is not included in the estimate.

Note: Costs and benefits under the intervention options are relative to the baseline scenario (i.e. are not absolute impacts but differences)

Table 5.2 Comparison of economic impacts by option (Present Value – 2010 €m prices)

Baseline scenario – National OELs		Introduce EU wide OEL=50ppm		Introduce EU wide OEL=10ppm	
Economic costs	**Economic benefits**	**Economic costs**	**Economic benefits**	**Economic costs**	**Economic benefits**
Industries affected (e.g. in particular the metal degreasing sectors) are estimated to incur costs of installing and using closed systems to achieve national OELs, the solvent emissions directive (SED) if use is above 1tpa and the voluntary industry agreement (Charter for the safe use of Trichloroethylene in metal cleaning) meaning any firms using trichloroethylene above 1tpa should already have closed systems in place.	Closed systems manufacturers should benefit from increased demand over time for closed systems.	There are not expected to be any significant costs relative to those already being incurred under the baseline scenario as firms are already investing in closed systems which will help to control exposure to below 50ppm.	There are not expected to be any significant benefits relative to those already being incurred under the baseline scenario as firms are already investing in closed systems which will help sales for closed systems manufacturers.	The GM exposure of 5.5ppm under the baseline means that the majority of the sector will comply with an OEL of 10ppm. There is insufficient data to estimate the number of firms that will require closed systems in order to meet an OEL of 10ppm. It is estimated that the cost of a small unit (when <1tpa is used) is €58-135k (annualised as €6k per year). For large sized firms this is not estimated to be a significant cost but for SMEs this could be more difficult to finance as it can represent a significant proportion of their operating surplus (see table 5.4), potentially leading to business closures. However it may be possible for firms to use an alternative substance to avoid the cost of a closed system or instead to pass through costs in terms of higher final good prices. Since the OEL will be applied at an EU level, there will be less competitive distortions within the EU if prices were increased.	Closed systems manufacturers should benefit from increased demand over time for closed systems. There may also be a sales redistribution benefit to manufacturers of alternative substances.

Note: Costs and benefits under the intervention options are relative to the baseline scenario (i.e. are not absolute impacts but differences)

Table 5.3 Comparison of social impacts by option (Present Value – 2010 €m prices)

Baseline scenario – National OELs		Introduce EU wide OEL=50ppm		Introduce EU wide OEL=10ppm	
Social costs	**Social benefits**	**Social costs**	**Social benefits**	**Social costs**	**Social benefits**
Under the baseline there is estimated to a greater number of firms installing and using closed systems for metal degreasing. The use of closed vapour degreasing systems should not affect the skills required by metal degreasing workers. Training costs are expected to be minimal.	Since the closed system reduces risks of human exposure in a way that should not inhibit production, there should also be improvements in working conditions. There should not be any changes in end products since would still be possible to use trichloroethylene and comply with the EU-wide OEL by using a closed system.	There are not expected to be any significant changes relative to the baseline scenario.		There are not expected to be any significant changes relative to the baseline scenario. Table 5.4 showed that smaller firms were most vulnerable to the capital cost of a closed system and may opt to close down or switch to an alternative substance or process (if technically feasible to do so). If they do decide to close down there is potential for some unemployment in Italy, Germany, Poland and the UK (in particular), who have the most employers with numbers of employees between 1 and 9.	

Note: Costs and benefits under the intervention options are relative to the baseline scenario (i.e. are not absolute impacts but differences)

Table 5.4 Comparison of macroeconomic impacts by option (Present Value – 2010 €m prices

Baseline scenario – National OELs		Introduce EU wide OEL=50ppm		Introduce EU wide OEL=10ppm	
Macroeconomic costs	**Macroeconomic benefits**	**Macroeconomic costs**	**Macroeconomic benefits**	**Macroeconomic costs**	**Macroeconomic benefits**
There is not expected to be any noticeable macroeconomic impacts under any scenario.		There is not expected to be any noticeable macroeconomic impacts under any scenario.		There is not expected to be any noticeable macroeconomic impacts under any scenario.	
The treatment and coatings of metals sector spent approximately €63bn in 2006 on goods and services within the EU economy. This is not significant considering the total value of goods and services in the manufacturing sector was €5trillion in 2006 and that users of trichloroethylene above 1tpa per year should already be using a closed system and therefore largely unaffected, (especially if they already have to comply with monitoring, reporting and verification requirements for national OELs). Therefore, while much of the sector may (or may not) be using less than 1tpa, it is very unlikely that the costs would be high enough collectively to cause significant macroeconomic impacts. It is also possible that some firms will substitute trichloroethylene or use an alternative process for metal degreasing. Therefore, there may only be a small redistribution of goods and services bought (i.e. to those firms producing the alternative substance rather than trichloroethylene) rather than any significant change in overall gross output.					

Table 5.5 Comparison of environmental impacts by option (Present Value – 2010 €m prices)

Baseline scenario – National OELs		Introduce EU wide OEL=50ppm		Introduce EU wide OEL=10ppm	
Environmental costs	**Environmental benefits**	**Environmental costs**	**Environmental benefits**	**Environmental costs**	**Environmental benefits**
There is not expected to be any noticeable change in environmental impacts		There is not expected to be any noticeable change in environmental impacts		There is not expected to be any noticeable change in environmental impacts	
The EU risk assessment for trichloroethylene concluded that there was a need to limit the risks to the environment associated with use of the substance in metal cleaning. However, as detailed in the environmental risk reduction strategy, once the implications of the Solvent Emissions Directive are taken into account (as of 2007), it was concluded that there would be no need for further limiting the environmental risks in this area. Nonetheless, if certain companies are required to install closed systems when using trichloroethylene (i.e. a certain proportion of generally smaller consumers of the substance), there could be a reduction in overall emissions of trichloroethylene to the environment.					

6 CONCLUSIONS

We estimate that in 2006 approximately 74,000 workers in the EU were potentially exposed to TCE with most exposed workers being involved in the manufacture of fabricated metal products including machinery and transport equipment or the manufacture of furniture. In these industries, about 28% of workers are exposed to more than 10 ppm and about 2% are exposed are to more than 50 ppm. The estimated overall weighted GM exposure across all countries and industries is 4.6 with a GSD of 3.7.

We estimate that in 2010 in the EU there will be about 34 deaths from liver cancer and a similar number of registrations that might be attributable to past exposure to TCE, which corresponds to about 0.071% of all liver cancer deaths amongst the exposed workers. There will also be about 13 deaths from kidney cancer and about 31 registrations, accounting for 0.046% of all kidney cancer deaths amongst the exposed workers. There will be about 12 deaths from NHL and 28 registrations accounting for 0.054% of all NHL deaths amongst exposed workers. If no specific actions are taken to reduce exposure to TCE, based on the assumption that current employment and exposure levels are maintained, the predicted numbers of cancer deaths in 2060 attributable to TCE would be 21, 15 and 7 for cancers of the liver and kidney and NHL respectively with the corresponding numbers of registrations between 18, 29 and 15. The predicted loss of life expectancy in 2010 attributable to these cancers is 866 YLLs and 904 DALYs falling to 515 YLLs and 544 DALYs in 2060.

The introduction of an OEL of 50 ppm is predicted to reduce the number of liver cancer deaths and registrations in 2060 attributable to TCE from current levels to 25 and 22 respectively, the number of kidney cancer deaths and registrations to 15 and 30 respectively and the number of NHL deaths and registrations to 11 and 21 respectively. The predicted loss of life expectancy attributable to these cancers in 2060 would be 603 YLLs and 636 DALYs.

The introduction of an OEL of 10 ppm is predicted to reduce the number of liver cancer deaths and registrations in 2060 attributable to TCE from current levels to 10 and 9 respectively, the number of kidney cancer deaths and registrations to 14 and 27 respectively and the number of NHL deaths and registrations to 4 and 8 respectively. The predicted loss of life expectancy attributable to these cancers in 2060 would be 328 YLLs and 353 DALYs.

The total net health benefits from setting an OEL at 10 ppm are estimated to be estimated between €1118m and €430m for the period of 2010-2070, whereas there would be no significant health benefit in setting an OEL of 50 ppm.

Given that the current GM exposure to TCE is 5.5 ppm, it is anticipated that the majority of employers will be able to comply with an OEL of 50ppm (with around 4% of workers potentially affected above this OEL). There may be more workers affected with an OEL of 10 ppm (with around 28% of workers potentially affected above this OEL).

However, since under the Solvents Emissions Directive (SED) those firms using solvents that are covered by the SED (i.e. not just TCE) above 1 tonnes per year (tpa)

are required to install and use a closed system. This is also reinforced by a voluntary industry agreement (Charter for the safe use of Trichloroethylene in metal cleaning) whereby TCE will not be sold to those without an installed closed system. Therefore it is possible that the main costs of compliance with an OEL (i.e. the use of closed systems) may already have been incurred by industries affected.

Given the interactions with the SED, it is difficult to provide a good estimate of the number of firms affected, but it is possible to examine costs per firm affected. The capital cost of installing closed systems (estimated to be between €58k-135k) per enterprise, which is appropriately €6k per year).

Therefore the cost to comply with an OEL of 10 ppm (or 50ppm) is unlikely to be significant for large businesses but for SMEs, the majority of affected enterprises, it could represent a substantial proportion of their operating surplus, which could potentially lead to some business closures. Many businesses, however, may be able to switch to use of an alternative substance or pass on the additional costs by charging more for their products. The macroeconomic, social and environmental impacts of introducing an OEL of 10 ppm are not predicted to be significant (relative to the baseline scenario).

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8 APPENDIX

8.1 ESTIMATED NUMBER OF EMPLOYEES IN EACH INDUSTRY GROUP – MEMBER STATE BREAKDOWN – MALES AND FEMALES

Table 8.1.1 Number of workers exposed to beryllium by Member State and NACE code – males and females

	NACE code														
	21			22			24			25			28		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Austria	5	4	1	5	4	1	48	39	9	53	43	10	215	174	41
Belgium	4	3	1	7	6	1	124	101	24	51	42	10	204	165	39
Bulgaria	3	2	2	3	2	2	46	24	22	45	24	22	125	65	60
Cyprus	0	0	0	0	0	0	3	3	1	2	2	1	11	9	3
Czech Republic	6	4	2	9	6	3	74	48	26	161	105	56	501	326	175
Denmark	2	2	1	7	5	2	53	39	14	39	29	11	142	104	38
Estonia	1	0	0	1	1	1	5	3	2	10	5	4	39	21	17
Finland	32	24	8	6	4	1	32	23	8	29	22	8	138	102	36
France	24	18	5	38	29	9	489	376	112	439	338	101	1288	992	296
Germany	43	34	9	73	57	16	814	635	179	720	561	158	2367	1846	521
Greece	2	2	1	6	4	1	32	25	8	22	17	5	121	92	29
Hungary	5	3	2	7	4	3	57	36	21	78	49	29	224	141	83
Ireland	1	1	0	3	2	1	44	33	11	19	14	5	39	29	10
Italy	0	0	0	33	25	8	355	266	89	382	286	95	2123	1592	531
Latvia	0	0	0	2	1	1	8	5	3	9	5	4	29	17	12
Lithuania	1	0	0	2	1	1	11	6	5	18	9	9	55	29	27
Luxembourg	Not Available			Not available			2	2	0	12	10	2	13	11	2
Malta	Not available			Not available			Not available			Not available			Not available		
Netherlands	7	5	1	16	13	3	113	94	19	62	52	11	295	245	50
Poland	13	9	4	19	13	6	192	129	63	286	192	94	833	558	275
Portugal	4	2	1	7	4	3	Not available			49	29	20	265	156	109
Romania	5	3	2	7	4	3	87	47	40	89	48	41	308	167	142

	NACE code														
		21			22			24			25			28	
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Slovakia	2	1	1	2	1	1	23	15	8	40	25	14	104	66	37
Slovenia	2	1	1	2	1	1	25	16	8	26	17	9	102	67	35
Spain	0	0	0	31	24	7	248	193	55	228	178	50	1127	879	248
Sweden	12	10	3	10	8	2	77	60	17	54	42	12	255	199	56
United Kingdom	22	18	4	66	53	13	381	309	72	396	320	75	998	808	190
Total	196	146	50	364	275	89	3343	2524	818	3320	2465	855	11924	8863	3061

	NACE code														
		29			30			31			34			35	
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Austria	187	152	36	6	5	1	28	23	5	169	137	32	58	47	11
Belgium	101	81	19	5	4	1	18	15	3	240	194	46	48	39	9
Bulgaria	161	84	77	11	6	6	22	11	11	14	7	7	58	30	28
Cyprus	2	2	1	0	0	0	0	0	0	1	1	0	1	1	0
Czech Republic	376	244	131	57	37	20	116	75	40	574	373	201	111	72	39
Denmark	144	105	39	6	4	2	24	17	6	33	24	9	40	29	11
Estonia	13	7	6	2	1	1	6	3	3	11	6	5	15	8	7
Finland	134	99	35	2	1	0	18	13	5	34	25	9	55	40	14
France	703	542	162	43	33	10	151	116	35	1365	1051	314	757	583	174
Germany	2430	1895	535	216	168	47	519	405	114	4286	3343	943	711	555	156
Greece	52	40	13	Not available			8	6	2	15	11	4	71	54	17
Hungary	158	99	58	49	31	18	69	44	26	261	165	97	41	26	15
Ireland	27	20	7	71	53	18	8	6	2	20	15	5	19	15	5
Italy	1305	979	326	81	61	20	185	139	46	847	635	212	553	415	138
Latvia	17	10	7	1	1	0	4	2	2	6	4	3	28	16	12
Lithuania	25	13	12	2	1	1	7	3	3	6	3	3	37	19	18
Luxembourg	5	5	1	0	0	0	Not available			Not available			Not available		
Malta	Not available			Not available			Not available			Not available			Not available		

	NACE code														
		29			30			31			34			35	
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Netherlands	206	171	35	29	24	5	17	14	3	115	95	20	128	107	22
Poland	477	320	157	35	24	12	107	72	35	613	411	202	363	243	120
Portugal	110	65	45	Not available			25	15	10	Not available			54	32	22
Romania	238	128	109	24	13	11	84	45	39	319	172	147	308	166	142
Slovakia	104	67	38	8	5	3	46	29	17	148	95	53	37	24	13
Slovenia	62	41	21	4	3	1	15	10	5	45	30	15	14	9	5
Spain	445	347	98	27	21	6	88	68	19	807	629	178	296	231	65
Sweden	270	210	59	24	18	5	25	19	5	438	341	96	113	88	25
United Kingdom	640	518	122	139	113	26	125	101	24	910	737	173	751	608	143
Total	8393	6245	2148	840	626	214	1713	1253	460	11277	8506	2772	4666	3456	1210

	NACE code														
		36			73			80			O			Grand Total	
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Austria	506	410	96	5	3	2	22	6	15	125	59	66	**1432**	**1105**	**326**
Belgium	274	222	52	6	4	2	37	12	26	103	53	49	**1222**	**940**	**281**
Bulgaria	397	206	191	0	0	0	21	7	15	86	54	32	**994**	**522**	**472**
Cyprus	28	21	7	0	0	0	2	1	2	12	5	6	**65**	**44**	**21**
Czech Republic	775	504	271	6	3	2	28	7	21	110	54	56	**2902**	**1857**	**1045**
Denmark	298	217	80	6	4	2	21	9	12	109	59	50	**925**	**647**	**277**
Estonia	137	75	62	0	0	0	6	1	5	23	8	15	**268**	**140**	**127**
Finland	156	116	41	6	4	3	50	16	33	140	56	84	**832**	**546**	**285**
France	1637	1261	377	38	25	13	176	60	116	736	324	412	**7884**	**5748**	**2136**
Germany	2665	2079	586	85	54	30	206	41	164	1330	878	452	**16463**	**12550**	**3912**
Greece	Not available			8	5	3	30	11	19	87	39	48	**455**	**306**	**149**
Hungary	358	226	132	6	4	2	31	8	24	110	52	58	**1454**	**887**	**568**
Ireland	Not available			2	1	1	13	3	9	67	33	33	**332**	**226**	**106**
Italy	3336	2502	834	0	0	0	0	0	0	0	0	0	**9200**	**6900**	**2300**

	NACE code														
	36			73			80			O			Grand Total		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Latvia	163	95	69	1	1	1	9	2	7	34	14	20	**310**	**170**	**139**
Lithuania	329	171	158	1	0	0	13	2	11	43	14	29	**550**	**273**	**277**
Luxembourg	3	3	0	Not available			1	1	1	4	2	2	**41**	**33**	**8**
Malta	Not available			Not available			1	0	1	4	2	2	**5**	**2**	**3**
Netherlands	424	352	72	30	22	9	53	21	32	198	87	111	**1695**	**1303**	**392**
Poland	2372	1589	783	4	2	1	112	27	85	359	190	169	**5786**	**3778**	**2008**
Portugal	663	391	272	1	1	0	31	8	22	98	42	56	**1306**	**745**	**561**
Romania	1225	662	564	21	13	7	41	11	30	163	98	65	**2919**	**1577**	**1342**
Slovakia	202	129	73	4	2	2	16	3	13	53	25	28	**789**	**489**	**301**
Slovenia	172	114	59	2	1	1	7	2	6	27	15	12	**506**	**328**	**178**
Spain	1975	1540	434	13	9	5	105	39	66	630	290	340	**6021**	**4450**	**1571**
Sweden	545	425	120	Not available			48	12	36	154	72	81	**2025**	**1507**	**519**
United Kingdom	1935	1567	368	93	63	30	251	73	178	989	505	485	**7695**	**5793**	**1901**
Total	20577	14877	5700	337	222	115	1331	382	949	5791	3029	2762	**74073**	**52868**	**21205**

8.2 SUMMARY OF OCCUPATIONAL EXPOSURE DATA FOR TRICHLOROETHYLENE

Table 8.2.1 Summary of occupational exposure data for trichloroethylene

NACE	Description	Source	Country	Year(s)	No.	Exposure (ppm)				
						Min	Max	AM	GM	GSD
22	Printing	Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	12			6.3	3.5	2.9
24	Manufacture of TCE	RAR, 2004	UK	1991-94	584		49		0.6	
24	Manufacture of TCE	RAR, 2004	UK	1991-94	171		128		0.5	
24	Manufacture of TCE	RAR, 2004	UK	1991-94	837		128		0.6	
24	Manufacture of TCE	RAR, 2004	UK	1991-94	298		1.3		590	
24	Use as an intermediate, manufacture of HCFC 133a	RAR, 2004	UK	1991-94	162		11.5	0.2		
24	Use as an intermediate, manufacture of HCFC 133a	RAR, 2004	UK	1991-94	7		1.5	0.3		
24	Use as an intermediate, manufacture of HFC 134a	RAR, 2004	UK	1991-94	57		1.6	0.2		
24	Use as an intermediate, manufacture of HFC 134a	RAR, 2004	UK	1991-94	34		2.7	0.2		
28, 29	Iron and metal	Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	371			13.0	5.0	4.5
28	Vapour degreasing	Selden *et al*, 1993	UK	1988	29			5.1		
29	Degreasing	NIOSH, 1984 (140)	US	1984	18	0.3	26	85	22	6.9
29	Degreasing	NIOSH, 1984 (140)	US	1984	12	2.2	274	86	30	8.4
29	Degreasing	NIOSH, 1990 (141)	US	1990	2	4.5	5.2	4.9		
29	Degreasing	NIOSH, 1986 (143)	US	1986	3	107	137	120	120	1.1
29	Degreasing	NIOSH, 1986 (143)	US	1986	18	20	89	38	36	1.3
29	Degreasing	NIOSH, 1980 (144)	US	1980	1	0.6				
30	NA	NIOSH, 1980 (164)	US	1980	28	0.1	27	2.7	0.7	4.6
30	NA	NIOSH, 1980 (164)	US	1980	49	0.038	40	2.5	0.7	4.6
30	Lacquer	NIOSH, 1993 (165)	US	1993	4	0.04	0.04			
31	Degreasing	NIOSH, 1990 (145)	US	1990	6	0.01	11	4.1	1	14
32	Electronics	Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	24			7.8	0.7	7.3
34	Degreasing	NIOSH, 1982 (146)	US	1982	2	0.3	1.1	0.7		
35.3	Degreasing	NIOSH, 1982 (147)	US	1982	1	4.1				
35.3	Degreasing	NIOSH, 1982 (147)	US	1982	29	0.2	39	5.7	2.2	4
36.2	Degreasing	NIOSH, 1988	US	1988	8	15	33	25	24	1.3
93	Dry-cleaning shops	Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	2			4.1	2.0	6.2

Source	Country	Year(s)	No.	Exposure (ppm) Min	Max	AM	GM	GSD	90th %ile	95th %ile
NIOSH, 1980 (144)	US	1980	1	0.6						
NIOSH, 1982 (149)	US	1981	2	0.8	1.7	1.2				
NIOSH, 1982 (146)	US	1982	2	0.3	1.1	0.7				
NIOSH, 1982 (147)	US	1982	1	4.1						
NIOSH, 1982 (147)	US	1982	29	0.2	39	5.7	2.2	4		
NIOSH, 1983	US	1983	4	<0.004	25	7.8	0.2	136		
NIOSH, 1983	US	1983	4	<0.004	25	7.8	0.2	136		
NIOSH, 1984 (140)	US	1984	18	0.3	26	85	22	6.9		
NIOSH, 1984 (140)	US	1984	12	2.2	274	86	30	8.4		
NIOSH, 1986 (143)	US	1986	3	107	137	120	120	1.1		
NIOSH, 1986 (143)	US	1986	18	20	89	38	36	1.3		
Selden *et al*, 1993	UK	1988	29			5.1				
NIOSH, 1988	US	1988	8	15	33	25	24	1.3		
NIOSH, 1990 (141)	US	1990	2	4.5	5.2	4.9				
NIOSH, 1990 (145)	US	1990	6	0.01	11	4.1	1	14		
Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	371			13.0	5.0	4.5		
Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	24			7.8	0.7	7.3		
Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	45			32.6	11.2	6.4		
Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	23			0.9	0.6	2.4		
Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	371			13				
Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	45			32.6	11.2	6.4		
Raaschou-Nielsen *et al*, 2002	Denmark	1980-89	23			0.9	0.6	2.4		
Bock *et al*, 1999	Germany	1990-95	14			7.6			56.3	109.6
Bock *et al*, 1999	Germany	1990-95	23			4.1			52.2	104.8

Source	Country	Year(s)	No.	Exposure (ppm) Min	Max	AM	GM	GSD	90th %ile	95th %ile
Bock *et al*, 1999	Germany	1990-95	159			10			44.3	67.4
Bock *et al*, 1999	Germany	1990-95	30			44.6			131.7	168.9
Negab *et al*, 1997	Australia	1997*	5			8.8				

8.3 ESTIMATED DEATHS AND REGISTRATIONS IN THE EU FROM KIDNEY AND LIVER CANCER AND NHL

Table 8.3.1 Forecast number of kidney and liver cancer in ages 25+ (ages 15+ registrations) and NHL cancers in ages 15-84 (males) and 15-79 (females) (ages 15+ for registrations), based on projected EU country populations

Kidney cancer deaths	*Men*						*Women*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Ages 25+												
Austria	265	332	407	483	536	539	203	226	273	318	359	358
Belgium	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	217	224	238	249	252	245	97	102	107	109	109	107
Cyprus	9	12	17	22	26	32	3	4	5	7	8	9
Czech Republic	750	926	1,100	1,245	1,364	1,433	414	481	565	618	658	702
Denmark	209	251	297	316	334	341	131	152	176	189	195	199
Estonia	76	82	92	106	115	121	42	47	49	55	56	57
Finland	214	272	335	363	369	381	133	153	183	196	196	196
France	2,168	2,603	3,139	3,576	3,830	4,006	1,152	1,320	1,542	1,780	1,882	1,905
Germany (including ex-GDR from 1991)	3,143	3,832	4,343	4,867	4,997	4,756	2,118	2,401	2,636	2,935	3,052	2,868
Greece	344	395	451	526	591	614	169	199	221	251	275	280
Hungary	459	511	585	645	712	754	271	298	330	351	369	384
Ireland	110	146	191	239	281	322	89	115	149	190	231	265
Italy	2,219	2,628	3,037	3,489	3,838	3,849	1,212	1,390	1,564	1,771	1,961	1,966
Latvia	124	137	153	176	195	209	86	91	96	102	108	109
Lithuania	192	218	249	287	320	329	112	122	135	149	156	155
Luxembourg	11	14	18	22	25	27	4	5	6	9	10	11
Malta	21	26	31	35	37	40	11	15	16	17	19	19
Netherlands	616	791	966	1,074	1,104	1,089	357	424	517	587	618	602
Poland	1,683	2,017	2,396	2,715	2,914	3,036	952	1,112	1,315	1,465	1,523	1,586

Kidney cancer deaths	*Men*						*Women*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Ages 25+												
Portugal	214	252	298	349	392	415	111	129	148	171	188	197
Romania	399	435	503	554	589	591	218	237	266	292	311	311
Slovakia	215	273	335	380	422	421	137	167	200	223	244	247
Slovenia	78	102	127	152	162	167	52	58	69	75	77	76
Spain	1,216	1,491	1,840	2,242	2,594	2,743	707	836	994	1,193	1,371	1,444
Sweden	341	411	478	517	557	588	264	299	349	380	405	428
UK	2,392	2,820	3,282	3,682	4,047	4,330	1,334	1,490	1,739	1,979	2,181	2,316
European Union (27 countries)	17,592	21,030	24,645	28,014	30,261	31,128	10,548	12,081	13,880	15,699	16,849	17,122

Kidney cancer registrations	*Men*						*Women*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Ages 15+												
Austria	859	1,023	1,182	1,283	1,322	1,328	602	682	784	855	880	875
Belgium	904	1,061	1,205	1,297	1,344	1,383	552	620	696	753	776	791
Bulgaria	286	287	299	307	293	274	128	129	131	131	126	118
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	1,762	2,099	2,371	2,599	2,739	2,722	1,087	1,245	1,366	1,463	1,523	1,517
Denmark	509	608	671	706	708	728	295	344	386	408	411	418
Estonia	155	165	182	200	212	216	105	109	113	117	117	114
Finland	496	608	665	677	686	700	392	461	504	513	508	509
France	5,082	5,918	6,580	7,011	7,242	7,501	2,536	2,894	3,201	3,422	3,478	3,508
Germany (including ex-GDR from 1991)	9,345	10,627	11,625	12,003	11,733	11,203	5,270	5,722	6,177	6,351	6,224	5,919
Greece	741	839	956	1,068	1,114	1,088	444	497	549	603	626	608
Hungary	1,024	1,117	1,230	1,335	1,406	1,422	680	728	768	804	824	819

Kidney cancer registrations	*Men*						*Women*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Ages 15+												
Ireland	245	320	404	495	561	596	135	174	220	271	312	336
Italy	6,315	7,244	8,188	8,900	9,057	8,890	2,887	3,210	3,544	3,809	3,858	3,739
Latvia	174	183	197	215	222	218	134	135	137	140	137	129
Lithuania	331	355	391	426	446	443	305	322	348	367	367	360
Luxembourg	33	42	51	58	63	67	21	25	30	34	38	40
Malta	18	22	25	26	27	28	18	22	25	26	28	29
Netherlands	1,340	1,654	1,875	1,961	1,944	1,953	772	925	1,060	1,128	1,119	1,109
Poland	3,618	4,170	4,687	5,174	5,350	5,243	1,857	2,137	2,377	2,558	2,626	2,569
Portugal	515	589	675	752	802	811	267	304	342	375	394	392
Romania	801	871	969	1,062	1,093	1,070	484	517	553	591	603	591
Slovakia	494	591	694	778	817	804	303	351	397	438	452	437
Slovenia	141	171	197	211	211	201	87	98	109	115	115	110
Spain	3,221	3,907	4,728	5,440	5,731	5,603	1,481	1,741	2,022	2,256	2,385	2,354
Sweden	760	883	973	1,039	1,091	1,147	516	579	637	679	708	738
UK	4,413	5,116	5,747	6,278	6,705	7,207	2,539	2,848	3,197	3,505	3,725	3,934
European Union (27 countries)	43,210	50,025	56,333	60,925	62,887	63,056	23,829	26,806	29,752	31,955	32,744	32,495

Liver cancer deaths	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Austria	586	724	875	986	1,071	1,075	301	340	402	467	507	505
Belgium	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	580	599	644	683	704	704	369	395	417	435	447	443
Cyprus	26	37	51	65	80	99	18	24	32	40	47	56
Czech Republic	605	727	882	998	1,081	1,144	348	401	478	519	551	595

Liver cancer deaths	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Denmark	222	267	306	323	332	340	108	130	155	174	184	184
Estonia	41	44	50	55	60	66	42	46	48	52	55	54
Finland	272	349	421	442	446	465	189	222	267	291	291	290
France	5,892	7,093	8,343	9,202	9,655	10,044	2,057	2,352	2,784	3,204	3,382	3,415
Germany (including ex-GDR from 1991)	4,762	5,692	6,488	7,184	7,229	6,924	2,478	2,802	3,058	3,411	3,547	3,333
Greece	1,032	1,203	1,381	1,623	1,826	1,906	578	714	792	925	1,055	1,113
Hungary	443	496	560	617	676	705	304	334	375	402	417	446
Ireland	111	152	202	259	323	375	91	118	157	201	246	288
Italy	6,827	8,006	9,310	10,725	11,575	11,460	3,642	4,161	4,694	5,375	5,940	5,925
Latvia	87	93	104	118	127	133	56	56	58	61	60	59
Lithuania	91	99	117	134	145	154	68	73	81	93	97	99
Luxembourg	23	32	41	52	62	67	12	14	18	23	28	31
Malta	12	16	18	20	21	22	5	7	9	10	11	11
Netherlands	374	478	587	656	677	664	222	267	329	378	393	380
Poland	1,127	1,363	1,690	1,932	2,106	2,287	1,028	1,213	1,454	1,676	1,737	1,854
Portugal	523	610	713	817	905	951	215	253	290	331	368	388
Romania	1,656	1,828	2,104	2,378	2,570	2,593	909	1,003	1,134	1,268	1,378	1,425
Slovakia	232	301	364	424	476	486	166	197	243	297	321	354
Slovenia	108	138	164	181	187	181	67	79	91	106	111	112
Spain	3,203	3,905	4,837	5,929	6,818	7,022	1,632	1,914	2,298	2,832	3,336	3,529
Sweden	390	470	541	587	627	663	274	310	360	392	417	438
United Kingdom	2,023	2,404	2,800	3,166	3,447	3,726	1,238	1,383	1,616	1,842	2,032	2,151
European Union (27 countries)	31,134	37,187	43,707	49,614	53,264	54,636	16,461	18,866	21,831	24,929	26,918	27,464

Liver cancer registrations	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Austria	594	713	846	936	966	977	290	324	382	427	440	441
Belgium	392	464	538	584	607	627	254	289	332	363	376	384
Bulgaria	299	309	328	347	356	346	204	214	222	228	229	221
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	620	758	863	963	1,036	1,033	319	380	418	450	482	488
Denmark	213	259	290	305	305	315	130	152	169	180	181	184
Estonia	39	43	48	53	58	60	32	33	35	36	36	35
Finland	167	213	235	240	244	250	95	116	128	131	130	131
France	5,537	6,574	7,413	7,947	8,223	8,526	1,420	1,653	1,858	2,006	2,041	2,058
Germany (including ex-GDR from 1991)	3,360	3,859	4,319	4,504	4,413	4,233	1,527	1,651	1,824	1,907	1,867	1,785
Greece	1,406	1,600	1,833	2,076	2,193	2,144	673	761	847	941	985	955
Hungary	712	795	876	975	1,067	1,095	463	506	533	559	585	589
Ireland	68	90	116	146	168	179	17	22	28	34	39	43
Italy	9,489	10,982	12,619	13,993	14,327	14,057	4,130	4,635	5,216	5,816	5,973	5,784
Latvia	59	63	70	78	84	85	52	52	54	56	56	56
Lithuania	76	83	95	106	114	117	69	73	80	85	86	85
Luxembourg	17	23	29	33	36	38	7	8	10	12	13	14
Malta	12	17	20	22	24	26	2	3	3	3	3	3
Netherlands	243	303	346	365	360	363	94	111	125	134	133	131
Poland	972	1,175	1,350	1,492	1,613	1,630	991	1,173	1,331	1,427	1,501	1,500
Portugal	477	550	638	719	770	780	201	228	258	285	302	301
Romania	1,602	1,758	1,994	2,257	2,396	2,370	815	888	977	1,081	1,135	1,120
Slovakia	239	297	356	407	443	445	145	175	206	230	248	249
Slovenia	89	111	131	143	146	140	36	41	46	49	50	48
Spain	3,516	4,319	5,344	6,326	6,817	6,667	1,514	1,800	2,173	2,571	2,815	2,769

Liver cancer registrations	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Sweden	336	397	440	473	496	528	205	232	256	275	285	301
United Kingdom	1,773	2,076	2,358	2,590	2,764	2,997	1,105	1,252	1,437	1,603	1,701	1,826
European Union (27 countries)	32,249	37,934	43,519	47,801	49,852	50,251	14,686	16,729	18,933	20,700	21,438	21,415

NHL deaths	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Austria	297	366	436	510	540	545	177	211	233	263	238	239
Belgium	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	162	164	172	179	181	175	114	115	115	111	109	95
Cyprus	21	28	37	45	55	65	12	16	20	23	26	28
Czech Republic	343	428	512	570	639	668	241	289	296	300	331	290
Denmark	201	250	283	305	311	311	108	131	137	142	135	130
Estonia	38	42	47	53	59	64	41	40	43	43	42	42
Finland	192	243	288	302	302	315	116	137	145	137	129	133
France	2,259	2,683	3,200	3,566	3,770	3,921	1,219	1,368	1,598	1,614	1,569	1,556
Germany (including ex-GDR from 1991)	3,135	3,685	4,177	4,666	4,572	4,411	1,982	2,096	2,310	2,379	1,976	1,971
Greece	370	413	474	545	602	610	215	216	242	257	254	231
Hungary	315	353	393	430	473	484	254	270	277	266	284	256
Ireland	152	204	269	338	414	478	76	99	124	146	165	175
Italy	2,461	2,848	3,256	3,714	3,976	3,916	1,548	1,647	1,825	2,016	1,908	1,675
Latvia	68	70	77	81	86	87	58	56	57	58	54	54
Lithuania	88	96	109	121	131	134	82	83	89	95	87	85
Luxembourg	15	18	23	27	29	31	13	15	19	22	22	24
Malta	14	19	23	25	27	29	7	8	8	8	8	8
Netherlands	581	735	878	959	958	951	336	404	450	460	417	409

NHL deaths	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Poland	1,122	1,344	1,606	1,779	1,927	2,037	834	937	1,076	1,014	1,078	1,035
Portugal	326	373	432	493	540	556	220	238	265	285	287	264
Romania	490	534	599	653	691	681	356	367	405	407	413	371
Slovakia	157	196	240	278	308	324	115	135	158	159	168	157
Slovenia	71	91	114	132	141	143	49	53	62	62	59	55
Spain	1,382	1,664	2,023	2,450	2,782	2,810	830	949	1,133	1,310	1,342	1,184
Sweden	330	403	456	493	523	555	204	247	251	265	266	275
United Kingdom	2,227	2,611	2,998	3,341	3,595	3,887	1,299	1,478	1,623	1,784	1,749	1,881
European Union (27 countries)	17,041	20,049	23,319	26,240	27,911	28,515	10,815	11,930	13,368	13,979	13,546	13,044

NHL registrations	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Austria	721	829	951	1,036	1,061	1,070	588	651	741	806	827	822
Belgium	998	1,146	1,292	1,389	1,432	1,475	733	819	914	985	1,014	1,033
Bulgaria	191	190	196	202	198	185	151	152	154	155	151	140
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	586	701	783	855	913	914	588	667	724	766	792	791
Denmark	435	506	551	573	577	591	350	397	433	452	457	463
Estonia	61	64	70	75	80	82	66	68	70	72	72	70
Finland	479	579	630	641	647	661	478	541	581	590	583	581
France	5,828	6,758	7,506	8,014	8,269	8,560	4,273	4,919	5,490	5,897	5,997	6,045
Germany (including ex-GDR from 1991)	6,696	7,431	8,139	8,448	8,225	7,884	6,228	6,637	7,148	7,378	7,198	6,858
Greece	345	381	421	457	472	462	294	321	345	370	380	369
Hungary	519	566	617	672	715	725	534	575	605	631	652	651
Ireland	290	371	459	542	615	656	226	285	351	422	476	509

NHL registrations	*MEN*						*WOMEN*					
FTY	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
Italy	6,287	7,093	7,842	8,388	8,493	8,334	5,085	5,629	6,183	6,644	6,731	6,523
Latvia	61	64	73	81	87	92	58	58	62	64	66	67
Lithuania	105	111	126	139	149	155	80	87	91	94	96	90
Luxembourg	38	47	56	64	69	74	29	35	42	49	53	57
Malta	30	34	36	38	39	39	31	36	40	41	43	44
Netherlands	1,324	1,599	1,789	1,870	1,851	1,854	1,114	1,313	1,486	1,581	1,566	1,547
Poland	1,704	1,920	2,120	2,287	2,353	2,311	1,190	1,324	1,434	1,508	1,526	1,483
Portugal	659	742	837	925	976	984	574	640	705	755	783	777
Romania	656	693	750	798	804	776	453	474	498	522	525	508
Slovakia	232	274	319	354	374	371	227	261	295	320	330	323
Slovenia	127	152	175	187	191	183	140	158	175	186	188	179
Spain	3,506	4,161	4,895	5,485	5,700	5,575	2,793	3,278	3,830	4,323	4,584	4,513
Sweden	856	992	1,089	1,165	1,216	1,283	699	784	859	920	952	998
United Kingdom	5,479	6,268	6,988	7,604	8,084	8,658	4,687	5,224	5,828	6,373	6,749	7,116
European Union (27 countries)	37,809	43,088	48,058	51,738	53,288	53,464	31,507	35,178	38,877	41,683	42,676	42,387

8.4 SUPPLEMENTARY TABLES - COSTS UNDER THE BASELINE SCENARIO

Table 8.4.1 Health costs – baseline scenario – Member State breakdown - Based on a 4% discount rate

Low	Female	Male	Total	High	Female	Male	Total
Austria	€ 5	€ 24	€ 30	Austria	€ 22	€ 90	€ 112
Belgium	€ 0	€ 2	€ 2	Belgium	€ 13	€ 55	€ 69
Bulgaria	€ 7	€ 9	€ 17	Bulgaria	€ 13	€ 17	€ 30
Czech Republic	€ 23	€ 48	€ 71	Czech Republic	€ 94	€ 192	€ 286
Cyprus	€ 0	€ 0	€ 1	Cyprus	€ 0	€ 0	€ 0
Denmark	€ 4	€ 10	€ 14	Denmark	€ 15	€ 40	€ 54
Estonia	€ 2	€ 2	€ 4	Estonia	€ 7	€ 9	€ 16
Finland	€ 4	€ 8	€ 12	Finland	€ 13	€ 28	€ 42
France	€ 37	€ 185	€ 221	France	€ 108	€ 549	€ 657
Germany	€ 65	€ 258	€ 322	Germany	€ 234	€ 912	€ 1,146
Greece	€ 2	€ 6	€ 7	Greece	€ 6	€ 21	€ 28
Hungary	€ 9	€ 16	€ 25	Hungary	€ 39	€ 68	€ 107
Ireland	€ 1	€ 3	€ 4	Ireland	€ 3	€ 8	€ 11
Italy	€ 83	€ 298	€ 381	Italy	€ 306	€ 1,219	€ 1,525
Latvia	€ 2	€ 3	€ 5	Latvia	€ 6	€ 7	€ 13
Lithuania	€ 4	€ 4	€ 8	Lithuania	€ 15	€ 14	€ 29
Luxembourg	€ 0	€ 0	€ 1	Luxembourg	€ 0	€ 2	€ 2
Malta	€ 0	€ 0	€ 0	Malta	€ 0	€ 0	€ 0
Netherlands	€ 4	€ 16	€ 20	Netherlands	€ 14	€ 60	€ 73
Poland	€ 33	€ 60	€ 92	Poland	€ 97	€ 208	€ 305
Portugal	€ 6	€ 11	€ 17	Portugal	€ 19	€ 34	€ 54
Romania	€ 21	€ 31	€ 52	Romania	€ 55	€ 84	€ 139
Slovakia	€ 5	€ 9	€ 14	Slovakia	€ 17	€ 32	€ 48
Slovenia	€ 3	€ 6	€ 9	Slovenia	€ 9	€ 19	€ 28
Spain	€ 20	€ 79	€ 99	Spain	€ 68	€ 278	€ 346
Sweden	€ 8	€ 24	€ 32	Sweden	€ 28	€ 89	€ 117
United Kingdom	€ 24	€ 100	€ 125	United Kingdom	€ 84	€ 335	€ 419
TOTAL	€ 372	€ 1,210	€ 1,582	TOTAL	€ 1,287	€ 4,370	€ 5,657

Table 8.4.2 Health costs – baseline scenario – Industry group breakdown - Based on a 4% discount rate

Low	Female	Male	Total
Manufacture of pulp, paper and paper products	€ 0	€ 1	€ 1
Publishing, printing and reproduction of recorded media	€ 1	€ 4	€ 6
Manufacture of chemicals and chemical products	€ 11	€ 41	€ 52
Manufacture of rubber and plastic products	€ 12	€ 40	€ 52
Manufacture of fabricated metal products, except machinery and equipment	€ 73	€ 249	€ 322
Manufacture of machinery and equipment n.e.c.	€ 51	€ 175	€ 226
Manufacture of office machinery and computers	€ 3	€ 10	€ 13
Manufacture of electrical machinery apparatus, appliances and supplies	€ 6	€ 20	€ 26
Manufacture of transport equipment	€ 65	€ 236	€ 302

Low	Female	Male	Total
Manufacture of motor vehicles, trailers and semi-trailers	€ 29	€ 99	€ 128
Research and Development	€ 0	€ 1	€ 1
Education	€ 3	€ 1	€ 4
Other community, social and personal service activities	€ 25	€ 36	€ 61
TOTAL	**€ 361**	**€ 1,167**	**€ 1,529**

High	Female	Male	Total
Manufacture of pulp, paper and paper products	€ 1	€ 3	€ 4
Publishing, printing and reproduction of recorded media	€ 4	€ 15	€ 19
Manufacture of chemicals and chemical products	€ 36	€ 142	€ 178
Manufacture of rubber and plastic products	€ 38	€ 139	€ 177
Manufacture of fabricated metal products, except machinery and equipment	€ 253	€ 885	€ 1,139
Manufacture of machinery and equipment n.e.c.	€ 177	€ 621	€ 798
Manufacture of office machinery and computers	€ 10	€ 35	€ 45
Manufacture of electrical machinery apparatus, appliances and supplies	€ 20	€ 70	€ 91
Manufacture of transport equipment	€ 225	€ 838	€ 1,063
Manufacture of motor vehicles, trailers and semi-trailers	€ 100	€ 349	€ 449
Research and Development	€ 2	€ 4	€ 6
Education	€ 13	€ 7	€ 20
Other community, social and personal service activities	€ 85	€ 133	€ 218
TOTAL	**€ 1,233**	**€ 4,130**	**€ 5,363**

Note: Industry breakdown results may not equate exactly to Member State breakdown due to differences in underlying health data.

Table 8.4.3 Health costs – baseline scenario – Member State breakdown - Based on a declining discount rate

Low	Female	Male	Total	High	Female	Male	Total
Austria	€ 6	€ 29	€ 35	Austria	€ 26	€ 109	€ 135
Belgium	€ 0	€ 2	€ 2	Belgium	€ 16	€ 66	€ 82
Bulgaria	€ 9	€ 11	€ 20	Bulgaria	€ 16	€ 20	€ 36
Czech Republic	€ 28	€ 58	€ 87	Czech Republic	€ 115	€ 236	€ 351
Cyprus	€ 0	€ 0	€ 1	Cyprus	€ 0	€ 0	€ 0
Denmark	€ 4	€ 12	€ 16	Denmark	€ 18	€ 47	€ 65
Estonia	€ 2	€ 3	€ 5	Estonia	€ 9	€ 11	€ 19
Finland	€ 4	€ 9	€ 14	Finland	€ 16	€ 33	€ 50
France	€ 43	€ 214	€ 257	France	€ 126	€ 640	€ 766
Germany	€ 77	€ 308	€ 385	Germany	€ 281	€ 1,097	€ 1,378
Greece	€ 2	€ 7	€ 9	Greece	€ 8	€ 25	€ 33
Hungary	€ 11	€ 19	€ 30	Hungary	€ 46	€ 82	€ 129
Ireland	€ 1	€ 3	€ 4	Ireland	€ 3	€ 10	€ 13
Italy	€ 105	€ 376	€ 480	Italy	€ 387	€ 1,540	€ 1,926
Latvia	€ 2	€ 3	€ 6	Latvia	€ 7	€ 9	€ 16
Lithuania	€ 4	€ 5	€ 9	Lithuania	€ 19	€ 17	€ 36
Luxembourg	€ 0	€ 1	€ 1	Luxembourg	€ 0	€ 2	€ 2
Malta	€ 0	€ 0	€ 0	Malta	€ 0	€ 0	€ 0
Netherlands	€ 4	€ 19	€ 23	Netherlands	€ 16	€ 71	€ 88
Poland	€ 39	€ 72	€ 112	Poland	€ 118	€ 255	€ 373

Low	Female	Male	Total	High	Female	Male	Total
Portugal	€ 7	€ 13	€ 20	Portugal	€ 23	€ 41	€ 64
Romania	€ 25	€ 37	€ 62	Romania	€ 66	€ 102	€ 168
Slovakia	€ 6	€ 11	€ 17	Slovakia	€ 20	€ 39	€ 59
Slovenia	€ 4	€ 8	€ 11	Slovenia	€ 11	€ 23	€ 34
Spain	€ 26	€ 100	€ 126	Spain	€ 86	€ 354	€ 440
Sweden	€ 10	€ 28	€ 38	Sweden	€ 33	€ 105	€ 139
United Kingdom	€ 28	€ 114	€ 142	United Kingdom	€ 97	€ 382	€ 479
TOTAL	**€ 449**	**€ 1,461**	**€ 1,910**	**TOTAL**	**€ 1,563**	**€ 5,317**	**€ 6,880**

Table 8.4.4 Health costs – baseline scenario – Industry group breakdown - Based on a declining discount rate

Low	Female	Male	Total
Manufacture of pulp, paper and paper products	€ 0	€ 1	€ 1
Publishing, printing and reproduction of recorded media	€ 1	€ 5	€ 6
Manufacture of chemicals and chemical products	€ 13	€ 47	€ 60
Manufacture of rubber and plastic products	€ 14	€ 46	€ 60
Manufacture of fabricated metal products, except machinery and equipment	€ 89	€ 304	€ 394
Manufacture of machinery and equipment n.e.c.	€ 62	€ 213	€ 275
Manufacture of office machinery and computers	€ 3	€ 12	€ 15
Manufacture of electrical machinery apparatus, appliances and supplies	€ 7	€ 23	€ 31
Manufacture of transport equipment	€ 79	€ 287	€ 366
Manufacture of motor vehicles, trailers and semi-trailers	€ 35	€ 119	€ 155
Manufacture of furniture: manufacturing nec	€ 95	€ 298	€ 393
Research and Development	€ 0	€ 1	€ 2
Education	€ 4	€ 2	€ 6
Other community, social and personal service activities	€ 29	€ 43	€ 73
TOTAL	€ 434	€ 1,402	€ 1,835
High	Female	Male	Total
Manufacture of pulp, paper and paper products	€ 1	€ 4	€ 5
Publishing, printing and reproduction of recorded media	€ 5	€ 18	€ 23
Manufacture of chemicals and chemical products	€ 43	€ 166	€ 209
Manufacture of rubber and plastic products	€ 45	€ 164	€ 209
Manufacture of fabricated metal products, except machinery and equipment	€ 309	€ 1,082	€ 1,391
Manufacture of machinery and equipment n.e.c.	€ 215	€ 757	€ 972
Manufacture of office machinery and computers	€ 11	€ 42	€ 53
Manufacture of electrical machinery apparatus, appliances and supplies	€ 24	€ 83	€ 107
Manufacture of transport equipment	€ 273	€ 1,018	€ 1,290
Manufacture of motor vehicles, trailers and semi-trailers	€ 122	€ 422	€ 544
Manufacture of furniture: manufacturing nec	€ 318	€ 1,055	€ 1,373
Research and Development	€ 2	€ 6	€ 8
Education	€ 18	€ 10	€ 27
Other community, social and personal service activities	€ 102	€ 161	€ 263
TOTAL	€ 1,487	€ 4,987	€ 6,474

Note: Industry breakdown results may not equate exactly to Member State breakdown due to differences in underlying health data.

Table 8.4.5 Summary

Costs by Gender (€m)	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
Female	105 to 360	86 to 291	86 to 290	70 to 241	56 to 206	45 to 175
Male	337 to 1187	282 to 993	285 to 1008	230 to 836	182 to 703	145 to 590
Total	442 to 1547	368 to 1284	371 to 1299	301 to 1076	239 to 909	189 to 765

Table 8.4.6 Health costs – baseline scenario – Member State breakdown - Based on a no discounting

Low	Female	Male	Total	High	Female	Male	Total
Austria	€ 15	€ 69	€ 84	Austria	€ 64	€ 264	€ 328
Belgium	€ 1	€ 4	€ 5	Belgium	€ 38	€ 155	€ 193
Bulgaria	€ 20	€ 25	€ 46	Bulgaria	€ 38	€ 49	€ 87
Czech Republic	€ 69	€ 145	€ 214	Czech Republic	€ 290	€ 604	€ 894
Cyprus	€ 0	€ 1	€ 1	Cyprus	€ 0	€ 0	€ 0
Denmark	€ 10	€ 28	€ 38	Denmark	€ 43	€ 113	€ 156
Estonia	€ 6	€ 7	€ 12	Estonia	€ 21	€ 28	€ 49
Finland	€ 9	€ 21	€ 31	Finland	€ 39	€ 79	€ 118
France	€ 96	€ 473	€ 570	France	€ 285	€ 1,433	€ 1,719
Germany	€ 183	€ 735	€ 918	Germany	€ 680	€ 2,677	€ 3,357
Greece	€ 4	€ 15	€ 19	Greece	€ 18	€ 58	€ 75
Hungary	€ 25	€ 45	€ 70	Hungary	€ 112	€ 203	€ 315
Ireland	€ 4	€ 7	€ 11	Ireland	€ 8	€ 24	€ 32
Italy	€ 285	€ 1,025	€ 1,311	Italy	€ 1,062	€ 4,222	€ 5,284
Latvia	€ 6	€ 8	€ 14	Latvia	€ 17	€ 23	€ 40
Lithuania	€ 11	€ 13	€ 23	Lithuania	€ 49	€ 45	€ 94
Luxembourg	€ 0	€ 1	€ 1	Luxembourg	€ 1	€ 5	€ 6
Malta	€ 0	€ 0	€ 0	Malta	€ 0	€ 0	€ 0
Netherlands	€ 11	€ 44	€ 55	Netherlands	€ 41	€ 171	€ 212
Poland	€ 96	€ 180	€ 276	Poland	€ 298	€ 651	€ 949
Portugal	€ 16	€ 31	€ 46	Portugal	€ 55	€ 99	€ 153
Romania	€ 59	€ 86	€ 145	Romania	€ 161	€ 249	€ 410
Slovakia	€ 15	€ 26	€ 41	Slovakia	€ 51	€ 99	€ 150
Slovenia	€ 9	€ 19	€ 28	Slovenia	€ 26	€ 57	€ 83
Spain	€ 69	€ 274	€ 343	Spain	€ 231	€ 986	€ 1,217
Sweden	€ 23	€ 65	€ 87	Sweden	€ 79	€ 248	€ 327
United Kingdom	€ 60	€ 239	€ 299	United Kingdom	€ 210	€ 812	€ 1,022
TOTAL	**€ 1,102**	**€ 3,587**	**€ 4,690**	**TOTAL**	**€ 3,917**	**€ 13,352**	**€ 17,269**

Table 8.4.7 Health costs – baseline scenario – Industry group breakdown - Based on a no discounting

Low	Female	Male	Total
Manufacture of pulp, paper and paper products	€ 1	€ 2	€ 2
Publishing, printing and reproduction of recorded media	€ 3	€ 11	€ 14
Manufacture of chemicals and chemical products	€ 28	€ 103	€ 131
Manufacture of rubber and plastic products	€ 30	€ 102	€ 132
Manufacture of fabricated metal products, except machinery and equipment	€ 225	€ 766	€ 991
Manufacture of machinery and equipment n.e.c.	€ 156	€ 533	€ 689
Manufacture of office machinery and computers	€ 7	€ 26	€ 33
Manufacture of electrical machinery apparatus, appliances and supplies	€ 16	€ 52	€ 68
Research and Development	€ 1	€ 3	€ 5
Education	€ 12	€ 6	€ 17
Other community, social and personal service activities	€ 68	€ 100	€ 168
Manufacture of transport equipment			
Manufacture of motor vehicles, trailers and semi-trailers			
TOTAL	**€ 1,048**	**€ 3,386**	**€ 4,434**
High	**Female**	**Male**	**Total**
Manufacture of pulp, paper and paper products	€ 3	€ 10	€ 13
Publishing, printing and reproduction of recorded media	€ 11	€ 41	€ 51
Manufacture of chemicals and chemical products	€ 99	€ 382	€ 481
Manufacture of rubber and plastic products	€ 104	€ 377	€ 481
Manufacture of fabricated metal products, except machinery and equipment	€ 782	€ 2,740	€ 3,522
Manufacture of machinery and equipment n.e.c.	€ 541	€ 1,904	€ 2,445
Manufacture of office machinery and computers	€ 25	€ 94	€ 120
Manufacture of electrical machinery apparatus, appliances and supplies	€ 55	€ 192	€ 247
Manufacture of transport equipment	€ 678	€ 2,536	€ 3,214
Manufacture of motor vehicles, trailers and semi-trailers	€ 302	€ 1,044	€ 1,347
Manufacture of furniture: manufacturing nec	€ 747	€ 2,501	€ 3,248
Research and Development	€ 7	€ 18	€ 25
Education	€ 55	€ 31	€ 86
Other community, social and personal service activities	€ 251	€ 399	€ 650
TOTAL	**€ 3,659**	**€ 12,270**	**€ 15,928**

Note: Industry breakdown results may not equate exactly to Member State breakdown due to differences in underlying health data.

Table 8.4.8 Summary

Costs by Gender (€m)	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
Female	128 to 438	155 to 524	180 to 608	198 to 677	213 to 780	228 to 891
Male	410 to 1444	508 to 1788	597 to 2111	648 to 2352	690 to 2659	735 to 2998
Total	537 to 1882	663 to 2312	777 to 2719	846 to 3029	903 to 3439	963 to 3889

8.5 HEALTH BENEFITS – INTERVENTION SCENARIOS

Table 8.5.1 Proportions exposed above the exposure limits being tested by country, forecast scenario

OEL	*50*	*ppm*					*10*	*ppm*				
	1971-80	**1981-90**	**1991-00**	**2001-10**	**2011-20**	**2021-30**	**1971-80**	**1981-90**	**1991-00**	**2001-10**	**2011-20**	**2021-30**
Austria	0.44	0.24	0.10	0.03	0.01	0.00	5.00	0.70	0.48	0.28	0.13	0.04
Belgium	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Bulgaria	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Cyprus	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Czech Republic	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Denmark	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Estonia	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Finland	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
France	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Germany	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Greece	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Hungary	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Ireland	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Italy	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Latvia	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Lithuania	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Luxembourg	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Malta	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Netherlands	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Poland	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Portugal	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Romania	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04

OEL	*50*	*ppm*					*10*	*ppm*				
	1971-80	1981-90	1991-00	2001-10	2011-20	2021-30	1971-80	1981-90	1991-00	2001-10	2011-20	2021-30
Slovakia	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Slovenia	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Spain	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
Sweden	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
United Kingdom	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04
TOTAL	0.44	0.24	0.10	0.03	0.01	0.00	0.86	0.70	0.48	0.28	0.13	0.04

Table 8.5.2 Numbers and proportions of the population ever exposed for baseline, forecast and intervention [(1)] scenarios (1) to (4a), by country, men plus women (for kidney and liver cancer)

Scenario	**All Scenarios**		**Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.**				**Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)**				**Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)**			
Country	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Number ever exposed in the REP														
Austria	5,094	5,305	5,577	5,717	5,817	5,879	5,577	5,717	5,817	5,879	5,577	5,717	5,817	5,879
Belgium	4,505	4,698	4,947	5,081	5,177	5,236	4,947	5,081	5,177	5,236	4,947	5,081	5,177	5,236
Bulgaria	4,186	4,348	4,555	4,650	4,719	4,761	4,555	4,650	4,719	4,761	4,555	4,650	4,719	4,761
Cyprus	241	255	274	287	296	302	274	287	296	302	274	287	296	302
Czech Republic	11,730	12,100	12,559	12,692	12,787	12,846	12,559	12,692	12,787	12,846	12,559	12,692	12,787	12,846
Denmark	3,515	3,676	3,887	4,010	4,098	4,152	3,887	4,010	4,098	4,152	3,887	4,010	4,098	4,152
Estonia	1,121	1,165	1,223	1,251	1,271	1,283	1,223	1,251	1,271	1,283	1,223	1,251	1,271	1,283
Finland	3,114	3,304	3,559	3,745	3,878	3,961	3,559	3,745	3,878	3,961	3,559	3,745	3,878	3,961
France	35,346	34,612	34,024	33,559	32,736	32,475	34,024	33,559	32,736	32,475	34,024	33,559	32,736	32,475
Greece	1,671	1,783	1,935	2,051	2,135	2,187	1,935	2,051	2,135	2,187	1,935	2,051	2,135	2,187
Hungary	5,866	6,094	6,386	6,524	6,622	6,683	6,386	6,524	6,622	6,683	6,386	6,524	6,622	6,683

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Number ever exposed in the REP														
Ireland	1,231	1,307	1,409	1,485	1,539	1,572	1,409	1,485	1,539	1,572	1,409	1,485	1,539	1,572
Italy	35,738	36,616	37,657	37,657	37,657	37,657	37,657	37,657	37,657	37,657	37,657	37,657	37,657	37,657
Latvia	1,268	1,325	1,399	1,440	1,470	1,488	1,399	1,440	1,470	1,488	1,399	1,440	1,470	1,488
Lithuania	2,336	2,428	2,545	2,601	2,641	2,666	2,545	2,601	2,641	2,666	2,545	2,601	2,641	2,666
Luxembourg	147	154	163	168	172	175	163	168	172	175	163	168	172	175
Malta	16	20	24	29	32	35	24	29	32	35	24	29	32	35
Netherlands	6,146	6,455	6,864	7,123	7,310	7,425	6,864	7,123	7,310	7,425	6,864	7,123	7,310	7,425
Poland	22,991	23,824	24,882	25,319	25,633	25,828	24,882	25,319	25,633	25,828	24,882	25,319	25,633	25,828
Portugal	5,372	5,579	5,844	5,967	6,055	6,110	5,844	5,967	6,055	6,110	5,844	5,967	6,055	6,110
Romania	12,305	12,731	13,269	13,470	13,615	13,704	13,269	13,470	13,615	13,704	13,269	13,470	13,615	13,704
Slovakia	3,177	3,297	3,450	3,519	3,568	3,598	3,450	3,519	3,568	3,598	3,450	3,519	3,568	3,598
Slovenia	2,022	2,092	2,181	2,214	2,238	2,252	2,181	2,214	2,238	2,252	2,181	2,214	2,238	2,252
Spain	13,998	17,554	22,485	27,426	31,121	33,593	22,485	27,426	31,121	33,593	22,485	27,426	31,121	33,593
Sweden	7,618	7,920	8,309	8,497	8,633	8,717	8,309	8,497	8,633	8,717	8,309	8,497	8,633	8,717
United Kingdom	39,514	37,300	34,156	30,957	28,653	27,215	34,156	30,957	28,653	27,215	34,156	30,957	28,653	27,215
TOTAL	291,882	299,942	310,620	315,914	319,370	321,932	310,620	315,914	319,370	321,932	310,620	315,914	319,370	321,932

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Proportion of the population exposed														
Austria	0.083	0.081	0.082	0.082	0.083	0.085	0.082	0.082	0.083	0.085	0.082	0.082	0.083	0.085
Belgium	0.059	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
Bulgaria	0.075	0.079	0.088	0.094	0.101	0.110	0.088	0.094	0.101	0.110	0.088	0.094	0.101	0.110
Cyprus	0.043	0.038	0.036	0.034	0.032	0.031	0.036	0.034	0.032	0.031	0.036	0.034	0.032	0.031
Czech Republic	0.154	0.151	0.157	0.159	0.164	0.172	0.157	0.159	0.164	0.172	0.157	0.159	0.164	0.172
Denmark	0.091	0.091	0.093	0.095	0.097	0.097	0.093	0.095	0.097	0.097	0.093	0.095	0.097	0.097
Estonia	0.119	0.121	0.132	0.136	0.142	0.150	0.132	0.136	0.142	0.150	0.132	0.136	0.142	0.150
Finland	0.082	0.083	0.088	0.093	0.097	0.100	0.088	0.093	0.097	0.100	0.088	0.093	0.097	0.100
France	0.082	0.075	0.071	0.067	0.064	0.063	0.071	0.067	0.064	0.063	0.071	0.067	0.064	0.063
Germany	0.100	0.101	0.107	0.112	0.119	0.127	0.107	0.112	0.119	0.127	0.107	0.112	0.119	0.127
Greece	0.020	0.020	0.022	0.023	0.024	0.025	0.022	0.023	0.024	0.025	0.022	0.023	0.024	0.025
Hungary	0.080	0.082	0.087	0.090	0.094	0.098	0.087	0.090	0.094	0.098	0.087	0.090	0.094	0.098
Ireland	0.041	0.036	0.035	0.034	0.033	0.033	0.035	0.034	0.033	0.033	0.035	0.034	0.033	0.033
Italy	0.078	0.077	0.078	0.077	0.078	0.080	0.078	0.077	0.078	0.080	0.078	0.077	0.078	0.080
Latvia	0.079	0.081	0.091	0.097	0.104	0.113	0.091	0.097	0.104	0.113	0.091	0.097	0.104	0.113
Lithuania	0.100	0.101	0.109	0.115	0.122	0.133	0.109	0.115	0.122	0.133	0.109	0.115	0.122	0.133
Luxembourg	0.042	0.039	0.037	0.036	0.034	0.033	0.037	0.036	0.034	0.033	0.037	0.036	0.034	0.033
Malta	0.006	0.006	0.007	0.009	0.010	0.011	0.007	0.009	0.010	0.011	0.007	0.009	0.010	0.011
Netherlands	0.053	0.053	0.054	0.056	0.058	0.060	0.054	0.056	0.058	0.060	0.054	0.056	0.058	0.060
Poland	0.085	0.084	0.088	0.091	0.096	0.103	0.088	0.091	0.096	0.103	0.088	0.091	0.096	0.103
Portugal	0.068	0.067	0.068	0.067	0.068	0.070	0.068	0.067	0.068	0.070	0.068	0.067	0.068	0.070
Romania	0.081	0.082	0.086	0.089	0.094	0.101	0.086	0.089	0.094	0.101	0.086	0.089	0.094	0.101
Slovakia	0.084	0.081	0.084	0.087	0.091	0.098	0.084	0.087	0.091	0.098	0.084	0.087	0.091	0.098
Slovenia	0.134	0.133	0.140	0.144	0.152	0.163	0.140	0.144	0.152	0.163	0.140	0.144	0.152	0.163

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Proportion of the population exposed														
Spain	0.040	0.046	0.057	0.066	0.075	0.084	0.057	0.066	0.075	0.084	0.057	0.066	0.075	0.084
Sweden	0.117	0.112	0.114	0.113	0.111	0.110	0.114	0.113	0.111	0.110	0.114	0.113	0.111	0.110
United Kingdom	0.092	0.080	0.070	0.060	0.053	0.049	0.070	0.060	0.053	0.049	0.070	0.060	0.053	0.049
TOTAL	0.081	0.079	0.080	0.080	0.081	0.084	0.080	0.080	0.081	0.084	0.080	0.080	0.081	0.084

Table 8.5.3 Numbers and proportions of the population ever exposed for baseline, forecast and intervention [1] scenarios (1) to (4a), by country, men plus women (for Non-Hodgkins Lymphoma)

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Number ever exposed in the REP													
Austria	4,009	4,112	4,196	4,228	4,228	4,228	4,196	4,228	4,228	4,228	4,196	4,228	4,228	4,228
Belgium	3,422	3,522	3,602	3,633	3,633	3,633	3,602	3,633	3,633	3,633	3,602	3,633	3,633	3,633
Bulgaria	3,042	3,114	3,172	3,194	3,194	3,194	3,172	3,194	3,194	3,194	3,172	3,194	3,194	3,194
Cyprus	186	196	203	206	206	206	203	206	206	206	203	206	206	206
Czech Republic	8,545	8,643	8,723	8,753	8,753	8,753	8,723	8,753	8,753	8,753	8,723	8,753	8,753	8,753
Denmark	2,656	2,748	2,822	2,850	2,850	2,850	2,822	2,850	2,850	2,850	2,822	2,850	2,850	2,850

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Number ever exposed in the REP													
Estonia	817	838	854	861	861	861	854	861	861	861	854	861	861	861
Finland	2,409	2,547	2,657	2,700	2,700	2,700	2,657	2,700	2,700	2,700	2,657	2,700	2,700	2,700
France	23,659	23,061	22,890	21,840	21,840	21,840	22,890	21,840	21,840	21,840	22,890	21,840	21,840	21,840
Germany	46,351	47,423	48,292	48,625	48,625	48,625	48,292	48,625	48,625	48,625	48,292	48,625	48,625	48,625
Greece	1,310	1,396	1,466	1,493	1,493	1,493	1,466	1,493	1,493	1,493	1,466	1,493	1,493	1,493
Hungary	4,317	4,419	4,501	4,533	4,533	4,533	4,501	4,533	4,533	4,533	4,501	4,533	4,533	4,533
Ireland	956	1,012	1,058	1,075	1,075	1,075	1,058	1,075	1,075	1,075	1,058	1,075	1,075	1,075
Italy	26,105	26,105	26,105	26,105	26,105	26,105	26,105	26,105	26,105	26,105	26,105	26,105	26,105	26,105
Latvia	937	967	992	1,001	1,001	1,001	992	1,001	1,001	1,001	992	1,001	1,001	1,001
Lithuania	1,696	1,736	1,769	1,782	1,782	1,782	1,769	1,782	1,782	1,782	1,769	1,782	1,782	1,782
Luxembourg	113	117	121	122	122	122	121	122	122	122	121	122	122	122
Malta	15	19	22	23	23	23	22	23	23	23	22	23	23	23
Netherlands	4,738	4,931	5,087	5,146	5,146	5,146	5,087	5,146	5,146	5,146	5,087	5,146	5,146	5,146
Poland	16,936	17,261	17,524	17,625	17,625	17,625	17,524	17,625	17,625	17,625	17,524	17,625	17,625	17,625
Portugal	3,930	4,021	4,094	4,122	4,122	4,122	4,094	4,122	4,122	4,122	4,094	4,122	4,122	4,122
Romania	8,892	9,043	9,165	9,212	9,212	9,212	9,165	9,212	9,212	9,212	9,165	9,212	9,212	9,212
Slovakia	2,336	2,387	2,428	2,444	2,444	2,444	2,428	2,444	2,444	2,444	2,428	2,444	2,444	2,444
Slovenia	1,484	1,508	1,528	1,536	1,536	1,536	1,528	1,536	1,536	1,536	1,528	1,536	1,536	1,536
Spain	15,151	18,624	22,000	24,058	24,058	24,058	22,000	24,058	24,058	24,058	22,000	24,058	24,058	24,058
Sweden	5,730	5,870	5,983	6,026	6,026	6,026	5,983	6,026	6,026	6,026	5,983	6,026	6,026	6,026

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Number ever exposed in the REP													
United Kingdom	23,911	21,289	19,123	18,268	18,268	18,268	19,123	18,268	18,268	18,268	19,123	18,268	18,268	18,268
TOTAL	213,655	216,910	220,378	221,459	221,459	221,459	220,378	221,459	221,459	221,459	220,378	221,459	221,459	221,459

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Proportion of the population exposed														
Austria	0.059%	0.059%	0.059%	0.059%	0.062%	0.063%	0.059%	0.059%	0.062%	0.063%	0.059%	0.059%	0.062%	0.063%
Belgium	0.041%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%
Bulgaria	0.049%	0.053%	0.058%	0.063%	0.069%	0.077%	0.058%	0.063%	0.069%	0.077%	0.058%	0.063%	0.069%	0.077%
Cyprus	0.028%	0.026%	0.024%	0.022%	0.021%	0.020%	0.024%	0.022%	0.021%	0.020%	0.024%	0.022%	0.021%	0.020%
Czech Republic	0.100%	0.101%	0.104%	0.108%	0.113%	0.124%	0.104%	0.108%	0.113%	0.124%	0.104%	0.108%	0.113%	0.124%
Denmark	0.062%	0.062%	0.064%	0.065%	0.065%	0.065%	0.064%	0.065%	0.065%	0.065%	0.064%	0.065%	0.065%	0.065%

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Proportion of the population exposed														
Estonia	0.076%	0.082%	0.085%	0.090%	0.095%	0.101%	0.085%	0.090%	0.095%	0.101%	0.085%	0.090%	0.095%	0.101%
Finland	0.057%	0.060%	0.063%	0.066%	0.067%	0.068%	0.063%	0.066%	0.067%	0.068%	0.063%	0.066%	0.067%	0.068%
France	0.050%	0.046%	0.045%	0.042%	0.042%	0.042%	0.045%	0.042%	0.042%	0.042%	0.045%	0.042%	0.042%	0.042%
Germany	0.069%	0.072%	0.076%	0.081%	0.088%	0.093%	0.076%	0.081%	0.088%	0.093%	0.076%	0.081%	0.088%	0.093%
Greece	0.014%	0.015%	0.016%	0.016%	0.017%	0.018%	0.016%	0.016%	0.017%	0.018%	0.016%	0.016%	0.017%	0.018%
Hungary	0.053%	0.056%	0.058%	0.062%	0.064%	0.070%	0.058%	0.062%	0.064%	0.070%	0.058%	0.062%	0.064%	0.070%
Ireland	0.027%	0.025%	0.023%	0.022%	0.022%	0.022%	0.023%	0.022%	0.022%	0.022%	0.023%	0.022%	0.022%	0.022%
Italy	0.054%	0.054%	0.053%	0.054%	0.057%	0.060%	0.053%	0.054%	0.057%	0.060%	0.053%	0.054%	0.057%	0.060%
Latvia	0.051%	0.057%	0.061%	0.065%	0.072%	0.078%	0.061%	0.065%	0.072%	0.078%	0.061%	0.065%	0.072%	0.078%
Lithuania	0.062%	0.067%	0.071%	0.076%	0.084%	0.092%	0.071%	0.076%	0.084%	0.092%	0.071%	0.076%	0.084%	0.092%
Luxembourg	0.029%	0.027%	0.025%	0.024%	0.023%	0.022%	0.025%	0.024%	0.023%	0.022%	0.025%	0.024%	0.023%	0.022%
Malta	0.005%	0.006%	0.006%	0.007%	0.007%	0.008%	0.006%	0.007%	0.007%	0.008%	0.006%	0.007%	0.007%	0.008%
Netherlands	0.037%	0.037%	0.038%	0.040%	0.041%	0.042%	0.038%	0.040%	0.041%	0.042%	0.038%	0.040%	0.041%	0.042%

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Proportion of the population exposed														
Poland	0.054%	0.056%	0.058%	0.063%	0.068%	0.075%	0.058%	0.063%	0.068%	0.075%	0.058%	0.063%	0.068%	0.075%
Portugal	0.046%	0.045%	0.045%	0.046%	0.047%	0.049%	0.045%	0.046%	0.047%	0.049%	0.045%	0.046%	0.047%	0.049%
Romania	0.051%	0.054%	0.056%	0.060%	0.064%	0.072%	0.056%	0.060%	0.064%	0.072%	0.056%	0.060%	0.064%	0.072%
Slovakia	0.053%	0.053%	0.055%	0.059%	0.063%	0.071%	0.055%	0.059%	0.063%	0.071%	0.055%	0.059%	0.063%	0.071%
Slovenia	0.089%	0.091%	0.094%	0.100%	0.109%	0.118%	0.094%	0.100%	0.109%	0.118%	0.094%	0.100%	0.109%	0.118%
Spain	0.040%	0.046%	0.052%	0.057%	0.060%	0.064%	0.052%	0.057%	0.060%	0.064%	0.052%	0.057%	0.060%	0.064%
Sweden	0.079%	0.077%	0.078%	0.076%	0.076%	0.075%	0.078%	0.076%	0.076%	0.075%	0.078%	0.076%	0.076%	0.075%
United Kingdom	0.049%	0.042%	0.036%	0.033%	0.033%	0.032%	0.036%	0.033%	0.033%	0.032%	0.036%	0.033%	0.033%	0.032%
TOTAL	0.054%	0.053%	0.054%	0.055%	0.057%	0.059%	0.054%	0.055%	0.057%	0.059%	0.054%	0.055%	0.057%	0.059%

Table 8.5.4 Results for baseline, forecast and intervention [1] scenarios (1) to (4a) for kidney cancer, by country, men plus women

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Fraction														
Austria	0.045	0.042	0.038	0.034	0.032	0.031	0.038	0.034	0.032	0.032	0.038	0.034	0.030	0.028
Belgium	0.034	0.031	0.027	0.024	0.022	0.021	0.027	0.024	0.022	0.021	0.027	0.024	0.021	0.019
Bulgaria	0.034	0.034	0.034	0.033	0.033	0.034	0.034	0.033	0.033	0.035	0.034	0.032	0.031	0.032
Cyprus	0.022	0.018	0.015	0.013	0.011	0.011	0.015	0.013	0.012	0.011	0.015	0.013	0.011	0.010
Czech Republic	0.084	0.078	0.073	0.066	0.061	0.060	0.073	0.065	0.061	0.062	0.072	0.064	0.057	0.055
Denmark	0.047	0.044	0.040	0.037	0.035	0.033	0.040	0.037	0.035	0.034	0.040	0.036	0.033	0.031
Estonia	0.054	0.052	0.052	0.049	0.047	0.046	0.052	0.048	0.046	0.047	0.052	0.048	0.044	0.043
Finland	0.043	0.039	0.036	0.033	0.032	0.032	0.036	0.033	0.032	0.032	0.036	0.033	0.031	0.031
France	0.051	0.044	0.035	0.029	0.025	0.023	0.035	0.029	0.025	0.023	0.035	0.029	0.024	0.021
Germany	0.059	0.057	0.053	0.049	0.046	0.046	0.053	0.049	0.047	0.048	0.053	0.048	0.044	0.042
Greece	0.011	0.011	0.010	0.009	0.008	0.008	0.010	0.009	0.008	0.008	0.010	0.009	0.008	0.008
Hungary	0.042	0.040	0.038	0.035	0.033	0.032	0.038	0.035	0.033	0.033	0.038	0.034	0.031	0.030
Ireland	0.019	0.016	0.014	0.012	0.011	0.010	0.014	0.012	0.011	0.011	0.014	0.012	0.011	0.010
Italy	0.046	0.044	0.040	0.037	0.036	0.037	0.040	0.037	0.036	0.037	0.040	0.037	0.035	0.036
Latvia	0.036	0.035	0.036	0.035	0.034	0.035	0.036	0.035	0.034	0.036	0.036	0.034	0.033	0.033
Lithuania	0.043	0.041	0.041	0.040	0.039	0.040	0.041	0.040	0.039	0.041	0.041	0.039	0.037	0.037
Luxembourg	0.027	0.023	0.020	0.016	0.014	0.013	0.020	0.016	0.014	0.013	0.020	0.016	0.013	0.012
Malta	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.003	0.003	0.002	0.002	0.003	0.003
Netherlands	0.030	0.028	0.025	0.023	0.022	0.021	0.025	0.023	0.022	0.022	0.025	0.022	0.021	0.020
Poland	0.044	0.041	0.039	0.036	0.035	0.036	0.039	0.036	0.035	0.036	0.039	0.035	0.033	0.033
Portugal	0.032	0.030	0.027	0.025	0.023	0.022	0.027	0.024	0.023	0.023	0.027	0.024	0.022	0.021
Romania	0.039	0.037	0.035	0.033	0.032	0.032	0.035	0.032	0.032	0.033	0.035	0.032	0.030	0.030
Slovakia	0.044	0.040	0.037	0.034	0.032	0.033	0.037	0.034	0.032	0.033	0.037	0.033	0.030	0.030
Slovenia	0.069	0.065	0.061	0.057	0.055	0.056	0.061	0.057	0.055	0.057	0.061	0.056	0.052	0.052

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Fraction														
Spain	0.018	0.020	0.023	0.025	0.028	0.030	0.023	0.025	0.028	0.031	0.023	0.024	0.026	0.028
Sweden	0.065	0.058	0.052	0.045	0.041	0.038	0.052	0.045	0.041	0.039	0.052	0.044	0.038	0.035
United Kingdom	0.057	0.047	0.036	0.027	0.020	0.017	0.036	0.027	0.021	0.017	0.036	0.026	0.020	0.016
TOTAL	0.046	0.042	0.038	0.034	0.031	0.030	0.038	0.034	0.031	0.031	0.038	0.033	0.030	0.028

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Deaths														
Austria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	2	2	2	2	1	1	2	2	1	1	2	2	1	1
Germany	3	4	4	4	4	4	4	4	4	4	4	4	4	3
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Deaths														
Italy	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poland	1	1	1	2	2	2	1	2	2	2	1	1	1	2
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Sweden	0	0	0	0	0	0	0	0	0	0	0	0	0	0
United Kingdom	2	2	2	2	1	1	2	2	1	1	2	1	1	1
TOTAL	13	14	14	15	15	15	14	15	15	15	14	14	14	14

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Registrations														
Austria	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Belgium	0	1	1	0	0	0	1	0	0	0	1	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	2	3	3	3	3	3	3	3	3	3	3	3	2	2
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	4	4	3	3	3	3	3	3	3	3	3	3	3	2
Germany	9	9	10	9	9	8	10	9	9	8	10	9	8	7
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	4	5	5	5	5	5	5	5	5	5	5	5	5	5
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Poland	2	3	3	3	3	3	3	3	3	3	3	3	3	3
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Registrations														
Spain	1	1	2	2	2	2	2	2	2	3	2	2	2	2
Sweden	1	1	1	1	1	1	1	1	1	1	1	1	1	1
United Kingdom	4	4	3	3	2	2	3	3	2	2	3	3	2	2
TOTAL	31	32	33	32	30	29	33	31	30	30	33	31	29	27

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lost (YLLs)														
Austria	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	2	2	2	2	1	1	2	2	1	1	2	2	1	1
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	14	14	15	14	14	13	15	14	14	13	15	14	13	12
Denmark	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Estonia	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Finland	2	2	2	2	2	2	2	2	2	2	2	2	2	2
France	25	25	22	20	18	17	22	20	18	17	22	20	17	16
Germany	44	47	48	46	43	40	48	46	43	42	48	45	40	37
Greece	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hungary	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lost (YLLs)														
Ireland	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Italy	22	24	25	25	25	24	25	25	25	25	25	24	24	24
Latvia	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lithuania	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	4	5	5	4	4	4	5	4	4	4	5	4	4	4
Poland	17	18	19	19	19	18	19	19	19	19	19	19	18	17
Portugal	1	1	2	2	2	2	2	2	2	2	2	2	1	1
Romania	4	4	4	4	3	3	4	4	3	3	4	4	3	3
Slovakia	2	2	3	3	2	2	3	3	2	2	3	2	2	2
Slovenia	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spain	5	7	10	12	14	15	10	12	14	16	10	11	13	14
Sweden	5	6	5	5	5	5	5	5	5	5	5	5	4	4
United Kingdom	32	29	25	20	16	14	25	20	16	15	25	20	16	14
TOTAL	189	196	196	188	179	174	196	187	180	178	196	184	170	162

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lived with Disability (DALYs)														
Austria	3	4	4	4	4	4	4	4	4	4	4	4	3	3
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	2	2	2	2	2	1	2	2	2	2	2	2	1	1
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	16	17	17	17	16	15	17	17	16	16	17	16	15	14
Denmark	3	3	3	3	2	2	3	3	2	2	3	3	2	2
Estonia	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Finland	2	3	3	2	2	2	3	2	2	2	3	2	2	2
France	29	28	25	23	20	19	25	23	20	19	25	22	19	18
Germany	52	55	56	53	50	47	56	53	50	49	56	52	47	43
Greece	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hungary	5	5	5	5	5	5	5	5	5	5	5	5	4	4
Ireland	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Italy	26	28	29	29	29	28	29	29	29	29	29	28	28	28
Latvia	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lithuania	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	5	5	5	5	5	5	5	5	5	5	5	5	5	4
Poland	19	20	21	22	21	21	21	22	21	21	21	21	20	19
Portugal	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Romania	4	4	4	4	4	4	4	4	4	4	4	4	4	3
Slovakia	3	3	3	3	3	3	3	3	3	3	3	3	3	2

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lived with Disability (DALYs)														
Slovenia	1	2	2	2	2	2	2	2	2	2	2	2	1	1
Spain	6	8	11	13	16	17	11	13	16	18	11	13	15	16
Sweden	6	6	6	6	5	5	6	6	5	5	6	6	5	5
United Kingdom	35	32	27	22	18	16	27	22	18	16	27	22	17	15
TOTAL	216	224	223	215	205	198	223	214	205	203	223	210	194	185

Table 8.5.5 Results for baseline, forecast and intervention [1] scenarios (1) to (4a) for liver cancer, by country, men plus women

Scenario	All Scenarios		*Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.*				*Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)*				*Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)*			
Country	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*	*2030*	*2040*	*2050*	*2060*	*2030*	*2040*	*2050*	*2060*
	Attributable Fraction													
Austria	0.076	0.071	0.063	0.050	0.035	0.023	0.063	0.049	0.037	0.031	0.063	0.044	0.021	0.006
Belgium	0.050	0.046	0.039	0.028	0.018	0.011	0.039	0.028	0.019	0.014	0.039	0.026	0.011	0.002
Bulgaria	0.056	0.056	0.055	0.045	0.033	0.022	0.054	0.044	0.031	0.023	0.054	0.040	0.019	0.004
Cyprus	0.034	0.027	0.022	0.015	0.009	0.005	0.022	0.015	0.009	0.007	0.022	0.014	0.006	0.001
Czech Republic	0.127	0.121	0.114	0.094	0.071	0.050	0.114	0.092	0.070	0.058	0.113	0.084	0.042	0.013
Denmark	0.077	0.072	0.062	0.048	0.031	0.019	0.062	0.047	0.032	0.024	0.062	0.043	0.019	0.004
Estonia	0.091	0.088	0.084	0.067	0.047	0.031	0.083	0.064	0.042	0.031	0.083	0.060	0.027	0.006
Finland	0.060	0.053	0.042	0.028	0.015	0.007	0.042	0.028	0.016	0.011	0.042	0.026	0.010	0.001
France	0.081	0.069	0.055	0.039	0.024	0.014	0.055	0.039	0.026	0.019	0.054	0.035	0.015	0.003

Scenario	All Scenarios		*Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.*				*Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)*				*Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)*			
Country	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***	***2030***	***2040***	***2050***	***2060***	***2030***	***2040***	***2050***	***2060***
	Attributable Fraction													
Germany	0.091	0.088	0.082	0.068	0.049	0.034	0.082	0.067	0.051	0.044	0.082	0.060	0.030	0.009
Greece	0.016	0.014	0.012	0.008	0.004	0.002	0.012	0.008	0.005	0.003	0.011	0.007	0.003	0.000
Hungary	0.064	0.062	0.056	0.044	0.030	0.019	0.056	0.043	0.030	0.022	0.056	0.040	0.018	0.004
Ireland	0.031	0.025	0.020	0.014	0.008	0.004	0.020	0.014	0.008	0.006	0.020	0.013	0.005	0.001
Italy	0.072	0.072	0.071	0.069	0.069	0.070	0.071	0.069	0.069	0.071	0.071	0.068	0.065	0.063
Latvia	0.060	0.058	0.055	0.044	0.031	0.020	0.055	0.043	0.030	0.024	0.055	0.040	0.018	0.004
Lithuania	0.074	0.071	0.066	0.055	0.039	0.026	0.066	0.053	0.036	0.027	0.066	0.049	0.023	0.005
Luxembourg	0.039	0.034	0.028	0.019	0.012	0.007	0.028	0.019	0.013	0.010	0.028	0.017	0.007	0.002
Malta	0.003	0.002	0.002	0.001	0.001	0.000	0.002	0.001	0.001	0.000	0.002	0.001	0.000	0.000
Netherlands	0.045	0.041	0.034	0.025	0.015	0.009	0.034	0.025	0.016	0.013	0.034	0.022	0.010	0.002
Poland	0.068	0.063	0.059	0.048	0.035	0.024	0.059	0.046	0.033	0.027	0.058	0.042	0.020	0.005
Portugal	0.052	0.048	0.042	0.032	0.022	0.014	0.042	0.032	0.022	0.017	0.042	0.029	0.013	0.003
Romania	0.061	0.059	0.055	0.044	0.032	0.022	0.055	0.043	0.030	0.024	0.054	0.039	0.019	0.004
Slovakia	0.067	0.061	0.055	0.043	0.030	0.020	0.055	0.042	0.029	0.022	0.054	0.038	0.018	0.004
Slovenia	0.108	0.103	0.095	0.076	0.055	0.038	0.095	0.075	0.054	0.044	0.094	0.068	0.033	0.008
Spain	0.029	0.032	0.036	0.034	0.029	0.022	0.036	0.034	0.030	0.029	0.035	0.029	0.016	0.006
Sweden	0.098	0.089	0.077	0.058	0.037	0.023	0.077	0.057	0.038	0.029	0.077	0.052	0.023	0.005
United Kingdom	0.086	0.070	0.051	0.031	0.016	0.007	0.051	0.031	0.016	0.010	0.050	0.029	0.010	0.001
TOTAL	0.071	0.066	0.058	0.047	0.035	0.025	0.058	0.046	0.035	0.030	0.058	0.043	0.024	0.012

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Deaths													
Austria	1	1	1	1	1	0	1	1	1	0	1	1	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	1	1	1	1	0	0	1	0	0	0	1	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	1	1	2	1	1	1	2	1	1	1	2	1	1	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	6	7	6	5	3	2	6	5	3	3	6	4	2	0
Germany	7	7	8	7	5	3	8	7	6	5	8	6	3	1
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	1	1	0	0	0	1	0	0	0	1	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	8	9	10	11	12	12	10	11	12	12	10	11	11	11
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poland	1	2	2	2	1	1	2	2	1	1	2	2	1	0
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	2	2	2	2	1	1	2	2	1	1	2	1	1	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	1	2	3	3	3	2	3	3	3	3	3	3	2	1

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Deaths														
Sweden	1	1	1	1	0	0	1	1	0	0	1	1	0	0
United Kingdom	3	3	2	2	1	0	2	2	1	1	2	1	1	0
TOTAL	34	37	38	35	28	21	38	35	28	25	38	32	19	10

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Registrations														
Austria	1	1	1	1	0	0	1	1	1	0	1	1	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	6	6	5	4	3	2	5	4	3	2	5	4	2	0
Germany	5	5	5	4	3	2	5	4	3	3	5	4	2	1
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	1	1	1	1	1	0	1	1	0	0	1	1	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	10	11	13	14	14	14	13	14	14	14	13	14	13	13

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Registrations														
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poland	1	1	2	1	1	1	2	1	1	1	2	1	1	0
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	1	2	2	1	1	1	2	1	1	1	2	1	1	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	2	2	3	3	3	2	3	3	3	3	3	3	2	1
Sweden	1	1	1	0	0	0	1	0	0	0	1	0	0	0
United Kingdom	2	2	2	1	1	0	2	1	1	0	2	1	0	0
TOTAL	34	36	37	33	25	18	37	32	26	22	37	30	17	9

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lost (YLLs)														
Austria	10	11	11	9	7	4	11	9	7	6	11	8	4	1
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	7	7	7	6	4	3	7	6	4	3	7	5	2	1
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	17	18	19	17	13	9	19	17	13	10	19	15	8	2
Denmark	4	4	4	3	2	1	4	3	2	2	4	3	1	0
Estonia	1	1	1	1	1	0	1	1	1	0	1	1	0	0
Finland	4	4	3	2	1	1	3	2	1	1	3	2	1	0
France	99	98	86	66	42	25	86	66	45	35	86	59	26	6
Germany	94	102	102	87	62	40	102	87	64	53	102	78	37	10
Greece	3	3	3	2	1	1	3	2	1	1	3	2	1	0
Hungary	7	7	7	6	4	2	7	5	4	3	7	5	2	0
Ireland	1	1	1	1	1	0	1	1	1	0	1	1	0	0
Italy	104	117	132	140	142	140	132	139	142	141	132	136	132	127
Latvia	1	1	1	1	1	0	1	1	1	0	1	1	0	0
Lithuania	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	4	4	4	3	2	1	4	3	2	1	4	3	1	0
Poland	20	22	23	20	15	10	23	20	14	11	23	18	9	2
Portugal	6	6	6	5	3	2	6	5	3	3	6	4	2	0
Romania	22	23	23	20	14	9	23	19	14	10	23	18	8	2
Slovakia	4	4	4	4	3	2	4	3	3	2	4	3	2	0
Slovenia	3	3	3	3	2	1	3	3	2	1	3	2	1	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lost (YLLs)														
Spain	21	27	37	40	36	28	37	40	38	37	37	35	20	7
Sweden	9	9	9	7	5	3	9	7	5	4	9	6	3	1
United KingdomK	41	38	30	20	11	5	30	20	11	7	30	19	7	1
TOTAL	481	509	506	437	331	243	506	433	338	288	504	397	227	112

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lived with Disability (DALYs)														
Austria	10	11	11	9	7	4	11	9	7	6	11	8	4	1
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	7	8	7	6	4	3	7	6	4	3	7	5	3	1
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	17	18	19	17	13	9	19	17	13	10	19	15	8	2
Denmark	4	4	4	3	2	1	4	3	2	2	4	3	1	0
Estonia	1	1	1	1	1	0	1	1	1	0	1	1	0	0
Finland	4	4	3	2	1	1	3	2	1	1	3	2	1	0
France	101	100	88	67	43	26	88	67	45	35	87	60	26	6
Germany	95	103	104	88	62	41	104	88	65	53	103	79	38	10
Greece	3	3	3	2	1	1	3	2	1	1	3	2	1	0
Hungary	7	7	7	6	4	3	7	6	4	3	7	5	2	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lived with Disability (DALYs)														
Ireland	1	1	1	1	1	0	1	1	1	0	1	1	0	0
Italy	107	120	135	143	145	144	135	143	145	145	135	140	136	130
Latvia	1	1	1	1	1	0	1	1	1	0	1	1	0	0
Lithuania	1	1	2	1	1	1	2	1	1	1	2	1	1	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	4	4	4	3	2	1	4	3	2	2	4	3	1	0
Poland	21	22	23	21	15	10	23	20	15	11	23	18	9	2
Portugal	6	6	6	5	4	2	6	5	4	3	6	4	2	0
Romania	22	23	24	20	15	9	24	20	14	10	23	18	9	2
Slovakia	4	4	4	4	3	2	4	4	3	2	4	3	2	0
Slovenia	3	3	3	3	2	1	3	3	2	1	3	2	1	0
Spain	21	28	38	41	37	28	38	41	39	37	37	36	21	7
Sweden	9	10	9	7	5	3	9	7	5	4	9	7	3	1
United Kingdom	41	38	30	20	11	5	30	20	11	7	30	19	7	1
TOTAL	490	519	516	445	338	247	515	441	345	294	514	405	232	114

Table 8.5.6 Results for baseline, forecast and intervention [(1)] scenarios (1) to (4a) for NHL, by country, men plus women

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Fraction													
Austria	0.048%	0.036%	0.023%	0.013%	0.014%	0.014%	0.024%	0.024%	0.026%	0.026%	0.004%	0.004%	0.005%	0.005%
Belgium	0.029%	0.020%	0.011%	0.006%	0.006%	0.006%	0.011%	0.011%	0.011%	0.011%	0.002%	0.002%	0.002%	0.002%
Bulgaria	0.034%	0.027%	0.018%	0.011%	0.012%	0.013%	0.014%	0.016%	0.017%	0.020%	0.003%	0.003%	0.003%	0.004%
Cyprus	0.020%	0.013%	0.007%	0.003%	0.003%	0.003%	0.007%	0.006%	0.006%	0.006%	0.001%	0.001%	0.001%	0.001%
Czech Republic	0.080%	0.064%	0.045%	0.029%	0.030%	0.033%	0.041%	0.043%	0.045%	0.051%	0.009%	0.010%	0.010%	0.012%
Denmark	0.046%	0.033%	0.020%	0.011%	0.011%	0.011%	0.020%	0.020%	0.021%	0.021%	0.003%	0.003%	0.003%	0.003%
Estonia	0.053%	0.042%	0.027%	0.016%	0.017%	0.018%	0.020%	0.022%	0.024%	0.026%	0.004%	0.004%	0.004%	0.005%
Finland	0.029%	0.018%	0.009%	0.004%	0.004%	0.004%	0.009%	0.009%	0.010%	0.010%	0.001%	0.001%	0.001%	0.001%
France	0.040%	0.026%	0.015%	0.008%	0.008%	0.008%	0.015%	0.014%	0.015%	0.014%	0.003%	0.002%	0.002%	0.002%
Germany	0.057%	0.045%	0.030%	0.019%	0.021%	0.022%	0.030%	0.032%	0.037%	0.038%	0.006%	0.006%	0.007%	0.008%
Greece	0.008%	0.005%	0.003%	0.001%	0.001%	0.001%	0.003%	0.003%	0.003%	0.003%	0.000%	0.000%	0.000%	0.000%
Hungary	0.037%	0.028%	0.018%	0.010%	0.011%	0.012%	0.016%	0.017%	0.017%	0.019%	0.003%	0.003%	0.003%	0.003%
Ireland	0.018%	0.011%	0.006%	0.003%	0.003%	0.003%	0.006%	0.006%	0.005%	0.006%	0.001%	0.001%	0.001%	0.001%
Italy	0.055%	0.054%	0.053%	0.053%	0.057%	0.061%	0.053%	0.054%	0.058%	0.062%	0.048%	0.049%	0.052%	0.056%
Latvia	0.034%	0.027%	0.017%	0.010%	0.011%	0.012%	0.014%	0.015%	0.017%	0.018%	0.002%	0.002%	0.003%	0.003%
Lithuania	0.043%	0.034%	0.022%	0.013%	0.014%	0.016%	0.017%	0.018%	0.020%	0.022%	0.003%	0.003%	0.004%	0.004%
Luxembourg	0.020%	0.013%	0.007%	0.004%	0.003%	0.003%	0.007%	0.007%	0.007%	0.007%	0.001%	0.001%	0.001%	0.001%
Malta	0.001%	0.001%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Netherlands	0.025%	0.017%	0.009%	0.005%	0.005%	0.005%	0.010%	0.010%	0.011%	0.011%	0.001%	0.001%	0.001%	0.001%
Poland	0.041%	0.032%	0.021%	0.013%	0.014%	0.016%	0.019%	0.021%	0.022%	0.025%	0.004%	0.004%	0.004%	0.005%

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Fraction													
Portugal	0.032%	0.023%	0.014%	0.008%	0.008%	0.008%	0.012%	0.012%	0.013%	0.014%	0.002%	0.002%	0.002%	0.002%
Romania	0.036%	0.028%	0.018%	0.011%	0.012%	0.014%	0.015%	0.016%	0.018%	0.020%	0.003%	0.003%	0.003%	0.004%
Slovakia	0.037%	0.028%	0.017%	0.010%	0.011%	0.012%	0.015%	0.017%	0.018%	0.021%	0.003%	0.003%	0.003%	0.004%
Slovenia	0.066%	0.051%	0.033%	0.021%	0.022%	0.025%	0.031%	0.034%	0.037%	0.041%	0.006%	0.006%	0.007%	0.008%
Spain	0.031%	0.027%	0.020%	0.014%	0.015%	0.016%	0.020%	0.024%	0.025%	0.028%	0.004%	0.005%	0.005%	0.006%
Sweden	0.060%	0.042%	0.026%	0.014%	0.014%	0.014%	0.026%	0.025%	0.026%	0.026%	0.004%	0.004%	0.004%	0.004%
United Kingdom	0.036%	0.021%	0.009%	0.004%	0.004%	0.004%	0.009%	0.008%	0.008%	0.008%	0.001%	0.001%	0.001%	0.001%
TOTAL	0.042%	0.033%	0.023%	0.016%	0.017%	0.017%	0.022%	0.023%	0.024%	0.025%	0.009%	0.009%	0.009%	0.010%

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Deaths														
Austria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	1	1	1	0	0	0	1	1	1	1	0	0	0	0
Germany	3	3	2	1	1	1	2	2	2	2	0	0	0	0
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	2	2	3	3	3	3	3	3	3	3	2	3	3	3
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Deaths														
Poland	1	1	1	0	0	0	1	1	1	1	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	1	1	1	1	1	1	1	1	1	1	0	0	0	0
Sweden	0	0	0	0	0	0	0	0	0	0	0	0	0	0
United Kingdom	1	1	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	12	10	8	6	7	7	8	9	10	11	3	4	4	4

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Registrations													
Austria	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	1	1	1	0	0	1	1	1	1	1	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	4	3	2	1	1	1	2	2	2	2	0	0	0	0
Germany	7	6	4	3	3	3	4	4	5	5	1	1	1	1
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	6	7	7	8	8	8	7	8	8	8	6	7	7	7
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Registrations													
Poland	1	1	1	0	1	1	1	1	1	1	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	2	2	2	1	1	1	2	2	2	2	0	0	0	0
Sweden	1	1	0	0	0	0	0	0	0	1	0	0	0	0
United Kingdom	3	2	1	0	1	1	1	1	1	1	0	0	0	0
TOTAL	28	24	19	14	15	15	18	19	20	21	7	8	8	8

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Years of Life Lost (YLLs)													
Austria	4	3	2	1	1	1	2	2	2	3	0	0	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	2	1	1	0	0	0	1	1	1	1	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	7	6	5	3	4	4	4	5	5	5	1	1	1	1
Denmark	2	2	1	1	1	1	1	1	1	1	0	0	0	0
Estonia	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Finland	1	1	1	0	0	0	0	0	1	1	0	0	0	0
France	23	17	11	6	6	6	11	10	11	11	2	2	2	2
Germany	46	39	28	18	18	18	27	29	30	30	5	6	6	6
Greece	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	3	3	2	1	1	1	1	2	2	2	0	0	0	0
Ireland	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Italy	37	39	42	45	46	46	42	45	47	47	37	40	42	42
Latvia	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	1	1	1	0	0	0	0	0	1	1	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	4	3	2	1	1	1	2	2	2	2	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Years of Life Lost (YLLs)													
Poland	13	12	8	5	6	6	7	8	9	9	1	1	2	2
Portugal	3	2	2	1	1	1	1	1	1	2	0	0	0	0
Romania	5	4	3	2	2	2	2	3	3	3	0	0	0	1
Slovakia	2	1	1	1	1	1	1	1	1	1	0	0	0	0
Slovenia	1	1	1	0	1	1	1	1	1	1	0	0	0	0
Spain	12	12	11	8	9	9	10	13	14	15	2	3	3	3
Sweden	5	4	3	1	1	2	2	3	3	3	0	0	0	0
United Kingdom	21	13	6	3	3	3	6	6	6	6	1	1	1	1
TOTAL	196	167	127	92	96	98	120	128	134	137	47	50	53	54

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lived with Disability (DALYs)														
Austria	4	3	2	1	1	1	2	2	3	3	0	0	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	2	1	1	0	0	0	1	1	1	1	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	7	7	5	3	4	4	4	5	5	5	1	1	1	1
Denmark	2	2	1	1	1	1	1	1	1	1	0	0	0	0
Estonia	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Finland	1	1	1	0	0	0	0	1	1	1	0	0	0	0
France	24	18	11	6	6	6	11	11	11	11	2	2	2	2
Germany	46	40	28	18	18	18	28	30	31	31	5	6	6	6
Greece	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	3	3	2	1	1	1	1	2	2	2	0	0	0	0
Ireland	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Italy	37	40	43	45	47	47	42	46	48	48	38	41	43	43
Latvia	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	1	1	1	0	0	0	0	0	1	1	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	4	3	2	1	1	1	2	2	2	2	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Country	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
Attributable Years of Life Lived with Disability (DALYs)														
Poland	13	12	8	5	6	6	7	8	9	9	1	1	2	2
Portugal	3	2	2	1	1	1	1	1	1	2	0	0	0	0
Romania	5	4	3	2	2	2	2	3	3	3	0	0	0	1
Slovakia	2	1	1	1	1	1	1	1	1	1	0	0	0	0
Slovenia	1	1	1	1	1	1	1	1	1	1	0	0	0	0
Spain	12	13	11	8	9	9	10	13	15	15	2	3	3	3
Sweden	5	4	3	1	1	2	2	3	3	3	0	0	0	0
United Kingdom	22	14	7	3	3	3	6	6	6	6	1	1	1	1
TOTAL	198	169	129	94	97	99	122	130	136	139	48	51	53	54

[1] Intervention scenarios have been estimated assuming baseline exposure and employment levels
[2] Change from 2010 in baseline scenario is due to trends in ‘historic’ (pre 2005) part of REP

Note: numbers and proportions ever exposed remain constant across the baseline and intervention scenarios

Table 8.5.7 Numbers and proportions of the EU population ever exposed, by industry, men plus women (for kidney and lung cancers)

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Number ever exposed in the REP													
Manufacture of pulp, paper and paper products	824	824	821	801	785	776	821	801	785	776	821	801	785	776
Publishing, printing and reproduction of recorded media	1,509	1,510	1,508	1,480	1,458	1,447	1,508	1,480	1,458	1,447	1,508	1,480	1,458	1,447
Manufacture of chemicals and chemical products	13,631	13,711	13,800	13,640	13,497	13,434	13,800	13,640	13,497	13,434	13,800	13,640	13,497	13,434
Manufacture of rubber and plastic products	13,448	13,519	13,594	13,418	13,266	13,195	13,594	13,418	13,266	13,195	13,594	13,418	13,266	13,195
Manufacture of fabricated metal products, except machinery and equipment	47,502	48,251	49,181	49,146	49,059	49,089	49,181	49,146	49,059	49,089	49,181	49,146	49,059	49,089
Manufacture of machinery and equipment n.e.c.	33,707	34,158	34,686	34,464	34,266	34,183	34,686	34,464	34,266	34,183	34,686	34,464	34,266	34,183
Manufacture of office machinery and computers	3,514	3,516	3,506	3,423	3,361	3,325	3,506	3,423	3,361	3,325	3,506	3,423	3,361	3,325
Manufacture of electrical machinery apparatus, appliances and supplies	6,924	7,017	7,126	7,080	7,039	7,022	7,126	7,080	7,039	7,022	7,126	7,080	7,039	7,022
Manufacture of transport equipment	45,155	45,707	46,379	46,131	45,878	45,797	46,379	46,131	45,878	45,797	46,379	46,131	45,878	45,797
Manufacture of motor vehicles, trailers and semi-trailers	19,699	19,642	19,539	19,108	18,753	18,569	19,539	19,108	18,753	18,569	19,539	19,108	18,753	18,569
Manufacture of furniture: manufacturing nec	82,680	84,055	85,727	85,655	85,540	85,594	85,727	85,655	85,540	85,594	85,727	85,655	85,540	85,594
Research and Development	991	1,194	1,480	1,770	1,978	2,106	1,480	1,770	1,978	2,106	1,480	1,770	1,978	2,106
Education	4,439	5,341	6,622	7,923	8,861	9,442	6,622	7,923	8,861	9,442	6,622	7,923	8,861	9,442
Other community, social and personal service activities	17,856	21,497	26,651	31,875	35,630	37,952	26,651	31,875	35,630	37,952	26,651	31,875	35,630	37,952

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Proportion of the population exposed													
Manufacture of pulp, paper and paper products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Publishing, printing and reproduction of recorded media	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Manufacture of chemicals and chemical products	0.004	0.004	0.004	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.004	0.003	0.003	0.003
Manufacture of rubber and plastic products	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Manufacture of fabricated metal products, except machinery and equipment	0.013	0.013	0.013	0.012	0.013	0.013	0.013	0.012	0.013	0.013	0.013	0.012	0.013	0.013
Manufacture of machinery and equipment n.e.c.	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Manufacture of office machinery and computers	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Manufacture of electrical machinery apparatus, appliances and supplies	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Manufacture of transport equipment	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
Manufacture of motor vehicles, trailers and semi-trailers	0.004	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Manufacture of furniture: manufacturing nec	0.023	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
Research and Development	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001
Education	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Other community, social and personal service activities	0.005	0.006	0.007	0.008	0.009	0.010	0.007	0.008	0.009	0.010	0.007	0.008	0.009	0.010

Table 8.5.8 Numbers and proportions of the EU population ever exposed, by industry, men plus women (for Non-Hodgkin's Lymphoma

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Number ever exposed in the REP													
Manufacture of pulp, paper and paper products	571	554	542	534	534	534	542	534	534	534	542	534	534	534
Publishing, printing and reproduction of recorded media	1,050	1,024	1,008	1,000	1,000	1,000	1,008	1,000	1,000	1,000	1,008	1,000	1,000	1,000
Manufacture of chemicals and chemical products	9,602	9,441	9,357	9,290	9,290	9,290	9,357	9,290	9,290	9,290	9,357	9,290	9,290	9,290
Manufacture of rubber and plastic products	9,586	9,415	9,319	9,251	9,251	9,251	9,319	9,251	9,251	9,251	9,319	9,251	9,251	9,251
Manufacture of fabricated metal products, except machinery and equipment	34,100	33,946	33,994	33,989	33,989	33,989	33,994	33,989	33,989	33,989	33,994	33,989	33,989	33,989
Manufacture of machinery and equipment n.e.c.	24,062	23,830	23,717	23,636	23,636	23,636	23,717	23,636	23,636	23,636	23,717	23,636	23,636	23,636
Manufacture of office machinery and computers	2,437	2,367	2,315	2,292	2,292	2,292	2,315	2,292	2,292	2,292	2,315	2,292	2,292	2,292
Manufacture of electrical machinery apparatus, appliances and supplies	4,933	4,886	4,863	4,845	4,845	4,845	4,863	4,845	4,845	4,845	4,863	4,845	4,845	4,845
Manufacture of transport equipment	32,232	31,933	31,833	31,714	31,714	31,714	31,833	31,714	31,714	31,714	31,833	31,714	31,714	31,714
Manufacture of motor vehicles, trailers and semi-trailers	13,582	13,195	12,942	12,778	12,778	12,778	12,942	12,778	12,778	12,778	12,942	12,778	12,778	12,778
Manufacture of furniture: manufacturing nec	59,240	58,978	59,039	59,109	59,109	59,109	59,039	59,109	59,109	59,109	59,039	59,109	59,109	59,109
Research and Development	963	1,183	1,361	1,430	1,430	1,430	1,361	1,430	1,430	1,430	1,361	1,430	1,430	1,430
Education	4,173	5,125	5,892	6,184	6,184	6,184	5,892	6,184	6,184	6,184	5,892	6,184	6,184	6,184
Other community, social and personal service activities	17,124	21,032	24,196	25,406	25,406	25,406	24,196	25,406	25,406	25,406	24,196	25,406	25,406	25,406

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Proportion of the population exposed													
Manufacture of pulp, paper and paper products	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Publishing, printing and reproduction of recorded media	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Manufacture of chemicals and chemical products	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%
Manufacture of rubber and plastic products	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%
Manufacture of fabricated metal products, except machinery and equipment	0.009%	0.008%	0.008%	0.008%	0.009%	0.009%	0.008%	0.008%	0.009%	0.009%	0.008%	0.008%	0.009%	0.009%
Manufacture of machinery and equipment n.e.c.	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%	0.006%
Manufacture of office machinery and computers	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
Manufacture of electrical machinery apparatus, appliances and supplies	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
Manufacture of transport equipment	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%	0.008%
Manufacture of motor vehicles, trailers and semi-trailers	0.002%	0.002%	0.002%	0.002%	0.002%	0.002%	0.003%	0.003%	0.003%	0.003%	0.003%	0.003%	0.003%	0.003%
Manufacture of furniture: manufacturing nec	0.015%	0.015%	0.014%	0.015%	0.015%	0.016%	0.014%	0.015%	0.015%	0.016%	0.014%	0.015%	0.015%	0.016%
Research and Development	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Education	0.001%	0.001%	0.001%	0.002%	0.002%	0.002%	0.001%	0.002%	0.002%	0.002%	0.001%	0.002%	0.002%	0.002%
Other community, social and personal service activities	0.004%	0.005%	0.006%	0.006%	0.007%	0.007%	0.006%	0.006%	0.007%	0.007%	0.006%	0.006%	0.007%	0.007%

Table 8.5.9 Occupation attributable fractions, deaths, registrations, YLLs and DALYs for kidney cancer by industry, men plus women

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Fraction													
Manufacture of pulp, paper and paper products	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Publishing, printing and reproduction of recorded media	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of chemicals and chemical products	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of rubber and plastic products	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of fabricated metal products, except machinery and equipment	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%
Manufacture of machinery and equipment n.e.c.	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
Manufacture of office machinery and computers	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of electrical machinery apparatus, appliances and supplies	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of transport equipment	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%
Manufacture of motor vehicles, trailers and semi-trailers	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of furniture: manufacturing nec	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Research and Development	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Education	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Other community, social and personal service activities	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Deaths													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of rubber and plastic products	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of fabricated metal products, except machinery and equipment	3	3	3	3	3	3	3	3	3	3	3	3	2	2
Manufacture of machinery and equipment n.e.c.	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Manufacture of office machinery and computers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of transport equipment	3	3	3	3	2	2	3	3	2	2	3	2	2	2
Manufacture of motor vehicles, trailers and semi-trailers	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of furniture: manufacturing nec	3	3	3	4	4	4	3	4	4	4	3	4	4	4
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	0	1	1	1	1	1	1	1	1	1	1	1	1	1

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Registrations													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of rubber and plastic products	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of fabricated metal products, except machinery and equipment	6	6	6	6	5	5	6	6	5	5	6	6	5	4
Manufacture of machinery and equipment n.e.c.	5	5	4	4	4	4	4	4	4	4	4	4	3	3
Manufacture of office machinery and computers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of transport equipment	6	6	6	5	5	5	6	5	5	5	6	5	5	4
Manufacture of motor vehicles, trailers and semi-trailers	3	3	2	2	2	2	2	2	2	2	2	2	2	2
Manufacture of furniture: manufacturing nec	7	7	8	8	7	7	8	8	7	7	8	8	7	7
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	1	1	0	0	1	1	0	0	1	1
Other community, social and personal service activities	1	1	2	2	2	3	2	2	2	3	2	2	2	3

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Years of Life Lost (YLLs)													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of chemicals and chemical products	7	7	8	7	7	7	8	7	7	7	8	7	7	7
Manufacture of rubber and plastic products	7	7	8	7	7	7	8	7	7	7	8	7	7	7
Manufacture of fabricated metal products, except machinery and equipment	39	39	37	34	32	30	37	34	32	31	37	33	29	26
Manufacture of machinery and equipment n.e.c.	28	28	26	24	22	21	26	24	22	22	26	23	20	18
Manufacture of office machinery and computers	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Manufacture of electrical machinery apparatus, appliances and supplies	3	4	4	4	4	4	4	4	4	4	4	4	4	3
Manufacture of transport equipment	37	37	35	32	30	28	35	32	30	29	35	31	27	24
Manufacture of motor vehicles, trailers and semi-trailers	16	16	15	13	12	11	15	13	12	12	15	13	11	10
Manufacture of furniture: manufacturing nec	41	44	47	46	44	44	47	46	44	44	47	46	44	43
Research and Development	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Education	1	1	2	3	3	4	2	3	3	4	2	3	3	4
Other community, social and personal service activities	7	9	11	13	15	16	11	13	15	16	11	13	15	16

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Years of Life Lived with Disability (DALYs													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of chemicals and chemical products	8	8	9	8	8	8	9	8	8	8	9	8	8	8
Manufacture of rubber and plastic products	8	8	9	8	8	8	9	8	8	8	9	8	8	8
Manufacture of fabricated metal products, except machinery and equipment	44	44	42	39	36	34	42	39	36	36	42	38	33	30
Manufacture of machinery and equipment n.e.c.	32	32	30	27	25	24	30	27	25	25	30	27	23	21
Manufacture of office machinery and computers	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Manufacture of electrical machinery apparatus, appliances and supplies	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Manufacture of transport equipment	43	43	40	37	34	32	40	37	34	33	40	36	31	28
Manufacture of motor vehicles, trailers and semi-trailers	19	18	17	15	14	13	17	15	14	13	17	15	13	11
Manufacture of furniture: manufacturing nec	46	51	54	53	50	50	54	53	50	50	54	52	50	49
Research and Development	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Education	1	2	2	3	4	4	2	3	4	4	2	3	4	4
Other community, social and personal service activities	8	10	12	15	17	19	12	15	17	19	12	15	17	19

Table 8.5.10 Occupation attributable fractions, deaths, registrations, YLLs and DALYs for liver cancer by industry, men plus women

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Fraction													
Manufacture of pulp, paper and paper products	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Publishing, printing and reproduction of recorded media	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of chemicals and chemical products	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of rubber and plastic products	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of fabricated metal products, except machinery and equipment	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%
Manufacture of machinery and equipment n.e.c.	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%
Manufacture of office machinery and computers	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of electrical machinery apparatus, appliances and supplies	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of transport equipment	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%
Manufacture of motor vehicles, trailers and semi-trailers	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacture of furniture: manufacturing nec	0.02%	0.02%	0.01%	0.01%	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%
Research and Development	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Education	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Other community, social and personal service activities	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Deaths													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	2	2	1	1	0	0	1	1	0	0	1	1	0	0
Manufacture of rubber and plastic products	2	2	1	1	0	0	1	1	0	0	1	1	0	0
Manufacture of fabricated metal products, except machinery and equipment	6	7	8	8	7	6	8	8	8	7	8	7	5	3
Manufacture of machinery and equipment n.e.c.	4	5	5	6	5	4	5	6	5	5	5	5	3	2
Manufacture of office machinery and computers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	1	1	1	0	0	0	1	0	0	0	1	0	0	0
Manufacture of transport equipment	6	7	7	8	7	5	7	8	7	6	7	7	4	2
Manufacture of motor vehicles, trailers and semi-trailers	3	3	3	3	3	2	3	3	3	3	3	3	2	1
Manufacture of furniture: manufacturing nec	9	10	9	6	4	3	9	7	4	3	9	6	3	2
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	2	2	2	1	0	0	2	1	0	0	2	1	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Registrations													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	2	2	1	1	0	0	1	1	0	0	1	1	0	0
Manufacture of rubber and plastic products	2	2	1	1	0	0	1	1	0	0	1	1	0	0
Manufacture of fabricated metal products, except machinery and equipment	6	7	7	8	7	5	7	8	7	6	7	7	4	2
Manufacture of machinery and equipment n.e.c.	4	5	5	5	5	4	5	5	5	4	5	5	3	2
Manufacture of office machinery and computers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	1	1	1	0	0	0	1	0	0	0	1	0	0	0
Manufacture of transport equipment	6	6	7	7	6	5	7	7	6	6	7	6	4	2
Manufacture of motor vehicles, trailers and semi-trailers	3	3	3	3	3	2	3	3	3	2	3	3	2	1
Manufacture of furniture: manufacturing nec	9	10	9	6	3	2	9	6	4	3	9	6	3	2
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	1	2	2	1	0	0	2	1	0	0	2	1	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Years of Life Lost (YLLs)													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	2	2	2	1	1	0	2	1	1	0	2	1	0	0
Manufacture of chemicals and chemical products	22	22	18	11	5	3	18	11	5	3	18	11	5	2
Manufacture of rubber and plastic products	22	22	18	11	6	3	18	11	6	4	18	11	5	3
Manufacture of fabricated metal products, except machinery and equipment	86	94	102	102	89	70	102	100	91	83	101	90	58	31
Manufacture of machinery and equipment n.e.c.	61	67	72	71	62	47	72	70	63	57	72	63	40	20
Manufacture of office machinery and computers	6	6	5	3	1	1	5	3	1	1	5	3	1	1
Manufacture of electrical machinery apparatus, appliances and supplies	11	11	9	6	3	2	9	6	3	2	9	6	3	1
Manufacture of transport equipment	83	90	97	96	81	60	97	95	84	74	97	84	49	20
Manufacture of motor vehicles, trailers and semi-trailers	36	39	41	40	34	25	41	39	34	30	41	35	21	10
Manufacture of furniture: manufacturing nec	130	133	119	82	46	30	119	82	46	33	119	80	40	23
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	22	24	22	15	5	0	22	15	5	1	22	14	4	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Years of Life Lived with Disability (DALYs)													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	2	2	2	1	1	0	2	1	1	0	2	1	0	0
Manufacture of chemicals and chemical products	22	22	19	11	5	3	19	11	5	3	19	11	5	3
Manufacture of rubber and plastic products	22	22	19	12	6	3	19	12	6	4	19	11	5	3
Manufacture of fabricated metal products, except machinery and equipment	88	96	104	104	91	72	104	102	93	85	103	91	59	32
Manufacture of machinery and equipment n.e.c.	63	68	74	73	63	48	73	72	64	58	73	64	41	21
Manufacture of office machinery and computers	6	6	5	3	1	1	5	3	1	1	5	3	1	1
Manufacture of electrical machinery apparatus, appliances and supplies	11	11	10	6	3	2	10	6	3	2	10	6	3	1
Manufacture of transport equipment	85	92	99	98	83	61	99	96	85	76	99	85	50	21
Manufacture of motor vehicles, trailers and semi-trailers	37	40	42	40	34	26	42	40	35	31	42	36	21	10
Manufacture of furniture: manufacturing nec	132	135	121	83	47	31	121	83	47	33	121	81	41	24
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	22	24	23	15	5	0	23	15	5	1	23	15	4	0

Table 8.5.11 Occupation attributable fractions, deaths, registrations, YLLs and DALYs for NHL by industry, men plus women

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	2010	2020	2030	2040	2050	2060	2030	2040	2050	2060	2030	2040	2050	2060
	Attributable Deaths													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of rubber and plastic products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of fabricated metal products, except machinery and equipment	2	3	2	2	2	2	2	3	3	3	1	1	1	1
Manufacture of machinery and equipment n.e.c.	2	2	2	1	1	1	2	2	2	2	1	1	1	1
Manufacture of office machinery and computers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of transport equipment	2	2	2	2	2	2	2	2	3	3	1	1	1	1
Manufacture of motor vehicles, trailers and semi-trailers	1	1	1	1	1	1	1	1	1	1	0	0	0	0
Manufacture of furniture: manufacturing nec	3	2	1	1	1	1	1	1	1	1	1	1	1	1
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Registrations													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of rubber and plastic products	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of fabricated metal products, except machinery and equipment	6	6	5	4	4	4	5	6	6	6	2	2	2	2
Manufacture of machinery and equipment n.e.c.	4	4	4	3	3	3	3	4	4	4	1	1	1	2
Manufacture of office machinery and computers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of transport equipment	6	6	5	3	3	4	5	5	5	5	1	1	1	1
Manufacture of motor vehicles, trailers and semi-trailers	2	2	2	1	1	2	2	2	2	2	1	1	1	1
Manufacture of furniture: manufacturing nec	6	4	2	2	2	2	2	2	2	2	1	2	2	2
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	1	1	0	0	0	0	0	0	0	0	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Years of Life Lost (YLLs)													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	7	3	1	1	1	1	1	2	2	2	1	1	1	1
Manufacture of rubber and plastic products	7	3	2	2	2	2	2	2	2	2	1	1	1	1
Manufacture of fabricated metal products, except machinery and equipment	40	42	37	27	28	28	35	37	39	40	13	14	15	15
Manufacture of machinery and equipment n.e.c.	29	29	25	18	18	19	24	25	26	27	9	9	10	10
Manufacture of office machinery and computers	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	3	2	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of transport equipment	38	39	33	22	22	23	31	33	34	35	8	9	9	10
Manufacture of motor vehicles, trailers and semi-trailers	16	16	14	9	10	10	13	13	14	14	4	4	5	5
Manufacture of furniture: manufacturing nec	44	26	14	13	14	14	14	15	15	16	10	10	11	11
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	9	4	0	0	0	0	0	0	0	0	0	0	0	0

Scenario	All Scenarios		Baseline (trend) scenario (1)[2] - Linear employment and exposure level trends assumed to 2021-30, constant thereafter.				Intervention scenario (2) - Full compliance for OEL = 50 ppm (273 mg/m3)				Intervention scenario (3) - Full compliance for OEL = 10 ppm (50 mg/m3)			
Industry sector	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
	Attributable Years of Life Lived with Disability (DALYs)													
Manufacture of pulp, paper and paper products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Publishing, printing and reproduction of recorded media	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of chemicals and chemical products	7	3	1	1	1	1	1	2	2	2	1	1	1	1
Manufacture of rubber and plastic products	7	3	2	2	2	2	2	2	2	2	1	1	1	1
Manufacture of fabricated metal products, except machinery and equipment	41	42	38	27	28	29	35	38	40	40	13	14	15	15
Manufacture of machinery and equipment n.e.c.	29	30	26	18	19	19	24	26	27	27	9	9	10	10
Manufacture of office machinery and computers	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Manufacture of electrical machinery apparatus, appliances and supplies	3	2	1	1	1	1	1	1	1	1	1	1	1	1
Manufacture of transport equipment	39	40	33	22	23	23	31	33	35	36	9	9	10	10
Manufacture of motor vehicles, trailers and semi-trailers	16	16	14	9	10	10	13	14	14	15	4	4	5	5
Manufacture of furniture: manufacturing nec	45	27	14	13	14	14	14	15	16	16	10	11	11	11
Research and Development	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other community, social and personal service activities	9	4	0	0	0	0	0	0	0	0	0	0	0	0

[1] Intervention scenarios have been estimated assuming baseline exposure and employment levels
[2] Change from 2010 in baseline scenario is due to trends in 'historic' (pre 2005) part of REP
Note: numbers and proportions ever exposed remain constant across the baseline and intervention scenarios

8.6 VALUING HEALTH BENEFITS – INTERVENTION SCENARIOS

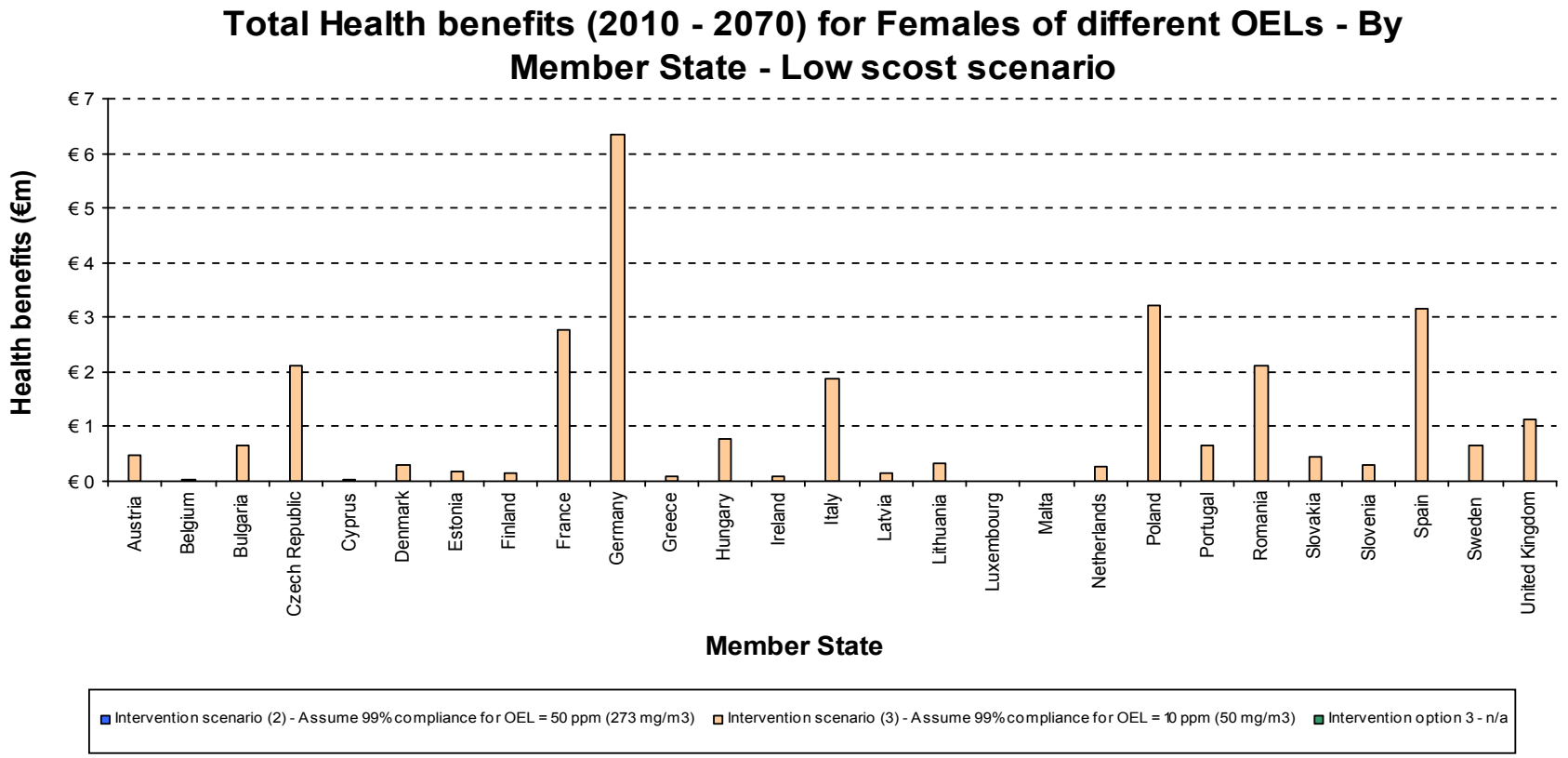

Figure 8.6.1 Total health benefits to females of introducing an EU wide OEL – By Member State – Low Scenario (Present Value – 2010 €m prices)

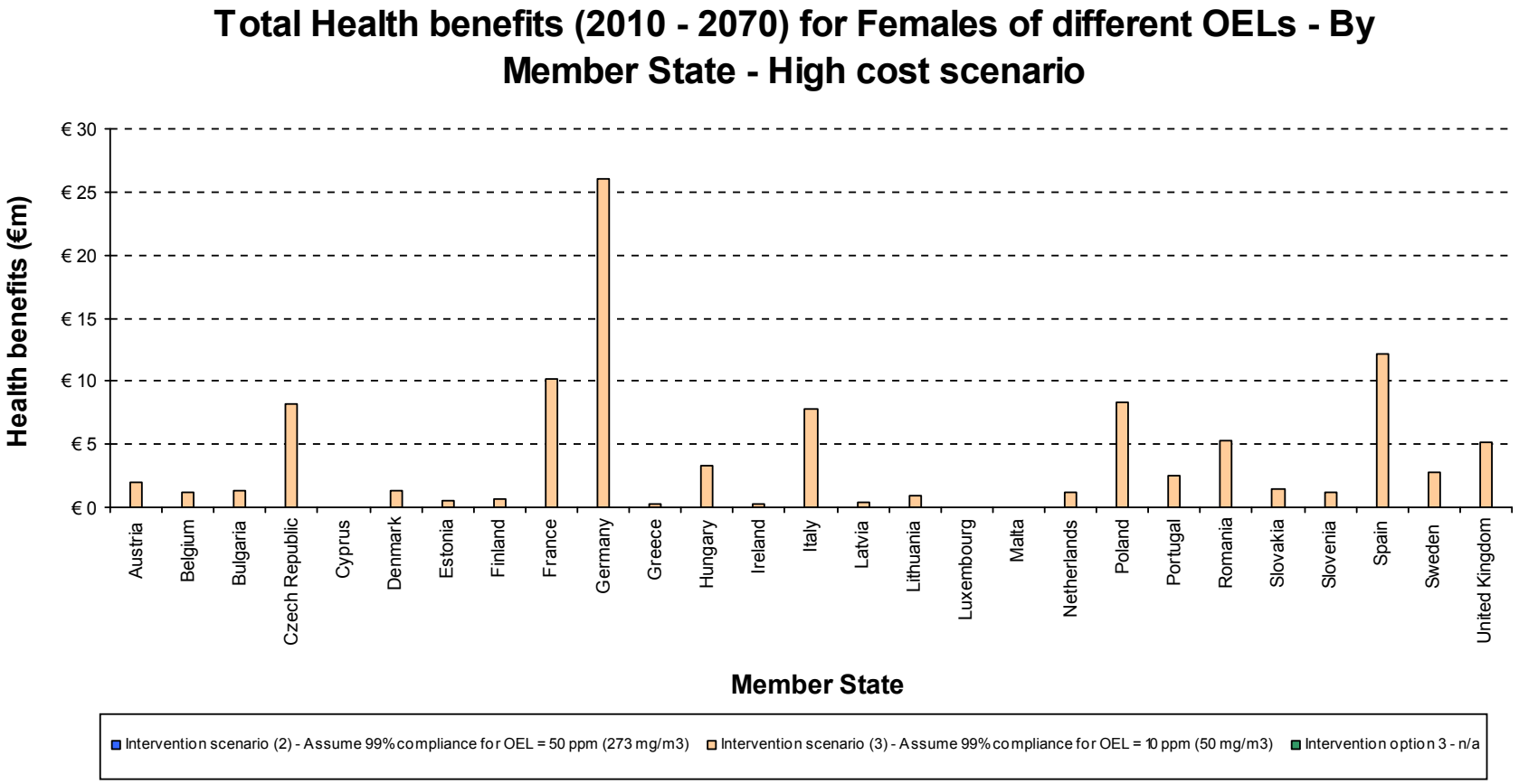

Figure 8.6.2 Total health benefits for females of introducing an EU wide OEL – By Member State – High Scenario (Present Value – 2010 €m prices)

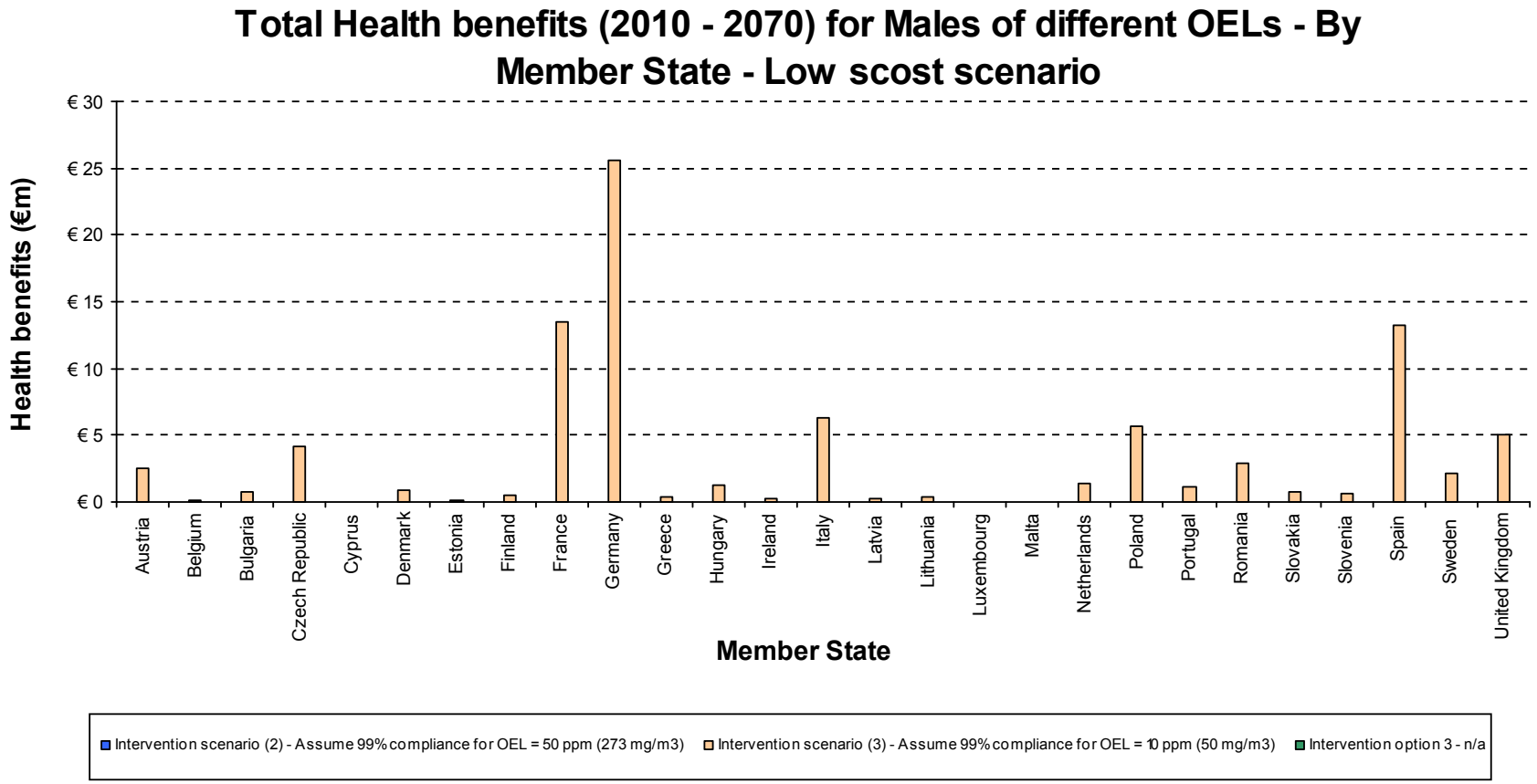

Figure 8.6.3 Total health benefits to males of introducing an EU wide OEL – By Member State – Low Scenario (Present Value – 2010 €m prices)

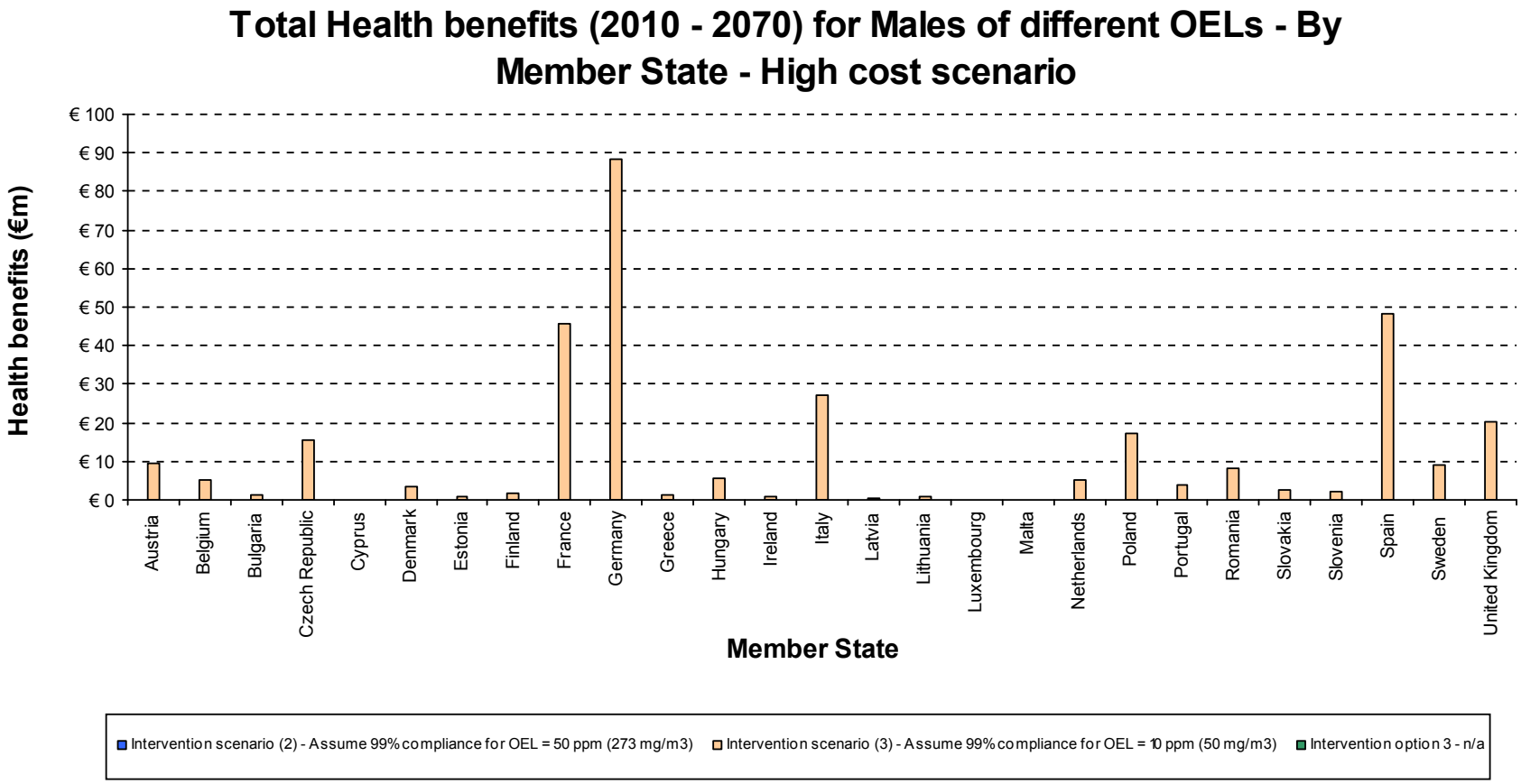

Figure 8.6.4 Total health benefits for males of introducing an EU wide OEL – By Member State – High Scenario (Present Value – 2010 €m prices)

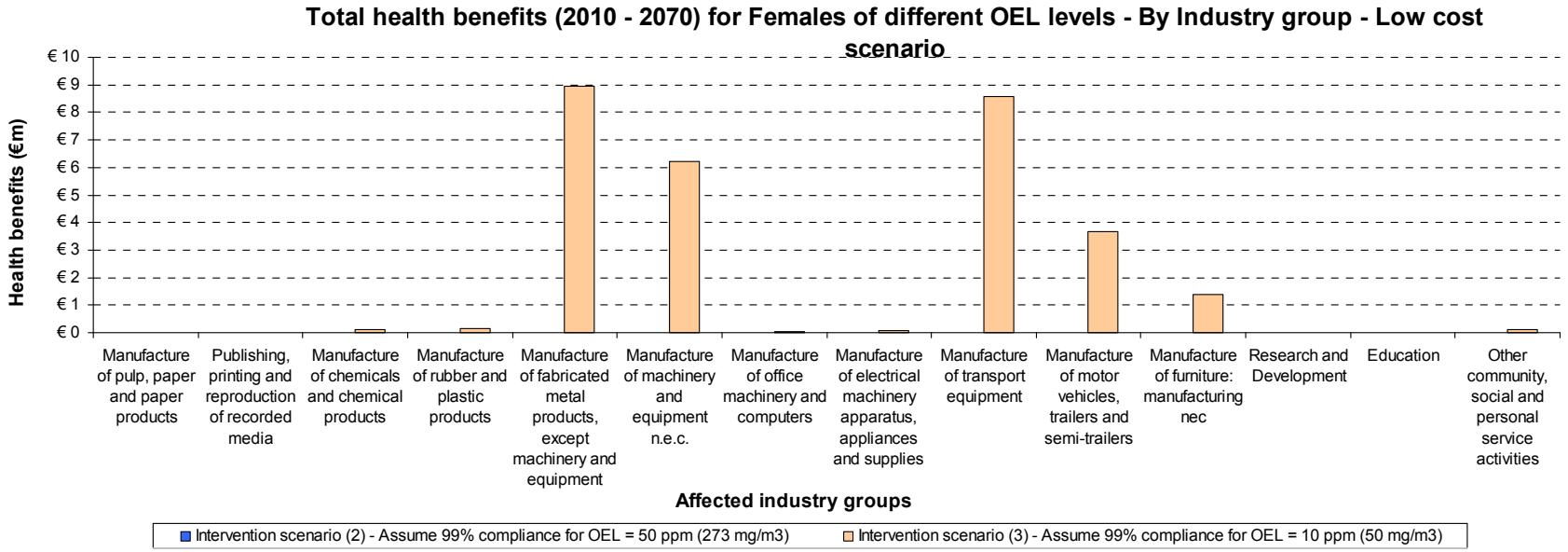

Figure 8.6.5 Total health benefits to females of introducing an EU wide OEL – By Industry Group – Low Scenario (Present Value – 2010 €m prices)

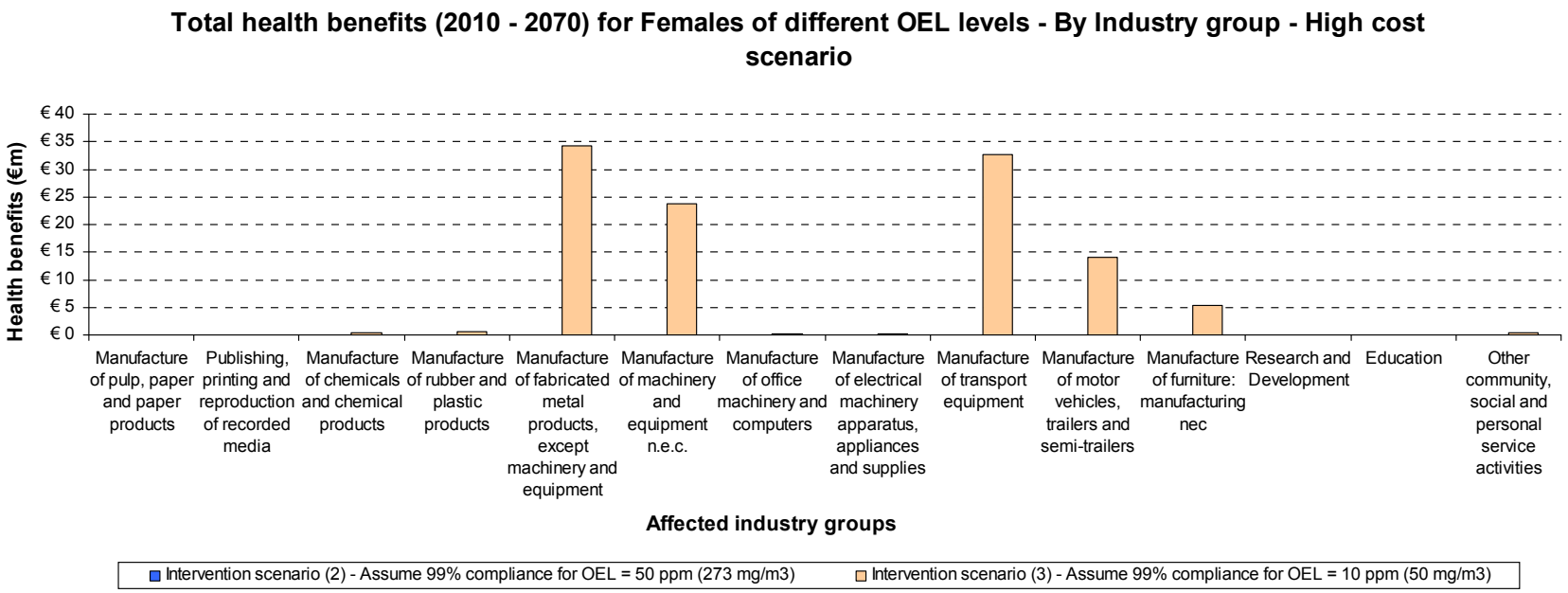

Figure 8.6.6 Total health benefits for females of introducing an EU wide OEL – By Industry Group – High Scenario (Present Value – 2010 €m prices)

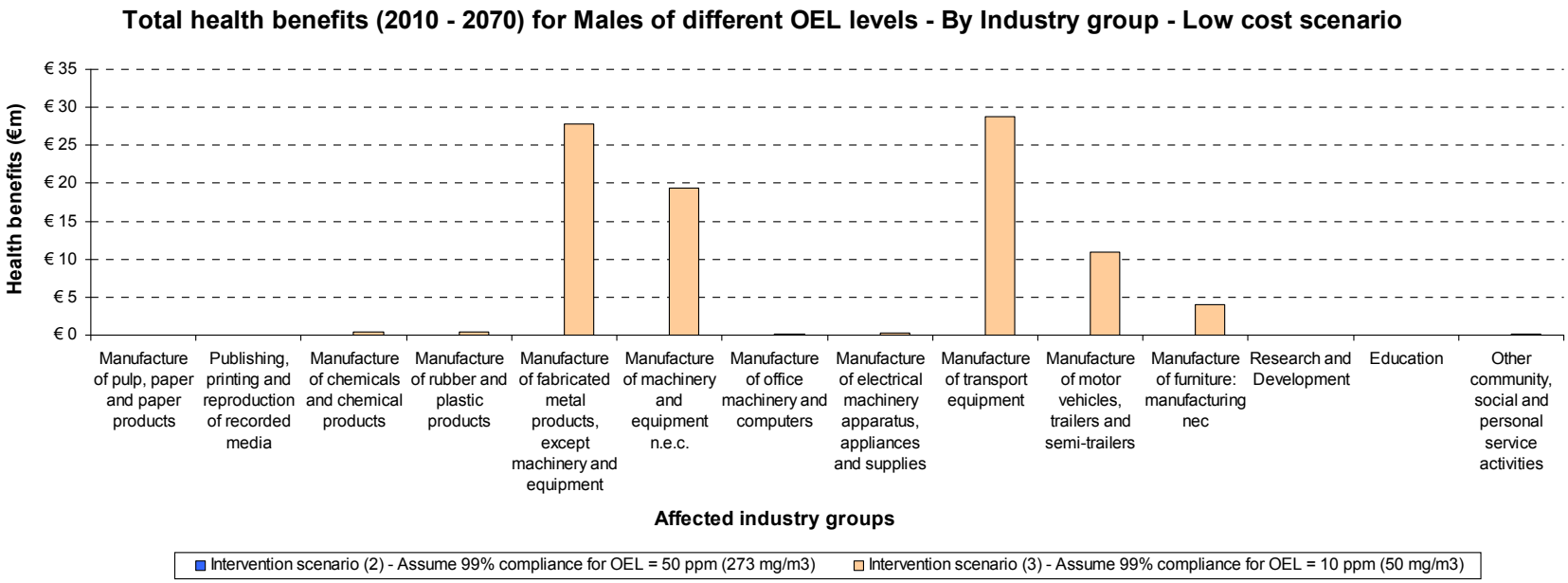

Figure 8.6.7 Total health benefits to males of introducing an EU wide OEL – By Industry Group – Low Scenario (Present Value – 2010 €m prices)

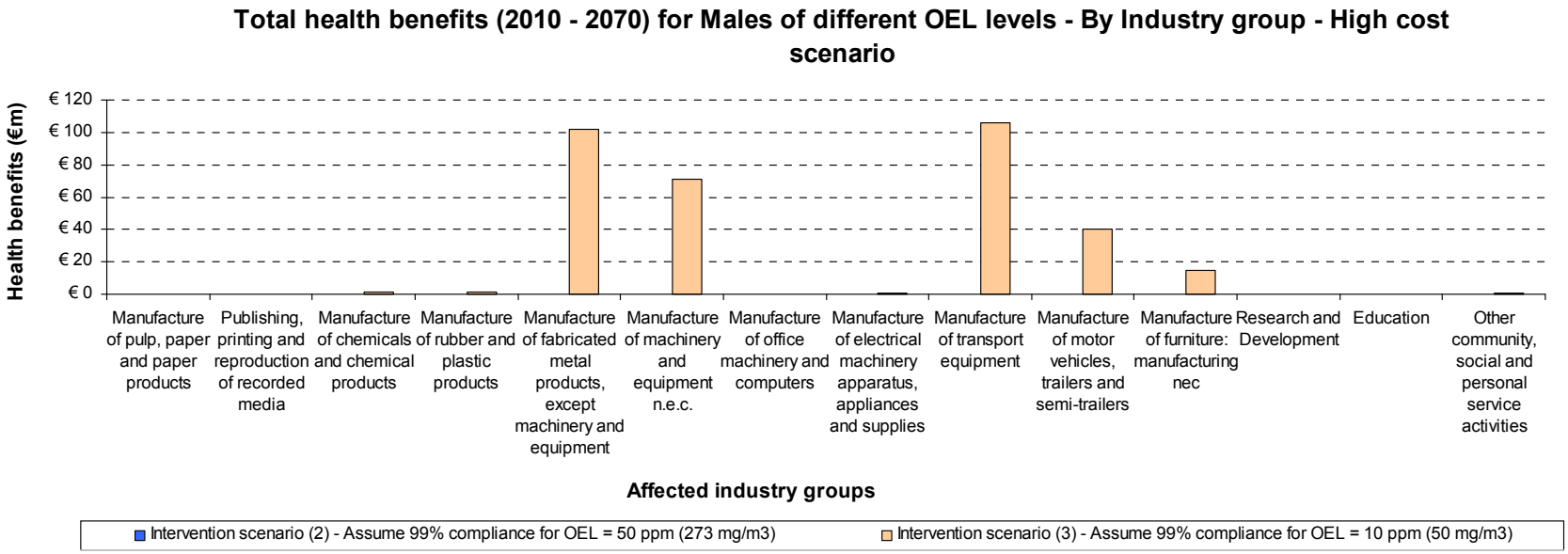

Figure 8.6.8 Total health benefits for males of introducing an EU wide OEL – By Member State – High Scenario (Present Value – 2010 €m prices)

8.7 HEALTH BENEFITS USING DIFFERENT DISCOUNT RATES

COLOUR KEY
No discount
Using the EU IA guidance - 4%
Using a declining discount rate (4% going to 3%)

Table 8.7.1 Introducing an OEL of 50pmm

Range of costs (€m)	Gender	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
	Females	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Males	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Totals	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Gender	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
	Females	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Males	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Totals	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Gender	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
	Females	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Males	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
	Totals	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0

Member State	Low cost	High cost	Low cost	High cost	Low cost	High cost
Austria	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Belgium	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Bulgaria	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Czech Republic	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Cyprus	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Denmark	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Estonia	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Finland	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
France	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Germany	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Greece	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Hungary	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0

Member State	Low cost	High cost	Low cost	High cost	Low cost	High cost
Ireland	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Italy	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Latvia	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Lithuania	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Luxembourg	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Malta	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Netherlands	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Poland	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Portugal	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Romania	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Slovakia	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Slovenia	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Spain	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Sweden	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
United Kingdom	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0

Industry Group	Low cost	High cost	Low cost	High cost	Low cost	High cost
Manufacture of pulp, paper and paper products	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Publishing, printing and reproduction of recorded media	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of chemicals and chemical products	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of rubber and plastic products	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of fabricated metal products, except machinery and equipment	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of machinery and equipment n.e.c.	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of office machinery and computers	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of electrical machinery apparatus, appliances and supplies	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of transport equipment	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of motor vehicles, trailers and semi-trailers	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Manufacture of furniture: manufacturing nec	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Research and Development	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Education	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0
Other community, social and personal service activities	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0	€ 0.0

Table 8.7.2 Introducing an OEL of 10 ppm

Range of costs (€m)	Gender	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
	Females	0 to 0	3 to 12	18 to 83	20 to 75	44 to 143	63 to 201
	Males	0 to 0	7 to 30	53 to 239	66 to 235	148 to 475	213 to 676
	Totals	0 to 0	9 to 42	71 to 322	86 to 310	192 to 619	276 to 877
	Gender	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
	Females	0 to 0	1 to 7	7 to 31	5 to 19	8 to 25	7 to 23
	Males	0 to 0	4 to 16	20 to 90	17 to 60	25 to 81	25 to 78
	Totals	0 to 0	5 to 23	27 to 121	22 to 79	33 to 106	32 to 101
	Gender	2010-2019	2020-2029	2030-2039	2040-2049	2050-2059	2060-2069
	Females	0 to 0	1 to 7	9 to 40	7 to 27	12 to 38	12 to 40
	Males	0 to 0	4 to 16	25 to 114	23 to 84	39 to 126	42 to 133
	Totals	0 to 0	5 to 23	34 to 154	31 to 110	51 to 164	54 to 173

Member State	Low cost	High cost	Low cost	High cost	Low cost	High cost
Austria	€ 16	€ 7	€ 3	€ 11	€ 4	€ 16
Belgium	€ 1	€ 0	€ 0	€ 7	€ 0	€ 9
Bulgaria	€ 8	€ 4	€ 1	€ 3	€ 2	€ 4
Czech Republic	€ 34	€ 15	€ 6	€ 24	€ 9	€ 35
Cyprus	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Denmark	€ 6	€ 2	€ 1	€ 5	€ 2	€ 7
Estonia	€ 2	€ 1	€ 0	€ 1	€ 1	€ 2
Finland	€ 3	€ 1	€ 1	€ 2	€ 1	€ 3
France	€ 88	€ 39	€ 16	€ 56	€ 24	€ 80
Germany	€ 167	€ 70	€ 32	€ 115	€ 47	€ 164
Greece	€ 3	€ 1	€ 0	€ 1	€ 1	€ 2
Hungary	€ 11	€ 5	€ 2	€ 9	€ 3	€ 13
Ireland	€ 2	€ 1	€ 0	€ 1	€ 1	€ 2
Italy	€ 48	€ 23	€ 8	€ 35	€ 12	€ 52
Latvia	€ 2	€ 1	€ 0	€ 1	€ 1	€ 1
Lithuania	€ 3	€ 1	€ 1	€ 2	€ 1	€ 3
Luxembourg	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Malta	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0

Member State	Low cost	High cost	Low cost	High cost	Low cost	High cost
Netherlands	€ 7	€ 3	€ 2	€ 7	€ 2	€ 9
Poland	€ 47	€ 20	€ 9	€ 26	€ 13	€ 38
Portugal	€ 9	€ 4	€ 2	€ 6	€ 3	€ 9
Romania	€ 28	€ 13	€ 5	€ 13	€ 7	€ 20
Slovakia	€ 7	€ 3	€ 1	€ 4	€ 2	€ 6
Slovenia	€ 5	€ 2	€ 1	€ 3	€ 1	€ 5
Spain	€ 92	€ 42	€ 16	€ 61	€ 25	€ 89
Sweden	€ 14	€ 6	€ 3	€ 12	€ 4	€ 17
United Kingdom	€ 30	€ 12	€ 6	€ 26	€ 9	€ 36

Industry Group	Low cost	High cost	Low cost	High cost	Low cost	High cost
Manufacture of pulp, paper and paper products	€ 0.0	€ 0	€ 0	€ 0	€ 0	€ 0
Publishing, printing and reproduction of recorded media	€ 0.3	€ 1	€ 0	€ 0	€ 0	€ 0
Manufacture of chemicals and chemical products	€ 2.8	€ 10	€ 1	€ 2	€ 1	€ 3
Manufacture of rubber and plastic products	€ 3.2	€ 11	€ 1	€ 2	€ 1	€ 3
Manufacture of fabricated metal products, except machinery and equipment	€ 196.9	€ 690	€ 37	€ 136	€ 54	€ 197
Manufacture of machinery and equipment n.e.c.	€ 137.4	€ 481	€ 26	€ 95	€ 38	€ 138
Manufacture of office machinery and computers	€ 0.6	€ 2	€ 0	€ 0	€ 0	€ 1
Manufacture of electrical machinery apparatus, appliances and supplies	€ 1.5	€ 5	€ 0	€ 1	€ 0	€ 2
Manufacture of transport equipment	€ 200.4	€ 701	€ 37	€ 138	€ 55	€ 201
Manufacture of motor vehicles, trailers and semi-trailers	€ 78.3	€ 274	€ 15	€ 54	€ 22	€ 79
Manufacture of furniture: manufacturing nec	€ 29.1	€ 103	€ 5	€ 20	€ 8	€ 29
Research and Development	€ 0.0	€ 0	€ 0	€ 0	€ 0	€ 0
Education	€ 0.0	€ 0	€ 0	€ 0	€ 0	€ 0
Other community, social and personal service activities	€ 1.1	€ 3	€ 0	€ 1	€ 0	€ 1

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