5. Campaign Effects on Youth

The primary audience for the Campaign is young people, with some focus until recently on youth in the early teen years who are seen as particularly vulnerable to initiation of drug use. The objectives of the Campaign include reducing the number of young people who try marijuana at all, and reducing the number of trial users who go on to regular use. Current regular users are not a primary target audience for the Campaign. Although the Campaign has at times focused on a variety of drugs (methamphetamines, Ecstasy, inhalants, and others), the major focus has been on drugs overall and marijuana specifically. Aside from alcohol and nicotine, marijuana is the illicit drug by far the most likely to be used by youth. Marijuana is thus the focus of the analyses presented here, and some attention is also paid to inhalants.

In part, the Campaign has aimed to affect youth drug use through influencing the behavior of parents and other adults important in youths' lives. Increased adult engagement in youths' lives is accepted as an important intervention in preventing drug use. The success of the Campaign in reaching and affecting adults is discussed in Chapter 6. However, the Campaign also expects to influence youth directly through its heavy promotion of anti-drug messages with advertising and other efforts. This chapter focuses on the assessment of this direct path of effect. Chapter 4 presented evidence for changes in drug use during Phase III of the Campaign. The evidence presented there did not support a claim of change in marijuana use overall or in any of the subgroups thus far. This chapter focuses back one step in the process of change, to the cognitive precursors of behavior outlined in the Campaign model laid out in Chapter 2. Is there evidence that the Campaign is influencing intentions to use marijuana, beliefs and attitudes about the outcomes of marijuana use, perceived social norms about marijuana use, or self-efficacy to turn down marijuana?

5.1 The Logic of Inferences About Effects

It would be desirable to show that target outcomes, including improved cognitions about marijuana use, are trending in a direction consistent with Campaign objectives. However, any observed positive trend, that is, a trend favorable to the campaign, may reflect only external forces other than the Campaign. There are many forces in society that potentially affect adolescent drug use (e.g., drug prices, drug availability, content of popular media), and a trend alone won't permit unambiguous attribution to the Campaign. An observed lack of a favorable trend might also miss real Campaign effects. The Campaign might be successfully keeping the level of drug use and its cognitive precursors from getting worse as the result of other negative forces, or it might be that this study lacked the statistical sensitivity to detect a small change. Still, despite these ambiguities, it will be easier to accept Campaign effects in the context of favorable trends than to have to explain why the lack of such a trend is still consistent with a Campaign effect. Given that the trend between 1992 and 1998 toward increased drug use justified the mounting of the Campaign, finding a reversal of that trend is desirable.

For a favorable trend to be more firmly linked to the Campaign, the presence of a second class of evidence is required: that youth who were more exposed to the Campaign do "better" on the desired outcomes (i.e., that youth who reported seeing Campaign ads two or three times a week are more

likely to believe, for instance, that there were negative outcomes of marijuana use than those who reported ad exposure less than once a week). However, even were such associations to be found, the results would be subject to three concerns. First, there is the risk that the observed association between exposure and outcomes is the result of other variables that affect them both; for example, youth who do less well in school are more likely to turn to drugs and also may spend more time watching television and thus seeing ads. The threat to an inference of Campaign effects from these other variables is addressed directly through the implementation of statistical controls for potential confounding variables. The procedure used for that purpose, propensity scoring, is described in detail in Appendix C.

Second, the absence of an association between exposure and outcome does not permit definitive rejection of all Campaign effects. Chapter 2 recognized the possibility of effects not detectable through comparisons between more and less well-exposed individuals. To the extent that effects are shared in social networks, or diffused through changes in institutional practices, they are sometimes not detectable through individual level comparisons.

The third concern in making inferences from cross-sectional associations is that the association might be the result of the influence of outcomes on exposure rather than exposure on outcomes. For example, is it possible that youth with a negative view of drugs are more likely to remember anti-drug advertising? This could explain the association just as well as the idea that exposure to that advertising affected their view of drugs. This concern, called the threat of reverse causation, cannot be eliminated under most circumstances with cross-sectional data. Therefore, in the face of significant associational results, it will be necessary to have data that will give evidence of causal order. Longitudinal analysis, described next, may provide such evidence.

With the Waves 4 and 5 data collections, the Campaign evaluation has access to over time, cohort data, with youth interviewed at Waves 1, 2, and 3 having been re-interviewed at Waves 4 and 5. As previously described in Chapter 2, the primary longitudinal analysis is delayed-effects analysis. This examines the association between exposure at Round 1, or Waves 1, 2, and 3, and outcomes measured at Round 2, or Waves 4 and 5. Because Round 1 exposure is measured prior to Round 2 outcomes, this analysis permits the sorting of causal order. However, a causal inference from the delayed-effects association is still threatened by possible effects of confounders, as are the cross-sectional analyses. The same statistical procedure, propensity scoring, was used to address those concerns. It is described in Appendix C.[1] With these delayed-effects associations, we are able to establish that any observed association between exposure and the later outcome cannot be the result of the outcome affecting exposure. Any delayed-effects association would either reflect delayed-effects of exposure at Round 1 directly on outcomes after Round 1, or that the effects of exposure at Round 1 would reflect continuing levels of subsequent exposure through Round 2 which, in turn, affects outcome at Round 2. Both of these routes are consistent with a claim of influence of Campaign exposure on outcome.

[1] The delayed-effects association would ordinarily be controlled for the Round 1 value of the outcome measures. This could not be done for the whole sample, in this case, because the youth who were aged 9 to 11 at Round 1 but older than 12 at Round 2 did not receive the full battery of outcome questions at Round 1. This should not bias the results, since as shown previously and show again in this report, there is no association between simultaneously measured exposure and outcome. Thus the Round 1 outcome could not account for the Round 1 exposure—Round 2 outcome association. However, since most such measures for the 9- to 11-year-olds are not available, it cannot be stated with absolute certainty that the lack of simultaneous association would hold for them as well.

The additional explanatory power gained by the delayed-effects associations is critical. This followup data can serve to sort out with some confidence the causal order between variables. Thus, the longitudinal analyses included in this chapter address one major concern raised above about making causal claims from cross-sectional associations. The remaining challenge to a claim of causal influence of exposure on outcome is that there was some additional confounder, not measured at Round 1, which influenced exposure at Round 1 and outcome at Round 2, but not outcome at Round 1.

In sum, the best cross-sectional evidence consistent with a Campaign effect is an association of reported exposure to the Campaign with the target outcomes statistically controlled for likely confounders. If this is accompanied by evidence of a favorable trend in the outcome, the argument that there was a Campaign effect is strengthened. Finally, evidence for a delayed effect provides a clearer understanding of the causal order between exposure and outcomes.

The overall analysis focuses on effects among current nonusers of marijuana who are 12- to 18-year-olds. Baseline current users do not receive a great deal of attention in the presentation. The Campaign would like to increase the resistance of these youth to use of marijuana. However, there are not enough of them in the samples, particularly at younger ages, to provide very much statistical sensitivity to their changes. Although almost 40 percent of 16- to 18-year-olds report prior use, fewer 12- to 13-year-olds (less than 5%) and 14- to 15-year-olds (less than 20%) report use. Therefore, analyses with those samples will be able to detect only large changes in outcomes.

In addition to the overall analysis, this chapter presents trend and cross-sectional associational results for subgroups of youth. The subgroup analyses are used for two purposes. If there is an overall effect for all 12- to 18-year-olds, there is a search for evidence that the trends or the association is significantly larger or smaller for particular groups. If there is no overall effect, the subgroups are examined to see if there is evidence of effect for only a subpopulation. As with the previous report, this chapter will include subgroup analyses by youth's risk for marijuana use with youth classified as "higher" or "lower" risk. This report also introduces the analysis of subgroups defined by wave at first interview. This was meant to permit the examination of whether different periods of the Campaign had different effects on the outcomes. A favorable increase across waves in the cross-sectional exposure-outcome association, for example, would be consistent with a claim that the Campaign's message was increasing in effectiveness. These subgroups are described later in this chapter and in further detail in Chapter 4. Subgroups' differences are noted when they show a consistent pattern. All trend, cross-sectional, and delayed-effects associational analyses are fully presented in the Detail Tables and summarized in the text.

The chapter contains a large number of analyses designed to examine Campaign effects, using several different analytic approaches and conducting analyses both for the full sample and for many different subgroups. Statistical tests of significance are used for each analysis to establish whether any effects observed might be simply the result of sampling error. In assessing the findings from these significance tests, it needs to be recognized that, even if there were no Campaign effects whatsoever, some of the large number of tests will produce significant results. Thus, for example, in the simplified case of 100 completely independent statistical tests with no effect present for any of them, one would expect that five of the tests would be significant if a 5 percent significance level is used. Considerable caution should therefore be exercised in assessing an isolated significant effect when many tests are conducted. For this reason, in interpreting the many analyses in this chapter, consistent patterns of effects are highlighted and individual significant effects are downplayed.

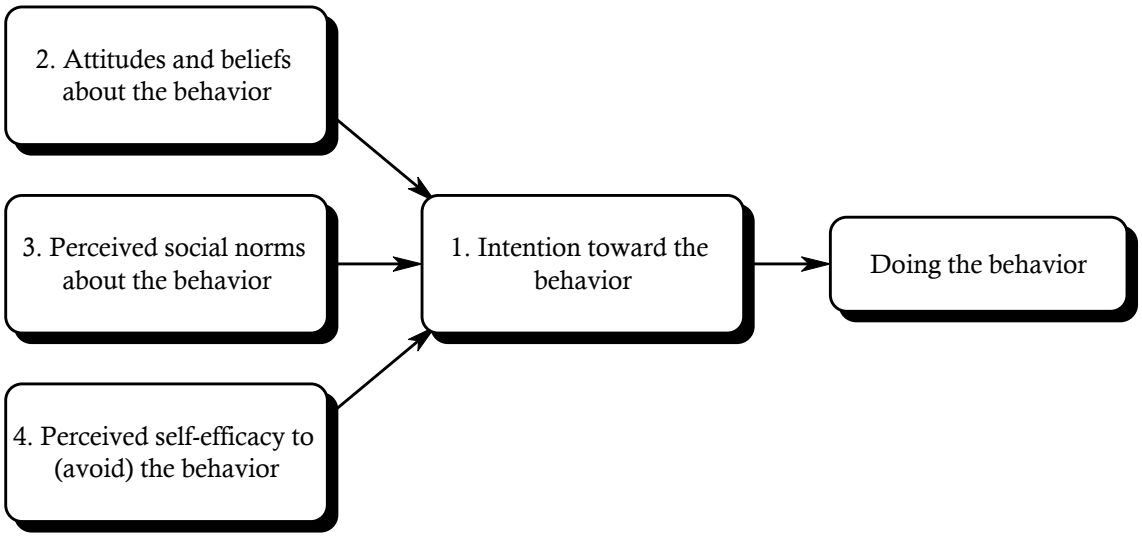
5.2 Development of Overall Scales, Combining Trial and Regular Use, and Summarizing Multiple Related Items

The Detail Tables provide information about trends in a total of 34 cognitive outcomes related to use of marijuana and 6 outcomes related to use of inhalants. In order to present that information efficiently, and to maximize the power of the analyses, this chapter presents that information largely through the use of a small number of summed indices. The indices reflect the expected theoretical model of Campaign effects. The use of these scales provides several advantages:

- Summed indices are, in general, more reliable than single measures, thus allowing easier detection of meaningful trends and associations;
- Using a small number of indices reduces the risk of chance findings of statistical significance when a very large number of tests are examined—a risk compounded when subgroups are to be examined for possible differential effects;
- Given the particular structure of the youth questionnaire, in which not all respondents are asked identical sets of questions, the use of summed indices permits a sharp increase in the numbers of respondents eligible for particular analyses, again increasing sensitivity to any true effects; and
- A theory-driven analysis featuring a small number of indices allows for a focused presentation of results.

In Chapter 2, the basic theoretical model underpinning the evaluation was presented. The model argues that if the Campaign were to be successful, it would affect behavior through one or more of the paths depicted in Figure 5-A.

Figure 5-A. The expected relationships among cognitive outcomes



The analysis of marijuana cognitive outcomes focuses on four measures that correspond to the expected four predictors of behavior:

- **Intentions to use marijuana at all in the next year.** The question asked how likely it was that the respondent would use marijuana even once or twice in the next year, and permitted answers of

definitely not, probably not, probably yes, and definitely yes. A substantial majority, 87 percent, of current nonusers aged 12 to 18 said, "definitely not." In the analyses below, this group is compared to the 13 percent of nonusers who were not definite in their intended rejection of use. Intentions are a very strong predictor of future behavior. Among Round 1 nonusers, 10 percent of those who said "definitely not" to any use of marijuana over the next year had initiated use by Round 2 (12 to 18 months later). Of those who said anything other than "definitely not" the rate of initiation was 42 percent.

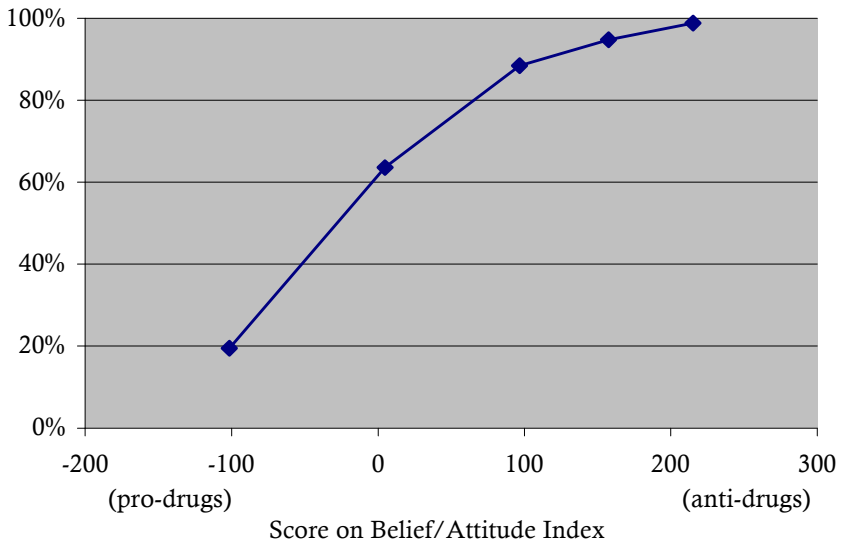
- **Attitudes and beliefs about marijuana.** All youth respondents were asked questions about how likely it was that a series of specific consequences would result if "you" use marijuana, either regularly (every month or almost every month) or once or twice over the next year. The eight consequences asked about for "once or twice" use included "Upset my parents," "Get in trouble with the law," "Lose control of myself," " Start using stronger drugs," "Be more relaxed," "Have a good time with friends," "Feel better," and "Be like the coolest kids." The eight consequences asked about for regular use included "Damage my brain," "Mess up my life," "Do worse in school," "Be acting against my moral beliefs," "Lose my ambition," "Lose my friends' respect," "Have a good time with friends," and "Be more creative and imaginative." Each nonusing respondent was randomly asked about one of the two eight-belief sequences. They were also each asked two questions that assessed overall attitude toward either "once or twice" use or regular use. All of the youth with prior use experience were asked about the consequences of and attitudes toward regular use.

  It is useful to look at the attitudes and beliefs about the two behaviors—using once or twice, and using regularly—as distinct. In the earlier reports, analysis focused on distinguishing between the two sets of outcomes. However, beginning with the Third Semi-Annual Report, it was decided to sacrifice the distinctions to allow the creation of a single index to capture beliefs and attitudes about marijuana. Since youth who have never used marijuana, referred to in this report as "nonusers," were randomly assigned to answer questions about "once or twice" or regular use, it was possible to equilibrate the two sets of responses on a single scale. This permitted the maximization of the number of youth who could be studied in a particular analysis and thus the power to detect an effect if any were present.

  The following steps were used to create the index. All nonusers were divided into two groups: those who had been randomly assigned to answer the questions about "once or twice" use, and the rest who were assigned to answer the questions about regular use. Each subgroup was then used in separate analyses in which intention to use was predicted from the eight consequence beliefs and two attitudes in a logistic regression equation. The regression coefficients from the prediction equation were then used to weight each of the items for a summed index. The weights derived from the nonusers' equations were also used to construct index scores for the population of prior users to ease interpretation. Each of the summed indices was then calibrated so that its mean and standard deviation were equal to 100 for the 12- to 18-year-old nonusers at Wave 1. Then the two indices were treated as equivalent to a single index with higher scores corresponding to more anti-drug attitudes and beliefs. This index could be used for all respondents, regardless of which sequence of questions they answered. The development of this and each of the following indices is described in more detail in Appendix E.

  The summed Attitudes/Beliefs Index, as expected, was substantially associated with the intention to use marijuana in the next year. Figure 5-B presents that relationship graphically. Twenty percent of those with the lowest scores on that index said "definitely not" to marijuana use in the next year, while almost 100 percent of those who were at the highest levels rejected such use.

Figure 5-B. Marijuana nonuse intention by Attitudes/Beliefs Index



- **Perceived social norms.** The perceived Social Norms Index was formed in a parallel way to the Attitudes/Beliefs Index. There were five parallel questions that assessed social normative pressure with regard to each of "once or twice" and regular use of marijuana. They asked about the perception of friends' use of marijuana, other peers' use of marijuana, parents' disapproval of "your" marijuana use, friends disapproval of "your" marijuana use, and disapproval of "your" marijuana use by most people important to you, in each case in the context of "once or twice" use or regular use over the next year. Using a regression model, the questions were then weighted according to their ability to predict the intention to use marijuana once or twice in the next year. The indices for nonusing youth randomly assigned to answer the "once or twice" or regular use questions were both set to a mean of 100 and a standard deviation of 100 for 12- to 18-year-old nonusers at Wave 1. The youth who had previously used marijuana and who had been asked the social norm questions about regular use were assigned index scores using the weights developed for the nonusers. Once again, all respondents were then assigned their score on the overall index based on their scores on the separate indices.

  The perceived Social Norms Index was substantially correlated with intentions, although the relationship was not quite as strong as that between the Attitudes/Beliefs Index and intention (Figure 5-C).

- **Self-efficacy to refuse marijuana.** All respondents were asked the same five questions about their confidence that they could turn down the use of marijuana under various circumstances ("How sure are you that you can say no to marijuana, if you really wanted to, if: You are at a party where most people are using it; A very close friend suggests you use it; You are home alone and feeling sad or bored; You are on school property and someone offers it; You are hanging out at a friend's house whose parents aren't home"). Using a regression model, the five questions were used to predict the intention to use marijuana once or twice in the next year. Each question was then weighted in the overall index reflecting the coefficient of the item in the predictive equation. Once again, to ease interpretation, responses were standardized to a mean of 100 and a standard deviation of 100 for Wave 1 12- to 18-year-old nonusers. The new index predicted intentions similarly, but less powerfully, than the other two indices (Figure 5-D).

Figure 5-C. Marijuana nonuse intention by Social Norms Index

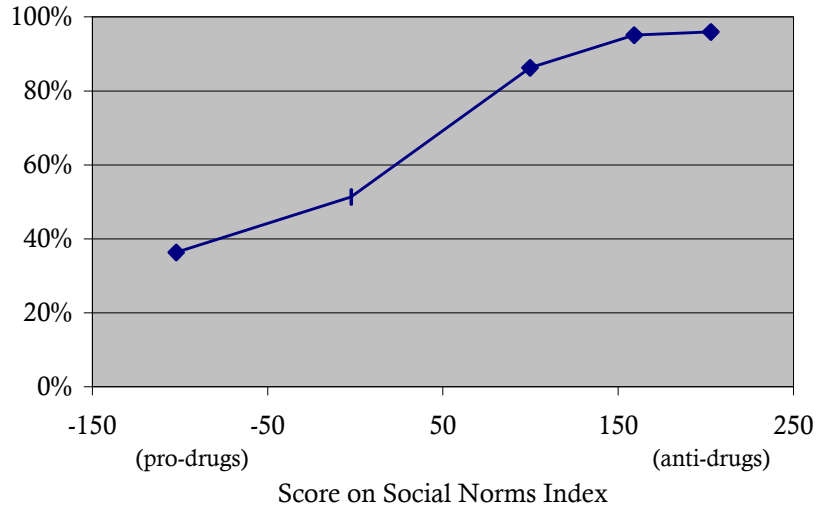
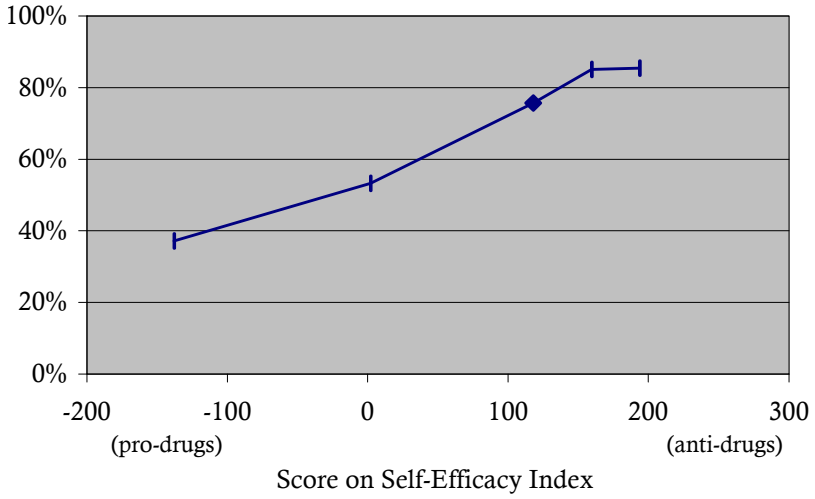


Figure 5-D. Marijuana nonuse intention by Self-Efficacy Index



5.3 Trends in Drug Attitudes and Beliefs, and Intentions about Use of Marijuana among Nonusing 12- to 18-Year-Olds

This section covers trends in intentions about trial use, attitudes and beliefs, perceived social norms, and self-efficacy about use across NSPY waves. The trends are broken out by age. It also discusses the evidence for diversity in trends across various subgroups.

All indices are scaled so that a higher score indicates stronger anti-drug attitudes, beliefs, and intentions.

5.3.1 Intentions About Marijuana Trial Use by Age and by Wave

There is no statistically significant change for the full 12- to 18-year-old sample in intentions to use marijuana once or twice over the five waves of measurement among prior nonusers. There is, however, a small trend, unfavorable to the Campaign, on marijuana intentions among 14- to 18-year-old nonusers. The downward trend appears to be statistically equivalent among both the 14- to 15-year-olds and 16- to 18-year-olds. Table 5-A presents these data. (See also Detail Table 5-1.)

Table 5-A. Trends in intentions to use marijuana once or twice for nonusers, by child age

	Percent of nonusers saying "definitely not"				
Age groups	Year 2000 (%)	Year 2001 (%)	Wave 5 (Jan-June 2002) (%)	2000 to Wave 5 Change (95% CI)	2001 to Wave 5 Change (95% CI)
12 to 13	92.3	90.9	91.7	-0.6 (-2.8, 1.7)	0.9 (-1.7, 3.4)
14 to 15	85.1	83.8	82.1	-3.0 (-6.8, 0.7)	-1.7 (-4.9, 1.4)
16 to 18	84.6	83.5	82.0	-2.6 (-7.3, 2.0)	-1.5 (-6.0, 3.0)
14 to 18	84.9	83.7	82.0	**-2.9* (-5.6, -0.1)**	-1.6 (-4.3, 1.0)
12 to 18	87.5	86.3	85.6	-1.9 (-3.9, 0.1)	-0.7 (-2.5, 1.0)

Note: The question asked was, " How likely is it that you will use marijuana, even once or twice, over the next 12 months? When we say marijuana, we mean marijuana or hashish."

* Between-year difference significant at $p < 0.05$.

The table provides two other pieces of information. Most nonusing youth, regardless of age, do not intend to use marijuana even once or twice in the next year. These reported intentions are consistent with the reported behavior of the population. It is possible to compare the levels of lifetime use reported by each age level, and from that information estimate what the annual rate of initiation is among nonusers. For 12- to 13-year-olds, the annual rate of marijuana initiation is about 6 percent; for 14- to 15-year-olds it is 11 percent, and for 16- to 17-year-olds it is 12 percent. Each of these numbers is close to two-thirds of the numbers of youth who do not indicate they will "definitely not" initiate marijuana use in the next year.

Also, there is some age association in these responses, with 14- to 18-year-olds less likely to say definitely not than 12- to 13-year-olds. However, the age effects are understated in this table, because the table presents only the responses of nonusers. Since almost 40 percent of 16- to 18-year-olds in Wave 5 were prior users, the numbers presented here are not reflective of the intentions of all youth in the age group. In Wave 5, among nonusers, 92 percent of all 12- to 13-year-olds, 82 percent of all 14- to 15-year-olds, and 82 percent of all 16- to 18-year-olds say "definitely not" to this question. Among both prior and nonusers, 78 percent of all 12- to 13-year-olds, 65 percent of all 14- to 15-year-olds, and 59 percent of all 16- to 18-year-olds say "definitely not" to this question.

5.3.2 Attitudes/Beliefs by Age and by Wave

The results for the Attitudes/Beliefs Index show no overall effects and no significant effects for any of the age subgroups. Table 5-B presents the results for each age subgroup and the entire sample of 12- to 18-year-olds. (See also Detail Table 5-2.) Table 5-B shows no statistically significant trend for the full sample comparing Year 2000 with Wave 5 and Year 2001 with Wave 5.

Table 5-B. Trends in Attitudes/Beliefs Index about marijuana use among nonusers by child age

	Score on Index				
Age groups	Year 2000 (Mean)	Year 2001 (Mean)	Wave 5 (Jan-June 2002) (Mean)	2000 to Wave 5 Change (95% CI)	2001 to Wave 5 Change (95% CI)
12 to 13	129.20	121.40	127.21	-1.99 (-8.60, 4.63)	5.81 (-1.60, 13.23)
14 to 15	102.29	100.85	101.33	-0.96 (-11.53, 9.60)	0.48 (-7.57, 8.53)
16 to 18	91.31	85.13	94.02	2.71 (-8.95, 14.37)	8.89 (-3.01, 20.79)
14 to 18	97.28	93.42	97.64	0.36 (-6.94, 7.66)	4.22 (-2.58, 11.02)
12 to 18	108.55	103.49	108.17	-0.38 (-5.49, 4.73)	4.68 (-0.57, 9.93)

Note: The index was standardized so 12- to 18-year-old nonusers had a mean and standard deviation of 100 at Wave 1.

Table 5-B does show a clear age gradient, despite the omission of marijuana users from the analysis, with older nonusers expressing weaker anti-drug sentiments than younger nonusers. In Wave 5, 12- to 13-year-olds had an index score of 127, while 16- to 18-year-olds had an index score of 94 (Detail Table 5-2).

5.3.3 Perceived Social Norms about Marijuana Use by Age and by Wave

Social norms against marijuana use show a significant decline from 2000 to Wave 5 for the full sample. The effects are apparently shared among all of the age groups. Table 5-C presents the essential results with additional detail presented in Detail Table 5-3.

Table 5-C. Trends in Social Norms Index about marijuana use among nonusers by child age

	Score on Index				
Age groups	Year 2000 (Mean)	Year 2001 (Mean)	Wave 5 (Jan-June 2002) (Mean)	2000 to Wave 5 Change (95% CI)	2001 to Wave 5 Change (95% CI)
12 to 13	136.87	129.47	129.63	**-7.24* (-13.08, -1.40)**	0.15 (-6.34, 6.64)
14 to 15	97.63	98.22	91.34	-6.29 (-17.17, 4.59)	-6.89 (-16.93, 3.16)
16 to 18	83.91	70.65	75.53	-8.38 (-20.52, 3.75)	4.88 (-7.84, 17.59)
14 to 18	91.37	85.19	83.36	-8.01 (-16.34, 0.33)	-1.83 (-10.26, 6.59)
12 to 18	107.43	101.12	99.83	**-7.60* (-13.28, -1.93)**	-1.29 (-7.04, 4.45)

Note: The index was standardized so 12- to 18-year-old nonusers had a mean and standard deviation of 100 at Wave 1.

* Between-year difference significant at $p < 0.05$.

Once again, the age gradient is clear, with older nonusers exhibiting more pro-drug norms than younger nonusers. The 16- to 18-year-olds scored an average of 76 in Wave 5; the 12- to 13-year-olds scored 54 points higher, even though marijuana users are excluded from the table.

5.3.4 Perceived Self-efficacy about Marijuana Use by Age and by Wave

The self-efficacy results suggest a trend favorable to the Campaign. The final index was the summed scale of five questions that dealt with the youths' confidence that they could turn down marijuana in a variety of circumstances. The overall results for the 12- to 18-year-olds as a group show significant favorable changes between Year 2000 and Wave 5 and between 2001 and Wave 5. The trend for each age group is statistically equivalent to the overall sample trend (Table 5-D and Detail Table 5-4).

Table 5-D. Trends in Self-Efficacy Index about marijuana use among nonusers by child age

	Score on Index				
Age groups	Year 2000 (Mean)	Year 2001 (Mean)	Wave 5 (Jan-June 2002) (Mean)	2000 to Wave 5 Change (95% CI)	2001 to Wave 5 Change (95% CI)
12 to 13	101.14	100.85	119.34	**18.20* (11.45, 24.95)**	**18.50* (11.30, 25.69)**
14 to 15	96.62	111.95	111.64	**15.02* (3.83, 26.21)**	-0.31 (-8.41, 7.79)
16 to 18	110.79	108.73	121.80	11.01 (-1.42, 23.44)	**13.07* (1.62, 24.51)**
14 to 18	103.09	110.43	116.77	**13.68* (4.73, 22.63)**	6.34 (-0.28, 12.96)
12 to 18	102.40	106.98	117.68	**15.28* (8.89, 21.67)**	**10.70* (5.79, 15.61)**

Note: The index was standardized so 12- to 18-year-old nonusers had a mean and standard deviation of 100 at Wave 1.

* Between-year difference significant at p<0.05.

There is no age gradient in Table 5-D for the self-efficacy measure among nonusers. However, when users are included there is a small association (12- to 13-year-olds=98.2; 14- to 15-year-olds=89.9, and 16- to 18-year-olds=88.0.)

5.3.5 Evidence for Diversity in Trends in Cognitions about Marijuana Use

The diversity effects analyses address two complementary questions. When there was not evidence of a significant overall trend, was there evidence of such a trend for a subgroup, in addition to the age subgroup effects described above? Alternately, when there was overall evidence of trend, did any subgroup show a significantly different trend? Altogether, there are seven subgroups of three grouping variables (two sexes; three race/ethnicity groups; two risk groups[2]). These groups are examined across four measures, making a total of 28 trend comparisons. For two of the outcomes (social norms and efficacy) there was an overall trend. All of the subgroups' trends were statistically consistent with the overall trend effects. For the other two outcomes, intentions and the attitude/belief index, for which the overall trend was not significant, there is only one subgroup trend that does not match the overall trend. Specifically, for the intentions outcome, there was a negative trend for the lower risk subgroup.

5.4 Cross-Sectional (Concurrent) Associations of Anti-Drug Advertising Exposure with Attitudes, Beliefs, and Intentions about Marijuana Use among 12- to 18-Year-Old Nonusers

The next step in the analysis turns to the examination of associations of recalled exposure and the four major outcomes. In contrast to the trend data, the associational evidence speaks directly to the influence of individual exposure to the Campaign. The analyses below show only rare evidence of association, and the observed associations are more often unfavorable than favorable.

Chapter 3 describes the two types of exposure measures available for analysis. One, called general exposure, represents the sum of recalled exposure in recent months to anti-drug advertising in four different types of sources (television and radio, movies and videos, print media including newspapers and magazines, and outdoor media). Some of that exposure could have represented recall of ads

[2] The Detail Tables present trend information for high and low risk groups and sensation-seeking groups. The risk group variable incorporates the sensation-seeking variable as well as other predictors of drug use. To avoid substantial redundancy of reporting, the text includes consideration of only the risk subgroups.

directed to parents, and some recall of ads presented by other institutions. The specific exposure measure sums the recalled exposure to the youth-targeted individual Campaign television ads that had been on the air in the two months before the interview.

Table 5-E presents the exposure levels for the 12- to 18-year-old population overall (i.e., across Waves 1 through 5). The distribution of exposures among nonusers, who are the focus of the analyses reported below, are very close to these overall estimates.

Table 5-E. Exposure per month reported by 12- to 18-year-olds

	<1 exposure (%)	1 – 3 exposures (%)	4 – 11 exposures (%)	12+ exposures (%)
General exposure	22.9		23.3	52.2
Specific exposure	19.7	34.4	35.7	10.2

The general exposure measures display substantially higher levels than do the specific exposure levels. For example, 52 percent of youth reported general exposure 12 or more times per month, but 10 percent reported specific exposure at that level. There are three factors that may contribute to that difference: the general exposure measure included more sources than the specific exposure measure; the general exposure measure allows recall of advertising that was directed to other audiences, while the specific exposure measure focuses only on television[3] ads directed to the youth; and finally, the general exposure measure may be less demanding since it does not require the respondent to claim that he or she has seen a specific ad. One might speculate, therefore, that it is at greater risk of inflated reporting. Since the two measures may capture different aspects of exposure, the evidence of association is presented for both of them, with the interpretation strengthened when both show the same pattern of effects.

The general exposure association tables compare youth who reported exposure less than 4 times per month, 4 to 11 times per month, and 12 or more times per month. There were very few youth who reported no exposure so they could not be considered separately. The specific exposure tables include four categories, since it was feasible to break out the lowest exposure group into those who recalled exposure less than 1 time per month and those who recalled ad exposure 1 to 3 times per month. However, the highest exposure group for the specific exposure measure is quite small, so in many of the tables the estimates for outcomes for this group have very wide confidence intervals. Usually the specific exposure claims must rely on the differences among the other three exposure groups. Subsequently, when the longitudinal analyses that rely on a reduced sample are presented, only three categories of specific exposure are used, with the top two categories collapsed.

In the exposure analyses that follow, the effects are corrected for the influence of confounder variables using the propensity scoring procedures described in Appendix C. They are the estimates of what people at each level of exposure would have been like had they all been similar on measured variables that were associated with exposure.

[3] The measures of specific exposure include only reports of exposure to television advertising. During Wave 1, the measure of exposure to radio advertising excluded ads that were only audio versions of television ads, which were the great majority of the ads. It was not meaningful to include specific radio exposure with the television exposure in the specific exposure index for that wave. Although all radio ads were asked about in Waves 2 through 5, and the exposure to them is reported in Chapter 3, they were not included in the exposure index for the analyses reported in this chapter so that comparability across waves could be maintained. However, recall of television advertising was, in any case, much greater than recall of radio ads, so it is unlikely that this exclusion is substantially affecting the associations reported here (Detail Tables 3-2 and 3-17).

All cross-sectional analyses of exposure include data from all five waves, but are restricted to 12- to 18-year-olds who reported never using marijuana.[4] Each of the detail tables that present these associational results (Detailed Tables 5-33 through 5-40) also provides estimates for subgroups of that population defined by youth characteristics (age, gender, race/ethnicity, risk of marijuana use, and sensation-seeking).

Each table presents three different measures of Campaign effect. The first, called the direct campaign effect, compares the score on the outcome variable (e.g., intention to use marijuana even once or twice in the next year) for the entire sample with the score projected to be achieved by the lowest exposure group if the entire population had received that level of exposure. It asks whether the average person was different from those who had minimal exposure. It is the best estimate of the average effect of the Campaign across the population. In addition, in order to have an estimate of the magnitude of association, the gamma coefficient is presented. Like the Pearson correlation coefficient, gamma varies from –1 to +1, with 0 being no relationship.[5] The final measure, called the maximum campaign effect, compares youth with the highest and lowest levels of exposure. De facto it answers the question: If the Campaign had been able to give everyone 12 or more exposures per month, how much of an effect would there have been? While each table reports all three tests, the presentation focuses on the gamma estimate to determine whether there is an overall effect. There is a risk that the use of three tests to examine each effect increases the likelihood of misleadingly claiming chance effects. Given the need to choose only one test, gamma was the one chosen. It is the only one of the tests that uses all of the data, and thus provides the fullest picture of association. The other tests are used to provide alternative views of the results, but they are not the focus of claims about Campaign effects.

5.4.1 Overall Analyses of Four Cognitive Measures by Exposure

After controlling for confounders by propensity scoring, there is no significant cross-sectional association between either exposure measure and intentions to use marijuana for the entire Wave 1 through Wave 5 population of 12- to 18-year-old youth (see Table 5-F and Detail Tables 5-33 and 5-34).

There is also no statistically significant cross-sectional association between general exposure and the Attitudes/Beliefs Index, nor between specific exposure and the Attitudes/Belief Index as shown by the nonsignificant gammas in the table above. However, there is a significant direct effect (comparing the lowest exposed group with the average group) of specific exposure on the Attitudes/Belief Index, in an unfavorable direction. This is shown in Table 5-G as well as in Detail Tables 5-35 and 5-36.

Table 5-F. Exposure per month and intentions to use marijuana reported by nonuser 12- to 18-year-olds

[4] These analyses treat all interviews as independent, although the Waves 4 and 5 interviews were done with youth first interviewed in Waves 1 through 3. This would violate the assumption of independence of observations ordinarily required for the calculation of standard errors from a sample. However, the estimation procedures used in these analyses, making use of the WESVAR program, adjust for any nonindependence.

[5] Unlike the Pearson correlation, gamma does not assume that both exposure and the outcome are measured as interval level variables. It is appropriately used to estimate associations between ordered variables. In previous reports this association was estimated with the Spearman rho coefficient for magnitude and the Jonkheere-Terpstra test for significance. Since the last report was published, staff statisticians have developed a procedure for estimating both the magnitude and the statistical significance for a single commonly reported coefficient, Goodman and Kruskal's gamma, in the context of the complex sample design. Using a single coefficient and statistical test provides a clearer presentation approach. Moreover, they found that it gamma produces virtually identical inferences about the nature of the observed associations as were produced by the previous two-part procedure.

Percent saying "definitely not" to likelihood of using marijuana even once or twice - overall average= 86.6%							
	<1 exposure	1 to 3 exposures	4 to 11 exposures	12+ exposures	Direct effect (CI)	Gamma (CI)	Maximum effect (CI)
General exposure	87.8		85.5	86.4	-1.2 (-3.6 to 1.3)	-.037 (-.12 to .05)	-1.3 (-4.2 to 1.6)
Specific exposure	88.6	87.1	85.2	88.0	-2.0 (-4.2 to 0.1)	-.028 (-.14 to .09)	-0.6 (-6.0 to 4.7)

Table 5-G. Exposure per month and Attitudes/Beliefs Index among nonuser 12- to 18-year-olds

Mean score on attitudes/belief index: average for the sample= 106.6							
	<1 exposure	1 to 3 exposures	4 to 11 exposures	12+ exposures	Direct effect (CI)	Gamma (CI)	Maximum effect (CI)
General exposure	108.25		104.63	107.66	-1.63 (-8.47 to 5.20)	.001 (-.03 to .04)	-0.59 (-9.22 to 8.05)
Specific exposure	114.40	107.92	102.03	110.37	**-7.78* (-14.45 to -1.11)**	-0.020 (-.06 to .02)	-4.02 (-16.26 to 8.21)

* Significant at $p < 0.05$.

The results for the cross-sectional association of Campaign ad exposure and the Social Norms Index are presented in Table 5-H. There is again no significant overall effect for youth aged 12 to 18. (See also Detail Tables 5-37 and 5-38.)

Table 5-H. Exposure per month and Social Norms Index among 12- to 18-year-olds

Mean score on Social Norms Index: average for the sample=103.2							
	<1 exposure	1 to 3 exposures	4 to 11 exposures	12+ exposures	Direct effect (CI)	Gamma (CI)	Maximum effect (CI)
General exposure	105.92		99.79	103.41	-2.70 (-8.98 to 3.58)	-.010 (-.04 to .02)	-2.51 (-9.59 to 4.57)
Specific exposure	109.45	105.47	100.63	104.30	-6.22 (-12.67 to 0.22)	-.19 (-.06 to .02)	-5.15 (-17.67 to 7.36)

The cross-sectional results for the self-efficacy scale are essentially consistent with the Attitudes/Beliefs Index. There is no statistically significant cross-sectional association of general exposure and the Self Efficacy to Refuse Index, nor of specific exposure and Self-Efficacy. There is a significant direct effect of specific exposure on the Self Efficacy Index in an unfavorable direction. Table 5-I summarizes the self-efficacy results (see also Detail Tables 5-39 and 5-40).

Table 5-I. Exposure per month and Self-Efficacy to Refuse Marijuana Index among 12- to 18-year-olds

Mean score on Self-Efficacy Index: average for the sample=107.9							
	<1 exposure	1 to 3 exposures	4 to 11 exposures	12+ exposures	Direct effect (CI)	Gamma (CI)	Maximum effect (CI)
General exposure	105.73		103.66	110.87	2.17 (-4.43 to 8.78)	0.005 (-.03 to .05)	5.14 (-3.13 to 13.40)
Specific exposure	115.22	106.30	106.79	123.54	**-7.31 * (-12.82 to -1.81)**	.014 (-.04 to .07)	8.33 (-0.06 to 16.71)

* Significant at $p < 0.05$.

In conclusion then, the gamma statistic provides no supportive evidence that concurrent campaign exposure is associated either favorably or unfavorably with any of the four cognitive outcomes for the full sample of 12- to 18-year-olds. The direct effect suggests an unfavorable association between

specific exposure and attitudes/behavior and self-efficacy. The next sections ask whether, in the absence of overall effects, there is any evidence of association for subgroups of the population.

5.4.2 Evidence of Diversity of Associations by Age of Youth, Risk Group, Gender, and Race/Ethnicity

Through the period covered by this report, the Campaign has been particularly focused on younger teens as its primary audience. Thus, there has been a particular interest in showing that there are effects among that group, represented here by the youth aged 12 to 13. They are, in general, not at high immediate risk of drug use; 95 percent of them report having never used marijuana, and more than 90 percent of the current nonusers say they definitely won't use marijuana in the next year. However, they are maturing into the age when more of them will try marijuana and other drugs. Thus they are of primary importance as an audience for the Campaign, and separating the results of younger (12 to 13) and older (14 to 18) teens is, therefore, informative.

Detail Tables 5-33 through 5-40 present data for two age subgroups: youth aged 12 to 13 and youth aged 14 to 18. There are a total of 16 analyses presented: two age groups by two exposure measures by four cognitive measures. In that entire set, there are no significant effects.

The Campaign has also had a particular interest in reaching higher risk individuals. Accordingly, the Campaign has been designed with a recognition that youth vary in their risk of drug use and tries to reach the subgroup category of high risk youth. There were no overall significant associations for either of the risk subgroups.

In addition to the subgroup analyses by age and risk, for which the Campaign had clear expectations of subgroup effects, separate analyses were also performed for subgroups defined by gender and race/ethnicity. There were a total of 40 such subgroup analyses examined: five groups (defined by two genders and three race/ethnicities) by four outcomes by two exposure measures. Since there were no a priori hypotheses about which of these groups were more or less likely to show effects, the possibility of chance effects needs particular attention. With 40 tests, it might be expected that a few tests would be significant at the conventional level by chance. In fact, there were no significant results.

5.5 Summary and Discussion of Trend and Cross-sectional Results for Marijuana Cognitions

This section summarizes the trend and cross-sectional associational results presented thus far for marijuana cognitions. As noted above, the most desirable result for a claim of Campaign effects from these data would be a favorable trend on a target outcome, and a favorable association between exposure to the Campaign and the outcome. The trends are significant for two of the outcomes (social norms and self-efficacy) for the entire population but in opposite directions, favorable to the Campaign for self-efficacy and unfavorable to the Campaign for social norms. In addition, there was an unfavorable effect for intentions for 14- to 18-year-olds, and an unfavorable effect on the attitude/belief index for youth who were at lower risk for marijuana use.

There was no evidence (judged by gamma) for statistically significant associations overall, nor for either of the age subgroups nor for any of the other subgroups. The trend results provide mixed evidence about favorable versus unfavorable, versus no Campaign effects, but the associational data

does not support any claims of effects in either direction. Thus far then, the analyses do not support an inference of Campaign effects.

5.6 Campaign Effects on Inhalant Intentions and Attitudes Among Prior Nonusers

During the Wave 3 data collection, the Campaign raised the profile of its anti-inhalant advertising, particularly those ads directed at parents, which might have been accessible to youth as well. About 43 percent of all radio and television GRPs for parents in Wave 3 related to inhalants. However, no parent anti-inhalant ad time was purchased in Waves 4 or 5. For general market youth, no anti-inhalant ads were run during Wave 3, and only a small amount of inhalant-specific advertising was directed toward youth in Wave 4 (about 4% of all youth-directed GRPs—see Table 3-I), and none in Wave 5. This pattern of buys may not be consistent with expecting changes among youth in behavior or cognitions. Nonetheless, this section of the report examines change in inhalant cognitions across time.

The analysis of trends focuses on two summary measures. The first is parallel to the marijuana intentions measure used in the previous sections. The analysis is limited to 12- to 18-year-old prior nonusers of inhalants. The second index sums four questions that addressed the youths' attitudes about inhalant use: disapproval of "once or twice" and regular inhalant use by others, and perception of risk of harm from once or twice and regular inhalant use. These questions were modeled on questions asked in the Monitoring The Future survey for many years. They contrast with the more personal and specific questions that were asked about the consequences of marijuana use and which made up the indices presented above. As with the marijuana Attitudes/Beliefs Index, the responses to the four questions were summed according to weights derived from the prediction of the intentions question in a logistic regression equation, and standardized to have a mean and standard deviation of 100 for 12- to 18-year-olds at Wave 1.

5.6.1 Intentions and Attitudes about Inhalant Use by Age and by Wave

There is no statistically significant change between Year 2000 to Wave 5 and Year 2001 to Wave 5 for any of the age subgroups in their intention to use inhalants in the next year. Almost all youth said they would not use in Wave 5 and almost all youth said they would not use in Years 2000 and 2001 (Table 5-J and Detail Table 5-27). This may be the result of a "ceiling effect"; the Campaign cannot show significant favorable effects because the criterion outcome is already so high.

Table 5-J. Trends in intentions to use inhalants once or twice by youth age

	Percent of nonusers saying "definitely not"				
Age groups	Year 2000 (%)	Year 2001 (%)	Wave 5 (Jan-June 2002) (%)	2000 to Wave 5 Change (95% CI)	2001 to Wave 5 Change (95% CI)
12 to 13	95.4	94.4	94.0	-1.5 (-3.4 to 0.4)	-0.5 (-2.8 to 1.8)
14 to 15	93.3	95.7	95.2	1.9 (-0.4 to 4.2)	-0.4 (-2.6 to 1.7)
16 to 18	96.2	94.8	96.4	0.2 (-1.7 to 2.1)	1.6 (-0.9 to 4.2)
12 to 18	95.1	95.0	95.3	0.3 (-0.8 to 1.4)	0.3 (-1.0 to 1.7)

Note: The question asked, "How likely is it that you will use inhalants to get high, even once or twice over the next 12 months?"

Table 5-K shows a statistically significant favorable trend in the Attitudes/Beliefs Index for the overall sample (see also Detail Table 5-28). The index's pattern also shows a little more variation by age: older youth tend to be slightly more accepting of inhalant use than younger ones though, in general, the age gradient is less clear cut than for marijuana. On average in Wave 5, 12- to 13-year-olds had a score of 122, while 16- to 18-year-olds had a score of 101.

Table 5-K. Trends in Attitudes/Beliefs Index about inhalant use by youth age

	Score on Index				
Age groups	Year 2000 (Mean)	Year 2001 (Mean)	Wave 5 (Jan-June 2002) (Mean)	2000 to Wave 5 Change (95% CI)	2001 to Wave 5 Change (95% CI)
12 to 13	117.34	117.77	122.26	4.92 (-1.64 to 11.48)	4.49 (-2.86 to 11.83)
14 to 15	100.10	91.61	104.44	4.35 (-5.58 to 14.27)	**12.83* (2.00 to 23.66)**
16 to 18	90.64	102.86	101.01	10.37 (-1.63 to 22.38)	-1.85 (-13.28 to 9.57)
12 to 18	101.73	103.64	108.33	**6.60* (1.14 to 12.06)**	4.69 (-1.21 to 10.58)

Note: The index was standardized so 12- to 18-year-old nonusers had mean and standard deviation of 100 at Wave 1.

* Significant at $p < .05$

All nonusing 12- to 18-year-olds show a positive significant change in attitudes and beliefs from Year 2000 to Wave 5, hence a favorable overall trend. Additionally, the 14- to 15-year-olds show a significant favorable trend from the Year 2001 to Wave 5, however, this largely represents a reversal of the decline from Year 2000 to 2001 and a return to its original level.

5.6.2 Evidence of Diversity in Trends

Aside from the age subgroup effects just described, there are no other significant trend effects for intentions in any of the subgroups of interest (males vs. females, Whites vs. African American vs. Hispanics, or among risk subgroups).

There are, however, significant trends in attitudes and beliefs about inhalant use for two subgroups: males and low-risk respondents. From Year 2000 to Wave 5, males show statistically significant positive change in anti-drug beliefs and attitudes, increasing from a score of 102 to 112, a clearly favorable trend. In addition, there is also an improvement from Year 2001 to Wave 5 in attitudes and beliefs for low-risk individuals consistent with Campaign goals. These results show a contrasting picture to the more unfavorable trend results regarding marijuana use.

5.7 Delayed-Effects Associations of Anti-Drug Advertising Exposure with Attitudes, Beliefs, and Intentions about Marijuana Use among 12- to 18-Year-Old Nonusers

This section presents an analysis of cohort data: the youth who were initially interviewed at Waves 1, 2, or 3 (Round 1), and again at Waves 4 or 5 (Round 2). With these youth, who averaged 12 to 18 months between their Round 1 and Round 2 interviews, it is possible to examine whether level of exposure to advertising at Round 1 predicts subsequent changes on the important outcomes by

Round 2.[6] Given the lack of evidence of Campaign effects shown in the previous sections, finding evidence for a delayed effect on the cognitive outcomes and on reported marijuana use had not been expected. Nonetheless, while the trend data showed both favorable and unfavorable changes since the start of the Campaign, and the cross-sectional analysis showed no evidence of effects at all, the longitudinal analysis exhibits a mix of no effect and unfavorable effect results. Where there are any effects, those who were more exposed to the Campaign at Round 1 tended to move more markedly in a "pro-drug" direction as they aged than those who were less exposed. These are consistent with the results from the previous report (Hornik, et al 2002).

The delayed-effects exposure analysis commences with a display of the fully adjusted results for the 12- to 18-year-olds. It then discusses results for each of the major subgroups. These analyses are adjusted for the complex sample design and the full set of potential confounders. The confounder adjustments follow the same procedures used for the cross-sectional association analyses above, although the propensity scores used for adjusting were based on the propensity models for the Round 1 exposure scores for this sample (see Appendix C). Only youth who were nonusers at Round 1 and were re-interviewed at Round 2 were eligible for this analysis.

Table 5-L presents the results of the delayed-effects analysis for the sample of youth who were 12- to 18-year-olds at Round 2 but who had never used marijuana at Round 1. (These results and the ones for subgroups are found also in Detail Tables 5-41 through 5-50.) The table shows 10 results. For the eight cognitive outcomes, all of the gammas are negative with four of the eight results statistically significant for the full sample. These outcomes involve intentions, social norms, and self-efficacy. The associations between both general and specific exposure at Round 1, with Round 2 intentions to not use marijuana, are unfavorable and statistically significant. Youth who were higher on exposure at Round 1 were more likely to intend to use marijuana at Round 2 than those with lower exposure at Round 1. A similar relationship was found for social norms. Youth with higher general exposure at Round 1 had more "pro-drug" social norms at Round 2 than those with lower exposure at Round 1. There is also a significant unfavorable relationship between specific exposure and self-efficacy. That is, youth with higher exposure at Round 1 had lower self-efficacy at Round 2 than those with lower exposure at Round 1. Only the attitude/belief index shows no association at all with either measure of prior exposure.

In contrast to the evidence from the cognitive variables, the overall results do not show any effect of Campaign exposure on behavior; i.e., the initiation of use. About 13 percent of all of these nonusing youth initiated marijuana use between the measurement waves. However the level of exposure youth reported at Round 1 does not predict their initiation, once the propensity scoring adjustments are incorporated.

The next question to be addressed is whether these results are consistent for the subgroups. When there was a significant unfavorable overall effect, were the subgroups showing consistent results? And, in the cases where there was no significant overall effect, was there evidence of a significant effect for one or more subgroups?

[6] Youth measured first in Wave 1 or Wave 2 had an average of 18 months between interviews; youth interviewed first in Wave 3 had only 12 months between interviews. The annual rate of initiation for all groups was about the same (9.6%) with annual initiation rates of 9.2%, 8.7%, and 10.8% for Waves 1, 2, and 3, which are not significantly different from one another. Thus there was no evidence of seasonality in their rates of initiation, although the groups were interviewed in different halves of the year. In addition, as will be shown in Table 5-M below, there was no difference in effects observed across subgroups defined by Wave at first interview.

Table 5-L. Exposure per month at Round 1 and outcomes at Round 2 among 12- to 18-year-olds who were nonusers of marijuana at Round 1

Round 2 outcome (average)		Round 1 Exposure				Gamma (95% CI)
		<1 exposure	1 to 3 exposures	4 to 11 exposures	12+ exposures	
Percent (Not) intending to use	General exposure	84.0%		78.4%	77.4%	**-.14* (-.25 to -.03)**
	Specific exposure	82.3%	78.2%	76.5%		**-.12* (-.21 to -.02)**
Attitudes/Beliefs Index (Mean score)	General exposure	99.55		87.38	90.46	-.03 (-.08 to .01)
	Specific exposure	92.34	93.39	85.98		-.03 (-.08 to .02)
Social Norms Index (Mean score)	General exposure	99.19		79.53	82.96	**-.07* (-.12 to -.02)**
	Specific exposure	90.21	85.89	77.79		-.05 (-.11 to .00)
Self-Efficacy Index (Mean score)	General exposure	105.80		105.81	106.66	-.01 (-.07 to .05)
	Specific exposure	119.96	102.17	104.33		**-.08* (-.15 to -.02)**
Percent Initiation of Use	General exposure	12.0%	11.8%	13.2%		.04 (-10 to .18)
	Specific exposure	12.8%	13.2%	12.8%		.00 (-.11 to .11)

* Significant at $p < .05$.

In general, where there were overall effects, the subgroups were not significantly different from the full sample, or from one another. Where there were overall effects some of the subgroups showed significant effects themselves, and the rest showed effects that were statistically consistent with the overall effects. This pattern is displayed in Table 5-M, focusing on the rows where there was a significant overall effect. In this table, for the cognitive outcomes, which are all scaled so that a high score is anti-drug, a negative gamma is unfavorable to the Campaign. For the initiation of marijuana use measure, a positive gamma indicates that exposure is associated with more initiation, and is unfavorable to the Campaign.

The diversity issue worth more attention is whether there were significant effects for subgroups when there was no overall effect. A summary of these results can be seen in Table 5-M as well, focusing on the rows where the overall gamma was not significant.

Neither of the measures of exposure was related to the attitude belief index for the subgroups, with two exceptions. There was a significant unfavorable association between the general exposure model among youth first interviewed at Wave 2, and the youth who were at low risk.

The social norms index was related, overall, with prior general exposure, in an unfavorable direction. The overall association was negative but not statistically significant for the specific exposure index, however it was significant for those first interviewed at Wave 1 and those first interviewed at Wave 3. In addition, the coefficient for specific exposure was negative for every one of the subgroups, reinforcing the appearance of a general unfavorable effect for this index as well.

Table 5-M. Association (gamma) between Exposure at Round 1 and Youth Outcomes at Round 2[1]

	Exposure Measure (gamma)	Age		Gender		Race/ethnicity			Risk of MJ Use		Wave of 1st interview		
		12-13	14-18	Male	Fem.	White	Afri-Amer.	Hisp	High	Low	1	2	3
Percent (Not) intending to use	General (-.14)	**-.40***	-.07	**-.17***	-.10	**-.18***	-.20	.12	-.00	**-.27***	-.05	**-.29***	-.08
	Specific (-.12)	-.11	**-.13***	-.06	**-.18***	-.12	**-.28***	.02	-.06	**-.15***	-.14	-.06	-.17
Attitudes /Beliefs Index	General (-.03)	-.07	-.01	-.05	-.02	-.03	-.09	-.01	.05	**-.06**	-.02	**-.10***	.02
	Specific (-.03)	-.08	-.02	-.03	-.03	-.03	-.06	.02	.01	-.02	-.03	-.02	-.05
Social Norms Index	General (-.07)	-.05	-.04	-.06	**-.07***	-.05	-.07	**-.12***	.05	**-.09***	.00	-.06	**-.13***
	Specific (-.05)	-.04	-.06	-.03	-07	-.05	-.06	-.03	-.04	-.06	**-.08***	.02	**-.11***
Self-Efficacy Index	General (-.01)	-.05	.01	-.03	.01	-.03	-.09	.11	.02	-.06	.02	-.07	.03
	Specific (-.08)	-.03	-.11	-.08	-.09	**-.09***	.04	-.12	-.10	-.06	-.09	-.08	-.07
Percent Initiation of MJ Use	General (.04)	.00	.02	.06	.02	.07	-.08	.02	-.03	.07	-.15	.15	.14
	Specific (.00)	.12	-.02	-.05	.06	.07	-.21	-.18	.09	-.09	.13	-.09	.03

* Significant at $p < .05$.

[1] In this table a positive association is favorable to the Campaign for the cognitive outcomes, but unfavorable to the Campaign for initiation of marijuana use.

Although the specific exposure scale was significantly associated with self-efficacy, the general exposure measure was not associated with the self-efficacy index. This lack of significant associations with general exposure was also the case for each of the subgroup analyses.

Similarly, initiation of marijuana use, which showed no overall association, also showed no significant association for any of the subgroups. This is a potentially important result for two reasons. The other measures, particularly intentions, are highly related to use, and are predictive of initiation of use. The intention measure does show a strong negative association with prior exposure, making the failure to find one for initiation itself surprising. In addition, in the previous report there was statistically significant evidence for a possible effect of specific exposure on initiation for some subgroups in the Wave 1 sample (females, 12- to 13-year-olds, lower risk youth) but they are not replicated here where the Waves 2 and 3 samples are also included.[7] It is worth noting, however, that there are a total of 120 results for subgroups presented in Table 5-M. Nineteen of those subgroup results are statistically significant. Every one of these statistically significant results is unfavorable to the Campaign.

[7] Close examination of three of these subgroups when all waves are considered (Whites, 12- to 13-year-olds and females) shows that there was still an unfavorable association for these groups between the specific exposure index and marijuana initiation before introducing the confounder controls through propensity scoring. The gamma for the Whites was .176, for the 12- to 13-year-olds was .262, and for the Females, .214. However the introduction of the propensity model sharply increases the sampling error around the gammas, and although the confounder controlled estimates of gamma for these three groups are still positive (unfavorable), the confidence limits are now sufficiently wide so that it is not possible to say whether they are different from no association at all.

This report introduces the analysis of subgroups defined by wave at first interview. This was meant to permit the examination of whether different periods of the Campaign had different effects on the outcomes. The final three columns of Table 5-M present that evidence. None of the gammas in those columns are statistically different than the overall pattern in the row. Both the youth who were first interviewed in Wave 2 and those who were interviewed in Wave 3 show two significant effects, while those interviewed during Wave 1 show one significant effect and all five are unfavorable. In all three columns the predominant pattern of gammas is unfavorable. These results provide no support for a claim that the delayed-effects of the Campaign have varied across the three first waves.

While the negative results described above are not desirable from the perspective of the Campaign, they are consistent with the similarly unfavorable results published in the last semi-annual report. However it was again important to make sure that the observed results were not an artifact of the complex adjustment procedures. While the adjustments for confounders were based in statistical theory, it would provide additional strength if the apparent results did not only appear at the end of that process. In Table 5-N, the overall results are presented again, unadjusted for confounder control, but incorporating NSPY sample weights.

Table 5-N. Exposure per month at Round 1 and outcomes at Round 2 among 12- to 18-year-olds who were nonusers of marijuana at Round 1- (data not corrected for confounders)

Outcome (average)		<1 exposure	1 to 3 exposures	4 to 11 exposures	12+ exposures	Gamma (95% CI)
Percent (Not) intending to use	General exposure	85.4%		80.1%	75.1%	**-.22* (-.31,-.14)**
	Specific exposure	85.7%	78.8%	74.9%		**-.20* (-.27,-.13)**
Attitudes/Beliefs Index (Mean score)	General exposure	106.5		91.2	83.6	**-.08* (-.11,-.05)**
	Specific exposure	102.3	94.7	81.3		**-.08* (-.11,-.04)**
Social Norms Index (Mean score)	General exposure	106.2		84.8	74.7	**-.13* (-.17,-.09)**
	Specific exposure	103.4	88.7	70.8		**-.12* (-.16,-.09)**
Self-Efficacy Index (Mean score)	General exposure	109.5		110.5	105.8	**-.05* (-0.10,-0.0)**
	Specific exposure	123.8	104.1	102.7		**-.09* (-0.14,-.04)**
Percent Initiation of Marijuana use	General exposure	10.6%		11.6%	14.1%	**.12* (.01,.23)**
	Specific exposure	10.4%	12.9%	13.8%		.09 (-.01,.19)
N	General exposure	1053-1068		993-1008	2345-2371	4390-4448
N	Specific exposure	957-972	1635-1655	1798-1821		4390-4448

* Significant at p < .05

These results make it clear that the unfavorable associations do not result from the procedures used to adjust for confounders. For both measures of exposure, and for all of the four cognitive outcomes and for general exposure with the measure of initiation of use, the relationship is unfavorable and

significant. Therefore, the pattern in Table 5-N is consistent with the unfavorable delayed-effects results found for the fully adjusted data. Indeed, in almost every case, the original association was less unfavorable to the Campaign after the confounder controls were introduced.

5.8 Summary and Discussion

In this chapter, a number of results were presented pertinent to direct Campaign effects on youth.[8] For each of the four cognitive indices plus reported use of marijuana, this report examined:
1) trends/changes from 2000 to the first half of 2002, 2) cross-sectional associations with both general and specific exposure, and 3) delayed-effects associations for the youth first interviewed in Waves 1, 2, and 3.

Chapter 4 presented the trends for marijuana use. There was no trend in marijuana use from the NSPY between 2000 and the start of 2002, neither overall nor for any of the age subgroups. The MTF findings through 2001 similarly showed no recent trend in use. However the just published NHSDA 2001 results suggested a significant increase in marijuana use for the population of 12- to 17-year-olds between 2000 and 2001 for all three indicators of use: lifetime, past year, and past month. The absolute size of the changes was small, and statistically detectable because of the NHSDA's large sample size. A change of a similar magnitude would not be detectable for NSPY.

This chapter presents the trends for cognitive outcomes to complement the use data from Chapter 4. The trends are significant for two of the outcomes (social norms and self-efficacy) for the entire youth population but in opposite directions, favorable to the Campaign for self-efficacy and unfavorable to the Campaign for social norms. In addition, there was an unfavorable effect for intentions for 14- to 18-year-olds, and an unfavorable effect on the attitude/belief index for youth who were at lower risk for marijuana use. However, trends alone, whether favorable or unfavorable to the Campaign, do not establish Campaign effect. Other forces may be affecting marijuana use in addition to the Campaign and influencing its upward or downward movement, regardless of Campaign effects.

The next step of analysis was to look at the cross-sectional associations between individual exposure to the Campaign and the several outcomes, as an additional strategy for sorting out Campaign effects. This analysis focused entirely on nonusers of marijuana at the time of the interview. The Wave 5 results largely confirm a pattern that was observed in the earlier reports from Waves 2 to 4. Scores on all of the cognitive outcomes did not vary systematically with levels of either the general or the specific exposure scale. No significant cross-sectional associations were observed, neither overall nor for any of the many subgroups examined, using the gamma coefficient as the criterion for a claim. None of the central analyses of effects supported a favorable Campaign effect and none supported an unfavorable effect on intentions, attitudes and beliefs, perceived social norms, or self-efficacy with regard to marijuana use, once the effects of potential confounders were removed.

The final step of the analysis utilized the availability of two rounds of measurement, 12 to 18 months apart, for the entire sample of youth. This made it possible to examine the association of exposure to advertising at the first measurement occasion (Round 1) and the subsequent scores on the outcomes, including the four cognitive outcomes, as well as marijuana use. This analysis was restricted to youth who were nonusers at Round 1, so the measure of marijuana use at Round 2 was effectively a measure of initiation of use. The delayed-effects results provided no evidence of a favorable Campaign

[8] Indirect effects mediated through parent exposure are presented in Chapter 6.

effect. On the contrary, all of the evidence from the delayed-effects analysis suggested either no Campaign effect, or an unfavorable effect. Three of the four cognitive outcomes showed an unfavorable significant association of exposure and outcomes for one or both of the exposure measures. The youth, who reported more exposure to Campaign advertising at Round 1, were more likely subsequently to show some intention to use marijuana and to report less self-efficacy to resist marijuana if it was available to them. However, they were not more likely to actually report more initiation of marijuana, once the full set of confounders were statistically controlled, nor were they more likely to report higher pro-marijuana scores on an index of beliefs and attitudes. The delayed-effects analysis suggests an unfavorable effect of the Campaign. The significant unfavorable effects on intentions, self-efficacy, and to some extent, social norms, have not yet produced statistically significant effects on marijuana initiation. However, those cognitive measures are very strongly predictive of subsequent marijuana initiation. Among nonusing youth, the odds of initiating use by Round 2 were 8 times as great for those who did not versus those who did say "definitely not" to the intentions question at Round 1. Thus these analyses do not support an inference of a favorable Campaign effect. In addition, there continues to be evidence that exposure to the Campaign predicts poorer, rather than better outcomes.

Can the results from the delayed-effects analysis be due to a statistical artifact? There are two logical threats to a causal claim that the Campaign produced an unfavorable effect. The first is that in the sheer complexity of the statistical analysis, with its adjustment for confounder effects, some error crept in and that the observed results are merely an artifact of that process. Multiple points argue against this theory. First, the fully weighted and controlled model provides similar results to a simple analysis of the uncontrolled data. The basic effects are all in the same direction. Second, the complex analysis has been undertaken with extended checks and quality control oversight.

There are two specific risks to causal inference associated with the analysis approach undertaken. First, is it possible that the potential covariates that were included in the analysis were not adequately controlled in the process? Second, is it possible that some unmeasured covariates could account for the observed negative association?

Propensity scoring is designed to remove the effects of confounding variables from the association between outcomes and exposures. It is possible to detect the success of that process by showing that the potential covariates do not vary across the adjusted exposure categories. This property is referred to as balance. If a confounder has been successfully balanced, it will have the same average score across all exposure levels, once propensity has been controlled. If confounders are not balanced, results can be biased. The ability to assess balance is an important advance of propensity scoring over traditional analysis of covariance (Rosenbaum and Rubin, 1984). A number of tests of balance were conducted for the overall data, as well as for the subgroups including age, race, gender, sensation seeking, risk-score, and wave. For each of these subgroups, the tests of balance were conducted on a large number of variables (more than a hundred variables, including some variables that were not in the original model). The analysis paid special attention to balancing variables that we considered to be substantively important. Overall, the number of covariates out of balance for the full sample and for the age subgroups were very few (fewer than 5% of the variables tested for balance).

The second threat is more substantive in character. Is it possible that there is some unmeasured covariate? Is there some variable not included in the propensity model that could have influenced recall of exposure to the television advertising at Round 1 and the outcomes at Round 2? An unmeasured covariate can bias the effect estimates even if all the measured covariates are perfectly

balanced. One can never be sure, of course. That is the difference between a randomized experiment and an observational study. It is always possible that some unmeasured characteristic accounts for an observed result.

However, such an unmeasured variable would have to have a particular character. The obvious possibility would be that youth with more interest in marijuana, with more positive beliefs and perceived social norms, pay more attention to the advertising. However, insofar as this can be examined, that does not appear to be a viable explanation. Baseline data are lacking on many of the cognitive measures for the youth who were just 9- to 11-years-old at Round 1, and these make up a substantial portion of the 12- to 13-year-olds at Round 2. Therefore, control could be implemented for these baseline cognitions only for the older youth. However, these Round 1 cognitions do not account for the observed unfavorable effect. There is no cross-sectional association between exposure and the outcomes. Thus the unmeasured variable would have to be one that suggests that youth who reported high exposure at Round 1 would have had a different trajectory regardless of that exposure, that the exposure was only an indicator of the already present tendency to move toward a more pro-drug position. The difference in trajectories would have to be not associated with any of the other variables that were measurable at Round 1, including projected risk of drug use, which predicted a great deal of the transition to drug use, and which was not associated with exposure levels.

This unmeasured covariate problem is related to the internal validity threat of *selection-maturation* (Cook and Campbell, 1979), which often must be confronted in quasi-experimental studies of youth. Here, such a threat occurs if the highest exposure groups have differential rates of "normal growth" between Round 1 and Round 2. Practically speaking, this is likely to occur if the measured variables do not fully capture the "selection" process producing the various exposure levels. Thus far there is no specific evidence that this is true, although it may be. Given the above findings, the evaluation team must proceed with caution, but with the recognition that the relationship has not been rejected by the challenges to it undertaken thus far.

How can it be that there is no significant trend in marijuana use, and there is no significant cross-sectional association of specific exposure and outcomes, but there is a robust unfavorable delayed-effects association? The following paragraphs offer some speculations.

Trend effects are, in fact, partly consistent with an unfavorable Campaign effect. There was evidence for an unfavorable, overall trend in social norms, and an unfavorable trend in intentions for 14- to 18-year-olds. Also, the newly published NHSDA results suggest that there was a small increase in marijuana use between 2000 and 2001, an increase that would not have been detectable with the NSPY sample. However, the favorable trend on the self-efficacy index is not consistent with the evidence for an unfavorable delayed-effects on the same outcome.

A more difficult inconsistency has to do with the failure to find any cross-sectional association between either measure of exposure and any of the cognitive outcomes. How can it be that there is an unfavorable delayed-effects but no cross-sectional association? The limited sets of analyses performed to investigate this issue have not yet provided a good answer.

There is then some difficulty, certainly, in reconciling the full set of results. The inference logic set at the outset asked for three mutually supportive results to make a claim for positive Campaign effects: a favorable trend, a favorable association, and evidence for a favorable delayed-effects. Obviously these have not been found, and thus there are no grounds to make a claim that the Campaign has had a

favorable effect on youth thus far. Still, if those same criteria were applied to claiming unfavorable Campaign effects, they have not been met for that purpose either.

Despite the above uncertainties, there is one more problem to address. How could it be that the Campaign could have produced an unfavorable effect? Through what mechanism could the Campaign have produced such an effect on intentions (both exposure measures), perceived norms (general exposure only), and perceptions of self-efficacy (specific exposure only)? The theory underlying the Campaign and the evaluation were all about the process of producing anti-drug beliefs and behavior. At this point in the evaluation, any explanation for the observed result is based on speculation.

Some of the strongest results relate to social norms. There are unfavorable trend and delayed-effects of general exposure present for that outcome for the entire population. At the same time, there is a strong delayed effect of specific exposure on self-efficacy. Is it possible that the Campaign, while its explicit message is anti-drug, provides a second implicit message—that drugs are a big problem and their use is widespread? The Campaign's communication plan had proposed using messages that would say that most kids don't use drugs. But, in fact, there were very few messages broadcast during Wave 1 through 3 that put this idea forward. Contrarily, the messages that were broadcast—negative consequences (20%), normative positive consequences (56%), and resistance skills (32%)—all have as an implicit assumption that drugs are a problem. Is it possible that youth took from these messages that drug use is expected behavior, and that resistance to drug use (as measured by self-efficacy) may be difficult given its pervasiveness?

A second speculation is that youth do not like being told what to do. The more they are told what to do the more resistant they are to the messages. A body of psychological theory refers to this phenomenon as "reactance." The more heavily exposed to the ads youth were, the more resistant to their ideas they became. As far as we know, there has not been prior evidence of reactance in published evaluation of campaigns. Snyder (2002) published a meta-analysis of 48 behavior change programs that made use of mass media. None of them showed an unfavorable effect. All of the evidence supporting this reactance hypothesis has come from experimental studies. Nonetheless, it may be possible that youth have gotten so much anti-drug information from school and elsewhere that their response to this extra exposure has been to go in the opposite direction.

5.8.1 Conclusion

Overall, the results are mixed. Some are consistent with no Campaign effects on youth, while some, particularly the delayed-effects analyses, are consistent with an unfavorable effect. This report did not find any evidence that the unfavorable effects were restricted to one of the periods of the Campaign. The previous report was based on only about 40 percent of the current sample, and at that time it was promised that the current report would provide a more definitive determination. By and large the current report sustains the unfavorable results from the previous one. The major exception is the lack of statistically significant evidence now for an unfavorable prediction of marijuana initiation for any subgroup once the full confounder set is controlled. An unfavorable result is a surprising result, both because it was unexpected for the Campaign and because it has no real precedent in the published communication campaign literature. Explanations presented for a possible unfavorable Campaign effect are speculation with only a small amount of empirical support.

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