



Identifying best practice in actions on tobacco smoking to reduce health inequalities

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Written by Knowledge Matrix

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Table of Contents

Table of Contents	3
Introduction	4
Background and context	4
Health inequalities in the EU	4
Methods	5
Findings	7
Tobacco smoking prevalence in the EU and its contribution to health inequalities. ...	7
Findings of the literature reviews	8
Prevalence of tobacco smoking by socio-demographic variables	8
The contribution of tobacco smoking to health inequalities	11
Tobacco control interventions in the EU and beyond	11
Implemented tobacco control interventions and their equity impacts	12
Tobacco control interventions targeted at specific socio-demographic groups.....	14
Cost-effectiveness of tobacco control interventions in specific socio-demographic groups.....	15
Lessons from the wider field of health promotion	16
Interventions in other areas of health promotion can provide insights into the impacts of tobacco control interventions on health inequalities	17
Effective interventions in other areas of health promotion	17
Cost-effective interventions	17
Differences in the impacts of interventions on different socio-demographic groups	18
Conclusions and recommendations for policy development.....	19
Best practices available in the field of tobacco control which can have a positive impact on reducing inequalities in health.....	19
Lessons from the wider field of health promotion	20
Implications for policy development in the area of reduction of tobacco harm	20
Bibliography	23
Tobacco smoking and contribution to health inequalities	23
Tobacco control interventions in the EU and beyond	26
Interventions in the wider field of health promotion with implications for actions on tobacco related health inequalities	28

Introduction

Tobacco smoking in the European Union is considered an important contributor to inequalities in health. Measures to control tobacco have been implemented at European Union level and in Member States for several decades and have often succeeded in reducing smoking. However, there are concerns that these efforts have been less effective for disadvantaged groups, so that tobacco remains one of the main sources of health inequalities in the EU (WHO 2014).

This study describes the impact of tobacco control policies on socio-demographic groups in Europe. It uses evidence from published academic literature, and draws on experience from other health promotion areas to inform policy-makers on EU national and local levels on further action and best practice in tobacco control measures. These could potentially reach socially disadvantaged groups, and, as a result, reduce the contribution of tobacco smoking to health inequalities.

Background and context

Although numbers are decreasing, almost one-third of the European Union (EU) population are still smoking (European Commission 2014). Tobacco smoking and second hand smoke is linked to a broad range of health risks, such as cancers, cardiovascular and respiratory diseases; it remains the largest avoidable health risk in the European countries (OECD 2012).

Health inequalities in the EU

Many health risks, such as poor living and working conditions and health behaviours, are more common among lower socio-economic groups, and have been shown to cause considerable health inequalities.

On the basis of 2004 estimates, the impact in EU25 of health inequalities on average life expectancy at birth was estimated at 1.84 years. The impact increases to a difference of 5.14 years in the average number of expected years lived in good health. More than 700,000 deaths annually can be attributed to differences in health based on educational level, and the number of life years lost due to these deaths is about 11.4 million. Similarly, more than 33 million cases of ill-health can be attributed to health inequalities (Mackenbach et al. 2007).

Health inequalities are a natural focus for the European Commission as it "regards the extent of the health inequalities between people living in different parts of the EU and between socially advantaged and disadvantaged EU citizens as a challenge to the EU's commitments to solidarity, social and economic cohesion, human rights and equality of opportunity" (European Commission 2009). The reduction of health inequalities has been an articulated goal since 2006, when the Council agreed conclusions on common values and principles in EU health systems. Specific EU action on health inequalities is set out in the 2009 Communication "Solidarity in Health- reducing health inequalities in the EU"

<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52009DC0567&from=EN>.

It aims to support Member States and stakeholder action as well as to improve the contribution of EU policies to addressing health inequalities. The latest progress report on the implementation of the Communication was published in September 2013 http://ec.europa.eu/health/social_determinants/docs/report_healthinequalities_swd_2013_328_en.pdf.

Methods

This study was carried out using mixed research methods in order to utilise best available evidence. The methods include analyses of tobacco smoking data from relevant databases, and reviews of relevant published literature evaluating the effectiveness and cost-effectiveness of different interventions and their effects on health inequalities. The details of the methods are as follows:

Statistical analyses: A descriptive statistical analyses was conducted to present available EU information on tobacco smoking in different socio-demographic groups. Two data sources were employed; the Eurobarometer and the European Health Interview Survey (EHIS) from 2008 to date. Eurobarometer data for 2012 is used to describe the current situation, while the changes over time are described by the data from Eurobarometer from 2005 to date.

Literature reviews: Three literature reviews were conducted. The study titles, abstracts and full texts of the search results were screened for relevance using customised inclusion / exclusion criteria. All included studies were assessed for quality, and data extracted from them.

- **Review 1:** This review summarised the literature on the prevalence of tobacco smoking in socio-demographic groups, and how tobacco smoking contributes to inequality in health, in the EU28 and in Iceland, Norway, USA, Australia and Switzerland. This review was conducted in accordance with standard review methodology and included studies published from 2004-2013.
- **Review 2:** This literature review included studies of the impact of tobacco control interventions on different socio-demographic groups and the cost-effectiveness of such interventions, as well as their equity impacts. This review was conducted using a pragmatic review methodology that consisted of:
 - a review of the most current systematic reviews of tobacco interventions aimed at reducing health inequalities, augmented by primary studies of interest that were not included in these reviews; and
 - a systematic review of primary studies of cost-effectiveness of tobacco interventions aimed at reducing health inequalities.

The identification of the reviews and the complementary studies were guided by a tobacco control research expert, who collected and analysed systematic reviews from the last decade, as well as studies of interest not included in these reviews. Studies published via a Medline search up until February 2014 were also included. The cost-effectiveness of relevant interventions were acquired following a systematic search of relevant databases in February 2013. In addition, some studies were included based on expert advice.

- **Review 3:** The third literature review provides an overview of other health promotion interventions that have been implemented in disadvantaged socio-demographic groups, to assess whether they could apply to tobacco control policies. A rapid review of published literature reviews and meta-analyses was conducted for this, in accordance with standard methodology. A robust search of relevant databases was carried out and included reviews and meta-analyses published from 2008-July 2013.

The full methodology is reported in a comprehensive report that also contains the full literature review results and bibliography. Appendices to the comprehensive report include the quality assessment of the studies and detailed evidence tables. As per usual practice, specific research questions were framed, in order to answer them using data from the literature reviews.

The characteristics within the socio-demographic groups considered in this report include:

- Educational attainment
- Socio-economic groups (income, wealth and occupational groups)
- Gender
- Other socio-demographic groups (including vulnerable and disadvantaged groups, and those from a minority background)

Findings

The findings of the study are detailed as follows:

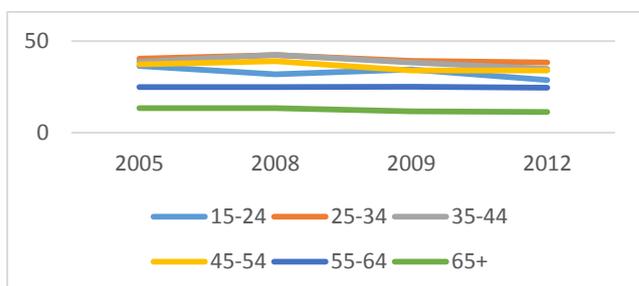
Tobacco smoking prevalence in the EU and its contribution to health inequalities.

Results of the statistical analyses

The statistical analyses of tobacco smoking among socio-demographic groups shows that smoking is still common in the European Union. As at 2012, a third of men and one in four women in the EU smoked. Since 2005 the smoking prevalence among females has been stable while decreasing slightly among males, from 38% to its current 33%.

The trend over the last decade shows that smoking has been decreasing, although the pattern when age groups are compared appears to indicate stability in the number of smokers. The exception is the youngest age group. The age pattern has been stable since 2005 (figure 1), with smoking prevalence of 30-40% among those aged below 55 years, 25% among those 55-65 years, and 10-15% among the older than 65 years. The most pronounced change, from 2005-2012, was found in the youngest age group where there has been a reduction in smoking prevalence from 36% in 2005 to 29% in 2012.

Figure 1: Prevalence of smoking by age group over time.



Source: Eurobarometer 2005, 2008, 2009 and 2012. Available at http://ec.europa.eu/public_opinion/archives/eb_special_en.htm.

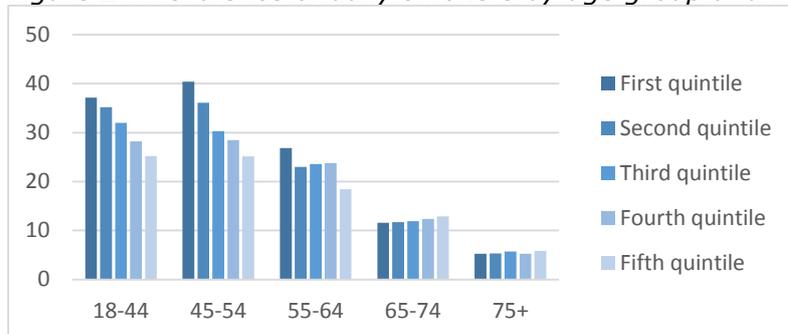
The analyses considered several characteristics by which social-demographic groups are described. These include level of education, income, and self-reported social status.

Eurobarometer data for 2012 indicates a clear relationship between smoking and the age an individual leaves full-time education (used as an indicator of educational attainment), especially for the young and middle-age groups. This is confirmed by the EHIS 2008 data, which measured educational level directly. It reports that within age groups 25-44 years, the smoking prevalence is twice as high among people with only pre-primary, primary or lower secondary education as among those who completed tertiary education. This indicates that low educational attainment is associated with tobacco smoking.

It was found that smokers were highest among those who have difficulty paying their bills most of the time when using ability to pay bills as an indicator of income. This income gradient is confirmed by EHIS data for the young and middle-age groups,

where smoking becomes less common as income increases. The fifth income quintile (containing the 20% of the population with highest incomes) were less likely to be smokers, than members of the first income quintile. From 65 years on, the relationship between income and smoking appears to reverse, with smoking prevalence increasing as incomes increase (figure 2).

Figure 2: Prevalence of daily smokers by age group and income



Source: *European Health Interview Survey 2008*. Available at http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database (table hlth_ehis_de3 and hlth_ehis_de4)

An analysis of self-rated social status and smoking prevalence revealed that the largest differences in smoking were found in those aged below 45 years, and most pronounced among males aged 35-44 years. In that age group, 57% of the males with a low social status smoke compared to 29% among those with a high social status. As our analysis does not distinguish between never smokers and former smokers, we cannot indicate whether this pattern is due to higher levels of uptake of smoking among self-rated lower social status groups, or to higher levels of smoking cessation among the higher social status groups.

Findings of the literature reviews

A total of 81 studies, found in scientific journal databases and from searches of grey literature, were included in the three reviews. The research questions and the findings are as follows:

Prevalence of tobacco smoking by socio-demographic variables

Lopez et al. (1994) developed a 'smoking epidemic' model, describing the spread of tobacco smoking within populations. This pattern is said to be mirrored by the pattern of inequalities in smoking among socio-demographic groups. According to the Lopez model, in the first stages of this epidemic, smoking spreads mainly among men, and then a decade or two later, among women. The model also stipulates that when smoking prevalence declines, the decline tends to be led by groups with higher socio-economic status (mainly in relation to education and income) and this occurs in the later stages of the epidemic.

The use of electronic cigarettes ("e-cigarettes") has now become commonplace and they have recently been regulated under the revised Tobacco Products Directive 2014/40/EU. A lack of consensus on their effect on health has led to differing approaches to their control (Etter et al., 2011). A review of available evidence found that they are typically used by smokers or ex-smokers, and their use is significantly

higher among young people across different socio-economic groups (Britton and Bogdanovica, 2014). Brown et al., (2014) however contend that they are used more by people with higher socio-economic status, than by those of low socio-economic status.

The relationship between smoking prevalence and educational attainment

A number of studies have examined the relationship between education and smoking across different countries. Most show less educated populations as having a higher smoking prevalence. One study, Giskes et al. (2005), reported that between 1985 and 2000, for nine of the EU15 countries covered, there was a greater decline in smoking in highly educated men and women compared to their less educated counterparts. A separate study of the EU15 countries, showed that for the younger and middle-aged population, there is a more pronounced relationship between smoking and education than between smoking and income (Huisman et al. 2005).

A large number of studies use national data, and describe a higher smoking prevalence among the social groups with least educational attainment. Some studies report this relationship among all age groups (Denny et al. 2012). Stringhini et al. (2012) however found this relationship in the youngest age group but not in the oldest groups. Schulze and Mons (2006) report a conflicting pattern of education and smoking. In men born 1931-40 and women born 1941-50, they report a decrease in the number of ever smokers (i.e. current smokers and ex-smokers combined) in the highly educated group but an increase in the least educated group. Similarly, Maralani (2013) reports educational differences in the never smoking population as accounting for most of the disparities in smoking prevalence.

Differences in smoking prevalence may be explained by the relationship between educational attainment and smoking initiation and cessation. Some studies report that smoking initiation is more frequent among lower educated groups than higher educated groups (e.g. Leinsalu et al. 2011), while other studies indicate that cessation rates are higher among the higher educated (Federico et al. 2009), but maybe only among women (Federico et al. 2007).

Not all studies report a clear negative gradient between education and smoking status. A study from Portugal (Alves et al. 2012) and one from a region of Austria (the 'Rauchfrei Dabei' report 2013) report that smoking increases with educational attainment. The Austrian report suggests that this is due to combined effect of low education among elderly women. A Spanish study (Redonado 2011) reports that smoking was more frequent among the higher educated in 1995, but that this had changed in 2005. It also reports a statistically significant interaction between the relationship of age and education on smoking; in young women prevalence was highest in the lowest education group whereas the opposite was found among women older than 45 years.

The relationship between smoking prevalence and socio-economic status

Research shows a fairly consistent relationship between smoking prevalence and socio-economic status, using measures of income, wealth and occupational groups, with less affluent groups having a higher smoking prevalence.

Four studies look at the effect of income on smoking across countries. For example, one study (Stringhini et al. 2011) reports an inverse relationship between income and smoking in France and the UK. Data from the World Health Study, shows that smoking was disproportionately prevalent in poorer males in the vast majority of countries. In

many cases they were found to be more than 2.5 times more likely to be smokers than the richest men (Hosseinpour et al. 2012). For women, the study showed a more varied pattern: in 20 countries the poorest women had a higher prevalence of smoking than the richest women but in nine countries the richest women had a greater prevalence than the poorest women. Nikolau (2009) found that income was positively related to smoking, i.e. smoking is more frequent among higher income groups, in females but not in males in Italy, Spain, Portugal and Greece.

A small number of studies report national data, with conflicting findings. Some (for example, Farmer et al. 2012) report an inverse relationship between low income and smoking, and higher rates of smoking initiation in low income women (Leinsalu et al. 2011). Two studies in the UK looked at the effect of income on smoking cessation activity and found that smokers in financial difficulties were less likely to be successful in quitting, despite being equally likely to engage in cessation attempts (Calyachetty 2012; Hawkins et al. 2011). Similarly, the French Observatoire Regional de la Sante report (2009) found that smoking cessation was higher in those in managerial and professional positions compared to the unemployed.

The relationship between smoking prevalence and gender

A number of studies highlight the differences in the evolution of the smoking epidemic in terms of demographics, with some conflicting results. In particular, we have seen in Huisman et al. (2005b) that inequalities in prevalence, with the less educated smoking more, tend to appear later among women. This view is consistent with the fact that these inequalities were found to be larger, in 1998 data, among women in countries in northern European countries and among the younger cohorts, while they are less clear in southern European countries and reversed in Greece and Portugal.

Several studies report findings indicating a narrowing of the gap in smoking rates between males and females. For example, the UK Department of Health (2010) reported a decrease in smoking prevalence among males only, while in Hungary Balku (2012) reported an increase in the female smoking prevalence even though the overall proportion of daily smokers was decreasing.

One possible reason for the gender gap might be women's empowerment, but one study found no clear relationship between gender equality in society and the gender ratio of smoking (Pampel et al. 2006), whereas another (Hitchman et al. 2011) did find an association.

The relationship between smoking prevalence and other socio-demographic groups

Limited evidence exists with regard to other socio-demographic groups and smoking prevalence. Two studies from the UK indicate a higher prevalence and difficulty quitting smoking among minority groups (Millward and Karlsen 2011, Karlsen and Nazroo 2010), although the variations in ethnic groups appear to be largely driven by variations in smoking among women. Other minorities at risk are found within Roma populations in Europe, caravan travellers in the UK, the Native Americans in the USA, and indigenous Australians in Australia. For example, those living in caravans in the UK are more than twice as likely to smoke as the general population (Zenner and Allison 2010), and the proportion of daily alcohol, drug users, and smokers is higher among Roma teenagers in Vilnius (Lithuania) and Ventspils compared to the general population of the same age (Kanapeckine et al. 2009). Australian studies report higher rates of smoking in indigenous Australian mothers compared to non-indigenous Australian mothers. One study finds that smoking prevalence is approximately twice

as high in mothers of low socio-economic status as among those with a high socio-economic status (Thrift et al. 2011).

The contribution of tobacco smoking to health inequalities

Smoking is one of the main behavioural factors responsible for the differences in mortality, morbidity and healthy life expectancy in the general population at large, and between socio-demographic groups. When studying differences in health outcomes for specific socio-demographic groups, these largely correlate with differences in educational attainment, socio-economic status, and other wider determinants of health.

Several studies report the incremental effect of smoking on mortality, morbidity or life expectancy in general populations. As an example, tobacco smoking is reported to be an important contributory factor in explaining the health difference between Bulgaria and former EU15 countries (Zatonski et al. 2008).

Studies in individual countries have reported educational attainment as being a major contributory factor to tobacco related health differences, with all reporting a decreased prevalence of smoking with increasing levels of education. One reported that this relationship remained significant even after adjusting for age, marital status, biologic and other health behavioural factors (Rostad et al. 2009).

Consistent evidence from across a range of countries suggests that higher levels of socio-economic variables, such as income, wealth and occupation, positively influence smoking related mortality, morbidity and health life expectancy. One study (Jha et al. 2006) reported that across four countries in Europe and North America men between the ages of 35-64, who belong to the lowest social strata, had double the risk of dying than their peers in the highest social strata, with more than half of this risk involving differences in the risk of being killed by smoking related conditions. These findings were later confirmed in European data (Menville et al. 2009).

There is a general agreement that smoking related mortality is lower in women than in men (Peto et al. 2012) although the gap is narrowing due to an increase in smoking-related mortality among women.

Very few studies report on smoking related health inequalities in other socio-demographic groups, though one study indicates strong disparities in tobacco related cancer incidence and mortality in US smokers of minority origin. The authors suggest that these groups of smokers have limited access to evidence-based smoking cessation support and consequently experience more difficulty in quitting (Vidrine et al. 2009). In addition, indigenous populations in Australia have a lower life expectancy than non-Indigenous, with smoking being the second largest contributor to the inequality behind social disadvantage (Zhao et al. 2013). Another study reports a similar pattern; indigenous Australian prisoners have a considerably poorer cardiovascular risk factor profile (including smoking) than the most deprived groups in the general population (Richmond et al. 2011).

Tobacco control interventions in the EU and beyond

A considerable body of evidence exists on the effectiveness and cost-effectiveness of interventions to reduce smoking among adults. Less is known, however, about interventions that are effective in smokers in disadvantaged socio-demographic groups and have the potential to reduce health inequalities between the most and least

deprived groups. A number of reviews have been conducted which have all drawn similar, if limited, conclusions that are reported in this section.

Implemented tobacco control interventions and their equity impacts

This review of reviews has confirmed existing knowledge as to which interventions may have a beneficial effect on inequalities in smoking.

Pricing interventions and their effect on smoking related health inequalities

Overall, increasing the price of, or imposing tax on cigarettes, was associated with a decrease in smoking prevalence, with adults in lower socio-economic groups appearing to be more responsive to price increases than those of higher economic status. Pricing was the intervention that provided the strongest evidence for reducing smoking related health inequalities in the review by Thomas et al. (2008). This was primarily achieved through reductions in smoking among adults with lower incomes and manual workers. A similar finding was reported in youths, although there was some evidence to suggest that boys, black or Hispanic adolescents and older children may be more sensitive to price increases.

Similar findings were reported by Hiscock et al. (2012), Hill et al. (2013), Amos et al. (2013a) and Amos et al. (2013b). For example, over half of the studies identified by Amos et al. (2013b) were associated with a positive equity impact, based on income and / or education as an indicator of socio-economic status.

The higher prevalence of smoking in low-income groups means that any equity benefit gained by increasing taxes may be outweighed in the short term by the financial burden experienced by those smokers who do not quit. Increasing taxes may result in a negative equity impact via a number of price-minimising strategies adopted by the smokers, such as buying cigarettes from cheaper sources, switching to cheaper brands or rolling their own cigarettes (Choi 2012). It has also been suggested that smokers of lower socio-economic status may continue to smoke despite being aware of the high financial cost due to stresses associated with life (Peretti-Watel & Constance 2009).

Smoke free spaces and their effect on smoking related health inequalities

Smoke-free spaces brought into being by legislation have shown some potential in reducing health inequalities in smoking. Thomas et al. (2008) concluded that although policies showed little evidence of increasing inequalities, smoking related behaviours and attitudes may be more favourably influenced in higher socio-economic groups. One study (Hill et al. 2013), however, did not find any clear evidence on how smoke-free spaces might influence the social gradient in smoking, while another reported that comprehensive smoke-free legislation reduces inequalities in exposure of second hand smoke (Hiscock et al. 2012).

In its review of interventions to reduce inequalities among youth, Amos et al. (2013a) concluded that whilst national comprehensive smoke-free restrictions decreased exposure to second hand smoke in primary school children, the equity impact varied. Exposure was generally lower among children from more affluent families and among those who had the lowest levels of exposure before legislation, with the likelihood of only partial or no smoking restrictions at home decreasing with lower socio-economic status.

A review of adult policy interventions reported that the voluntary adoption of smoke-free environmental policies increased inequalities; individuals with a lower level of income, education and occupation and higher smoking prevalence and second hand

smoke exposure did not benefit as much from these policies as other population groups. However, stricter smoke-free policies are associated with reduced inequalities since these have relatively high impacts on smoking prevalence within this population. Similarly, smoke-free legislation in enclosed public spaces report a positive equity impact. There is very little evidence presented for smoke-free cars (Amos et al. 2013b). ENSP (2006) point out that the attempts to protect children from second hand smoke at home are more likely to succeed.

Promising evidence shows that while low income smokers are less likely to implement smoke-free homes than their more affluent counterparts, those that did implement such policies, had consumption levels and cessation rates similar to those with higher incomes (Vijayaraghavan et al. 2013). Vijayaraghavan suggests that interventions should promote home smoke-free policies among less affluent smokers.

Restriction of cigarettes availability and their effect on smoking related health inequalities

Little evidence was found regarding the inequality impact of restricting the availability of tobacco. Amos et al. (2013a) concluded that the small number of studies in this area makes it difficult to estimate how this policy may reduce health inequalities, but previous reviews have reported that restrictions in sales to minors might be more effective in white than non-white groups (Thomas et al. 2008).

Mass media warnings and their effect on smoking related health inequalities

Mass media campaigns targeted on smokers of low socio-economic status could potentially have a positive equity impact (Hiscock et al. 2012), in particular television adverts using personal testimony (Hill et al. 2013).

No positive equity impact of marketing interventions in youths were found by Amos et al. (2013a), and only three studies out of 29 reported a positive equity impact in adults. Amos et al. (2013b) suggest that narrative and higher emotion anti-smoking advertisements may increase calls to 'quit lines' by smokers in lower socio-economic groups, and that multimedia campaigns to promote the use of nicotine replacement therapy (NRT) could have a positive equity impact due to increased reach among low income and education groups.

Community or setting-based interventions and their effect on smoking related health inequalities

Little evidence was presented across the reviews for the potential for community or setting-based interventions to reduce inequalities in smoking. Of five studies identified by Amos et al. (2013a) only one reported having a potential to reduce inequalities; a social network approach where adolescents considered as 'influential' by their peers deliver the intervention. Only two of seven studies identified in adults (Amos et al. 2013b) demonstrated a positive equity impact; one workplace health promotion intervention with integrated health and safety efforts in the USA and one community 'Breathe Easy' intervention. A London-wide campaign for smoking cessation among Muslim adults during Ramadan was not included in the reviews, but reported an increased awareness of where to obtain help for smoking cessation (Taket et al. 2003). Finally, findings highlighted in ENSP (2006) show that the involvement of local communities and peer groups increases the effectiveness of tobacco control policies addressed to young people and children.

Population interventions and their effect on smoking related health inequalities

The review by Hiscock et al. (2012) reported very limited evidence that telephone 'quit lines' have an impact on inequalities; they do though suggest that individuals with a higher level of education were more likely to call 'quit lines' than those with a lower level of education. The evidence concerning the use of the internet for smoking cessation information was also limited. Amos et al. (2013b) reported that the comprehensive national coverage of the UK NHS stop smoking services are able to reach disadvantaged smokers, when targeted appropriately, implying a positive equity impact. While the population level coverage of services provided in the UK is somewhat unique, the findings may be relevant to other European countries in terms of increasing positive equity impacts of smoking cessation support. It is also suggested that a contract providing financial reimbursement to general practitioners for recording smoking status and offering cessation support in UK primary care could have a positive equity impact.

None of the additional studies of individual interventions identified had any positive equity impacts.

Individual interventions and their effect on smoking related health inequalities

Brief interventions, behavioural support, pharmacotherapy only, internet support and incentives have either a neutral or negative equity impact (Hiscock et al. 2012). This study did find, however, evidence to support the potential role of a combination of pharmacotherapy and behavioural support as a cessation intervention with a positive equity impact. The review by Hill et al. (2013) reported that evidence concerning smoking cessation services / combination of pharmacotherapy and behavioural support suggests a negative equity impact, due to lower quit rates among disadvantaged populations. This is confirmed in the review by Amos et al. (2013c); of the 15 studies identified that evaluated combined behavioural and pharmacological interventions, 11 were based around UK NHS stop smoking services, of which eight were reported as having a negative equity impact, the remaining three being 'neutral'. Hill et al. (2013), however, point out that a concentration of services in more deprived areas may attenuate the negative equity impact.

UK NHS stop smoking services' cessation rates were significantly lower in disadvantaged areas than others, but a significantly higher proportion of smokers were being treated (Bauld et al. 2007). The net effect of this increased reach was a positive impact on inequalities.

None of studies of behavioural support identified in the review by Amos et al. (2013c) reported any form of positive equity impact, although a number of studies, not included in the published reviews, have reported a potential positive equity impact. Examples are found among Polish adults, and counselling for preventing relapse in low income, post-partum women. Studies around cognitive behavioural therapy interventions have produced conflicting results, with some positive findings reported for Hispanic smokers and pregnant African-American smokers.

Tobacco control interventions targeted at specific socio-demographic groups

A number of studies investigated the effects of tobacco control interventions targeting specific socio-demographic groups.

Robles et al. (2008) found in its review of studies 'evaluating the efficacy of smoking cessation pharmacotherapies in non-white US populations', that existing studies appear to support a role for nicotine patch and bupropion SR in smoking cessation

among non-white smokers. A small number of studies, not included in existing reviews, evaluated the effectiveness of nicotine replacement therapy (NRT) among low-income American adults. Burgess et al. (2009) reported that among pregnant, ethnic Chinese women, NRT improved quit rates, and Shelley et al. (2010) found that nicotine patches, when combined with a self-help smoking cessation guide, also improved quit rates in a similar population. De Dios et al. (2012) found that in Latino smokers, the group receiving varenicline had higher quit rates than those receiving NRT.

A systematic review and meta-analysis by Bryant et al. (2011) investigated the effectiveness of behavioural support interventions, targeting selected disadvantaged groups. The authors concluded that despite limited evidence, there is some indication that some strategies show benefit. Among the primary studies included in this review, group based, behavioural management plus NRT was found to be effective for cessation among female prisoners, while an eight week, group cognitive behavioural therapy programme incorporating NRT and a 'buddy' proved effective for pregnant adolescents. Two of the studies targeted individuals living in deprived neighbourhoods or attending health clinics for deprived populations. Statistically significant outcomes were produced after evaluating a self-help cognitive behaviour therapy (CBT) smoking cessation programme for smokers living in a deprived area of London, and dental practitioner brief advice combined with NRT for low-income smokers, respectively. Only one study conducted in a mental health population found that by integrating cessation care with treatment for post-traumatic stress disorder (PTSD) the intervention was over five times more effective than referrals to external care.

Boyd et al. (2011) combined three studies of women attending planned parenthood or paediatric clinics in a meta-analysis, which revealed a statistical significant effect of a multi-component, motivational interviewing intervention compared to usual care or brief advice at the shortest follow-up point, but not at long term follow-up.

Two studies of mass media campaigns targeting disadvantaged groups, included in a review by Guillaumier et al. (2012), reported positive equity findings; one campaign targeting African American smokers found a significant increase in calls to 'quit lines' and another campaign targeting American Vietnamese males reported lower odds of being a smoker at follow up. Two other studies in indigenous Australian populations and New Zealand Maori found that targeted campaigns were more effective at promoting awareness and motivational response than general population targeted campaigns. However, a further study in the same Maori population reported that despite the high proportion of smokers reporting the targeted campaign as effective, there was no change in smokers' motivation to quit smoking during the study period (Grigg et al. 2008).

Cost-effectiveness of tobacco control interventions in specific socio-demographic groups

There is sparse evidence about the cost effectiveness of tobacco control interventions directed at different socio-demographic groups. The few studies found, however, report that the interventions are cost-effective, with low costs per health gains achieved.

The cost per quality adjusted life year (QALY) was estimated at £8,500 for using outreach workers of the same minority group compared to usual care among men of Asian origin (Begh et al. 2011). The cost per quitter was \$299, at end of pregnancy,

for a counselling intervention conducted in the prenatal clinic in a population of low-income, pregnant, predominantly Hispanic women, when compared to standard cessation advice from a health care provider (Dornelas et al. 2006). Ruger et al. (2008), however, found no effect on smoking cessation when motivational interviewing was compared to usual care in low-income pregnant women, but estimated the cost per life year saved for relapse prevention at \$628. Using a cost-benefit approach, Richard et al. (2012) found that the return on investment for Medicaid amounted to \$2.12 (range \$2.00 to \$2.25) for every dollar spent on a smoking cessation programme including medication and telephone support in a low-income population. The different health gains used in the economic evaluations reported makes comparison difficult, but all should be considered low cost, and thus value for money.

The UK smoking cessation services show potential to reduce smoking related health inequalities and several studies have calculated the cost effectiveness of these services. Examples include: £438 per life year saved, including savings in future healthcare costs (Godfrey et al. 2005); costs per QALY of £4400 and £5400 for pharmacy support and for group support, respectively, compared to self-quit attempts (Boyd et al. 2009), and £4800 per QALY for group services based in pharmacies and £2600 per QALY for individual support (Bauld et al. 2012). All these estimates indicate that the services are cost-effective, i.e. well below frequently quoted thresholds.

For the Netherlands, a recent study simulated the cost-effectiveness of two tobacco control policies: tobacco tax increase and reimbursement of cessation support, both known to have favourable effects in low socio-economic status groups (Over et al. 2014). The simulations showed that quitters were proportionally divided across the socio-economic groups in the tax increase scenario, while the reimbursement scenario resulted in relatively more quitters in the higher socio-economic groups. The cost-effectiveness of the tax increase was 5,000 Euros per QALY, ranging from 6,100 Euros for those with the lowest educational level to 4,500 Euro per QALY for those with the highest educational level. The reimbursement scenario result was 15,000 Euros per QALY; 21,000 Euros per QALY for those with the lowest educational level and 11,000 Euros per QALY for those with the highest educational level. Although both policies were able to improve health in the lowest educational groups at fairly low cost-effectiveness ratios, neither policy was capable of reducing socio-economic differences in smoking.

Lessons from the wider field of health promotion

The third literature review was a rapid review of already published literature reviews and meta-analyses of health promotion interventions implemented in disadvantaged socio-demographic groups. The review seeks to present evidence on measures to address other risk factors for poor health to derive possible lessons about how to address tobacco-related health inequalities.

Physical activity, prevention of obesity and prevention of excessive alcohol consumption were reviewed. They were chosen as the socio-demographic groups that experience health inequalities often share these risk factors for disease. As such, lessons may be drawn from any public health intervention that targets them and has an impact on the reduction of health inequalities due to socio-economic status.

Interventions in other areas of health promotion can provide insights into the impacts of tobacco control interventions on health inequalities

The reviews included a variety of interventions, such as taxation or subsidies, policy such as legislation and availability, marketing such as mass media and internet-based, community and group-based, individual in the form of advice and support for lifestyle modifications, as well as multi-component interventions. They also included a range of socio-demographic groups, including ethnic minorities, young people, pregnant women and the general population.

Effective interventions in other areas of health promotion

Group-based interventions were found to significantly increase physical activity in low income women (Cleland et al. 2013) as well as in the general population, and in economically disadvantaged communities, particularly among women experiencing disadvantage (Cleland et al. 2012).

Specifically designed and targeted interventions to prevent obesity in particular groups were reported as effective, by Perez et al. (2013) in its review of studies of US Latino adults. Community-based, culturally relevant, faith-group based interventions and promotora-led (community members who receive specialised training to provide basic health education) interventions were found to be most effective.

Several reviews on the effectiveness of pricing interventions to prevent obesity included evaluating either taxes on unhealthy foods, such as sugar or fat, or subsidies for healthy foods, such as fruits and vegetables. In general, taxes and subsidies influenced consumption, but the impact of taxes may be overestimated if shifts in consumption to other foods are not taken into account (Thow et al. 2009; Maniadakis et al. 2013). These two reviews point out that there were notable substitution effects detected between different products, as corroborated by Eyles et al. (2012), potentially leading to adverse health outcomes.

Conflicting findings are reported on the impact of pricing over socio-demographic groups. Thow et al. (2009) and Maniadakis et al. (2013) pointed out that factors such as the income group affect the impact of taxes, and that taxes are more regressive towards the lowest income groups. The majority of the studies in Eyles et al. (2012) that evaluated the effects among lower socio-economic groups estimated that food pricing strategies would have the potential to reduce health inequalities, while another review (Powell & Chaloupka 2009) reported that in some cases larger associations were found between food and restaurant prices (taxes) for low socio-economic status populations.

Pricing, and in particular taxes, were also the subject of several alcohol intervention reviews. Two reviews (Wagenaar et al. 2009; Wagenaar et al. 2010) report highly significant relationships between alcohol tax and consumption of alcohol, as well as on morbidity and mortality and other health outcomes. Elder et al. (2010) report that there is a relation between the pricing of alcohol, and alcohol-related health outcomes in low income communities, and even more so in underage populations.

Cost-effective interventions

Two included reviews provide evidence that targeted public health interventions are cost-effective in reducing health risk. The North-West Health Observatory (2011) found that brief behaviour change interventions delivered in primary care in the UK are cost-effective in promoting physical activity in the general population, as well as reducing pregnancy and STIs among teenagers. The other (Cobiac et al. 2009) found that mass media campaigns, internet based interventions and use of pedometers are likely to be cost-saving in promoting physical activity in Australian adult populations, with a low cost per disease adjusted life year (DALY).

Differences in the impacts of interventions on different socio-demographic groups

Some of the included systematic reviews assessed interventions to improve health outcomes, and report evaluations of their effectiveness with respect to their effects on socio-demographic groups.

While one review (Bambra et al. 2010) found that use of targeted, culturally-relevant interventions produced mixed effects on health inequalities, another (Magnee et al. (2013) found that high-intensity community-based interventions provided best evidence for higher effectiveness in low socio-economic groups. The mass media campaign it evaluated showed higher effectiveness among the high socio-economic groups. Lorenc et al. (2012) agreed with this conclusion that mass media campaigns and the use of printed communication material had a negative equity impact. It also concludes that structural workplace interventions, provision of resources and fiscal interventions (such as pricing) reduced inequalities.

Some of the included reviews (Maniadakis et al. 2013; Eyles et al. 2012) which evaluated the effect of targeted food or drink tax and pricing policies found that although these policies can reduce consumption of the targeted products, and might help reduce health inequalities among low socio-economic groups, they can produce negative impacts such as substitution effects which can be more regressive in the lower socio-economic groups.

Conclusions and recommendations for policy development

Best practices available in the field of tobacco control which can have a positive impact on reducing inequalities in health

The decision about which interventions to employ in order to reduce inequalities in health caused by smoking, across socio-demographic groups, remains far from simple. The majority examined produced a neutral equity impact and while this will not help to reduce health inequalities the net effect is an improvement in health in the population as a whole.

There appears to be agreement that price increases show the greatest potential for reducing inequalities in both adults and youths. However, the higher prevalence of smoking in low-income groups means that any equity benefit gained by increasing taxes may be outweighed in the short term by the financial burden experienced by those smokers who do not quit. Increasing taxes may also result in a negative equity impact via price-minimising strategies adopted by the smokers, such as buying cigarettes from cheaper sources, switching to cheaper brands or rolling their own.

Interventions need to be effectively targeted at smokers in low socio-demographic groups, as untargeted interventions may actually increase inequalities despite reducing overall prevalence. For example, combinations of pharmacotherapy and behavioural support, as delivered by UK NHS stop smoking services, have been shown to have a negative equity impact on quit rates if not well targeted. Evidence shows that targeting these services to smokers of low socio-economic status results in a relatively high uptake of services. This higher reach compensates for relatively lower quit rates and so a positive equity impact can be achieved. Economic analysis of these services also shows them to be cost-effective.

Mass media campaigns, with emerging evidence that emotive, graphic and / or personal testimony advertisements, appear to be more effective to smokers of lower socio-economic status despite the fact that mass media campaigns in general appear to have a negative or neutral equity impact. This can, though, have a less negative equity impact if television is used instead of print media, the message is conveyed in an intensive manner, and specifically targeted at disadvantaged groups using emotive personal stories. Some evidence suggests that when these are used for minority groups, they should be presented in language specific to the target groups.

Legislation for smoke-free places has increased quit attempts and had positive health effects in the general population, however, its impact on reducing inequalities remains unclear. Legislation has removed inequalities in exposure to second-hand smoke in the workplace and enclosed public spaces, but there has been a limited demonstrable impact on smoking behaviour and quit rates. It is possible that this impact may be seen in the future as smoking continues to become less acceptable in society.

No consistent evidence was apparent as to any type of intervention being effective for youth smoking (either prevention or cessation) and so no strong conclusions can be drawn for this particular target group.

Lessons from the wider field of health promotion

One way to increase the evidence base for interventions that might reduce smoking inequalities is to study best practices from other health promotion fields.

Price, i.e. taxation on alcohol and on foods high in saturated fat and sugar and subsidies on healthy food such as fruit and vegetables, was found to influence consumption. The impact may, however, be overestimated if studies fail to take into account shifts in consumption to other foods, so called substitution effects, which could actually decrease health outcomes. Conflicting findings were reported on the differential effects of pricing over socio-demographic groups, and the risk that the price changes might be regressive, i.e. that lower income groups pay a larger share of the tax than higher income groups.

It was also found that community-based culturally targeted interventions are effective in specific socio-demographic groups. Examples reviewed involved local groups such as churches, and those produced using language and cultural contexts relevant to the target population group. Group interventions, such as group-based physical activity interventions, were also found to be more effective in disadvantaged areas. This is likely due to the fact that group health interventions are typically conducted in the community and become culturally relevant and accessible to the target groups.

Multi-component interventions, e.g. interventions that include a mix of face-to-face and group activities in conjunction with health education were shown to increase adherence of healthy lifestyles.

Implications for policy development in the area of reduction of tobacco harm

The evidence presented shows that there is an increasingly clear socio-economic gradient in tobacco smoking and in related morbidity and mortality. Tobacco and its consequences are exacerbating health inequalities among EU citizens. At the same time, the gender gap is shrinking. There is a welcome decrease in smoking prevalence among men, however, among women it has not decreased significantly and smoking-related female mortality is actually growing.

Tobacco control policies have been quite effective in reducing tobacco smoking among adults, and have also been found to be cost-effective when considering the health consequences. However, as shown in the literature and in policy notes (see in particular WHO, 2014), the benefits have often been greater among people with high socio-economic status.

Pricing policies constitute an exception. Increasing the prices or imposing taxes on cigarettes not only decreases general consumption levels, but also reduces inequalities. This is an effect of the higher sensitivity to prices in the demand by people with lower financial means. These policies do, though, entail the risk of a disproportionate financial burden on those low-income and low-wealth people who are not able to reduce tobacco smoking despite price increases. Policy-makers should, therefore, consider this side effect, for instance by reinforcing poverty reduction programmes together with the design of pricing policies, while maintaining the economic incentives to quit or at least reduce smoking.

The impact of smoke free legislation interventions on health inequalities are not clear-cut. There is some evidence of stronger positive impacts among high-income groups

but also instances of reductions of inequities in relation to second-hand smoke. Inequalities appear to increase with approaches based on voluntary adoption of smoke free policies, while strict rules tend to curb them. A key lesson consists of the need to avoid reliance of voluntary-based changes when designing smoke free legislation.

Marketing and educational campaigns show evidence of greater benefits to the most educated people, especially when using printed communication materials. These campaigns should employ television and highly emotional advertisements in order to reach and to affect behaviour by low socio-economic groups.

Community-based interventions are quite effective in reducing tobacco-related health inequalities when specifically targeted to groups in vulnerable situations. Population based interventions can reduce inequalities when specific efforts are devoted towards reaching socially disadvantaged smokers. Individual interventions based on pharmacotherapy and behavioural support have often resulted in stronger quit rates among the most educated people. Concentration in deprived areas, reinstatement of free services and specific tailoring to disadvantaged groups should be implemented to foster cessation among people with low socio-economic status.

The findings of this study can be summarised as follows:

- Tobacco smoking remains a considerable health issue in the European Union, with around one in three men and one in four women still smoking in 2012.
- There is a clear social gradient in smoking in the EU. A higher smoking prevalence is found in disadvantaged socio-demographic groups, whether defined by educational attainment, socio-economic status or other factors such as minority ethnic group. One of the mechanisms of the inequality in smoking might be difficulties in smoking cessation among these groups.
- Tobacco control interventions are effective in reducing smoking prevalence and much has been achieved over recent years in the EU28 and in the other countries analysed.
- Until recently, tobacco control interventions have not been specifically targeted at disadvantaged groups, and the research on the equity impact of measures is still sparse.
- There is now evidence that tobacco control measures, whilst effective at reducing overall prevalence, might actually increase inequalities in health and inequalities in smoking,.
- Positive impacts in terms of reducing inequalities have nevertheless been reported for some tobacco control measures, such as taxation, smoke free legislation, culturally relevant, community-based interventions and comprehensive coverage of high-quality smoking cessation services.
- Population-based interventions can reduce inequalities when specific efforts are undertaken to reach socially disadvantaged people.
- Individual interventions often result in higher quit rates among people with high socio-economic status.
- Evidence from other health-promotion programmes reinforce the need to target low socio-economic groups when designing tobacco control policies.

Based on these findings, it is recommended that:

1. Any policy framework should include interventions that address needs specific to local populations, and take into consideration the wider social determinants of health, in order to reduce health inequalities.
2. Tobacco control policies aimed at reducing smoking prevalence and health inequalities should include a combination of different targeted interventions,

aimed specifically at the socio-demographic groups that bear the greater burden of disease.

3. Provision of resources at community level would enable a wider dissemination of community-based and culturally relevant targeted interventions, using language and cultural contexts relevant to target population groups.
4. Barriers to accessing high-quality comprehensive smoking cessation services should be reduced, by removing financial, cultural and geographical constraints. .
5. Increasing taxation and imposing higher prices on tobacco should be considered, but unwanted substitution, in addition to the regressive nature of the tax need to be taken into account.
6. Marketing campaigns should be designed to have a strong impact on low socio-economic status groups, for instance relying more on television than on printed materials and including powerful, emotional messages.
7. Further research is needed to better understand which interventions narrow rather than widen health inequalities due to smoking, with regard to both prevention of smoking initiation and promotion of smoking cessation.

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