



### Key messages

- ▶ Smoking is a danger to health and increases the risk e. g. of cardiovascular and respiratory diseases and cancers.
- ▶ In 2009 26 % of women aged 18 and over and 34 % of men of the same age were smokers; the percentage of heavy smokers was 5 % (among women) 9 % (among men) respectively.
- ▶ A decline in both smoking and heavy smoking was observed for the first time between 2003 and 2009.
- ▶ The smoking habits of young adults in particular have changed. No significant decline in smoking can be observed in the older age groups.
- ▶ The results suggest that the measures that have been implemented on tobacco prevention have been successful; however, a lot still needs to be done to help people stop smoking.

## Smoking

Smoking is the most significant single health risk and the leading cause of premature mortality in the industrialized countries. Diseases that are more common among smokers include cardiovascular and respiratory diseases and cancers (IARC 2004, USDHHS 2006). In Germany alone, 100,000–120,000 people die from the effects of smoking every year (DKFZ 2009, Mons 2011). Diseases, health problems and premature deaths caused by regular exposure to second-hand smoke, also known as environmental tobacco smoke (ETS), are also part of the topic (DKFZ 2010).

The costs of treating diseases and health problems that can be traced back to smoking amount to an estimated €7.5 billion per annum. If disability, early retirement and fatalities are also included, total economic costs can be assumed to total as much as €21 billion a year (Neubauer et al. 2006).

In recent years, the Federal Government has taken numerous measures to reduce tobacco consumption in the population and to protect non-smokers from ETS. Here are some examples: the increase in tobacco tax in several stages between 2002 and 2005; the amendment of workplace regulations in 2002; the raising of the age limit for the purchase and consumption of tobacco products in 2008; the restrictions and far-reaching ban on tobacco advertising in line with valid EU law; and the federal and state non-smoking acts passed in 2007 covering public buildings, means of transport, schools, hospitals and catering establishments – with specific exemptions in certain states.

These have been supported by educational campaigns such as the »Smoke-Free« youth campaign run by the Federal Centre for Health Education (BZgA) and numerous activities in schools, businesses and hospitals. Many of these are local initiatives, but others are regional or even nationwide, like the »Smoke-Free Workplace« project of the Federal Ministry of Health (BMG) and the initiatives of the German Network of Smoke-Free Hospitals (DNRfK).

Marking World No Tobacco Day on 31 May 2011, the following article examines the extent to which the efforts of the last few years have led to a reduction in tobacco use in the adult population in Germany. It reports on results from the 2009 »German Health Update« (GEDA) study, which was conducted by the Robert Koch Institute (RKI) in the context of its health monitoring programme. It is also able to provide information on trends and developments over time, because the RKI had collected comparable data on smoking habits in previous health surveys. The article begins by detailing the health hazards related to smoking – to emphasize both the individual and social relevance of this preventable health risk.

## Smoking is a health risk

Tobacco smoke consists of more than 4,800 substances, many of which are harmful to human health like carbon monoxide, nicotine and the components of the condensate. The carbon monoxide damages the smoker's blood vessels, thus contributing to blood-circulation disorders, atherosclerosis and cardiovascular diseases, while the condensate components are primarily involved in the development of cancers. The nicotine contained in tobacco smoke impacts on the cardiovascular system, e. g. increasing the heart rate and raising the blood pressure; it also reduces the feeling of hunger.

The psychotropic effect of nicotine via the central nervous system is largely responsible for smoking's physical and psychological addictive properties. Among the effects perceived to be positive – thereby promoting addiction – are an enhanced power of concentration and a feeling of

relaxation; these are triggered by stimulation of certain areas of the brain, e. g. an increase in dopamine transmission. Nicotine addiction is estimated to develop among 70% to 80% of smokers (Batra, Fagerström 1997).

In addition to cardiovascular and respiratory diseases and cancers, certain metabolic disorders are also more common in smokers than non-smokers. Furthermore, smoking damages the eyes, the periodontium and the skeleton; it also restricts fertility. Maternal smoking during pregnancy harms the unborn child – with considerable effects on health development later on in the child's life (Figure 1).

Smoking often forms an integral part of a person's individual lifestyle and of ways of coping with everyday demands and pressures. For many adolescents smoking is an expression of adulthood and membership of a particular peer group or youth culture. For adults, too, smoking is widely used as a means of communication, social representation and stress management. In order to stop smoking, therefore, a person must not only overcome the physical and psychological dependence, but also accept a change of self-image and everyday and leisure lifestyle.

**Figure 1**  
Diseases and health problems that are more common among smokers  
Source: adapted from DKFZ 2009

<b>Cancer:</b>	Lung cancer Oral cavity cancer Laryngeal cancer Oesophageal cancer Stomach cancer Pancreatic cancer Ureteral cancer Bladder cancer Kidney cancer Leukaemia
<b>Cardiovascular:</b>	Arteriosclerosis Heart attack Stroke Abdominal aortic aneurysm Vascular obliteration (smoker's leg)
<b>Metabolism:</b>	Diabetes mellitus
<b>Respiratory tract:</b>	Chronic obstructive pulmonary disease Pneumonia Bronchitis Asthma
<b>Eyes:</b>	Cataract
<b>Teeth:</b>	Periodontitis
	<b>Women</b>
	Infertility Pregnancy complications Osteoporosis (after the menopause) Cervical cancer Breast cancer
	<b>Men</b>
	Impotence
	<b>Newborn children</b>
	Small size Low birth weight Smaller head circumference Birth defects Sudden infant death syndrome

## Almost a third of adults still smoke

The German Health Update (GEDA) study is carried out by the Robert Koch Institute in order to supply regularly updated data on the health situation of the adult population in Germany (Kurth et al. 2009; RKI 2011). To determine their current smoking status, the study participants were asked: »Do you currently smoke – even if only occasionally?« (the response options were: »Yes, daily«, »Yes, occasionally«, »No, no longer«, »No, I've never smoked«).

According to the data from the 2009 GEDA survey, 30% of the population aged 18 and over smoke: 24% smoke every day, and 6% smoke a cigarette or some other tobacco product at least occasionally. A further 26% of adults used to smoke, but have given it up in the meantime. 44% of adults say they have never smoked. This means that the number of adults in Germany who currently smoke is about 20 million. The number of adults who have smoked at some time in their lives can be put at 38 million.

26% of women smoke, fewer than men, of whom 34% are smokers. This gender difference is more striking among daily tobacco users than occasional smokers. Figure 2 also shows that among today's adults, almost half of the women and as many as two-thirds of the men have smoked at some time.

## Cigarettes are most common product

Most smokers consume cigarettes. About 83% of the women and 76% of the men who smoke use exclusively or preferably ready-made cigarettes. Self-rolled or self-filled cigarettes are used by 24% of female smokers and 26% of male smokers.

## German Health Update (GEDA)

<b>Data holder:</b>	Robert Koch Institute
<b>Objectives:</b>	To provide up-to-date data on health-related issues, to analyse temporal developments and trends
<b>Survey method:</b>	Computer-assisted telephone interviews (CATI)
<b>Population:</b>	Residential population of Germany aged 18 and over
<b>Sample:</b>	21,262 women und men
<b>Cooperation rate:</b>	51.2%
<b>Survey period:</b>	July 2008 to June 2009

Other tobacco products are much less common. For example, cigars and cigarillos are smoked by 2 % of female smokers and 11 % of male smokers. 0.2 % of female smokers and 4 % of male smokers smoke a pipe. These tobacco products are only more widespread among men smokers aged 65 and over: 18 % of them smoke cigars and cigarillos and 13 % use pipes.

### Young adults smoke most frequently

Smoking is most widespread in young adulthood. 38 % of women and 43 % of men smoke in the 18- to 29-year-old age group, and the prevalence rates are only slightly lower in middle age. Only from the age of 65 do we observe a significant decrease (Figure 3).

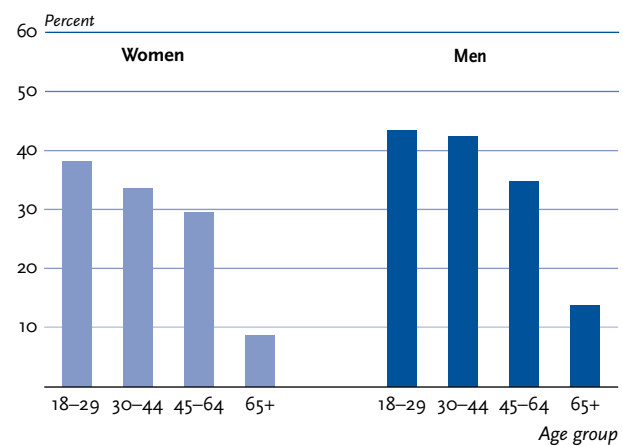
This fall is not only due to people voluntarily giving up tobacco use; it should also be seen against the background of a rising number of tobacco-related illnesses and deaths. There is also a cohort effect among women, since a compa-

ratively small percentage of the women started smoking in the older birth cohorts (cf. Lampert, Burger 2004).

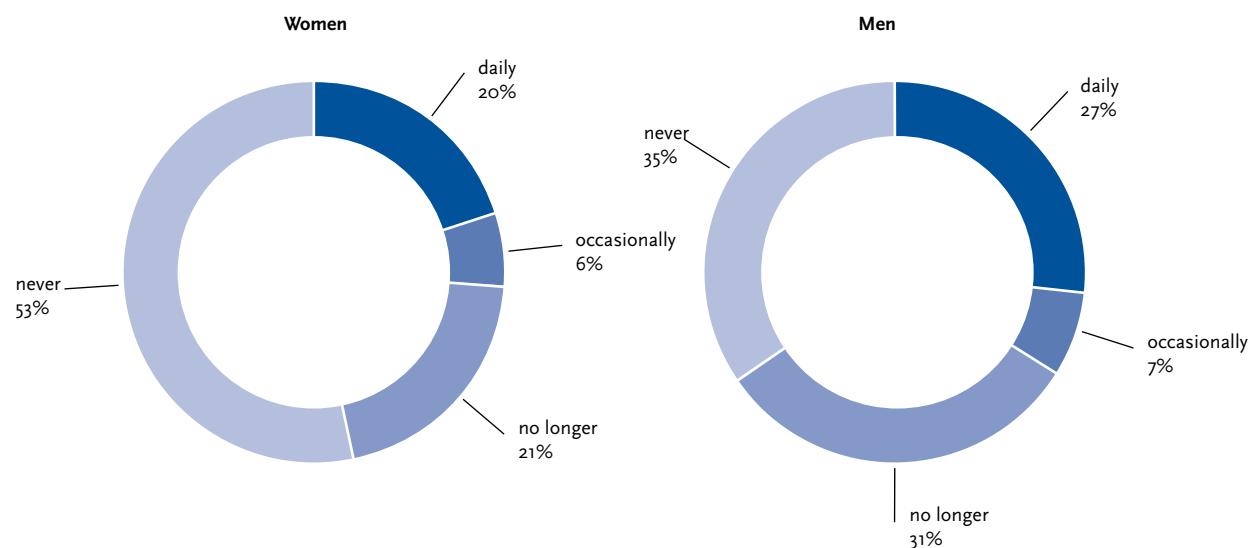
### Heavy smoking most widespread in middle age

The risk to health increases with the duration and intensity of tobacco use. The GEDA study therefore also asked cigarette smokers how many cigarettes they currently smoked a day on average. 37 % of smokers consumed fewer than 10 cigarettes a day. 39 % smoked between 10 and 19, and 24 % as many as 20 or more cigarettes daily. The latter group are referred to as heavy smokers in line with a World Health Organization

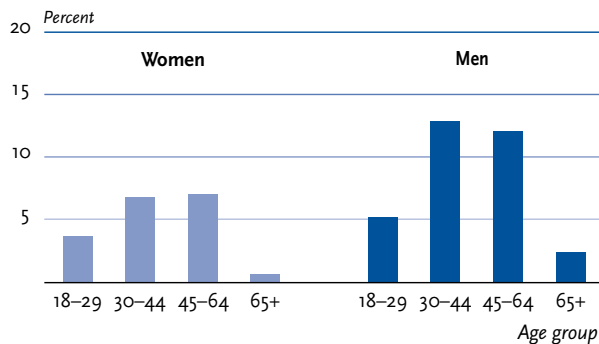
**Figure 3**  
Percentage of smokers in various age groups  
Data basis: GEDA 2009



**Figure 2**  
Smoking habits of men and women aged 18 and over  
Data basis: GEDA 2009



**Figure 4**  
**Percentage of heavy smokers (20+ cigarettes a day) in different age groups**  
 Data basis: GEDA 2009



(WHO) definition.

The GEDA data quantify the prevalence of heavy smoking in the overall population aged 18 and over at 7%. This figure is much lower in women (5%) than in men (9%).

It is also striking that, unlike in the case of smoking a whole, heavy smoking is more common in middle age than in young adulthood (Figure 4). One reason is likely to be that when people are addicted to nicotine, over time they need a higher nicotine intake to achieve the desired psychoactive effect. The fact that the percentage of heavy smokers is lower in the 65+ age group is partly due to changing life circumstances and daily routines in older age. The other factor is that the morbidity and premature-mortality risk increases with the duration and intensity of the smoking habit.

### A lack of education increases the risk of smoking

Numerous studies indicate that smoking is more common in socially disadvantaged population groups than in socially privileged groups (Schulze, Lampert 2006; Lampert 2010). The GEDA data confirms this with respect to a person's education. The level of education is determined using an international classification which takes into account both school education and professional qualifications and distin-

guishes between three education groups (CASMIN – Comparative Analyses of Social Mobility in Industrial Nations, Braun et al. 2003).

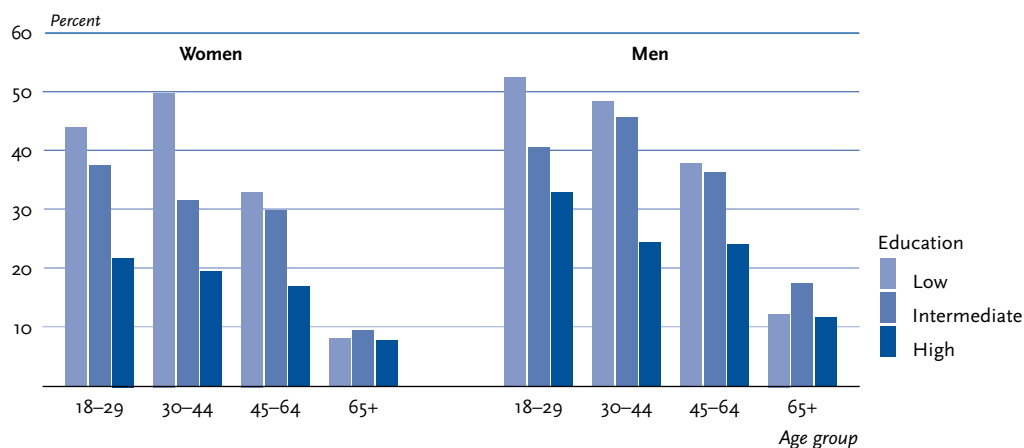
Young adults already reveal marked differences to the disadvantage of people with a low level of education compared to the intermediate and especially the higher education group (Figure 5). In middle age, too, the educational differences are clearly reflected in smoking behaviour. Only among the 65+ are no significant variations by educational level apparent. After statistical control of the age effect it can be said that the risk of smoking is 2.3 times higher among women and 1.9 times higher among men with a low level of education compared to people from the high education group (OR=2.33; 95% CI=1.99-2.73 and OR=1.91; 95% CI=1.65-2.22). The differences in education emerge even more clearly when the focus is on heavy smoking. The corresponding risk in the low compared to the high education group is increased by a factor of 3.4 among women and by a factor of 2.9 among men (OR=3.37; 95% CI=2.38-4.77 and OR=2.89; 95% CI=2.21-3.79).

### Proportion of smokers is decreasing

In order to provide information on trends and developments in smoking over time, the results of the 2009 GEDA study were compared with those of previous RKI health surveys conducted in 1990-92, 1998 and 2003. This extended the observation period to cover nearly 20 years. Since only data for the 25- to 69-year-old population were available for the 1990-92 period, the analysis of long-term development had to be restricted to this age group.

In the early 1990s, 27% of 25- to 69-year-old women and 40% of men of the same age smoked (Figure 6). In subsequent years, the proportion of female smokers increased successively, while that of male smokers remained largely constant. In the course of this development the former big difference between women and men had narrowed significantly by 2003. In the period from 2003 to 2009, the prevalence of smoking fell in both sexes, a fact

**Figure 5**  
**Percentage of smokers in different age groups, by education**  
 Data basis: GEDA 2009



that can be described as a trend reversal, especially in the case of women.

As regards heavy smoking, a decline was already observed among the 25- to 69-year-old population in the 1998-2003 period, particularly among men (Figure 7). This trend continued up to 2009. Compared to 1990-92, the percentage of heavy smokers had declined from 9% to 6%. Among men, the figures were down from 20% to 11%, almost halving the proportion of heavy smokers.

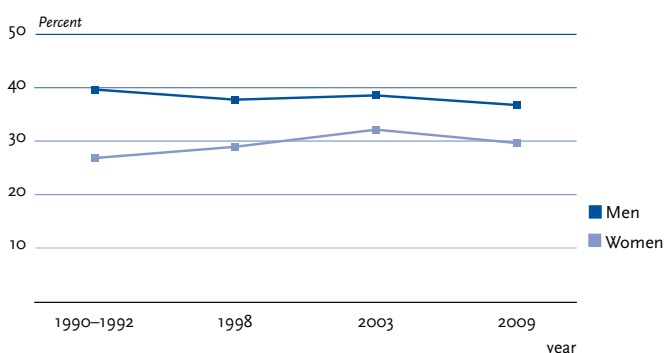
### The smoking habits of young adults have changed

In the light of these figures, one can speak of a change in smoking habits starting to emerge in 2003 at the latest. We therefore subsequently conducted an age-differentiated analysis of the development of smoking for the period from 2003 to 2009. Since the 2003 Health Survey also related to the population aged 18 and over, this age range could be used as a basis.

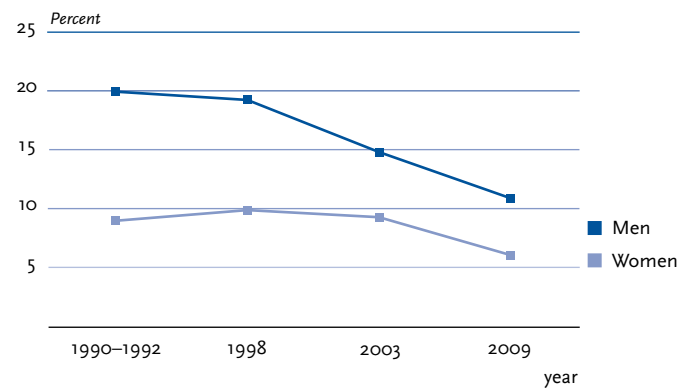
As the age-differentiated analysis shows, the decline in smoking was largely caused by changes among young adults (Table 1). The proportion of female smokers in the 18-29 age group decreased by more than 8 percentage points between 2003 and 2009. In the case of male smokers of the same age, the decline was even more marked at more than 11 percentage points. A significant decline in smoking can also be observed among women in the 30-44 age group. The changes in the other age groups, some of which show an increase in the proportion of female or male smokers, are not statistically significant when error probabilities (*p* values) are taken into account.

Furthermore, the data of the 2003 Health Survey and the 2009 GEDA study can be used to show that the percentage of smokers has declined in all education groups. In the low education group the decline is even more clearly visible than in the intermediate and high education groups. As a result, the risk of smoking in the low education group relative to the high group has declined slightly – in women from a factor of 2.8 to 2.3 (OR=2.79; 95% CI=2.11-3.70 and OR=2.33; 95% CI=1.99-2.73), in men from a factor of 2.2 to 1.9 (OR=2.21; 95% CI=1.81-2.71 and OR=1.91; 95% CI=1.65-2.22).

**Figure 6**  
Development of the percentage of smokers in the 25-69 age group, 1990-2009  
Data basis: 1990-92, 1998, 2003 Health Surveys, GEDA 2009



**Figure 7**  
Development of the percentage of heavy smokers in the 25-69 age group, 1990-2009  
Data basis: 1990-92, 1998, 2003 Health Surveys, GEDA 2009



### Discussion

On the one hand, the results of the GEDA study show that a considerable percentage of adults in Germany still smoke. On the other hand, a significant decline in smoking has been observed for the first time in recent years. In the period 2003 to 2009 this decline can be quantified at just under 3 percentage points among women aged 18 and over, and at more than 4 percentage points among men of the same age. There was an even bigger relative fall in the percentage of heavy smokers. The decline is attributable in particular to changes in the smoking habits of 18- to 44-year-olds. The changes in the older age groups are considerably weaker and for the most part not statistically significant.

The decline in smoking can also be substantiated using other data sources, e.g. the Epidemiological Survey on Addiction of the Institute for Therapy Research (IFT) and the micro-census of the Federal Statistical Office (DESTATIS). According to data from the Epidemiologic Survey on Addiction, which relates to the population aged 18-59, the proportion of female smokers fell from 30.5% in 2003 to 26.4% in 2009, while the proportion of male smokers went down from 37.1% to 34.1% (Kraus et al. 2010).

The micro-census data, which are representative of the population aged 15 and older, also suggest a decline during this period. While the prevalence of smoking among women only fell from 23.1% to 22.3%, a marked fall from 35.3% to 33.2% was found among men (DESTATIS 2011). The fact that the decline in smoking is emerging particularly in the younger age groups suggests that changes are taking place in starting rather than quitting scenarios. This assumption can be backed up by data from the Drug Affinity Study conducted by the Federal Centre for Health Education (BZgA): for the period from 2004 to 2010 it reports a decrease from 23% to 12% among 12- to 17-year-old girls and from 24% to 14% among boys of the same age (BZgA 2011).

Against this background it can be concluded that the efforts undertaken in recent years to reduce tobacco use in the population have been successful. The successes can be especially linked to a decline in smoking in the younger

**Table 1**  
**Change in the percentage of (heavy) female/male smokers in different age groups**  
 Data basis: 2003 Health Survey, GEDA 2009

	Smoking				Heavy smoking			
	2003	2009	Difference	p-value	2003	2009	Difference	p-value
<b>Women</b>								
18–29 years	46.2%	37.9%	-8.3	p<0.010	6.3%	3.7%	-2.6	p<0.050
30–44 years	39.6%	33.4%	-6.2	p<0.010	12.8%	6.8%	-6.0	p<0.001
45–64 years	27.8%	29.4%	+1.6	p=0.277	8.5%	7.0%	-1.5	p=0.114
65 years +	7.0%	8.7%	+1.7	p=0.204	0.9%	0.7%	-0.2	p=0.562
Total	28.9%	26.1%	-2.8	p<0.050	7.4%	4.7%	-2.7	p<0.001
<b>Männer</b>								
18–29 years	54.5%	43.2%	-11.3	p<0.010	12.4%	5.2%	-7.2	p<0.001
30–44 years	45.9%	42.2%	-3.7	p=0.068	18.3%	12.4%	-5.9	p<0.010
45–64 years	33.4%	34.6%	+1.2	p=0.526	13.2%	12.1%	-1.1	p=0.677
65 years +	17.1%	13.7%	-3.4	p=0.112	4.7%	2.4%	-2.3	p<0.050
Total	38.3%	33.9%	-4.4	p<0.001	13.2%	9.2%	-4.0	p<0.001

Difference = change in prevalences between 2003 and 2009 in percentage points; p-value = error probability for the described difference. A statistically significant change can be assumed from a p-value of p<0.050.

age groups and thus to measures and programmes aimed at preventing people from starting to smoke (Maschewsky-Schneider, Pott, 2010; Mons, Pötschke-Langer 2010).

The fact that few or no changes in tobacco consumption can be observed among the older age groups indicates that there is still a great need for services to help smokers to quit (Kröger, Gradl 2010). However, a sustainable reduction in smoking will ultimately only be achieved if the efforts to date are continued and expanded in terms of both preventing people from starting and helping them to stop smoking.

In addition to regular reporting on the spread and development of smoking, other important factors are health targets as instruments of planning, controlling and monitoring the success of measures and programmes, especially when these are formulated with the involvement of the relevant players and linked to concrete recommendations for action (BMG 2003; Kröger et al. 2010).

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#### Comparability of the studies on smoking

A direct comparison of results on the dissemination and development of tobacco use is not possible because the studies differ in several respects: e. g. in the way they generate – and the degree to which they use – their samples; in their survey methodology (telephone, postal or personal interviews); in the way they measure smoking behaviour and define smoking status; in their statistical analyses; and in the population weights they use to ensure that the results are representative. It is, however, possible to compare the overall trend and the pattern of changes over time: all the studies mentioned confirm a decline in smoking, especially in the younger age groups.

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GBE kompakt

**Published by**

Robert Koch Institute  
Nordufer 20  
13353 Berlin

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**How to quote the title**

Lampert T (2011)  
Smoking.  
Published by Robert Koch Institute Berlin,  
GBE kompakt 2(4)  
[www.rki.de/gbe-kompakt](http://www.rki.de/gbe-kompakt) (last revised: 24.05.2011)

ISSN 2191-4974

The Robert Koch Institute is a federal institute  
within the portfolio of the Federal Ministry of Health