

Vermonters Awareness, Knowledge and Opinions of
Genetic Modification
Vermont Poll 2004

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Introduction

Genetic modification¹ of food has created controversy in U.S. policy for over two decades, raising questions about food safety, environmental impact, and ethical implications. Reports on the use of genetically modified organisms (GMOs) in the food system estimate that 70% of the nation's manufactured foods currently contain genetically modified ingredients (e.g., Brown, 2003). While genetically engineered foods have become much more prevalent in the United States in the past decade, many consumers remain uninformed about the topic, unaware of GE pervasiveness in the food industry and conflicted in their attitudes toward genetic modification.

Consumer awareness of GMOs in the U.S. peaked in 1999 with 53% of Americans having heard about genetic engineering (GE) (Hoban, 2001). A more recent study showed the nation's awareness to have declined to only 34% in 2003 (Pew, 2003). While consumer knowledge and awareness has been generally low, studies have found mixed attitudes toward GE technology. One survey reported that 66% of consumers would support GE foods that were insect protected (IFIC, 2004), while another found only 25% of consumers to be supportive of GMO use in general (Pew Initiative, 2003).

Some research suggests that receiving more information about GMOs reduces a consumer's opposition to GMO use. Hoban and others found a connection between opposition to genetic modification and lower levels of GMO awareness (Hoban et al, 1992). Groups that oppose genetic engineering, however, have provided information to the public to increase awareness of the possible risks related to GE food. Consumer opinion toward genetic modification likely reflects the degree to which consumers associate benefits or risks with this relatively new but increasingly common food production technique (Schilling et al, 2002).

The questions surrounding consumer awareness, knowledge and opinion of GMOs have grown in importance as states and the federal government consider requiring companies to disclose GMO information to the public. How individuals use their awareness and knowledge to form opinions about genetic modification is an important area to understand from multiple perspectives. This paper examines data from a survey of Vermonters to gain an understanding of this population's awareness, knowledge and opinions about genetic engineering. We investigate whether Vermonters' awareness and knowledge about genetic modification influences them to hold specific attitudes toward GMO use and labeling.

Methods and Data

The data used in this report came from this year's Vermont Poll, a telephone survey conducted annually by the Center for Rural Studies at the University of Vermont. The 2004 Vermont Poll asked residents questions on issues related to public policy in Vermont as well as questions about demographics. Trained and supervised interviewers administered the survey using Computer-Aided Telephone Interviewing (CATI) software. The survey took place between the hours of 4:00pm and 9:00pm during February 2004. Telephone numbers were selected through random digit dialing from a list of all Vermont households with active, land-based phone lines. The survey required its respondents to be Vermont residents who were 18 years of age or older. The sample was statistically representative of the adult Vermont population with a 95 percent level of confidence.

The sample contained 693 respondents, and 646 of those who were called completed the entire survey. Forty-five percent (45%) of the sample were male, and 55% were female. The average age in the sample was 50 years old. The median household income category was \$35,001 to \$50,000. The median education level completed was some college with no degree, and 41% of respondents reported completing a bachelor's

¹ Genetic modification, a method used to create certain desired traits in plants and animals, involves combining genes from different organisms to directly change the traits or qualities of an organism. The term "genetic modification" is used interchangeably with GM, genetically modified organisms, GMOs, genetically engineered food or GE food, among others (Schilling et al, 2002).

degree or higher. The majority of households consisted of two adults, with only 37 percent of respondents with one child or more in the house.

Analysis

Our study examined responses to eight questions about genetic modification from the 2004 Vermont Poll. Three questions concerned the respondent's awareness of GMOs; three questions asked about the respondent's knowledge about GMOs; and, two questions surveyed the respondent's opinions on GMO issues. We used the Poll's questions on demographics to obtain information on age, education, family type, gender and income.

We used the information generated from the questions mentioned above to:

1. *Determine the level of Vermonters' awareness and knowledge about genetic modification*
2. *Identify the characteristics of Vermonters who are aware and knowledgeable about GMOs*
3. *Examine Vermonters' opinions of GMO use in food and GMO seed labeling*
4. *Investigate how GMO awareness and knowledge influences on GMO opinions*

When we looked at the questions related to changes in knowledge, awareness, and media attention over the last five years, we excluded respondents who previously answered that they had not heard the term "GMO."

References to "significance" values for various results indicate that, based on the data from our sample, the results we found could be considered true for the Vermont population at specific levels of confidence. A significance value of 0.10 means that 90% of the time, one could expect to find the same relationship in the Vermont population as a whole. Significance values of 0.05 and 0.01 indicate 95% and 99% levels of confidence, respectively.

Results

Awareness

Three questions were used to assess Vermonters' awareness of genetic engineering: had the respondent heard of GMOs, did the respondent's awareness increase over the last five years, and did the respondent believe that the media's attention to GMOs had increased in the last five years.

Two thirds (67%) of Vermont respondents reported that they had "heard the term 'genetically modified organism' or 'GMO'," while 33% had not heard the term or did not know if they had. About 74% of Vermonters surveyed reported an increased awareness of GMOs during the past five years, while 62% of Vermonters believed that media attention to GMO issues had increased during the same period.

An increase in awareness makes intuitive sense, as well-known GMO cases such as the StarLink corn contamination, drafting of EU labeling laws, and the unveiling of Golden Rice occurred in the last five years. In spite of reported media attention increases, the percentage of Vermonters who reported that they had heard the term "genetically modified organism" or "GMO" had decreased 11% since 2000, dropping from 79% to 68%. The question wording has not changed (Center for Rural Studies, 2000).

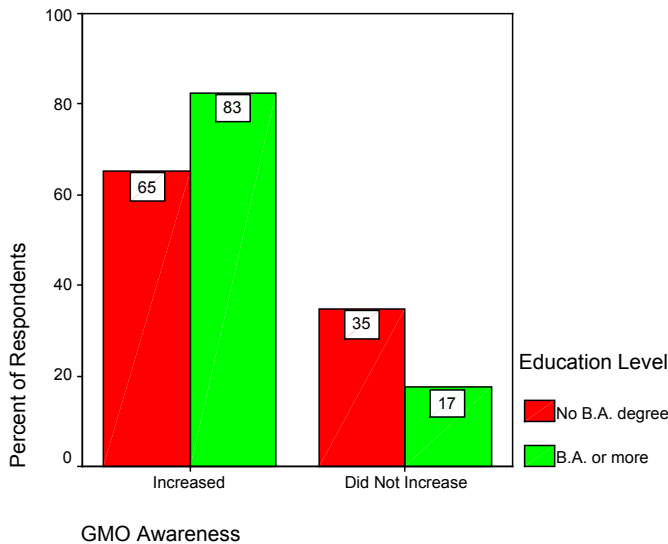
Awareness & Demographics. To evaluate whether Vermonters' awareness of GMOs was influenced by their demographics, we looked at the education, income, age and family type of our respondents. Overall, respondents with higher levels of education were more likely to report higher levels of awareness about GMOs. Specifically, we found:

- 79% of Vermonters with a bachelor's degree or higher said they had heard the term GMO while 58% of those without a bachelor's degree had heard the term (significance <0.001);

- Those with a bachelor's degree also appeared more likely to report an increase in awareness than those without a bachelor's degree (Figure 1);
- Respondents with more household income (more than \$35,000) were more likely to have heard of a GMO (significance <0.001) and more likely to report increased awareness than respondents with lower incomes (significance = 0.05)²; and,
- Vermonters with a bachelor's degree or higher were also more likely to say that media attention to GMOs had increased (significance = 0.05) compared to those without a bachelor's degree.

Based on our Vermont sample, families with children did not appear to be more or less aware of GMOs compared to families without children. The age of the respondent also did not appear to be related to the respondent's awareness of GMOs.

Figure 1: Change in GMO Awareness vs. Education Level
(n=402, significance < 0.001)



Source: Center for Rural Studies, University of Vermont, 2004 Vermont Poll

Knowledge

Our examination of Vermonters' knowledge about GMOs considered both *actual* knowledge and *perceived* knowledge. Actual knowledge was measured by asking the respondent to correctly define the term "genetic modification" and to estimate the percentage of GMOs in commercial food. To measure perceived knowledge, we used the question asking respondents whether their knowledge about GMOs had increased in the last five years.

The correct definition of the term "genetic modification" is an alteration of genes that would not occur naturally, while the incorrect definition was a broad description that would include many biotechnology methods. While 67% of respondents had heard the term "GMO," only 63% of those who had heard the term knew how to correctly define "genetic modification." Thus, only 42% of the total sample could correctly define GM (those who had not heard the term were not asked to define it) (Table 1).

² Preliminary analysis conducted by the authors also showed that those with higher levels of education frequently had higher incomes.

Table 1. Ability to Define the term “Genetic Modification”

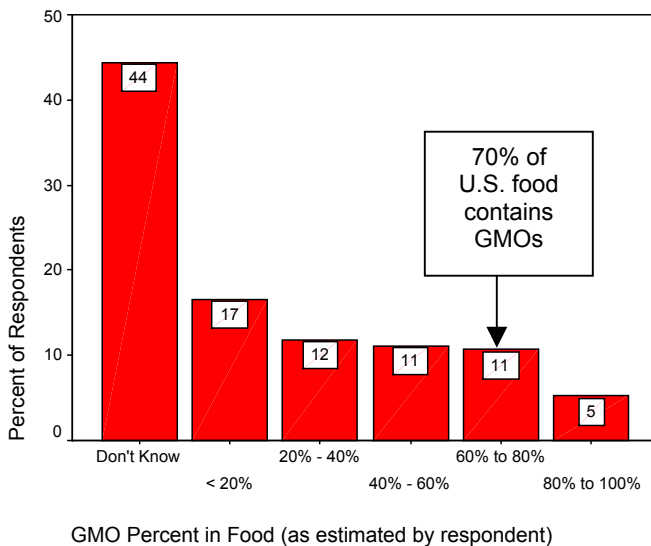
Definition of GM	Frequency	Percent
<i>Correct:</i> “the selective, deliberate alteration of genes . . .that would not naturally occur in nature or through traditional breeding”	267	63.1%
<i>Incorrect:</i> “the movement of genes . . .that may or may not occur naturally or through traditional breeding”	85	20.1%
Don’t Know	71	16.8%
<i>Total</i>	423	100%

Source: Center for Rural Studies, University of Vermont, 2004 Vermonter Poll

When asked if their knowledge of GMOs had changed in the last five years, 57.5% of Vermonters believed that their knowledge about GMOs had increased. Furthermore, more people who claimed to have increased knowledge both thought that they knew the definition of genetic modification (did not choose “Don’t Know”) and in fact did know the correct definition answer compared to those who said their knowledge did not increase. This result shows a connection between perceived knowledge and actual knowledge.

When asked how much of the processed food in the U.S. contained GMOs, 44% of respondents answered “Don’t Know” while only 11% gave an answer close to the correct amount (about 70% of food in the U.S. contains GMOs) (Figure 2).

Figure 2: Knowledge of Percentage of GMOs in Food (n=421)



Source: Center for Rural Studies, University of Vermont, 2004 Vermonter Poll

Respondents who reported an increase in knowledge more often guessed a percentage of foods (i.e., did not choose “Don’t Know”). The same group, however, more often gave an incorrect percentage (not within 10% of the correct amount) compared to those who did not report a knowledge increase. This result shows less of a connection between perceived knowledge and actual knowledge.

Knowledge and Demographics. When comparing Vermonters who chose the correct definition of a GMO to those who chose the incorrect definition (excluding those who said “Don’t Know”), we did not see similar demographics amongst those who were knowledgeable about the definition. However, when we looked at those who knew the correct definition compared to *everyone else* (by including respondents who said they didn’t know, i.e., “Correct” vs. “Incorrect/Don’t Know”), we found:

- Vermonters with a B.A. degree or higher appeared more likely to know the correct definition (68%) than those without a B.A. degree (58%) (significance < 0.05);
- Those with children in the household were slightly more likely to know the definition of a GMO (67%) compared to those without children (60%) (significance = 0.09)

Sixty-four percent (64%) of respondents with a bachelor's degree or higher reported that their knowledge of GMOs increased over the past five years compared with 51% of those without a bachelor's degree (significance<0.01). Respondents with more education overall were also more likely to report that their knowledge of GMOs increased (significance=0.017).

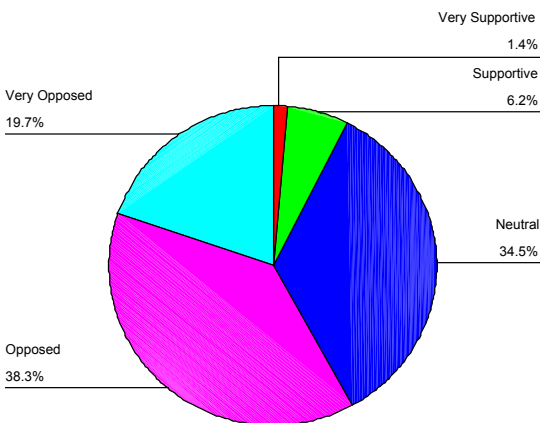
Interaction Between Media Attention and Knowledge. Noticing increased media attention to GMOs did not necessarily imply that Vermonters became more knowledgeable about GMOs. Vermonters who thought media attention to GMOs increased were more likely to report that their knowledge about GMOs increased (68%) compared to those who reported no increase in media attention (42%) (significance < 0.001).

Respondents who said that media attention to GMOs increased, however, did not appear more likely to have more *actual* knowledge about GMOs. They were not more likely than others to know the correct definition of 'GMO', nor did they appear more likely to know the correct percentage of GMOs in commercially available food.

GMO Opinions

Vermonters' attitudes toward GMOs were examined in two questions using a scale ranging from very supportive to very opposed. In the first question, Vermonters were asked how supportive they were of the use of GMOs in commercial foods. Fifty-eight percent (58%) of Vermonters were opposed or very opposed to the use of GMOs in food (Figure 3).

Figure 3: Support/Opposition for GMO Use in Food (n=580)



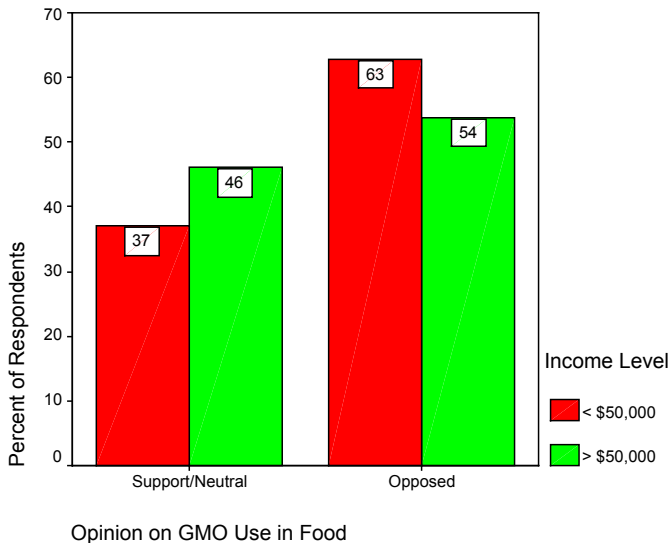
Source: Center for Rural Studies, UVM, 2004 Vermonter Poll

Opinion on GMO Use and Demographics. We next looked at which Vermonters opposed the use of GMOs in food, and which Vermonters were supportive or neutral to GMO use. We found:

- Respondents whose incomes were above \$50,000 less likely to oppose GMOs in commercially available food (54%) compared to those making below \$50,000 who were opposed (63%) (Figure 4); and,
- More women (62.2%) than men (53.2%) opposed GMOs in food (significance = .030)

Neither educational attainment, age, nor the presence of children in the household demonstrated any influence on GMO use in food.

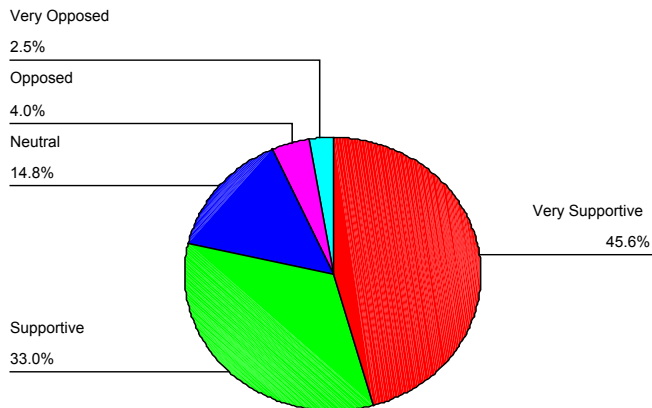
Figure 4: Opinion on GMO Use vs. Income Level
(n=503, significance < 0.05)



Source: Center for Rural Studies, University of Vermont, 2004 Vermont Poll

The second question concerning Vermonters' opinions about GMOs asked respondents whether genetically engineered seed for farmers should be labeled as such. More than three quarters (79%) of Vermonters were supportive or very supportive of the labeling of genetically modified seed (Figure 5). The proportion of Vermonters that support seed labeling is relatively high when compared to the percentage of consumers nationally who support GMO food labeling. This outcome could be related to a proposal to label GMO seeds that was being discussed by the Vermont state legislature at the time of the 2004 Vermont Poll (Rathke, 2004).

Figure 5: Support for Labeling GE Seed for Farmers (n=594)



Source: Center for Rural Studies, University of Vermont, 2004 Vermont Poll

Opinion on GMO Seed Labeling and Demographics. While most Vermonters supported the labeling of GMO seed for farmers, respondents with a bachelor degree or higher were somewhat more likely to support GMO seed labeling (84.2%) compared to those without a bachelor's degree (74.8%) (significance = 0.006). Neither income, age, nor the presence of children appeared to influence respondents' attitudes toward GMO seed labeling.

Relationship between GMO Awareness/Knowledge and GMO Attitudes

In this section, we tried to understand whether greater awareness and knowledge about GMOs led to particular opinions about GMOs.

Influence of Awareness on Opinion. Of the three measures of awareness—having heard of a GMO, reporting increased awareness of GMOs and perceiving an increase in media attention to GMOs—reporting an increase in awareness had the most influence on GMO opinions. Respondents who said they experienced an increased awareness about GMOs (64%) were more likely to oppose GMO use in food compared to those who did not report an awareness increase (significance<0.001). Similarly, respondents who said their awareness to GMOs increased were more likely to support GMO seed labeling (85%) compared to those without increased awareness (74%) (significance<0.05).

There was no apparent relationship between whether one had heard of a GMO and whether one opposed GMO use in food. Those who had heard of a GMO, however, were more likely to support GMO seed labeling for farmers (81.5%) than those who had not heard of a GMO (72.5%) (significance =0.016).

Our data did not suggest any connection between those who thought media attention to GMOs had increased and whether they opposed GMO use. We also did not find a connection between perceived increases in media attention and support for GMO seed labeling, even though a considerable amount of media attention concerning a Vermont proposal for GMO seed labeling occurred during the months and weeks leading up to our survey.

Influence of Knowledge on Opinion. Vermonters with greater actual and perceived knowledge were more likely than others to oppose the use of GMOs in food. All three of our measures of GMO knowledge appeared related to Vermonters' opposition to GMO use.

- 63 % of those who correctly defined “genetic modification” opposed GMOs in food, while 43% of those who did not correctly define the term opposed GMOs in food (significance = 0.001).
- Those who opposed GMO use estimated that 49.2% of processed food in the U.S. contained GMOs (higher and closer to the correct amount of 70%) compared to 36.5% estimated by those who did not oppose GMO use (lower and farther from the correct percentage).
- Vermonters who reported increased knowledge were more likely to oppose GMOs (64%) compared to those who did not report increased knowledge (50%) (significance value = 0.004).

Likewise, Vermonters with more GMO knowledge seemed more likely to support GMO seed labeling. Eighty-four percent (84%) of individuals who reported a knowledge increase supported GMO seed labeling compared to 73% of those who did not say their knowledge increased (significance < 0.005). There was no significant difference between the percentages estimated for GMOs in food when comparing those who supported GMO seed labeling and those who did not.

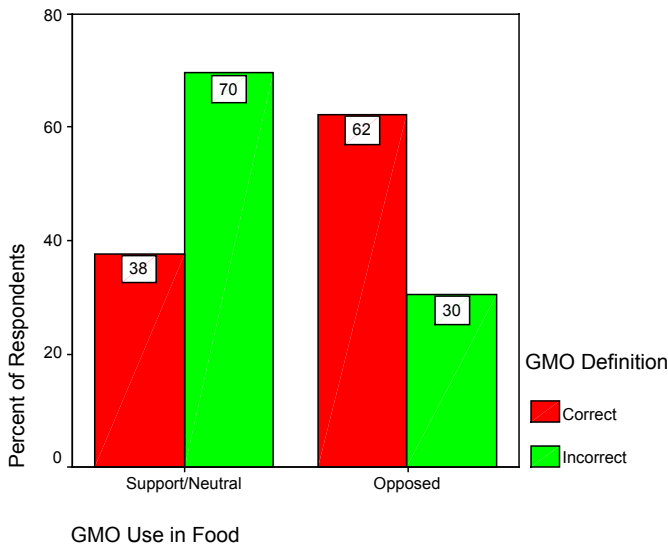
The Effect of Income on Knowledge and Opinion. At this point in the study, a contradiction in the results became apparent. Overall, Vermonters with more education and higher incomes appeared to be those with greater awareness and knowledge about GMOs. Our data also suggested that greater awareness and knowledge influenced people to oppose GMO use in food and to support GMO seed labeling for farmers. Meanwhile, our analysis of the characteristics of people with different GMO opinions showed that respondents with *greater* household income were more likely to be *less opposed* to GMO use. This led to the following analysis.

Given the lower opposition to GMOs shown by those with higher incomes, we set out to examine the higher income group separately to determine whether possessing information and forming opinions differed somehow for the high-income group compared to our total sample of Vermonters. Our initial results suggested that increased knowledge might have a connection with the higher income group's greater acceptance of GMOs. Those with higher incomes were more likely to have more education, and those with higher incomes were more likely than others to report an increase in GMO knowledge.

The high-income group was defined as Vermonters with household incomes greater than \$50,000. The sample size for this group equaled 258. Sixty-one percent of the high-income group had a bachelor's degree or higher, while only 24% of the remaining income groups had this level of education. Seventy-seven percent of the high-income group had previously heard the term “GMO” while 63% of those earning less had heard the term.

Our analysis of the high-income group looked at the relationship between actual and perceived knowledge about GMOs and opposition to GMO use in food. In the high-income group, more respondents who could define GM voiced opposition to GMOs in commercially available food (significance < 0.001). This result paralleled the findings for the total sample. High-income respondents who opposed GMOs in food estimated (on average) that 48% of processed food in the U.S. contained GMOs while those who were neutral or supportive to GMO use estimated only 36% (both lower and further from correct amount of 70%) (significance value = 0.021). Both of these results support the idea that more actual knowledge about GMOs leads to more opposition to GMO use (Figure 6).

Figure 6: Knowledge of GM Definition vs. Opinion on GMO Use
High Income Group (> \$50,000)
(n=160, significance < 0.001)



Source: Center for Rural Studies, University of Vermont, 2004 Vermonter Poll

More than half of Vermonters in higher income households who reported increased knowledge (56.3%) also opposed GMOs in food, while only 43% of those who did not report increased knowledge opposed GMOs (significance = 0.069). We observed the same relationship between increased knowledge and opposition to GMOs in our total sample of Vermonters, but the results appeared slightly stronger for the whole sample (significance = 0.004).

The closer analysis presented here failed to find that individuals with higher incomes use information differently to form opinions about GMOs. Having more knowledge about GMOs and believing one's knowledge about GMOs has increased in recent years seems to be related to greater opposition to GMO use in food for both high income households and Vermonters overall. More study may be needed to fully understand why high income respondents in our total sample appeared less opposed to GMO use than respondents with lower incomes.

Conclusions

Two thirds of Vermonters had heard of GMOs, and most of them believed their awareness about GMOs had increased in recent years. More than half of those surveyed also said they noticed an increase in media attention toward GMOs. According to results from the 2004 Vermonter Poll, however, the proportion of people who had heard the term "GMO" has fallen compared to the 2000 Vermonter Poll.

The decrease in people who recognize the term GMO suggests that if media attention has in fact increased, then that increase has not translated into broader awareness. Greater media attention and lower measured awareness of genetic modification presents a paradox that will require further study.

A greater percentage of Vermonters believe their knowledge about GMOs has increased compared to the percentage of Vermonters who have actual knowledge about GMOs. More than half of Vermonters believed their knowledge about GMOs had increased in the past five years. Less than half of the respondents, however, knew the correct definition of "genetic modification." Furthermore, very few Vermonters seemed to know the extent to which GMOs are currently used in the U.S. food industry.

Vermonters with more education and income were more likely to report having greater awareness and knowledge about GMOs. Those with more education also were more likely to have *actual* knowledge about GMOs (i.e., to know the definition of GMO). We did not find, however, that those with more income possessed more actual GMO knowledge than those with less income.

While 58% of Vermonters opposed the use of GMOs in commercial food, more than one third of Vermonters were neutral toward the use of GMOs. This result may reflect consumers' efforts to process both positive and negative perceptions about GMOs. Consumers may support the potential benefits of GE technology and simultaneously have concerns about the potential risks of using genetic modification in food production.

Vermonters overwhelmingly supported the labeling of GE seeds for farmers. Even amongst those who had not heard of genetic modification prior to the 2004 Vermont Poll, the majority of respondents were supportive of the collection and provision of this information. While GE seed labeling received widespread approval by Vermonters, residents with greater educational attainment were even more likely than those with less education to support seed labeling.

The depth of GMO knowledge that an individual acquires may influence the degree to which this knowledge affects opinion. For the individuals in the high income group, knowing a specific fact about genetic modification (definition of the term) had a much stronger correlation to opposing GMO use than did reporting a generally increased knowledge level. Based on the Vermont Poll data, however, we could not conclude that increased knowledge leads to either consumer rejection or acceptance of GMO food products. The results from our analysis of the high income group illustrated that other factors (perhaps income alone, or perhaps other variables combined with income) inform opinions.

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References

Brown, J.L., & Ping, Y. (2003). Consumer perception of risk associated with eating genetically engineered soybeans is less in the presence of a perceived consumer benefit. *Journal of the American Dietetic Association*, 103(2), 208-215.

Center for Rural Studies. (2000). *Attitudes towards genetically modified organisms*. Retrieved April 2004 from the University of Vermont, Center for Rural Studies website: <http://crs.uvm.edu/vtrpoll/2000/gmo>.

Hoban, T.J. (2001, March 6). American consumers' awareness and Acceptance of Biotechnology. Paper presented at NABC Winter/Spring Council Meeting, Washington, D.C.

Hoban, T.J. (1999). Public perceptions and understanding of agricultural biotechnology. *Economic Perspectives*. Retrieved April 2004 from the U.S. Department of State website: <http://usinfo.state.gov/journals/ites/1099/ijee/bio-hoban.html>.

Hoban, T.J., Woodrum, E., & Czaja, R. (1992). Public opposition to genetic engineering. *Rural Sociology*, 57 (4).

International Food Information Council. (2004). *Support for food biotechnology stable despite news on unrelated food safety issues*. [Executive summary] Retrieved April 2004 from <http://www.ific.org/research/biotechres03.cfm>.

Pew Initiative on Food and Biotechnology. (2003). *Americans' knowledge of genetically modified foods remains low and opinions on safety still split*. Retrieved April 2004 from <http://www.biotech-info.net/knowledge.html>.

Rathke, L. (2004, April 7). Vermont house passes GE seed labeling and farmer protection. *Associated Press*.

Schilling, B.J., Hallman, W.K., Adelaja, A.O., & Marxen, L.J. (2002). *Consumer knowledge of food Biotechnology: A Descriptive Study of U.S. Residents*. Retrieved April 2004 from Rutgers University, Food Policy Institute website: <http://foodpolicyinstitute.org/publicationsall.php>.