

# Cost–Utility Analysis of the National truth<sup>®</sup> Campaign to Prevent Youth Smoking

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**Background:** In 2005, the *American Journal of Public Health* published an article that indicated that 22% of the overall decline in youth smoking that occurred between 1999 and 2002 was directly attributable to the truth<sup>®</sup> social marketing campaign launched in 2000. A remaining key question about the truth campaign is whether the economic investment in the program can be justified by the public health outcomes; that question is examined here.

**Methods:** Standard methods of cost and cost–utility analysis were employed in accordance with the U.S. Panel on Cost-Effectiveness in Health and Medicine; a societal perspective was employed.

**Results:** During 2000–2002, expenditures totaled just over \$324 million to develop, deliver, evaluate, and litigate the truth campaign. The base-case cost–utility analysis result indicates that the campaign was cost saving; it is estimated that the campaign recouped its costs and that just under \$1.9 billion in medical costs was averted for society. Sensitivity analysis indicated that the basic determination of cost effectiveness for this campaign is robust to substantial variation in input parameters.

**Conclusions:** This study suggests that the truth campaign not only markedly improved the public's health but did so in an economically efficient manner.

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## Introduction

The truth<sup>®</sup> campaign, launched in February 2000 by the American Legacy Foundation (ALF), is the largest national youth smoking prevention campaign and the only national campaign not directed by the tobacco industry. Its goal is to capitalize on the desire of youth aged 12–17 years to be rebellious and independent, by exposing them to facts about the industry's deceptive practices and encouraging them to make their own choices about tobacco. The campaign was created by the ALF, which was founded as a result of the 1998 Master Settlement Agreement between the tobacco industry, 46 states, and five U.S. territories.

In February 2005, the results of an evaluation of smoking behavior were published in the *American Journal of Public Health*.<sup>1</sup> The evaluation found that 22% of the overall decline in youth smoking that occurred between 1999 and 2002 was directly attributable to the truth campaign launched in 2000.<sup>1</sup> By 2002, smoking

rates among youth were 1.6% lower than they would have been in the absence of the campaign: this equates to approximately 300,000 fewer youth smokers in 2002 as a result of truth.<sup>1</sup>

A key question about any prevention program is whether the economic investment in the program can be justified by the public health outcomes. Although there are some economic evaluation studies of smoking cessation and of prevention programs in small geographic areas,<sup>2</sup> no economic evaluation of a national social marketing campaign (such as truth) has been done in the U.S. Therefore, this paper retrospectively addresses the following questions: (1) What were the total costs of developing and delivering the truth campaign; (2) What is the cost per quality adjusted life year (QALY) saved by the truth campaign; and (3) How does this cost per QALY saved compare to other public health and medical interventions.

## Methods

Standard methods of cost and cost–utility analysis were employed following the guidance of the U.S. Panel on Cost-Effectiveness in Health and Medicine.<sup>3,4</sup> Consistent with this guidance, a societal perspective was employed. The costs and effects of the truth campaign were compared to the absence of the campaign. Whenever a judgment needed to be made about an input parameter value, conservative values

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**Table 1.** Cost elements of truth<sup>®</sup> antismoking advertisement campaign, 2000–2002

| Fiscal year  | Actual expenses (\$) |             |            |             | Explanation of expenses   |
|--|----------------------|-------------|------------|-------------|---|
|  | 2000                 | 2001        | 2002       | Total       |   |
| Media  | 56,686,000           | 71,438,000  | 48,673,000 | 176,797,000 | TV, radio, print, gear, talent fees; all aspects of creation, printing, and dissemination           |
| Interactive media  | 13,755,000           | 11,662,000  | 5,229,000  | 30,646,000  |   |
| Web and email media  | 825,000              | 760,000     | 313,000    | 1,898,000   | Website production, email hosting, and ALF organization-wide backup                                 |
| Grass-roots  | 13,274,000           | 4,878,000   | 4,350,000  | 22,502,000  | truth <sup>®</sup> tour (does not include gear): storage of trucks and gear, drivers, related costs |
| Research   | 2,499,000            | 1,750,000   | –182,000   | 4,067,000   | “Red flag checks,” communication checks (i.e., focus groups), related costs                         |
| Public relations   |                      | 1,081,000   | 126,000    | 1,207,000   | Materials such as an awards manual, image rights, related costs                                     |
| Agency travel/Miscellaneous  |                      | 1,278,000   | 994,000    | 2,272,000   |   |
| Agency fees  | 16,395,000           | 19,363,000  | 17,475,000 | 53,233,000  |   |
| Other ALF direct expenses  |                      | 485,000     | 569,000    | 1,054,000   |   |
| Evaluation costs   |                      |             |            | 12,782,759  |   |
| Litigation costs   |                      |             |            | 17,027,177  |   |
| Total truth <sup>®</sup> (includes additional costs such as travel and fees) | 104,018,000          | 112,695,000 | 77,547,000 | 324,069,936 |   |

were selected so as to bias the results against the truth campaign.

**T1** Table 1 lists all the components of the cost of the truth campaign for the first 3 full years of national implementation. The cost data were derived directly from ALF expenditure records. The costs include (1) the development and delivery of the television, radio, online, and print media elements; (2) the development and delivery of a grass-roots summer truth tour that traveled throughout the U.S. following youth music events; (3) a formative, process, and summative evaluation; and (4) the litigation costs to defend the campaign. The litigation costs were incurred as a result of a lawsuit brought against ALF by a tobacco manufacturer. No valuation of client time was included because exposure to the truth campaign generally occurred while the recipient was engaged in other, regular life activities (such as watching television or attending a concert); it is not clear that any clients “lost” time to receive the truth campaign messages.

The cost–utility analysis aims to calculate the cost per QALY saved by the campaign. Four major parameters are needed for this analysis, and values are provided for these four parameters in three different analyses: a base case, an optimistic case, and a pessimistic case.

The first key parameter, C, is the gross cost of the truth campaign and is obtained from the cost analysis provided in Table 1. The second main parameter, A, is the number of young people who were prevented from smoking as a function of exposure to the truth campaign. As noted in the introduction, it has been previously estimated that the campaign prevented about 300,000 youth from becoming smokers.<sup>1</sup> (This estimate does not include older youth and young adults, aged 18–24 years, who composed an important secondary audience for the campaign.) This value is used in the optimistic case, but in the base-case and pessimistic-case analyses, a lower estimate is used so as to be highly conser-

vative. Gilpin et al.<sup>5</sup> examined the smoking trajectories of adolescents and young adults, and found that 43.4% were not likely to become established smokers or experiment later in life. Therefore, in the base and pessimistic cases, the estimate of 300,000 youth was multiplied by .566 (1[–]0.434) to obtain a conservative estimate of 169,800 youth who were prevented from initiating smoking.

The third main parameter (Q) is the number of QALYs saved when smoking initiation is prevented. This number has been cautiously estimated by CDC researchers at 1.05 (0.67 life years saved times 1.57 QALYs saved per life year saved).<sup>6</sup> This estimate of QALYs saved is discounted into net present value at 3%, as is standard practice.<sup>6</sup> The value, 1.05, is employed in the current base and pessimistic-case analyses, but it is highly conservative. Elsewhere, the CDC has estimated that the number of years of potential life lost as a result of smoking is 13.2 to 14.5 for each smoker, which is well over 1.05 QALYs lost per smoking career started.<sup>7</sup> Also, Kaplan and colleagues<sup>8</sup> have estimated the number of QALYs saved when smoking is prevented at 3.5 (undiscounted), an estimate used in the current optimistic-case analysis.

The fourth major parameter, T, is the net present value (discounted at 3%) of the lifetime medical costs related to smoking. Hence, if smoking is prevented, T is saved. Researchers at the CDC have employed a value of \$8160 for T; however, this is in 1990 dollars.<sup>6</sup> By converting this estimate to Year 2000 dollars by the medical care component of the consumer price index,<sup>9</sup> this value becomes \$13,072 and is the value used for T in the base case. In the optimistic case, a slightly different approach was used, which included the estimate from Sloan and colleagues<sup>10</sup> of \$1041 for the annual cost of medical care related to smoking (this figure accounts for gender and age, as well as the probability of smoking cessation and premature death). For the current analyses, it was assumed that such costs would be incurred over at least 27

years, and the cost stream was discounted at 3% into net present value. The estimate of 27 years was obtained by very conservatively assuming that 14.5 years of life before age 65 would be lost as a result of smoking, and that the cost stream runs at least from ages 24 through 50. The resultant value of \$19,078 was used in the optimistic-case analysis; however, even this value for T is highly conservative.

In the pessimistic case, a very different approach was used for estimating T. In the literature, some have argued that people who either never initiate or quit smoking live longer and thereby incur additional medical costs because of their longer lifespan. The U.S. Panel on Cost-Effectiveness in Health and Medicine does not require that such costs be included in cost-utility analyses.<sup>3</sup> However, in the current pessimistic-case analysis, these costs were included. Warner and colleagues<sup>11</sup> have estimated that the additional lifetime medical cost for nonsmokers is \$2609 (net present value discounted at 3%). It should be noted that this is a loss per smoking career prevented rather than a cost savings per smoking career prevented. This estimate was employed here in the pessimistic analysis, and since it is a loss, it is represented in parentheses in the summary of input parameter values in Table 2.

Table 2 also displays the formulae used to calculate the cost-utility ratio. The gross cost of the truth campaign is simply C. The net cost of the campaign is  $C - (A \times T)$ . If the net cost is negative, the campaign is declared to be cost saving and no further calculation is required. If it is not cost saving, the cost-utility ratio is calculated as  $(C - [A \times T]) / (A \times Q)$ . Although there is no single threshold for determining if an intervention is cost effective, it is generally well accepted that a program is cost effective if it costs less than \$50,000 to \$100,000 per QALY saved.<sup>12</sup>

**Results**

The cost analysis and cost-utility results are displayed in Tables 1 and 2. During 2000–2002, expenditure data reveal that just over \$324 million was spent to develop, deliver, evaluate, and litigate the truth campaign. The base-case result demonstrates that the campaign was cost saving. Indeed, the estimate from the current study is that the campaign recouped its costs and that just under \$1.9 billion in medical costs was averted for society. The optimistic case also yields cost-saving re-

sults, estimating that almost \$5.4 billion in medical costs were saved over and above the campaign costs.

By definition, the pessimistic case cannot yield cost-saving results because it assumes that when a smoking career is prevented, the client lives longer and thereby incurs additional medical resources. However, the pessimistic-case analysis yields an estimate that the cost per QALY saved is \$4302. This cost per QALY saved is an order of magnitude under any readily accepted standard for determining whether an intervention is cost effective to society (so even if the parameter of a \$2609 cost per smoking career prevented increased tenfold, the result would still indicate cost effectiveness in the pessimistic case).

**Discussion**

The cost-utility analysis conducted here indicates that even though more than \$324 million was expended over 3 years to deliver the truth antismoking advertisement campaign, the expenditures yielded excellent returns. The base-case and optimistic-case analyses both indicate that the campaign was cost saving to society. The pessimistic-case analysis (which was constructed in a very cautious manner that did not allow for the possibility of a cost-saving finding) indicates that the cost per QALY saved would clearly be considered cost effective. It is worth noting that, by assigning a cost for medical care to each potential tobacco-attributable death averted, this pessimistic case fails to account for the many benefits these lives represent to society.

Of course, this study is subject to several limitations. Of necessity, a prospective economic evaluation is preferable to a retrospective one. However, a historically unique campaign is being examined here, so a prospective analysis is by definition impossible. Still, very cautious estimates have been employed in this retrospective analysis, and it is not believed that a prospective analysis would not have led to a different overall qualitative conclusion.

Another potential limitation is that the original estimate of the number of youth who were prevented from becoming smokers is based on the Monitoring the Future

**Table 2.** Input parameter values and cost-utility analysis of the truth<sup>®</sup> campaign

| Parameter label | Parameter definition                           | Base-case value (\$) | Source/reference | Optimistic case value (\$) | Source/reference | Pessimistic case value (\$) | Source/reference |
|-----------------|--|----------------------|------------------|----------------------------|------------------|-----------------------------|------------------|
| C               | Gross campaign costs                           | 324,069,936          | ALF              | 324,069,936                | ALF              | 324,069,936                 | ALF              |
| A               | Number of tobacco use cases averted            | 169,800              | 1, Text          | 300,000                    | 1, Text          | 169,800                     | 1, Text          |
| T               | Medical treatment costs saved per case averted | 13,072               | 6                | 19,078                     | 10, Text         | (2,609)                     | 11               |
| Q               | QALYS saved per case averted                   | 1.05                 | 6                | 3.5                        | 8                | 1.05                        | 6                |
| <b>RESULTS</b>  |  |                      |                  |                            |                  |                             |                  |
|                 | Net costs (C-AT)                               | (1,895,562,339)      |                  | (5,399,461,993)            |                  | 767,078,136                 |                  |
|                 | QALYs saved (AQ)                               | 178,290              |                  | 1,050,000                  |                  | 178,290                     |                  |
|                 | (C-AT)/(AQ)                                    | Cost-saving          |                  | Cost-saving                |                  | 4,302 per QALY saved        |                  |

ALF, American Legacy Foundation; QALY, quality adjusted life years

survey,<sup>13</sup> which is conducted in schools with students in Grades 8, 10, and 12; those data do not reflect youth who have dropped out of high school nor those in Grades 9 or 11. As such, they may be somewhat limited in their ability to represent the entire U.S. youth population. However, this data collection method is considered one of the most valid and comprehensive surveillance mechanisms available for tracking youth substance use trends. Another limitation of the study is that it makes use of repeated cross-sections rather than longitudinal survey data, which reduces the strength of the causal inference about the effect of truth exposure on youth smoking behavior.<sup>1</sup>

The cost utility of the truth campaign has major policy implications for a variety of reasons. First, the campaign has led to far fewer youth initiating smoking, and thus it will avert future healthcare costs of roughly \$1.9 billion (and perhaps ranging as high as \$5.4 billion). Collectively, these nonsmokers will be spared marked levels of human suffering, disability, and death. Under the pessimistic analysis, the cost per QALY is substantially below the cost of other major prevention interventions (e.g., breast cancer screening<sup>14</sup>; see also <https://research.tufts-nemc.org/cear/default.aspx> for a comprehensive registry of cost-utility analyses). Therefore, this intervention should be sustained and indeed expanded to maximize its positive effect.

The campaign was created by the ALF, a public charity established through litigation between state Attorneys General and the tobacco industry in a negotiated settlement. Under this settlement, funding to the ALF was dependent on the collective total market share of the four tobacco manufacturer participants reaching 99.05 or higher—an extremely unlikely scenario. As a result, the ALF received its last payment from the settlement in April 2008 and has been slowly reducing its expenditures on the truth<sup>®</sup> campaign over the past few years. In 2009, the ALF and its truth campaign will be funded solely from income generated from its reserve fund. Maintaining a reserve fund to support the ALF and its efforts was implemented to guarantee its existence in perpetuity or at least until youth and adult smoking rates reach negligible levels.

Given the efficacy and cost effectiveness of the truth campaign and other potential mass public education campaigns like it,<sup>15</sup> support should be provided through public funds, philanthropy, and air time donated by the various media outlets. At present, only an estimated 17 seconds of air time is donated per hour by networks for all non-sponsor paid public service announcements.<sup>16</sup> At present, there is only one major federally funded health-related public education campaign that is supported by the Office on Drug Control Policy to reduce youth substance abuse. However, the messages do not address tobacco and alcohol use—the two substances most used by youth and that cause the greatest disease and death. A successful CDC-funded campaign focused on increasing

physical activity, “VERB,” was de-funded several years after it was developed.<sup>17</sup> Similarly, a federally funded HIV/AIDS televised public education effort was short lived. The potential public health utility of mass education efforts designed to increase knowledge and encourage attitude and behavior change has been largely unexploited. This study suggests that truth and other future programs like it can be cost effective and markedly improve the public’s health.

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