

A modified method of estimating the postsecondary enrollment rates of recent Vermont high school graduates: Class of 2007 Senior Survey

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The Vermont Student Assistance Corporation (VSAC) conducts a biennial survey of Vermont's high school graduates. Since its inception in 1978, the "Senior Survey" was designed to determine the post-high school plans of high school graduates, and to examine the factors that might influence post-high school activities.¹ This paper will present the methodology used in, and findings from, the Class of 2007 Senior Survey. Specifically, unlike previous Senior Surveys, the study used a stratified, random sample, with multiple points of contact and incentives to estimate college-going rates. The modifications in this study were intended to evaluate the impact of non-response bias in the traditional methodology as well as assess the utility of a new methodology for estimating college-going rates.

Data for the Senior Survey study are collected at two points in time; the first survey (Wave 1) takes place in the senior year and collects information pertaining to students' plans after high school. This survey, known as the In-School Senior Survey, is administered at public and private high schools throughout the state, as well as at high schools in New York and New Hampshire that serve Vermont residents. Historically, response rates on the Wave 1 surveys have ranged from 73 percent to 87 percent.

The second survey (Wave 2), conducted one year after high school graduation, collects information about students' actual activities after graduation. The Wave 2 questionnaire is mailed to students who participated in the Wave 1 survey. Since 1996, Wave 2 data collection has been supplemented by telephone interviews with students who do not respond to repeated mailings. Response rates on Wave 2 surveys, known as

¹ Copies of the survey instruments for the Class of 2007 are available from the VSAC Research Department.

the Follow-Up Senior Survey, have ranged from 66 percent (most recently in 2005) to 85 percent (in 1997).

Data from the Wave 2 Senior Survey are used to estimate the college-going, or continuation, rate of Vermont high school graduates.² The continuation rate is computed by taking the number of students from the Wave 2 survey who self-report immediately enrolling in some form of postsecondary training or education program and dividing it by the number of students who completed the Wave 1 Senior Survey. So, for example, the college continuation rate for the Class of 2005 was 70.0 percent, or:

$$\frac{4,271 \text{ college-goers}}{6,105 \text{ high school graduates originally surveyed}} = 70.0\%$$

Other published estimates of Vermont's college-going rate have varied somewhat from those reported in the Senior Survey. While it is not uncommon that estimates will vary among studies using different methodologies (see National Center for Public Policy and Higher Education, 2006 on differences in published national high school completion rates), the Senior Survey's estimate has been consistently higher than those reported elsewhere. Differences in the published rates can be attributed to several factors. Fundamentally, the differences are based in how the rates' numerator (number of college-goers) and denominator (number of high school graduates) are defined and derived. Table 1 lists and describes the most commonly cited continuation rates for Vermont, and how they differ.

The Numerator

Students who continue their education after graduating from high school have a wide range of education and training options available to them. The Senior Survey classifies a student who pursues any form of training or education in the autumn following high school graduation as a "college-goer" in the calculation of the continuation rate, as the numerator. This includes taking a single course to improve job skills, as well as attending foreign postsecondary institutions. The postsecondary participation estimate published in Postsecondary Education OPPORTUNITY (PEO;

² High school graduates who participate in the survey reside in Vermont, but attend schools in New Hampshire and New York as well as Vermont. This is an important distinction because other estimates are based on Vermont high schools exclusively, but without eliminating non-residents from the count.

Mortenson, 2008) is limited to enrollment in a bachelor's, associate's, or certificate program at Title-IV-eligible institutions in the United States. This method, by definition, excludes students attending Canadian and other international postsecondary institutions, as well as students participating in non-Title-IV-eligible job training or certification programs.

Another estimate (Quality Counts, 2007) adds age in its criteria for the numerator. Quality Counts includes 18- to 24-year-old students who are currently enrolled at, or who have already graduated from, any postsecondary college, regardless of where the institution is located, as college-goers in its postsecondary participation rate.

The Denominator

The pool of possible college-goers, as expressed in the denominator, also differs among the competing estimates. As noted above, researchers (Quality Counts, 2007) have based it on the predominant college-going age range without considering when young adults might have graduated from high school. Therefore, students who might have waited several years after graduating from high school to pursue postsecondary studies are included in the pool of college-goers. The more commonly cited estimate, however, uses the number of students who have obtained a high school diploma or GED within 12 months of the beginning of a specific postsecondary academic year (PEO, 2008). In contrast, VSAC's denominator is based on a cohort of Vermont residents who graduate from high school in a specific year (i.e., the Class of 2007).³

Another source of variability in the denominator stems from the manner in which original data sources are used to derive the college-going estimate. Specifically, PEO (2008) uses information drawn from the State Non-fiscal Survey of Public Elementary/Secondary Education and the Private School Universe Survey, two independent federal surveys conducted by the National Center for Education Statistics (NCES), to obtain the total number of high school graduates (from public and private high schools located within the state) for a given year.

³ Vermont students who earned a GED are not included in the population studied in the Senior Survey. This is not insignificant; there were 643 GEDs awarded in Vermont in the 2007 calendar year. <http://www.acenet.edu/Content/NavigationMenu/ged/pubs/2007ASRfullreport.pdf>

Table 1. Recent Postsecondary Continuation Rates for Vermont, by Source

<i>Source</i>	<i>Continuation Rate</i>	<i>Source of Data</i>	<i>Year</i>	<i>Continuer defined as:</i>
VSAC Senior Survey, 2006	Senior Survey Continuation Rate: 70.0	Self-report survey data	2005	Vermont resident who enrolls in any form of postsecondary training program immediately after graduation from a public or private high school (HS can be in VT or in a border state)
Postsecondary Education OPPORTUNITY (PEO), 2008	College Continuation Rate: 55.0 Chance for College by Age 19: 43.8	Secondary analysis of data from three NCES programs: a) IPEDS, Fall 2006 b) Common Core of Data (CCD) "State Non-fiscal Survey of Public Elementary/Secondary Education, AY 2005-06" c) Private School Universe Survey, AY2004-05	2006	Student who graduates from a Vermont high school and is reported to be a Vermont resident by a qualifying postsecondary institution; must be enrolled as a degree-seeking student, must have graduated or obtained a GED within 12 months of enrolling (students attending 2- and 4-yr postsecondary institutions, as well as certificate-granting programs are included) Person who by age 19 is enrolled as a degree-seeking student (includes public high school dropouts in the analysis)
Quality Counts 2007	Postsecondary Participation Rate: 49.9	Secondary analysis of data from U.S. Census Bureau's American Community Survey	2005	Adult aged 18 to 24 enrolled in a postsecondary program or with a postsecondary credential

The state of Vermont has five private high schools that technically serve as the public high schools in towns without one. Data from these high schools are reported in both federal surveys. By combining the count of graduates from public high schools with that of the private high schools obtained from the two federal sources, the PEO method double-counts a student who graduated from one of the five private high schools serving this dual role.⁴ This method has consistently overstated the number of Vermont high school graduates, sometimes by as much as 1,000.⁵ In a state that produces approximately 7,500 high school graduates each year, the difference between using 7,000 or 8,000 as the denominator reduces the continuation rate by nearly 15 percent. Using the Class of 2005 continuation rate as an example, the overstated number of high school graduates results in an estimated continuation rate of 61percent.⁶

Unlike the PEO data drawn from institutional surveys, the Senior Survey is based on self-reported data. As such, the estimate is subject to another source of variability that may affect VSAC's estimates of the continuation rates: non-response bias. VSAC has undertaken efforts to gauge the extent of this bias. There is some evidence of non-response bias in the one-year follow-up survey of recent high school graduates. The continuation rate of students who responded to the mail survey in Wave 2 is higher than the rate of those who could be considered to be non-responders, students who completed a telephone interview after having received up to three mailings.⁷ For example, the overall continuation rate for the Class of 2005 was reported as 70.0 percent. However,

⁴ Adding to the source of variability is the fact that the Private School Universe Survey is conducted biennially while the CCD data are collected annually. Again, for PEO's 2006 estimate, the number of Vermont's Class of 2006 public high school graduates was added to the number of Class of 2005 private high school graduates.

⁵ For more on the differences between the Mortenson and VSAC methods, see Arce, W. & Giles, S. (2009). *A comparison of Postsecondary Continuation Rate Estimates among Recent Vermont High School Graduates*. Winooski, Vermont: Vermont Student Assistance Corporation.

⁶ The nearly 15 percent comes from $8000/7000=1.143$, which is the percentage decrease that would result from the increased denominator. The nearly 61 percent comes from the actual value of a 15 percent decrease from the Class of 2005 continuation rate of 70 percent.

⁷ For some schools, the initial response rate is lower than the target 80 percent. When this occurs, students may be called to complete a telephone survey. Non-response bias is estimated by comparing the responses of students who returned the survey in the mail to those of students who completed the survey by telephone.

among students who returned a completed questionnaire, the rate was 77.7 percent, while the rate among non-responders was 61.2 percent. Nearly 47 percent of the Class of 2005 respondents completed telephone interviews.

One way to ameliorate potential bias is by weighting the Wave 2 data by variables whose distributions are known to differ from the Wave 1 surveys. To this end, data from the Wave 2 surveys conducted since 1996 have been weighted on gender, high school program, and post-high school plans, factors that have consistently correlated with postsecondary activities (see www.vsac.org for Senior Survey statewide reports of the one-year follow-up surveys for details on the weighting methodology). Weighted data produce sample distributions on these three variables that mirror those in a cohort's corresponding Wave 1 study. Given expressed concerns about the potential bias due to non-response and the apparent inconsistencies in published continuation rates, the 2007 Senior Survey study, unlike its predecessors, collected information about post-high school activities from a randomly selected sample of Class of 2007 Vermont high school graduates. Using an alternate approach, the present study was designed to address potential non-response bias in previous study designs and to compare the continuation rate to estimates published by other researchers. If the continuation rate obtained using this methodology is comparable to rates published by VSAC previously, it would lend support to the reliability and validity of the traditional Follow-up Survey method. In this case, the study would provide an indication of what, if any, changes have occurred since 2005, the last time the Wave 2 survey was conducted. If, on the other hand, the estimate from the present study aligns more closely to continuation rates published by other researchers, it would suggest a pattern of overstating the actual postsecondary continuation rate among recent high school graduates.

Method

Participants:

The 2007 Senior Survey Follow-up used a stratified, random sample of respondents to the 2007 Senior Survey In-School Survey. A total of 6,327 Vermont high school graduates (or 84.2 percent) responded to the In-school Senior Survey (Wave 1) and were eligible for selection for the follow-up. From these eligible students we

randomly selected 1,628 for the Wave 2 survey. This sample size was designed to yield approximately 1,000 completed follow-up surveys. Based on historical information, it was expected that about 60 percent of the selected students would receive and return the mail-in survey. The sample design was based on three requirements:

1. +/-3 percent confidence interval for overall estimates
2. +/-5 percent confidence interval for regional estimates
3. At least one sampled student from each school

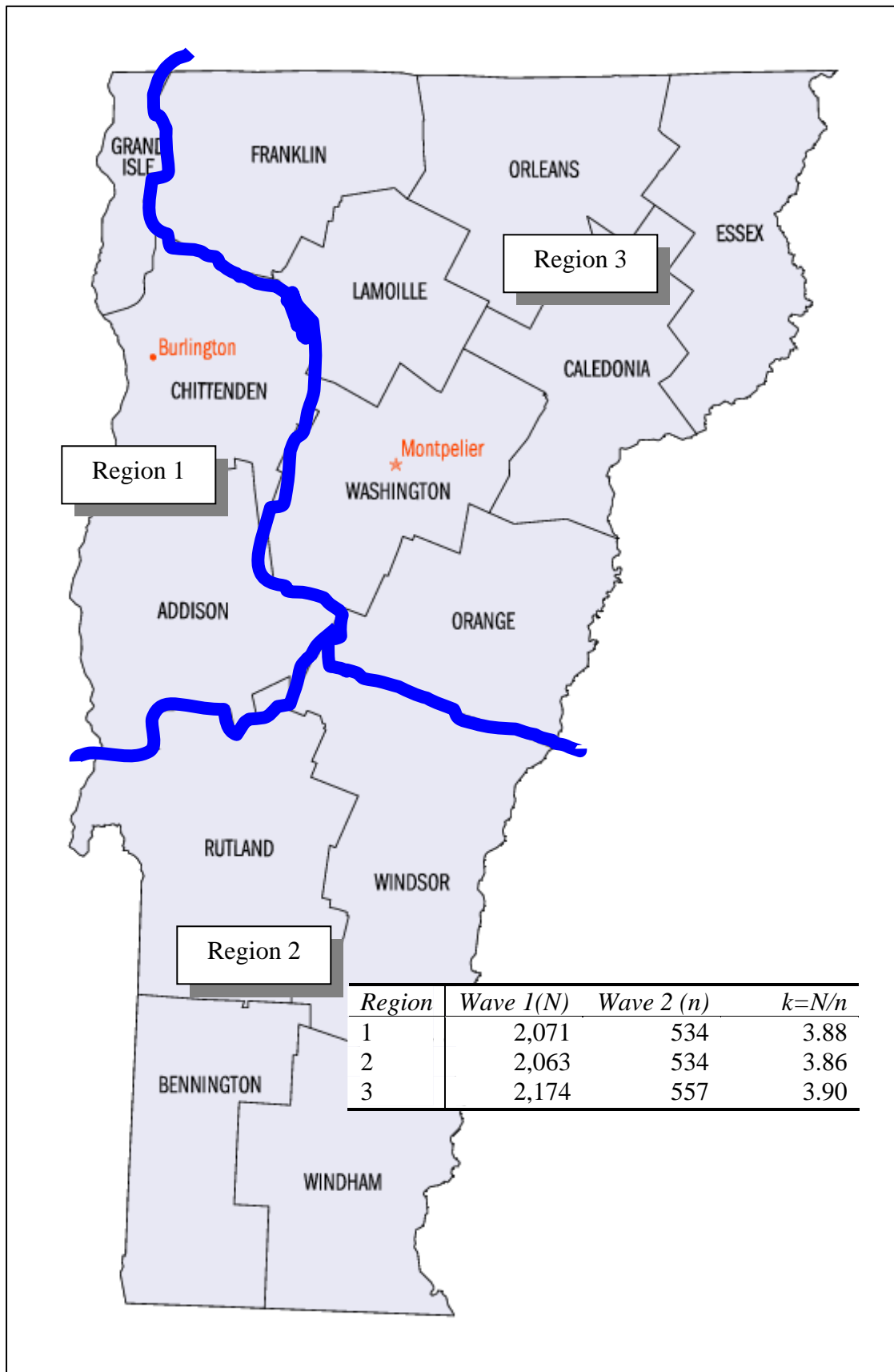
To meet these requirements, the eligible students were stratified into three county-based regions. The regions were roughly the same size in terms of student populations (see Figure 1.)

The sample was a systematic random sample, where a starting point is randomly selected and 1-in-k records are selected from the sampling frame. The sampling rate (1-in-k) is determined by dividing sample size (n) by the total number of students eligible for selection (N) in each region. Prior to the selection, the frame is sorted by school ID and student ID. This ensures that the sample is proportionally distributed to the number of students per school. Further, it ensures that at least one student is selected from each high school. Three schools with three or fewer students were grouped into a small school stratum and one student was selected from each.

Weighting:

The weighting for the 2007 Senior Survey Follow-up is based on a two-step process. First, the respondents are weighted by the inverse of their selection probability, $w_1=1/k$. This base weight accounts for the disproportionate sampling at the regional and small school level. Second, the sample (weighted by the base weight) is adjusted to match the distribution of students for gender, high school program, and post-graduation plans. The adjustment is based on iterative proportional fitting, or raking. Raking is an iterative series of ratio adjustments that is used in cases where there is more than one distribution to match, as in this case with the distributions for gender, high school program, and post-high school plans.

Figure 1. Senior Survey regions and distribution of cases selected to participate in the survey



Historical data show that probability of response to Wave 2 is related to these three dimensions (gender, high school program, and post-high school plans). Thus, this adjustment mitigates the risk of bias for survey estimates that are related to these variables. Each of these variables was collected in Wave 1. The sample distributions are presented in Table 2.

Table 2. Sample distribution by post-graduation plans, gender, and high school program

<i>Post-Graduation Plans</i>	<i>Percentage</i>
Attend 4yr college	60.8
Attend 2yr college	6.6
Attend 2yr then transfer	4.6
Attend voc/tech of less than 2yrs	3.5
Get a full-time job	11.1
Take time to decide	6.8
Do not know	3.9
Other non-continuers	2.7
<i>Gender/ High School Program</i>	
Male	
General/vocational	27.4
College prep	22.2
Female	
General/vocational	22.7
College prep	27.7

Procedure:

The study’s design called for multiple contacts with the randomly selected graduates. First, eligible graduates were sent a postcard approximately six months after high school to notify them of their selection to participate in a brief, five-minute telephone interview to take place the following summer (June 2008.) More than 94 percent of these postcards were “successfully” delivered.⁸

⁸ Even though 6 percent of the postcards were returned as undeliverable, these students remained in the pool of eligible students since they had provided a telephone number in order to be contacted for the Wave 2 survey. Similarly, there were 25 students for whom we had an address, but no phone number. These students remained in the pool of eligible students because the mailing would provide them with the opportunity to complete the Web survey as well as the information needed to contact the research team to complete a telephone interview.

In late May, potential respondents from the sample received a second mailing, a post-card invitation to participate in a Web survey, or alternatively, to wait to be contacted by telephone interviewers. The second mailing included a small incentive, a 64K flash drive “bracelet,” loaded with a file containing a hyperlink to the Web-based survey instrument. The second mailing also informed students about a second incentive, a drawing to win a Nintendo Wii console, with one winner to be drawn from among all students completing a Web or telephone survey.

VSAC contracted with the Survey Research Institute (SRI) of Cornell University to survey the postsecondary activities of the Class of 2007 high school graduates. Data collection for the Web survey began on June 4, 2008, and was closed on June 16, 2008. SRI made follow-up phone calls to all graduates who did not complete the Web survey. Telephone survey data collection began on June 16, 2008, and was completed on July 20, 2008. A parent was permitted to answer the telephone survey when the named graduate was unable to participate.

Overall, 1,001 individuals completed the survey. Of these, 77 completed the survey on the Web. An additional 866 high school graduates and 58 parents of graduates completed the survey by phone. The response outcome for each of the students selected for the sample is summarized in Table 3.

Table 3. Response outcome for follow-up sample

<i>Outcome</i>	<i>Sample Size</i>	<i>Percent</i>
Completed survey	1,001	61.5
<i>Web</i>	77	
<i>HS graduate by phone</i>	866	
<i>Parent by phone</i>	58	
Bad phone number	174	10.7
Ill or otherwise incapable of responding	1	<1.0
Pending --- called more than 5 times	329	20.2
Pending --- called 5 times or less	92	5.7
Refused	6	<1.0
No telephone number available	25	1.5
Total	1,628	100

Confidence Intervals:

The approximate size of 95 percent confidence intervals based on the follow-up respondents can be tabulated, based on the sampling and weighting described above. The confidence interval width depends on the percentage being estimated. For example, for a percentage of 50 percent, the approximate 95 percent confidence interval is +/-2.9 percentage points for the total sample. Similarly, for a percentage of 30 percent or 70 percent, the approximate confidence interval is +/-2.7 percentage points. Table 4 presents approximate error margins for the follow-up responses at different percentages. The actual confidence intervals may be higher or lower.

Table 4. Margins of error for the Class of 2007 follow-up

	<i>N</i>	<i>n</i>	<i>Percentage</i>				
			10/90	20/80	30/70	40/60	50/50
Total	6314	1001	1.7%	2.3%	2.7%	2.9%	2.9%
Region 1	2071	344	3.0%	4.0%	4.5%	4.8%	4.9%
Region 2	2063	308	3.2%	4.2%	4.8%	5.2%	5.3%
Region 3	2180	349	3.0%	3.9%	4.5%	4.8%	4.9%

Results

Based on the study, we estimate that 74.8 percent of the Class of 2007 graduates continued their education or training on a full- or part-time basis in the fall immediately after high school graduation. As previously mentioned, postsecondary education is defined broadly in the VSAC Senior Survey, reflecting the institutional mission of serving the needs of all Vermonters.⁹ In order to compare the Senior Survey data to the most recent rates published by PEO, we re-calculated the continuation rate for the Class of 2007 by eliminating those who were not enrolled as degree-seeking students in a Title-IV-eligible postsecondary institution located in the United States.¹⁰ After excluding

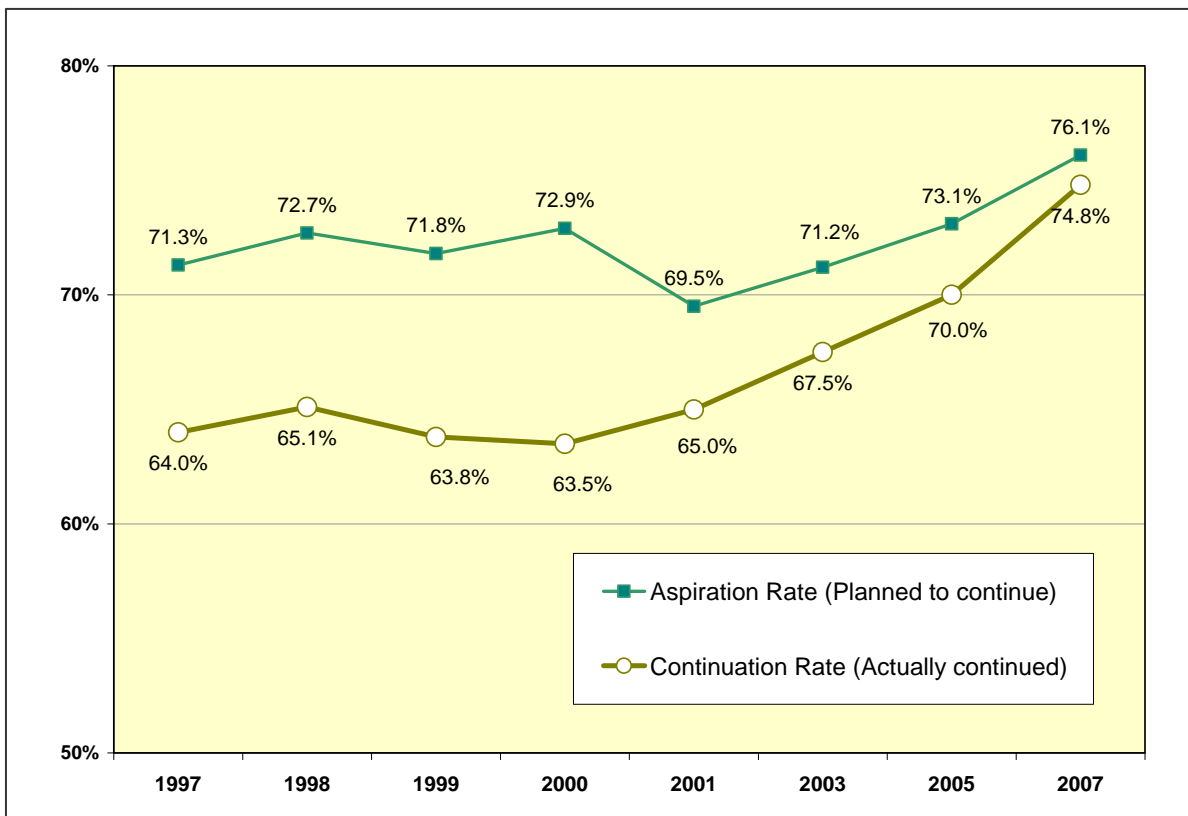
⁹ We include any kind of postsecondary education or training when reporting aspiration or continuation rates, not just training or education that leads to a degree or certificate.

¹⁰ PEO's estimates are based on the data for residency of first-year students that institutions are required to report to the Integrated Postsecondary Education Data System (IPEDS) in the fall of even years, i.e., 2004, 2006, etc. PEO has not yet published its 2008 estimate.

students who met these criteria, the continuation rate dropped 3.3 percentage points, to 71.5 percent. In either case, the rates for this study are much higher than those reported by PEO and continue a trend reported in previous VSAC Senior Surveys.

The more comprehensive rate represents an increase of nearly five percentage points over a two-year span, the last time the one-year follow-up survey was conducted, and 10 percentage points in the last decade (Figure 2).

Figure 2. Vermont postsecondary education aspiration and continuation rates (includes all types of education and training)



Continuation rates for different demographic groups from the 2007 survey were compared to the estimates obtained from the Class of 2005. Again, consistent with previous Senior Survey findings, we see that even as the postsecondary continuation rates have increased across different segments of the cohort, gaps persist when considering gender and geographic region (see Table 5.)

Table 5. Postsecondary continuation rates for Class of 2005 and 2007 by demographic classification

<i>Demographic classification</i>	<i>Continuation Rates (in percent)</i>	
	Class of 2005 n = 4,032	Class of 2007 n = 1,001
<i>Gender</i>		
Females	75.7	79.2
Males	64.1	70.2
<i>Region</i>		
Region 1: Grand Isle, Chittenden, Addison counties	73.8	76.5
Region 2: Rutland, Windsor, Bennington, Windham counties	70.1	73.2
Region 3: Caledonia, Essex, Franklin, Lamoille, Orange, Orleans, Washington counties	66.3	74.9
Any postsecondary education or training	70.0	74.8

Discussion

The study, using a stratified, random sample, with multiple points of contact and incentives, was designed to maximize participation and reduce the possibility of non-response bias. Using this methodology, findings from the present study appear to align with those of previously published Senior Survey reports, and differ from PEO's 2006 estimate of the college continuation rate of recent Vermont high school graduates.

One could argue that the difference may be partly attributed to the temporal difference in the estimates. Starting with the Class of 2008, VSAC will conduct the Senior Survey only in even years. This will enable us to compare estimates more readily in the future. Data collection for the one-year follow-up of the Class of 2008 is scheduled to begin in June of 2009.

Another critique that could be offered to past (and present) Senior Surveys is that the potential for non-response bias is compounded because of the method used to conduct the

initial Senior Survey. Historically, the response rate for the Wave 1 survey has been high (from 73 percent to 87 percent, depending on the year). In a high school setting, response rates are lowered if students were present when the survey was administered but refused to complete it; students were out of school (sick, vacation, college visit, etc.); or students were unable or unwilling to participate for other reasons (disability, reading comprehension, etc.) VSAC does not have information about non-respondents beyond their names, nor the reasons for non-response.

VSAC examined the non-response bias in the Wave 1 survey in a 1997 VSAC study of all non-responders. This study showed a difference of 2.5 percentage points in aspiration rates when non-responders were compared to those who completed the survey in school (68.9 percent among non-responders and 71.4 percent among responders). Findings from analyses of the Wave 1 data for Class of 2003 suggest that the estimate of non-response bias was approximately 3 percent; i.e., 71.2 percent (+/-3 pts) of the cohort planned to pursue some form of postsecondary education or training immediately after high school.¹¹ Using a similar approach, an analysis of the Wave 1 survey for the Class of 2007 also suggests a margin of error of +/-3 percent. Taken together, these findings suggest that the margin of error in the Wave 1 surveys has consistently been less than 5 percent, and that using the Wave 1 respondents as the basis from which to draw a random sample should not pose a significant concern. Investigators from Dartmouth College are undertaking a joint project with VSAC, the Vermont Department of Education, and The College Board that will enable researchers to provide information on non-responders from the classes of 2003, 2005, and 2007, as part of a larger study (Carrell and Sacerdote, in progress).

One significant drawback of the methodology used for this study is that it does not allow VSAC to provide Vermont high schools with individual estimates of the continuation rates of its alumni, nor does it allow for sub-group analyses, by parents' educational attainment, for example. The present study suggests that the established

¹¹ As described earlier, for some schools, the initial response rate at the school level is lower than the target 80 percent. This might be the case for a school that failed to distribute the survey as planned. When this occurs, a school provides VSAC with contact information so that surveys can be mailed or students can complete a telephone survey. Non-response bias for the Class of 2003 was estimated by comparing the responses of students who completed the survey in school to those of students who completed the survey by mail or telephone.

Senior Survey methodology continues to yield reliable estimates of the activities of high school graduates a year after leaving high school. Future surveys will utilize the established methodology in order to provide schools and other stakeholders with a rich source of information about the post-high school activities of Vermont's young adults as well as allow for the sub-group analyses necessary for important policy and research development.

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