Reducing Tobacco Use and Secondhand Smoke Exposure: Interventions to Increase the Unit Price for Tobacco Products

Summary Evidence Table – Economic Evidence

Author & Year **Study Design** **Economic Method** **Perspective**	**Study Location** **Sample Size** **Population Characteristics** **Time Horizon**	**Intervention Description**	**Effect measure (Size)**	**Program Costs**	**Health Care Cost Averted** **Productivity Losses Averted**	**Full Economic Summary Measure ($2011)**
Ahmad, 2005 Discrete time dynamic simulation Benefit-only Societal	Simulated CA Based on CA population 75 years	Simulated price increases of 20%, 40%, 60%, 80%, 100% from baseline average of $3.95/pack	Econometric estimates of price elasticity using BRFSS data (see Table 1 on p. 279 in original). Note that this is prevalence only. Age- and gender-specific initiation, cessation, and relapse probabilities from regression models (TUS, NHIS). Simulation parameter sources: **Population:** US Census **Smoking prevalence:** BRFSS, TAPS, CA DHS Fertility: CA DHS **Mortality:** estimated as function of age, gender, smoking status (CPS, NHIS) assuming Weibull distribution **Migration:** CA DF Medical costs increasing over time in model.	N/A	Health care (HC) costs averted calculated with MEPS data and from Hodgson 2001. Sum of medical costs of population; each individual assigned their age/ gender/ smoking status average medical cost. Additional tax revenue.	Medical cost savings ($2003 billion) 20%: 187.8 (229.58) 40%: 286.1 (349.76)) 60%: 345.1 (421.88) 80%: 384.0 (469.44) 100%: 411.6 (503.18) Additional tax revenues ($2003 billion): 20%: 10 (12.22) 40%: 18.14 (22.18) 60%: 25.26 (30.88) 80%: 31.97 (39.08) 100%: 38.15 (46.64) (see Table 3 on p. 281 in original) Life years, [quality-adjusted life year (QALYs)] gained (see Table 2 on p. 280 in original)

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			Model results calibrated to external sources (CA Dept. of Health Services, CA Dept. of Finance, and American Academy of Actuaries). No discounting.			
Ahmad & Franz, 2008 Discrete time dynamic simulation Benefit-only Societal	Simulated USA Based on USA population 20 years	Simulated price increases of 20%, 40%, 60%, 80%, 100% from baseline average of $3.37/pack Sensitivity analysis on elasticity (see Table 3 on p. 8 in original).	Econometric estimates of price elasticity using BRFSS data (see Table 1 on p. 6 in original). Age- and gender-specific initiation, cessation, and relapse probabilities from regression models (data from TUS, NHIS, TAPS II). Simulation parameters (publicly available data): **Population:** Fertility **Mortality:** estimated as function of age, gender, smoking status assuming Weibull distribution **Net migration:** US Census Smoking status: BRFSS, TAPS Model calibrated to external data sources (e.g. CDC, TIPS, CPS, American	N/A	HC costs averted calculated with MEPS data and estimates from literature (Hodgson 1992). Sum of medical costs of population; each individual assigned their age/gender/smoking status average medical cost. Additional tax revenue.	Medical cost savings ($2000 billion) 20%: 178.7 (233.43) 40%: 316.7 (413.69) 60%: 428.2 (559.34) 80%: 521 (680.57) 100%: 600 (783.76) Additional tax revenues ($2000 billion): 20%: 194.98 (254.70) 40%: 364.87 (476.62) 60%: 516.8 (675.08) 80%: 655.04 (855.66) 100%: 782.39 (1022.01) Life years, QALYs gained (see Table 2 on p. 7 in original)

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			Academy of Actuaries). No discounting			
Congressional Budget Office, 2012 Projection Benefit-only Government	USA Based on USA population projections Size, demographic breakdown, and smoking behavior to match USA population as projected over time horizon Short term (through 2021), long term (through 2085)	$0.50 per pack increase in federal excise tax on cigarettes and small cigars, adjusted to keep pace with inflation and (in the long term) income growth.	Assumed average prevalence elasticity slightly less than -0.3 (with sensitivity analysis). Regression estimates of the effects of smoking on health care spending (MEPS, NHIS), longevity (NHIS, Nat'l Death Index), earnings (CPS and TUS—adjusts for unobservable differences). (Also looked at second hand smoke (SHS)) Age- and gender-specific initiation, cessation, and relapse probabilities from regression models. Created an index to control for delay in health improvement upon quitting.	N/A	Medicaid, Medicare, HI exchange subsidies, FEHB, SS, Civil Service retirement, Military (both health care costs and retirement costs) Revenues from excise tax and from increased income taxes from more productive, longer-lived labor force.	2013-2021 Medicaid: -$563million(m), including $95m from pregnancy outcomes and $103m from children's exposure to SHS Medicare: -$251m (savings from smoking-related costs minus longevity costs) Subsidies through HI exchanges: -$95m FEHB: -$17m for retirees, -$24m for current workers Social Security: OASI +$152m, DI -$1m Civil Service Retirement: +$19m Military Programs: +$17m retirement, -$3m and -$61m health care, -

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						$18m VHA Revenues: add $38b, mostly from excise tax 2013-2085: Increase non-interest spending by 0.002% of GDP in 2035, and by 0.012% of GDP in 2085 Increase revenues by 0.025% GDP in 2035, by 0.027% of GDP in 2085, (overall deficit reducing)
MacKillop et al., 2012 In-person descriptive survey assessment (informed by behavioral econ theory) Estimate cost savings and tax revenue Societal	Academic departments at 3 universities (Athens, GA; Providence, RI; Aiken, SC) Estimates of benefits for 10 US states (AL, GA, ID, KY, LA, NC, ND, SC, VA, WV)	Survey of hypothetical cigarette consumption at 73 prices, from $0 to $10. Then projected effects of $1 per pack increase in price, with incomplete pass-through (equivalent to	Changes in demand according to hypothetical consumption from survey. Note, left-digit effects, bitonic curvilear demand. Reduction in HC costs and lost productivity from estimated economic burden per pack sold (campaign for tobacco-free kids)	N/A	Average HC cost averted of $530.6m (varies by state) (See Table 3 on p. 7 in original.)	Disability-adjusted life year (DALYs) gained: 85,000 for men, 60,000 for women Average HC cost averted $530.6m (See Table 3 on p. 7 in original for state-by-state savings.)

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		price rises of $0.20, $0.40, $0.60, $0.80)				
Ranson et al., 2011 Static cohort model Cost effectiveness analysis (CEA) Societal	Global [high income countries (HIC)] Smokers in 1995 Smokers (age and gender breakdown where appropriate) 1995 to death of cohort	10% price increase	Elasticity of -0.2 to -0.8; with 3x higher for 15-19 year olds and 2x higher for 20-29 year olds than for 30+ (no difference by gender) Assume 50% of impact is on prevalence. 95% of quitters aged 15-29 avoid tobacco-related death; 75% of quitters aged 30-39, 70% of 40-49, 50% of 50-59, 10% of 60+ Discount rates used are 3% and 10% Account for delay in health improvement upon quitting.	0.005-0.02% of GNP (assumed value)	0.5-1.6m deaths averted in high income region Does not include tax revenues	$116/DALY saved to $3884/DALY saved, depending on cost of intervention and discount rate applied
Reed, 2010 Projection Cost benefit analysis (CBA), Public finances analysis (PFA)	UK Changes to size and age structure of UK pop from U.K. Office of National Statistics (ONS).	Postulated 5% real price increase, afterwards adjusted for inflation	Prevalence elasticity of -0.35 (with separate sensitivity analysis for -0.25 and -0.54) Risk of developing a smoking-related disease (aggregated): two possible risk evolution profiles, low and high, account for fact	N/A	CBA (all monetized) -Does not include end-of-life HC costs for those who quit smoking (or never start) on philosophical grounds -Savings to NHS (£1.97b/$3.08b)	CBA: 50 year horizon £10.2b in NPV ($15.98b) PFA: 5 year average £519m ($811.19m) (see Tables 3 and 4)

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Government	50 years (2010-2059) for CBA, 5 years (2010-2014) for PFA		that risk of smoking-related adverse health outcomes declines gradually upon quitting Age-adjusted mortality figures for smokers and ex-smokers from literature. Discount rate: 3.5%		-Output gains due to reduced mortality (£1.15b/$1.79b) -Output gains due to reduced absenteeism (£1.36b/$2.13b) -Years of life gained ('human value' of prevention of a fatality just under £1 million) (£5.75b/$8.98b)—note that this accounts for the lion's share of the benefits in the CBA PFA -Increased revenue from tobacco tax (£433.7m/$677.86m -Savings to NHS(£27.4m/$42.83m) -Increased tax revenue from additional years of working life (£14.9m/$23.29m)and reduced absenteeism (£16.7m/$26.10m) -Reduced benefit	

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					spending on sickness/disability (£33.3m/$52.05m) -Increased benefit spending for retired people (-£3.6m/-$5.63m) (£2010)	
Van Baal et al., 2007 Discrete dynamic simulation (Chronic Disease Model(CDM)) CEA	The Netherlands 25, 50, 100 years	10% price increase (via 15% tax increase)	Total elasticity of demand -0.4; prevalence modeled as 25%, 50%, 75% of total elasticity Initiation, quit and relapse rates return to baseline after first year. Note: no effect through decreased initiation. Parameters and variables specified for age/gender in CDM HC costs from Dutch Cost of Illness study Discount rate 4% for costs, 1.5% for effects	N/A - strict health care perspective	Smoking-related HC costs decrease, but increased longevity means incidence of all diseases increases (cost savings over 20 years, then expensive chronic diseases mean net positive costs) Assuming prevalence elasticity of -0.2, total health care costs increase by €84m ($109.92m) over 100 years. Tax revenues in NPV (4% discount rate) over 100 years: €3.7b-4.2b ($4.84b-5.50b). (€2004)	Over 50 years: €1700/LY ($2224.54/LY) €2000/QALY ($2617.11/QALY) Over 100 years: €2000/LY ($2617.11/LY) €2500/QALY ($3271.38/QALY) Note: 3% of additional revenues cover the additional health care cost over the 100 year time horizon Cost saving over 25 yrs. (see Table 2)

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Van Genugten et al., 2003 Dynamic model Benefit only	The Netherlands Birth cohorts by gender Looking at lung cancer, coronary heart disease, stroke, chronic obstructive pulmonary disease (COPD) Cohorts followed from 1994-2050	50% price increase (via tax increase)	Start and quit rates from age-period cohort analysis Prevalence elasticities: -1.2 for teenagers -0.08 for adult men -0.23 for adult women In first year, start rates 60% lower than references value; quit rates are 4% (male) and 11.5% (female) higher. Effects diminish 3% per year due to inflation, returning quit rates to baseline values in 1 year. Thus mostly affect teenagers. Assume no remission from smoking related diseases HC costs from Cost of Illness in The Netherlands Migration, birth, total mortality by gender/age from Statistics Netherlands	N/A - strict health care perspective	HC costs averted: €145m for men, €120m for women See Figure on p. 498 in original. (€1999)	DALYs gained: 85,000 for men, 60,000 for women €145m for men ($215.14m) €120m for women ($178.04m) Approximate—values taken from figures in the paper.