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Health Impact of Tobacco Price Changes in Virginia

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The Institute for Drug and Alcohol Studies (IDAS) was established at Virginia Commonwealth University (VCU) in 1993 to promote excellence in research and education on substance abuse. Currently, the Institute is comprised of over 40 faculty members from eight different departments within the university, thus enabling a multidisciplinary approach to addressing the complex problems associated with alcohol, tobacco and other drugs.

The substance abuse research conducted by IDAS faculty spans the disciplines of medicinal chemistry, molecular biology, pharmacology, psychiatry and behavioral sciences, as well as clinical services and research on community-based treatment and prevention. One major focus of the Institute is on the biological basis for the actions of drugs of abuse on the brain, where significant contributions have been made to the study of cocaine, opiates, marijuana, alcohol, hallucinogens, tobacco, inhalants and PCP. This research has been particularly valuable in providing the scientific basis for developing new drug abuse treatments. Other important areas of substance abuse research include the study of behavioral and genetic factors related to drug addiction, the evaluation of abuse liability of new medications, and the development and evaluation of new prevention and treatment models. IDAS faculty also have made major contributions to the study of tobacco use and dependence among youth.

Director, Robert L. Balster, Ph.D. Executive Director, J. Randy Koch, Ph.D.

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—Executive Summary—

Scientific research has found that increases in the price of tobacco products have predictable effects on tobacco consumption and on the related health impact of tobacco use. This report summarizes this research and provides predictions on health consequences for Virginia of the tobacco price increases that would likely accompany increases in tobacco taxes.

- A 10% increase in the current retail price of tobacco, achievable by raising the excise tax on cigarettes by about 30 cents per pack, will reduce cigarette consumption among adults by about 4%.

- A 10% price increase will reduce consumption among youth by 9% to 15%.

- A 10% price increase will likely induce more than 5,000 Virginia youth ages 12 to 17 to quit smoking or never start regular use.

- Higher tax rates, of $1.00 per pack or more, will result in reductions in tobacco consumption proportionate to those cited above (See table, page 7).

- Over time, a permanent increase in the retail price of tobacco products, achievable by increases in the excise tax indexed to the rate of inflation, will save the lives of hundreds of Virginians each year and substantially reduce tobacco-related healthcare costs. For example, a 10% increase in the cost of tobacco would eventually save the lives of at least 350 Virginians per year, and save Virginia citizens more than $60 million in annual healthcare costs.

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According to the federal government's Centers for Disease Control and Prevention, tobacco use in the United States results in approximately 440,000 deaths per year.[1] This is a greater toll in human life than that exacted by car accidents, murders, suicides, other drug and alcohol use, and HIV/AIDS, combined. In monetary terms, tobacco use leads to over $75 billion in public and private healthcare costs each year, and reduces the productivity of Americans by more than $80 billion per year. If current trends go unchecked, American taxpayers will have to contribute, every year, more than $30 billion — an average of some $300 per household — to deal with the devastation wrought on our nation's health by tobacco; and more than 6 million people now under the age of 18 will die from tobacco's effects.[2] In Virginia alone, people accrue yearly more than $1.6 billion in tobacco-use-related healthcare costs, and over 9,000 Virginians die each year from tobacco-use-related illnesses.[3]

Once people become addicted to tobacco, they usually find it extremely difficult to quit — because the nicotine that tobacco delivers to the body is one of the most addictive substances known. In order to curtail tobacco's burden on our public health and welfare, policy makers have shown support for reliable ways to help people who want to quit, and more importantly, to prevent young people from becoming tobacco users in the first place.[4]

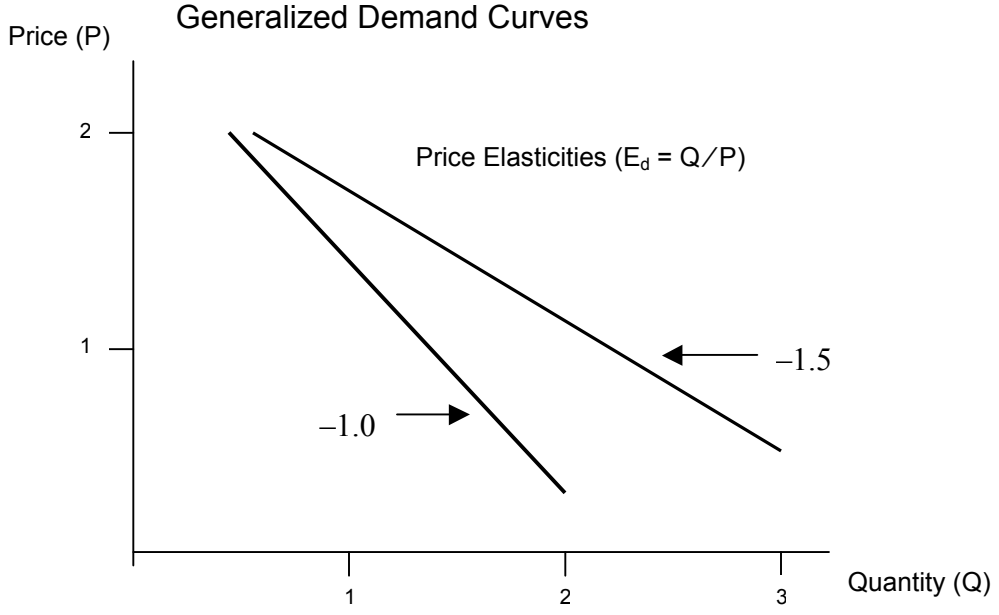
Some states have addressed the tobacco use problem by adopting measures that act to raise the price of tobacco products. Classical economic theory holds, in general, that the rate of consumption of a commodity depends upon the market price of that commodity, and that increases in price will result in lower levels of consumption. In the following report, scientific evidence on the following questions will be summarized.

- What is known about the relationship of tobacco prices to tobacco consumption?
- Is tobacco consumption by young people affected more than adults by price increases?
- What is the projected health impact of tobacco price changes in Virginia?

There are various proposals before the 2004 General Assembly to raise tobacco taxes in Virginia. It is recognized that this is an important policy issue with many economic and social consequences. It is not the intention of this report to make recommendations on increases in tobacco taxes but to help inform the debate with scientific information on only one aspect of the debate, the health consequences of increasing the price of tobacco. As will be seen, there are significant health-related benefits that can be predicted to occur.

Elasticity of Demand:
The Theoretical Relationship Between Changes in Price and Consumption

The most fundamental observation concerning markets is the relationship between prices and sales. When prices go up for a particular commodity, people generally buy less of it (and vice versa). The relationship of price to sales is different for different commodities (for example, diamonds vs. water), and it varies according to other market conditions (think of ticket scalpers). Economists studying markets seek to measure the relationship of prices and sales, and to determine how it varies from commodity to commodity and under differing conditions. They call this fundamental market measurement "price elasticity of demand" (E_d) — defined as the percentage change in consumption that results from a given percentage change in price. (See figure below.) For example, a price elasticity of demand of –1.5 means that a 10% increase in price would result in a 15% reduction in consumption.



One's willingness to buy (actual demand) is also strongly influenced by characteristics of the consumer, such as one's sense of value, one's income level, one's social, cultural, and other demographic variables, and one's exposure to advertising and other information about a product. In the case of tobacco, addiction is also a factor that affects demand and price sensitivity. That is to say, because of bio-psychological factors such as drug reinforcement, tolerance, and withdrawal, future consumption levels of an addictive substance like the nicotine in tobacco may be affected by past consumption. As well, policies that regulate access to a commodity — for example, tobacco sale-to-minors restrictions or indoor smoking restrictions — may affect a consumer's cost in time or inconvenience in using it, and so affect demand. By understanding how these sorts of factors together influence propensity to consume tobacco, policymakers may craft measures that better respond to the evolving tobacco marketplace.

Price Sensitivity:
Determining the Empirical Relationship of Tobacco Price to Consumption

Researchers have studied and published scientific literature on the elasticity of demand for tobacco products, especially cigarettes, for about three decades. A wide array of theoretical models and analytical techniques has been brought to bear on the question. Several types of data have been employed, including national and state-level time-series data on prices and sales volume. Though these time-series data present certain problems for analysis (for example, observed elasticities are affected by changes in industry advertising practices, or by consumers' changing knowledge about the effects of smoking), state-of-the art econometric modeling has been able to address these difficulties by instituting appropriate controls in the analyses, such that the more recent studies have produced converging results.[5] Other studies of aggregate data have looked at comparisons between states that enacted a tobacco tax increase and ones that did not.[6] Smuggling between low-tax and high-tax locales can affect observed elasticities in these comparisons, generally overestimating consumption in the former and underestimating it in the latter.[7] Some studies have examined the smuggling effect and instituted analytical techniques to control for it, producing final price elasticities in a range similar to that found using time-series data.[8] Moreover, studies that employ individual-level data, obtained from surveys of individuals, produce very similar results for adult smokers.[9] Summarizing the overall findings in the field at an NIH conference in 1998, Dr. Frank Chaloupka said, "Permanent, inflation-adjusted increases in cigarette prices, which could be achieved by increasing cigarette taxes, will lead to significant reductions in cigarette smoking. Estimates imply that every 10% increase in price reduces cigarette demand among adults by approximately 4%; similar findings are obtained for other tobacco products."[10] This decline in demand comes as a combined result of 1) some consumers reducing consumption to a lower level and 2) some consumers quitting altogether. When consumers quit as a result of a price increase, economists say the "prevalence" of demand has declined. As discussed below, economists have been especially interested in the effect of price increases on the prevalence of tobacco use among young people, and have worked to estimate this effect.

Elsewhere, Chaloupka notes that in the past tobacco companies have responded to tax increases by carefully adjusting wholesale prices downward. The consequent effect of such price reductions is to minimize the demand reduction effect of the tax increase. Documents that have been made public from tobacco manufacturing and sales organizations demonstrate the keen interest of these firms in the price elasticity of their products because of its relationship to sales volume and marginal profit.[11] Selective price reductions are especially effective in bolstering demand for highly advertised, "premium" cigarette brands and among particular segments of the market that demonstrate high brand loyalty. Ross and Chaloupka discuss the differential effects on demand for cigarettes among adults and youth that resulted from increases in federal excise taxes in the early 1990s and from tobacco company responses to these tax increases.[12] After declining for almost three decades, rates of smoking among all Americans stabilized at about 23% in the mid 1990s. Unfortunately, the number of 12th grade high school students who were daily smokers increased 73% between 1988 and 1996. Ross and Chaluopka say that this result can be explained in part by the

economics of demand. Even though the federal government increased cigarette taxes twice in the early 1990s, the actual average price of a pack of cigarettes fell about 10% as companies cut wholesale prices. For example, in April 1993 Philip Morris reduced the price of its Marlboro brand by 25%; this triggered competitive decreases for other brands; moreover, the price reduction in the Marlboro brand disproportionately affected young people, because it is the brand of choice for 60% of teenagers, though it's overall market share is 23.5%. These findings suggest that policymakers, if they want tobacco taxes to serve as a continual deterrent to adoption of cigarette smoking during adolescence, will want to craft policy to take into account likely industry responses to government actions.

As well, it is important to note that because of general price inflation, cigarette excise taxes (calculated in cents per pack) are now much lower as a percentage of retail price than they were in the 1950s. This points to the fact that, over time, unless excise taxes are adjusted upward proportional with inflation, the consumer price of tobacco products will tend to fall relative to other commodities, and the deterrent effect that excise taxes have on consumption will diminish accordingly.[13]

It should be acknowledged that much less is known about the effects of price increases on the consumption of cigars, snuff and chewable tobacco products than is known about the price of cigarettes. It is not known at this time if the price elasticity for these other tobacco products is the same as for cigarettes. It might be predicted that increases in the price of cigarettes without accompanying price increases in these other tobacco products would cause some smokers to switch to the relatively cheaper products because of the well-established economic principal of substitution.

Effects of Price on Youth Smoking

Additional work has been done over the last 20 years to determine the elasticity of demand for tobacco among youth. Most of this work has used individual-level data, since cigarette sales to minors are restricted nationwide, and so would be underrepresented in aggregate sales data.[14] One might expect that demand should be more elastic — there should be a higher sensitivity to price increases — among young people, because they have less disposable income, and because most are less addicted (they use less on a daily basis) than is typical among adult smokers. Young people are also an attractive target for price policy intervention because we have determined, both in Virginia and at the national level, that young people's market access to tobacco should be restricted.[15] Moreover, efforts to prevent tobacco use among the young offer potentially high payoffs: Nearly 90% of current adult daily smokers began to use tobacco before the age of 19; over 70% of adult daily smokers were smoking daily before they turned 19.[16] Also, the most serious and pervasive health effects of tobacco use typically take decades of use to develop, and so prevention efforts that succeed with youth will work effectively to reduce health costs associated with long-term tobacco consumption.

Most empirical studies confirm that young people are more price sensitive than adults in the market for cigarettes. Total demand elasticities among youth range from –0.9 to –1.5, that is, about two to three times higher than those for adults. Published measured effects on *smoking prevalence* among youth and young adults range from

–0.37 to –1.20. Price sensitivity also varies according to race or ethnicity, as studies show young blacks and Hispanics to be substantially more sensitive to price than are young whites.[17] There is also evidence that if cigarette prices rise relative to those of other tobacco products (spit tobacco, cigars, etc.) young people (especially males) will engage in product substitution in response to such price changes.[18]

All in all, the scientific literature strongly suggests that policies that increase the price of tobacco products will reduce the consumption of tobacco, and this effect will be disproportionately powerful among young people.[19] As a 1998 report from the Centers for Disease Control concludes, "Policies that affect the price of tobacco products are the single most effective means of decreasing tobacco use, especially among youths and young adults."[20]

Projected Impact of a Cigarette Excise Tax Increase in Virginia

The impact of an excise tax increase depends, of course, on its magnitude relative to the current retail price of the taxed commodity. It also depends on other factors, such as the relative tax imposed by neighboring jurisdictions. For example, a recent study concludes that if Virginia were to increase its per pack cigarette tax to $0.70 — which is near the current national average state tax rate — sales of cigarettes in Virginia would decline 36% while state revenues on cigarette sales would rise about 17 fold, to nearly $300 million per year. These numbers assume that Virginia alone were increasing its cigarette tax in this manner; if surrounding states were also to raise taxes to the national average, sales volume declines in Virginia would be somewhat lower (about 32%) but revenue increases somewhat higher, due to expected decreases in cross-border sales and smuggling as states reduced price disparities between states.[21]

As mentioned above, the effect a price increase has on consumption also depends on characteristics of individual consumers — in particular, young people, blacks, and Hispanics have been found to be more price sensitive than are adults in general. So, in estimating the impact that a given tax increase would have on consumption rates one needs to take into account how many consumers fall into such categories and the price sensitivities we can apply to them. Fairly recent data are available on rates of smoking by age category in Virginia. The federal government's Substance Abuse and Mental Health Services Administration estimates that 66,000 Virginians age 12-17 were current smokers in 2000-2001.[22] If one assumes a prevalence elasticity of demand among these smokers of –0.8 (in the midrange of empirical findings[23]), then a ten percent increase in price, which would be achieved by about a $0.30 increase in the state cigarette excise tax, would induce more than 5,000 young Virginians to quit smoking. Survey data show that more than 15,000 of Virginia's under-18 youth become daily smokers every year. Because of the sensitivity of this age group to rises in tobacco prices, this number could be cut substantially by moving rates of Virginia cigarette taxes toward the national average of 73.5 cents per pack.

A $0.30 cigarette tax increase now — that is, one that would institute about a 10% rise in retail cigarette prices, would also make possible significant long-term impacts on health and healthcare spending in Virginia. Assuming a total elasticity of demand of –0.4 (the consensus empirical finding for adult smokers), and assuming proportional benefits from the expected reduction in cigarette consumption, a policy

strategy that succeeded in imposing and maintaining a 10% increase in tobacco prices would eventually save the lives of at least 350 Virginians per year, and save Virginia citizens more than $60 million (1998 dollars) in annual healthcare costs.[24]

The table below summarizes the impact of various levels of cigarette excise tax increase on price and consumption. Evidence suggests that in the range of tax increases presented in the table, positive effects on health would be proportional to decreases in consumption.

Estimated Impact of Various Levels of Cigarette Excise Tax Increase on Price and Consumption in Virginia

Cigarette Excise Tax Increase (¢)	Cigarette Price Increase (%)[1]	Adult Cigarette Demand Decrease (%)[2]	Youth Cigarette Demand Decrease (%)[3]	Number[4] of Youth Smokers Decrease
25	8.5	3.4	10.2	4488
50	17.0	6.8	20.4	8976
75	25.4	10.2	30.5	13411
100	33.9	13.6	40.7	17899

[1] Based on an average retail price of $2.95 per pack. Assumes entire tax increase will be passed on to consumers.

[2] Based on an adult total elasticity of demand of –0.4.

[3] Based on a youth total elasticity of demand of –1.2.

[4] Based on a youth prevalence elasticity of demand of –0.8. Assumes there are currently 66,000 Virginia smokers ages 12-17.

Facts About Tobacco Use and Prevention in Virginia[25]

Smoking-Attributable Direct Medical Expenditures, 1998

Ambulatory	$597,000,000
Hospital	$406,000,000
Nursing Home	$353,000,000
Prescription Drugs	$150,000,000
Other	$123,000,000
Annual Total	$1,629,000,000
Annual Per Capita	$240

Smoking-Attributable Productivity Costs, 1999

Annual Total	$2,080,000,000
Annual Per Capita	$303

State Revenue from Tobacco Sales and Settlement

Tobacco settlement revenue received in 2001	$126,823,184
Gross cigarette tax revenue collected in 2000	$16,918,000
Cigarette tax per pack was $0.025 in 2001	
Cigarette sales were 96.7 packs per capita in 2000	

Investment in Tobacco Control

Funding Source	*FY02 Amount*	*Funding Cycle*
State Appropriation—Settlement (Tobacco Only)	$15,807,984	7/01–6/02
State Appropriation—Excise Tax Revenue	$0	
State Appropriation—Other	$0	
Subtotal: State Appropriation	**$15,807,984**	
Federal—CDC Office on Smoking and Health	$1,131,145	6/01–5/02
Federal—SAMHSA	$0	
Non-Government Source—American Legacy Foundation	$0	
Non-Government Source—RWJF/AMA	$0	
Subtotal: Federal/National Sources	**$1,131,145**	
FY02 Total Investment in Tobacco Control		**$16,939,129**
CDC *Best Practices* Recommended Annual Total (Lower Estimate)		**$38,866,000**
CDC *Best Practices* Recommended Annual Total (Upper Estimate)		**$106,854,000**
FY02 Per Capita Investment in Tobacco Control		**$2.36**

SMOKING-ATTRIBUTED DEATHS, (1999)		**SMOKING-ATTRIBUTED DEATHS, *DISEASE-SPECIFIC* (1999)**		**YOUTH PROJECTED TO DIE FROM SMOKING, (1999 – 2000)**	
			(Per 100,000)		
Overall	9,157	State Lung Cancer	94.9	Overall	134,529
Men	5,604	All States	90.2		
Women	3,553	State CHD*	54.0	Projected	
Death Rate	290.8/100,000	All States	59.7	Death Rate:	7,739/100,000
All States	295.5/100,000	State COPD**	65.6	Projected	
		All States	59.7	All States:	8,830/100,000

*Coronary heart disease **Chronic obstructive pulmonary disease

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Endnotes and References

[1] Total mortality and economic cost figures reported in *Morbidity and Mortality Weekly Report* (*MMWR*) 51(14): 300-3 (April 12, 2002) http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5114a2.htm Data cited are based on annual estimates for the years 1995-1999. For details on tobacco-attributable diseases and economic costs, see http://apps.nccd.cdc.gov/sammec/

[2] Federal and state per-capita tax burden based on data from *MMWR* 43(26): 469-72 (July 8, 1994) http://www.cdc.gov/mmwr/PDF/wk/mm4326.pdf For projected mortality, see Centers for Disease Control and Prevention, *Tobacco Control State Highlights 2002: Impact and Opportunity*, Atlanta, GA: Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health, 2002, http://www.cdc.gov/tobacco/statehi/html_2002/FrontMaterial.htm

[3] Centers for Disease Control and Prevention, *Tobacco Control State Highlights 2002*, http://www.cdc.gov/tobacco/statehi/html_2002/virginia.htm

[4] U.S. Department of Health and Human Services. *Preventing Tobacco Use Among Young People: A Report of the Surgeon General,* Atlanta, Georgia: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1994, http://www.cdc.gov/tobacco/sgr/sgr_1994/index.htm

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[6] See Baltagi, B.H., and Goel, R.K., "Quasi-experimental Price Elasticities of Cigarette Demand and the Bootlegging Effect," *American Journal of Agricultural Economics* 69(4):750–4 (1987); and Peterson, D.E., Zeger, S.L., Remington, P.L., and Anderson, H.A. "The Effect of State Cigarette Tax Increases on Cigarette Sales 1955–1988," *American Journal of Public Health* 82(1):94–6 (1992).

[7] *Reducing Tobacco Use: A Report of the Surgeon General*, p.326.

[8] Baltagi, B.H., and Levin, D., "Estimating Dynamic Demand for Cigarettes Using Panel Data: The Effects of Bootlegging, Taxation, and Advertising Reconsidered," *Review of Economics and Statistics* 68(1):148–55 (1986); Showalter, M.H., *Essays in Applied Econometrics. Essay III: Monopoly Behavior with Intertemporal Demands.* PhD Dissertation. Cambridge, MA: Massachusetts Institute of Technology, 1991; Chaloupka, F.J. and Saffer, H., "Clean Indoor Air Laws and the Demand for Cigarettes," *Contemporary Policy Issues* 10(2):72–83 (1992); Becker, G.S., Grossman, M. and Murphy, K.M., "An Empirical Analysis of Cigarette Addiction," *American Economic Review* 84(3):39–418 (1994); Yurekli, A.A. and Zhang, P. "The Impact of Clean Indoor-air Laws and Cigarette Smuggling on Demand for Cigarettes: An Empirical Model," *Health Economics* 9(2):159–70 (2000).

[9] *Reducing Tobacco Use: A Report of the Surgeon General*, p.327.

[10] "Addicted to Nicotine: A National Research Forum, Section III: Nicotine-Environmental Risk Factors for Initiation," National Institutes of Health, Bethesda MD, July 27-28,1998 http://www.drugabuse.gov/MeetSum/Nicotine/Chaloupka.html For a complete summary of work in this area, see Chaloupka, F.J., and Warner, K.E. "The Economics of Smoking," in Newhouse J., and Cuyler, A., eds. *The Handbook of Health Economics*. New York: North-Holland, 1999.

[11] See http://www.library.ucsf.edu/tobacco/batco/index.html#Browse

[12] Ross, H. and Chaloupka, F.J., "The Effect of Cigarette Prices on youth Smoking," *Health Economics* 12: 217-230, 2003.

[13] *Reducing Tobacco Use: A Report of the Surgeon General,* p.341-342

[14] Individual-level data – such as that obtained with instruments like the National Health Interview Survey – can provide much more detailed information about conditions in sub-populations, such as youth and various ethnic groups. On the other hand, self-report data can produce underestimation of actual consumption.

[15] Federal lawmakers passed Section 1926 of Title XIX of the Federal Public Health Service Act, commonly called the Synar Amendment, in 1992. Named after the late Oklahoma Senator Mike Synar, it requires states to pass and enforce laws that prohibit the sale of tobacco to individuals under 18 years of age. On January 19, 1996, the U.S. Department of Health and Human Services (USDHHS) issued the final implementation regulations for the Synar Amendment. These establish conditions for states receiving the Substance Abuse Prevention and Treatment (SAPT) block grant. Up to 40 percent of the block grant funding can be withheld for not complying with the Synar Amendment regulations.

[16] *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*, p.65.

[17] "Response to Increases in Cigarette Prices by Race/Ethnicity, Income, and Age Groups—United States, 1976-1993," *MMWR* 47(29): 605-609 (1998). http://www.cdc.gov/mmwr/PDF/wk/mm4729.pdf

[18] See Ohsfeldt, R.L., Boyle, R.G., "Tobacco Excise Taxes and Rates of Smokeless Tobacco Use in the US: An Exploratory Ecological Analysis," *Tobacco Control* 3(4): 316–23 (1994); Ohsfeldt, R.L., Boyle, R.G., Capilouto, E., "Effects of Tobacco Excise Taxes on the Use of Smokeless Tobacco Products in the U.S.," *Electronic Health Economics Letters* 1(3): 10–9 (1997); Chaloupka, F.J., Tauras, J.A., Grossman M., "Public Policy and Youth Smokeless Tobacco Use," *Southern Economic Journal* 64(2):503–16 (1997); and Ohsfeldt, R.L., Boyle, R.G., Capilouto, E.L., "Tobacco Taxes, Smoking Restrictions, and Tobacco Use," in *The Economic Analysis of Substance Use and Abuse: An Integration of Econometric and Behavioral Economic Research*, Chaloupka, F.J., Grossman, M., Bickel, W.K., Saffer, H., eds. Chicago: University of Chicago Press, 1999, pp.15–29.

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[20] "State Laws on Tobacco Control—United States, 1998," *MMWR* 48(SS-3): 21-62; quote at p.33.

[21] See Matthew C. Farrelly, M.C. and Nimsch, C.T., *Increases in Low-Tax Southern States on Cigarette Sales, Cigarette Excise Tax Revenue, Tax Evasion, and Economic Activity*, Tobacco Technical Assistance Consortium, Emory University, Rollins School of Public Health, September 2003 http://tobaccofreekids.org/reports/prices/RTIReport.pdf

[22] Current smoker is defined in this data as one who reports having smoked a cigarette in the past month. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, *2001 State Estimates of Substance Abuse* http://www.samhsa.gov/oas/nhsda/2k1State/vol2/toc.htm

[23] Lewit, E.M., Coate, D., and Grossman, M., "The Effects of Government Regulation of Teenage Smoking," *Journal of Law and Economics* 4 (1981); Lewit, E.M. and Coate, D., "The Potential for Using Excise Taxes to Reduce Smoking," *Journal of Health Economics* 1, 1982; Grossman, M., Coate, D., Lewit, E.M. and Shakotko, R.A., *Economic and Other Factors in Youth Smoking. W*ashington: National Science Foundation, 1983; Chaloupka, F.J. and Grossman, M., "Price, Tobacco Control Policies, and Youth Smoking," *Working Paper 5740*, New York: National Bureau of Economic Research, 1996; Chaloupka, F.J. and Wechsler, H., "Price, Tobacco Control Policies and Smoking among Young Adults," *Journal of Health Economics* 16(3):359–73 (1997); Chaloupka, F.J., Tauras, J.A., Grossman M., "Public Policy and Youth Smokeless Tobacco Use," *Southern Economic Journal* 64(2):503–16 (1997); Lewit, E.M., Hyland, A., Kerrebrock, N. and Cummings, K.M., "Price, Public Policy, and Smoking in Young People," *Tobacco Control* 6(Supp 2):S17–S24 1997); "Response to Increases in Cigarette Prices by Race/Ethnicity, Income, and Age Groups—United States, 1976-1993," *MMWR* 47(29): 605-609 (1998). http://www.cdc.gov/mmwr/PDF/wk/mm4729.pdf

[24] These numbers assume that a permanent 10% increase in cigarette prices will result eventually in a 4% decline in smoking-attributable deaths and healthcare costs. This calculation is conservative, as it probably underestimates the *long-run* effect of price increases on consumption of an *addictive substance* by employing a single elasticity estimate (-0.4) that research has consistently found with respect to *short-run* price effects on tobacco consumption among adults. "For addictive goods, the long-run impact of price on demand will exceed the short-run impact because the latter largely entails current consumption, which represents an established addiction that tends to be slow to decrease even in the face of a price increase. In the studies that used such a model, the estimated long-run impact of price elasticities of demand indeed exceeded — by up to twice as much — the estimates for the short-run impact, presumably because the long-run impact reflected would-be newly addicted consumers who were put off by price increases." *Reducing Tobacco Use: A Report of the Surgeon General,* p.326-327.

[25] Source: National Center For Chronic Disease Prevention and Health Promotion, Tobacco Information and Prevention Source (TIPS), Centers for Disease Control and Prevention http://www.cdc.gov/tobacco/statehi/html_2002/virginia.htm#1