The use of adjustment weights in voter surveys. Correcting for panel attrition and nonresponse can produce less accurate estimates of voting behavior

Audun Fladmoe [a,*], Johannes Bergh [b]

[a] Institute for Social Research, Munthes gate 31, P.O. Box 3233, Elisenberg, 0208, Oslo, Norway
[b] Institute for Social Research, Norway

ARTICLE INFO

ABSTRACT

Declining response rates make it harder to justify survey data as adequately representative. Adjustment weighting is often used to address this problem, but the premise of that approach is that people within a specific social category who respond to a survey are representative of those that do not. This paper compares self-reported voting in a low response panel survey and a "gold standard" national election survey, with the actual election result in the Norwegian parliamentary election in 2017, and estimate the effects of various inverse probability weights. The results indicate that the panel sample becomes less accurate in predicting the election result when weighted for age than without the use of such a weight. Young adults who respond to surveys may not be representative of this age group as a whole, especially in low response panel surveys.

1. Introduction

Polling errors have received great attention in recent years, especially in the aftermath of the Brexit vote and the US presidential election in 2016. A likely explanation for these polling errors was differential nonresponse, i.e. voters supporting Brexit and Trump were less likely to respond to polls, leading to biased samples (Gelman, 2021). Concerns about biased samples are especially raised in studies relying on panel data more generally (Bianchi and Biffignandi, 2018), and web-based surveys more specifically (Strabac and Aalberg, 2011). Online panel surveys make it possible to establish datasets, often with a panel structure, in a cost-efficient way, but relatively few studies using panel data describe patterns of attrition (Ahern and Le Brocque, 2005).

The standard means of alleviating concerns about nonresponse bias and attrition is to weight the data according to social background variables (post-stratification weights). In doing this, we assume that the people who respond to surveys – even groups that have disproportionally low response rates – are representative of those that have similar characteristics but do not respond to surveys. Is that a reasonable assumption? If not, we run the risk of not alleviating and perhaps even increasing bias when weighting the data (Gelman, 2021; Yeager et al., 2011).

The purpose of this paper is to investigate when that assumption is

reasonable and, thus, when weighting is a good strategy and when it is not. We use two sources of data: 1) A web-based panel survey where the last round was conducted right after an election. Due to nonresponse and panel attrition, the final round of the panel study has a low response rate (18%), which makes it comparable to the numerous web surveys used by political scientists. 2) A high-quality, high response-rate survey: the Norwegian National Election Study (NNES). This is a survey of the type that the study of political behavior was built on but that is now in the minority among surveys used in this field. The two surveys offer the possibility of a unique comparison of representativeness, as sampling strategies were identical: respondents were randomly drawn from the Norwegian electoral register.

Since these are both post-election surveys carried out simultaneously, after the Norwegian Parliamentary (Storting) Election of 2017, we use voting in the election as the outcome variable. Voting behavior in post-election surveys, carried out immediately after an election, is an instance in which we have the possibility to compare reported attitudes (statements about voting) to the real attitudes (actual votes) in the entire population. Voting is an expression of attitudes and political preferences, but since we measure actual voting, we use the term "behavior" rather than attitudes in the remainder of the paper.

Our empirical strategy is, first, to compare sociodemographic characteristics and self-reported voting in the two surveys with population

---

data. Second, we construct post-stratification weights based on the "usual suspects" of social background variables – age, gender, and education level – with one weight per variable and a combined weight. We then measure how self-reported voting is influenced by the different weights in the two datasets. A key concern is whether weights are helpful in mitigating the effects of a low response rate, as is premised when weights are used in web surveys and other types of low-cost surveys.

The results suggest that the panel sample produces equally as good estimates of voting behavior as the NNES. However, due to nonresponse and attrition among young people and adults without a higher education, the panel sample is much more sensitive to weighting. While applying education weights improves the estimation of voting choice, applying age weights *worsens* the estimates compared to the actual election result. The main reason is that panel attrition is higher among young adults supporting right-wing parties than among young adults supporting center and left-wing parties, resulting in a biased sample of this age group. The NNES samples are much less sensitive to different weighting strategies. This indicates that panel attrition may reduce the representativeness of groups with particularly low response rates in surveys (such as young adults), and the implication is that weighting or controlling for such biases in web-based panel surveys may produce erroneous estimates.

2. Nonresponse and panel attrition

Nonresponse is the failure of a sampled respondent to take part in a survey at all, while panel attrition is the process of dropping out of a panel survey when a fixed group of individuals participate in multiple surveys over time. Both phenomena contribute to the overall bias of a panel survey.

The problem of nonresponse has been around for as long as we have had surveys, but it has clearly grown in significance over time (De Heer and De Leeuw, 2002). While surveys in the 1950s and 1960s often had response rates above 80 percent, such numbers are unheard of today. In fact, response rates are not routinely reported in academic publications like they used to be (Werner et al., 2007). That may be because nonresponse is not seen as a serious problem, either because data may be representative of the population even without a high response rate (Hellevik, 2016) or because the purpose of the analysis, such as in survey experiments, may not require a representative sample (Mutz, 2011).

If the goal is to produce a representative sample, nonresponse should be taken seriously. The likelihood that a person will respond to a survey varies between demographic groups and between countries and cultures. There are also interviewer and mode effects, and the use of incentives may play a role (Lepkowski and Couper, 2002). Some studies suggest that low response rates may not necessarily produce biased estimates of attitudes and behaviors (Hellevik, 2016), but a general problem is that it increases uncertainty.

Depending on the survey design, panel attrition can be permanent or temporary (Lugtig, 2014; Satherley et al., 2015). While permanent attrition means that a respondent drops out and never returns, temporary attrition means that a respondent drops out of one (or more) wave (s), but that s/he returns in later waves. Lugtig (2014) distinguishes between *stayers*, *fast attriters*, *gradual attriters*, and *lurkers*, while Satherley et al. (2015) distinguish between *explicit withdrawals*, *lost respondents*, *intermittent respondents*, and *constant respondents*.

The biases associated with panel attrition largely follow known patterns of nonresponse, which is a particular problem in certain social groups, such as the young and those without higher education, and among immigrants. In a large study of attrition between the pre- and post-election surveys in the American National Election Study between 1964 and 2004, Olson and Witt (2011) find that attrition is higher among men (see also Satherley et al., 2015), whites, and young adults. Attrition in ANES is also related to campaign interest and turnout (Bartels, 2000).

Several studies find that panel attrition is related to socioeconomic factors. Attrition is higher among lower socioeconomic status individuals and among those with more unstable earnings, long working hours, and poor and unstable housing conditions (Fitzgerald et al., 1998; Uhrig, 2008). Attrition is also related to unstable marriages, migration, poor health, impairment, and depression (Fitzgerald et al., 1998), and these effects increase with age (Mirowsky and Reynolds, 2000).

Comparative panel studies suggest, however, that these effects may not be universal. In particular, analyses of the European Community Household Panel (ECHP) found that the effect of socioeconomic status was different in Southern European countries (and Ireland) compared to Northern European countries. In the southern countries and Ireland, attrition was highest among those at the top of the income distribution (Vandecasteele and Debels, 2004; Watson, 2003). Furthermore, attrition strongly depended on whether respondents had moved between two waves (Behr et al., 2005; Watson, 2003).

Other studies have focused on how psychological factors determine attrition. Satherley et al. (2015) argue that socio-psychological variables are more important predictors of attrition than sociodemographics. Community attachment seems to be especially important, more so than personality factors and well-being related variables (Bianchi and Biffignandi, 2018).

While there are several studies on the effects of panel attrition, most studies have been concerned with the effect on demographic and psychological characteristics (personality traits) (Bianchi and Biffignandi, 2018; Olson and Witt, 2011; Satherley et al., 2015). Fewer have been concerned with attitudinal measures, which are central to the study of political behavior and are focused on in this paper (but see, Frankel and Hillygus, 2014).

Finally, studies of the ECHP also identify more 'technical aspects' predicting attrition. Attrition was higher among those who did not complete a personal interview in the initial wave (Watson, 2003), and also if the interviewer changed between two waves (Behr et al., 2005). Such "technical" factors have also been highlighted in other surveys. The effect of assigning the same interviewer wave after wave has been confirmed by other studies (Hill and Willis, 2001), as has item nonresponse in the first wave (Burkam and Lee, 1998). Perhaps going against conventional wisdom, Hill and Willis (2001) found that reducing the length of the interview had no effect on attrition, but Frankel and Hillygus (2014) argue that survey experience affects attrition above and beyond standard demographic predictors.

Interview mode is another technical aspect of surveys. With increased internet penetration in the 2000s, online surveys have become the most used survey mode in behavioral research (Pforr and Dannwolf, 2017). Although internet penetration is very high in Norway,[1] online surveys discriminate against citizens who are not online. The lack of an interviewer may also affect response rates, as response rates tend to be

---

[1] Internet penetration in Norway is very high: 98% (https://www.interne tworldstats.com/).

higher in face-to-face surveys than in online surveys (Braekman et al., 2022). Generally, one would predict mixed-mode sampling to fare better in terms of representativeness than single-mode sampling (Carina and Michael, 2018). As described below, this is an important difference between the two surveys analyzed.

3. Data from the NNES and NECPS

The 2017 Norwegian National Election Study (NNES) provides a unique opportunity to analyze consequences of nonresponse and panel attrition. In addition to this high-quality post-election study with a response rate of 61.8 percent,[2] the research team fielded a four-wave web-based election campaign panel study (NECPS). Both surveys were carried out by Statistics Norway with samples drawn from the Norwegian electoral register. Both are random probability samples. The gross sample of the NNES was randomly divided into two subsamples, and each was contacted either by telephone or via the web (Kleven, 2017), but respondents could choose the survey mode based on what they preferred.[3] The NECPS was carried out in four waves over a three/four-month period, with the final wave (w4) coinciding with the main post-election survey (the NNES). Since the samples were drawn from the same source and the surveys were carried out simultaneously, by the same agency, with the same survey questions, the two surveys are suited for comparison. This offers the opportunity to study the effect of panel attrition (the fourth wave of the panel) on an attitudinal measure (voting behavior), taking into account standard sociodemographics, and to compare high-quality web and telephone surveys with a low response rate web survey.

The surveys were fielded in connection with the Norwegian Storting (Parliamentary) Election, held on September 11, 2017. Norway has a proportional electoral system through which several parties compete for seats in the Storting. Although losing some support, the sitting governing coalition of the Conservative and Progress Parties, whose governing majority depended on the support of two smaller centrist parties, retained their majority in 2017. On the center-left side of Norwegian politics, five political parties managed to win seats in parliament; this was one more (the Red Party) than in the previous election when the Greens won a seat for the first time. The largest, and traditionally dominant party in Norway, the Labor Party, lost support in the 2017 election, which largely benefitted the Center Party – a party that represents rural interests. All in all, the center left became substantially more fragmented in the 2017 election.

The election campaign panel study's (NECPS) first wave was fielded in June, prior to the summer holiday. The next two waves were conducted during the month-long election campaign,[4] and the final wave

took place right after Election Day. Due to panel attrition, the response rate dropped from 40.3 percent (w1) to 18.4 percent (w4). The aim of the panel was to study media effects and attitudinal change during the election campaign.

Survey data on self-reported voting were compared with official voting data from the 2017 parliamentary election retrieved from Statistics Norway. We also used data from Statistics Norway on gender, age, and education level in the Norwegian population to calculate post-stratification weights. This enabled us to identify the differences in terms of nonresponse that are not caused by sampling and to test the effect of weighting on high-quality sampled data.

3.1. Weighting

Weighting can potentially overcome attrition, nonresponse problems, or skewed samples caused by the survey mode. The process of weighting data is well described by Caughey et al. (2020) as a two-step process. The first step, which in some circumstances is the most challenging, is to estimate the population targets. The distribution of the relevant population (e.g., eligible voters in a given election) with regard to weighting variables, such as gender, age, and education level, may not be fully known. The challenge then becomes producing estimates of these population targets. In our case, they are identified accurately through the Norwegian population register. The process of weighting the data is therefore limited to the second step: constructing weights that calibrate the survey samples to the population targets.

In order to construct the weights, we divided the sample and population data into identically defined cells based on gender (two cells: men and women), age (three cells: 18–29, 30–59, 60+ years), and education level (three cells: basic schooling/NA, high school, university/college). Weights were then constructed so that the proportion of the sample represented by a cell was adjusted to the proportion that the same cell was equal to in the entire population. A simple gender-based weight, for instance, adjusted the gender distribution in the sample to match that in the population. These are known as "post-stratification" weights.

4. Results

The results are presented in four steps. First, we compare sociodemographic statistics in the NNES, the NECPS, and the population. In order to study panel attrition, we include sample data from both the first and the fourth waves of the NECPS. Next, we compare self-reported voting across the samples (the NNES and NECPS, w4) with the actual election result. Third, in order to study the representativeness of each sample, we analyze the effect of sociodemographic post-stratification weights on self-reported voting. Finally, we review panel attrition across age groups based on voting intentions prior to the election.

---

[2] Throughout most of its history, the NNES has not used weights at all. The response rate has been quite high – sometimes exceeding 90 percent in some of the early studies in the 1960s and 1970s – and the samples have been highly representative of the Norwegian electorate in terms of measurable parameters. The rate of response declined a bit in the 1980s to around 70 percent and remained at that level until 2005. The 2009 election study saw a decline in the response rate to 60 percent, which prompted the use of weights for the first time in the following 2013 study. The response rate rose a little in the 2017 NNES to 62 percent. Given the history of not weighting the NNES data and the need for comparisons over time, it was decided to implement a minimal, fairly conservative approach to weighting, using post-stratification weighting for a few demographic variables: age, gender, and educational attainment. Nonresponse and panel attrition were much more significant in the NECPS, thus enhancing the need for weighting DeBell, M., & Krosnick, J. A. (2009). Computing weights for American national election study survey data. *nes012427. Ann Arbor, MI, Palo Alto, CA: ANES Technical Report Series.* .

[3] A majority preferred to respond via telephone (n = 1197), followed by web (n = 742) and face-to-face (n = 27).

[4] Wave 2 was conducted from August 15 to 22, and wave 3 was carried out between August 29 and September 5.

Table 1
Sociodemographic characteristics among eligible voters and respondents in post-election surveys (the NECPS and NNES) of the Norwegian parliamentary election 2017 (in percentages).

	Eligible voters	NECPS w1	NECPS w4	NNES
Men	49.5	50.0	54.5	51.8
Women	50.5	50.0	45.5	48.2
18–29 yrs	20.0	17.3	10.3	19.6
30–39 yrs	14.8	13.6	12.0	14.3
40–49 yrs	17.0	17.6	17.4	19.2
50–59 yrs	16.8	18.9	21.3	20.4
60+ yrs	31.4	32.6	38.9	26.6
Basic schooling/unknown[a]	23.1	18.1	11.6	25.4
High school[a]	45.6	38.6	37.8	31.4
University/college[a]	31.4	42.7	50.3	43.2
n	3 765 229	4033	1836	1966

[a] Estimates based on all adults in Norway.

Sources: Statistics Norway; the Norwegian Election Campaign Panel Study (NECPS); the Norwegian National Election Study (NNES)

Table 1 displays descriptive statistics on gender, age, and education level among eligible voters, among the respondents in the first (w1) and fourth (w4) waves of the NECPS, and among NNES respondents. Considering the NECPS, the table shows that women, young adults (18–29 years old), and respondents with basic schooling as their highest level of education become increasingly underrepresented between the first and fourth waves. Thus, panel attrition in the NECPS was highest for these three groups. The NNES is much more aligned with voter demographics than the fourth wave of the NECPS, though men, adults aged between 50 and 59, and respondents with university or college education were somewhat overrepresented when compared to eligible voters. Older adults (60+) and those with a high school degree were somewhat underrepresented.

The most noteworthy categories in Table 1 are the young, those aged 18–29, and those without higher education. The young are heavily underrepresented in NECPS w4, but they are almost perfectly represented in the NNES sample. Those with basic schooling or unknown level of education constitute about a quarter of the voting age population, and practically the same share of the NNES sample. This educational category constitutes only 11.6 percent of the sample in NECPS, wave 4.

Next, we compare self-reported voting in the two post-election surveys with the election result. Since we now compare vote choice between respondents and those who actually voted, the number of respondents (n) is lower than reported in Table 1. Table 2 reports the official election result based on those who cast their ballots in the 2017 parliamentary election and on self-reported voting among those who stated a party preference in each sample. The table shows the results for each party (in addition to the "other parties" group), the average deviation across the 10 parties (incl. "other parties") between the self-reported voting and the official election result, and the average squared deviation for each party. This latter measure takes into account that large deviations are more critical than small deviations. On aggregate, the sample from the NECPS (w4) actually came closest to the official election result, with an average deviation across the 10 parties/party groups of 1.2 percentage points (2.5 sq. avg.). The average deviation in the NNES sample was 1.3, and the average squared deviation was 2.9. Both samples underestimated the vote shares of the social democratic Labor Party and the right-wing populist Progress Party. The NECPS (w4) predicted aggregate voting behavior more accurately across most of the parties, but overall, the differences between the two samples are not very large.

The question arises as to what extent the observed deviations between self-reported voting and the election result are affected by the

representativeness of the samples, regarding age, gender and level of education. In order to estimate the representativeness, we calculated post-stratification weights and adjusted for gender, age, and education level, respectively, as well as determining a full weight that was adjusted for all these factors simultaneously. If the samples are representative, the self-reported voting should approximate the election result when weighting the data. Conversely, if the deviations between the self-reported voting and the election result increase when weighting the data, this suggests that the samples are not representative of the larger population.

Fig. 1 displays the average deviations between the self-reported voting and the election result across all 10 parties/party groups when different weights are applied (party-specific results are reported in the Appendix). The results suggest that gender weights have minimal effects, reflecting a fairly balanced gender distribution in the surveys (see also Table 1). Adjusting for age, however, we see that the average deviation in the NECPS (w4) *increases* by 0.4 percentage points, from 1.2 points to 1.6 points across the parties. The NNES sample is not affected by age weighting at all. In effect, when adjusting for age, the NECPS (w4) fares worse than the NNES in predicting voting behavior. The implication of this finding is that young adults taking part in the NECPS (w4), who are underrepresented in the sample (see Table 1), do not seem to be representative of young adults in the Norwegian population when it comes to voting behavior.

Weighting for education has the opposite effect on the NECPS sample. When education weights are applied, the average deviations between the self-reported voting and the election result are reduced in both samples, especially in the NECPS (w4), where the average deviation across the 10 parties/party groups is reduced to 0.8 percentage points. In other words, the sample predicts the actual election result with less than a percentage point deviation for each party. The average deviation in the NNES sample is reduced by about 0.1 points when applying education weights.

Finally, when applying full weights – taking into account gender, age, and education level simultaneously – the average deviation in the NECPS increases by more than 0.2 percentage points compared to when only applying education weights. In the NNES sample, the total deviation decreases marginally (by 0.04 points) compared to the education weight.

When applying age weights to the NECPS, support for the largest parties (the Labor, Conservative, and Progress Parties) decreases compared to other weights, while support for smaller, center-left parties (the Socialist Left, Christian Democratic, Green, and Red Parties) increases (see the Appendix, Table 1). In order to understand the impact of panel attrition on increased deviation between self-reported voting and actual voting when applying age weights to the NECPS sample, we analyze voting intentions in the first wave of the panel before the election. This is carried out by comparing the voting intentions in wave 1 of respondents who were still on the panel in wave 4 (those who participated in both w1 and w4) and of those who dropped out before the final wave. It is important to note that party preference in wave 1, three months prior to the election, is not as precise a measure as self-reported voting after the election. Furthermore, some respondents stated party preference in wave 1, but did not report in wave 4 that they had voted (note the difference in n between Table 3 and Table 2 and Fig. 1). Nevertheless, any deviation between the two groups of respondents indicates that panel attrition correlates with political behavior. Table 3 summarizes the deviation in party preference in wave 1 between those who completed wave 4 and those who did not, across gender, age and education. The table shows that there are important deviations across all subgroups, but that these are much higher among young adults (18–29 yrs) than in any other group. The average deviation across parties is 3.9 percentage points in the youngest age group, 2.1 points in the oldest group (60+), and below 2 points across all other subgroups. The differences are even more visible when considering the average squared deviations, with 26.6 points among young adults and 3–6 points in all
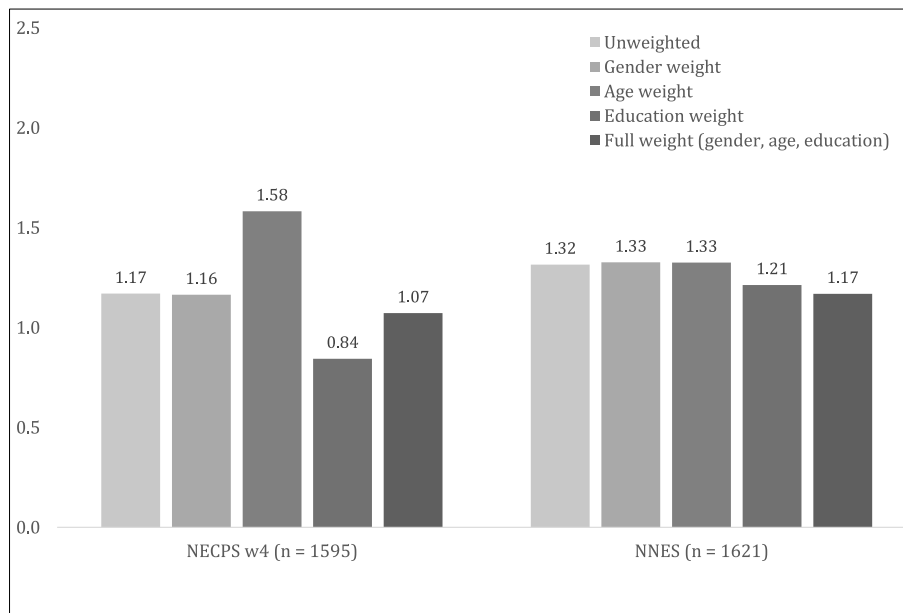
Table 2

Official election result and self-reported voting in post-election surveys (the NECPS and NNES).

	Official election result	NECPS web w4	NNES
Labour Party (Ap)	27.4	25.7	24.6
Conservative Party (Høyre)	25	26.7	26.8
Progress Party (Frp)	15.2	11.2	11.9
Center Party (Sp)	10.3	10.5	10.5
Socialist Left Party (SV)	6	7.4	7.8
Liberal Party (Venstre)	4.4	5	5.8
Christian Democratic Party (Krf)	4.2	4.3	4.4
Green Party (MDG)	3.2	4.5	3.3
Red Party (Rødt)	2.4	3.1	3.5
Other parties	1.8	1.6	1.4
Election result vs. self-reported (average dev.)	–	1.20	1.32
Election result vs. self-reported (average squared dev.)		2.56	2.89
n	2 945 352	1595	1621

NECPS: Norwegian Election Campaign Panel Study; NNES: Norwegian National Election Study.

NOTE: Calculations (n) based on the ballots counted (election result) and respondents stating their party preference (post-election surveys).

Fig. 1. The effect of sociodemographic post-stratification weights on self-reported voting for 10 parties (incl. "others"). Average deviation between self-reported voting and the election result (in percentage points).

Table 3
Deviation in party preference in wave 1 of the NECPS between respondents participating in wave 4 and respondents dropping out before wave 4 across gender, age and education (percentage points).

	Men	Women	18–29 yrs	30–59 yrs	60+ yrs	Basic sc.	High school	Uni./college
Labour Party (Ap)	−5.7	−0.4	−0.4	−5.3	−4.3	−2.2	−3.7	−3.8
Conservative Party (Høyre)	0.5	1.5	−11.1	2.7	−2.5	2.0	2.5	−1.3
Progress Party (Frp)	−1.7	−4.7	−8.0	0.6	−3.1	−2.0	−2.2	−0.8
Center Party (Sp)	2.2	−2.9	1.7	0.6	1.9	−1.2	2.4	−1.1
Socialist Left Party (SV)	1.3	3.1	5.5	1.6	2.1	3.0	0.8	2.4
Liberal Party (Venstre)	1.6	1.2	0.6	−0.3	2.8	−0.2	0.4	1.8
Christian Dem. Party (Krf)	0.3	0.5	4.6	−0.7	−0.6	−1.3	0.0	−0.1
Green Party (MDG)	0.1	−0.3	4.0	−1.1	1.4	−3.0	−0.9	1.4
Red Party (Rødt)	0.5	1.8	2.7	0.4	1.4	3.2	1.0	0.5
Other parties	0.9	0.2	0.5	1.3	1.0	1.7	−0.3	1.0
Avg. deviation	1.5	1.6	3.9	1.5	2.1	2.0	1.4	1.4
Avg. sq. deviation	4.6	4.7	26.6	4.2	5.5	4.7	3.3	3.0
n (dropped out before w4/completed w4)	544/900	524/724	232/169	577/854	259/601	210/175	411/592	447/857

NECPS: Norwegian Election Campaign Panel Study.

other subgroups.

Furthermore, there is a clear attrition bias among young adults, which largely follows the effects of age weighting. Attrition rates are especially high among young adults supporting large right-wing parties (the Conservative and Progress Parties) and lower among those supporting smaller center-left parties (the Socialist Left, Christian Democratic, Green, and Red Parties). The patterns are less clear in other subgroups. Thus, the results clearly suggest that, compared to other subgroups, panel attrition among young adults was much higher among respondents supporting right-wing parties, resulting in a final sample in wave 4 of young adults with a center-left-leaning bias. Since young adults were underrepresented in the fourth wave, the implication is that applying age weights increased these biases and resulted in less precise estimates of voting behavior.

5. Discussion

This study has compared self-reported voting between the fourth wave of a web-based panel survey (NECPS) with a low response rate and high attrition, and the NNES, which is carried out by telephone, via the web, and face-to-face and is considered the "gold standard" of political surveys in Norway. Since both surveys relied on gross samples drawn

from the same high-quality source and were conducted in the immediate aftermath of the national election, it was possible to compare an attitudinal measure (self-reported voting) with an actual behavior (voting). In order to review the representativeness of the different samples, we estimated self-reported voting by applying different post-stratification weights based on sociodemographic characteristics.

The results showed, first, that the NNES sample was far more representative of the relevant population (eligible voters) than the fourth wave of the NECPS survey. This could partly be attributed to the lower response rate in general to the NECPS survey, but the lack of representativeness was further reinforced by biased panel attrition among women, respondents with a low level of education, and – most significantly – young adults (aged 18–29). Second, considering self-reported voting, even though the NECPS sample was less representative in terms of sociodemographic variables, on an aggregate level, this sample was actually somewhat more accurate than the NNES sample in predicting voting behavior. Third, although accurate on an aggregate level, the NECPS sample turned out to be much more sensitive to post-stratification weights than the NNES sample. While applying education weights improved the accuracy of predicting voting behavior in the NECPS substantially, applying age weights reduced it. Analyses of voting intentions prior to the election (the first wave of the NECPS)

suggested that attrition among young adults was systematically higher among those supporting right-wing parties than among those supporting center and left-wing parties, resulting in a final sample of young adults that was not representative of those in the larger population. This finding corroborates analyses of recent US presidential elections, suggesting higher nonresponse by Republicans (Gelman, 2021).

There are at least three implications of the findings in this paper, which are relevant for survey practitioners as well as researchers using this type of data. First, given the uncertainties related to the post-stratification weighting of panel samples, survey researchers should pay special attention to reducing panel attrition in low response groups. This may include mixed-mode sampling and the use of incentives (Lepkowski and Couper, 2002).

Second, if these efforts are not entirely successful, special attention should be payed to groups that are the most underrepresented. In the final wave of our panel-data, young people and those without higher education constitute half or less than half of their share of the actual voting age population. We cannot determine what the critical threshold is, but our findings indicate that a rate of underrepresentation of 0.5 should be taken seriously.

Third, be cautious when applying post-stratification weights to biased samples from panel surveys. Adjusting for age bias in the panel sample did not improve representativeness in terms of voting behavior; it had the opposite effect. The reason for this is that young people who support parties on the right were less likely to respond to the final wave of the NECPS. This makes it particularly important to treat age biases carefully, but we cannot rule out the possibility that the same problem applies to other social groups that are typically underrepresented in surveys, such as immigrants, low-income groups, people with poor and unstable housing conditions, and respondents with low political interest and community attachment (Bianchi and Biffignandi, 2018; Fitzgerald et al., 1998; Mirowsky and Reynolds, 2000; Uhrig, 2008). The problem is that, with the exception of sociodemographic statistics, we rarely have registry-based information enabling us to fully estimate the implications of nonresponse and panel attrition. An important lesson from this paper therefore is that one should be cautious in using final waves of panel surveys for estimating population statistics and, rather, limit the use of such data to correlational and inferential analyses.

Declaration of competing interest

None.

Data availability

Data are available from the Norwegian Centre for Research Data (NSD).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.electstud.2022.102486.

References

Ahern, K., Le Brocque, R., 2005. Methodological issues in the effects of attrition: simple solutions for social scientists. Field Methods 17 (1), 53–69. https://doi.org/10.1177/1525822x04271006.

Bartels, L.M., 2000. Panel effects in the American national election studies. Polit. Anal. 8 (1), 1–20. http://www.jstor.org/stable/25791593.

Behr, A., Bellgardt, E., Rendtel, U., 2005. Extent and determinants of panel attrition in the European community household panel. Eur. Socio Rev. 21 (5), 489–512. https://doi.org/10.1093/esr/jci037.

Bianchi, A., Biffignandi, S., 2018. Social indicators to explain response in longitudinal studies. Soc. Indicat. Res. 141 (3), 931–957.

Braekman, E., Demarest, S., Charafeddine, R., Drieskens, S., Berete, F., Gisle, L., Van Hal, G., 2022. Unit response and costs in web versus face-to-face data collection: comparison of two cross-sectional health surveys. J. Med. Internet Res. 24 (1), e26299 https://doi.org/10.2196/26299.

Burkam, D.T., Lee, V.E., 1998. Effects of monotone and nonmonotone attrition on parameter estimates in regression models with educational data: demographic effects on achievement, aspirations, and attitudes. J. Hum. Resour. 33 (2), 555–574. https://doi.org/10.2307/146441.

Carina, C., Michael, B., 2018. Is there an association between survey characteristics and representativeness? A meta-analysis. Surv. Res. Methods 12 (1), 1–13. https://doi.org/10.18148/srm/2018.v12i1.7205.

Caughey, D., Berinsky, A.J., Chatfield, S., Hartman, E., Schickler, E., Sekhon, J.S., 2020. Target Estimation and Adjustment Weighting for Survey Nonresponse and Sampling Bias. Cambridge University Press. https://doi.org/10.1017/9781108879217.

De Heer, W., De Leeuw, E., 2002. Trends in household survey nonresponse: a longitudinal and international comparison. Surv. Nonresp. 41, 41–54.

Fitzgerald, J., Gottschalk, P., Moffitt, R., 1998. An analysis of sample attrition in panel data: the Michigan panel study of income dynamics. J. Hum. Resour. 33 (2), 251–299. https://doi.org/10.2307/146433.

Frankel, L.L., Hillygus, D.S., 2014. Looking beyond demographics: panel attrition in the ANES and GSS. Polit. Anal. 22 (3), 336–353. http://www.jstor.org/stable/24573074.

Gelman, A., 2021. Failure and success in political polling and election forecasting. Stat. Publ. Pol. 8 (1), 67–72. https://doi.org/10.1080/2330443X.2021.1971126.

Hellevik, O., 2016. Extreme nonresponse and response bias. Qual. Quantity 50 (5), 1969–1991. https://doi.org/10.1007/s11135-015-0246-5.

Hill, D.H., Willis, R.J., 2001. Reducing panel attrition: a search for effective policy instruments. J. Hum. Resour. 36 (3), 416–438. https://doi.org/10.2307/3069625.

Kleven, Ø., 2017. Velgerundersøkelsen 2017 – større datagrunnlag og raskere rapportering. Statistics Norway. Retrieved from. https://www.ssb.no/valg/artikler-og-publikasjoner/velgerundersokelsene-2017-storre-datagrunnlag-og-raskere-rapportering.

Lepkowski, J., Couper, M.P., 2002. Non-response in the second wave of longtitudinal household surveys. In: Groves, R.M., Dillman, D.A., Eltinge, J.L., Little, R.J.A. (Eds.), Survey Nonresponse. John Wiley & Sons, pp. 259–272.

Lugtig, P., 2014. Panel attrition:separating stayers, fast attriters, gradual attriters, and lurkers. Socio. Methods Res. 43 (4), 699–723. https://doi.org/10.1177/0049124113520305.

Mirowsky, J., Reynolds, J.R., 2000. Age, depression, and attrition in the national survey of families and households. Socio. Methods Res. 28 (4), 476–504. https://doi.org/10.1177/0049124100028004004.

Mutz, D.C., 2011. Population-based Survey Experiments. Princeton University Press.

Olson, K., Witt, L., 2011. Are we keeping the people who used to stay? Changes in correlates of panel survey attrition over time. Soc. Sci. Res. 40 (4), 1037–1050. https://doi.org/10.1016/j.ssresearch.2011.03.001.

Pforr, K., Dannwolf, T., 2017. What do we lose with online-only surveys? Estimating the bias in selected political variables due to online mode restriction. Stat. Polit. Pol. 8 (1), 105–120. https://doi.org/10.1515/spp-2016-0004.

Satherley, N., Milojev, P., Greaves, L.M., Huang, Y., Osborne, D., Bulbulia, J., Sibley, C. G., 2015. Demographic and psychological predictors of panel attrition: evidence from the New Zealand attitudes and values study. PLoS One 10 (3), e0121950.

Strabac, Z., Aalberg, T., 2011. Measuring political knowledge in telephone and web surveys: a cross-national comparison. Soc. Sci. Comput. Rev. 29 (2), 175–192.

Uhrig, S.N., 2008. The Nature and Causes of Attrition in the British Household Panel Survey. ISER Working Paper Series 2008-05.

Vandecasteele, L., Debels, A., 2004. Modelling Attrition in the European Community Household Panel: the Effectiveness of Weighting. 2 Nd International Conference of ECHP Users. EPUNet.

Watson, D., 2003. Sample attrition between waves 1 and 5 in the European community household panel. Eur. Socio Rev. 19 (4), 361–378. https://doi.org/10.1093/esr/19.4.361.

Werner, S., Praxedes, M., Kim, H.-G., 2007. The reporting of nonresponse analyses in survey research. Organ. Res. Methods 10 (2), 287–295. https://doi.org/10.1177/1094428106292892.

Yeager, D.S., Krosnick, J.A., Chang, L., Javitz, H.S., Levendusky, M.S., Simpser, A., Wang, R., 2011. Comparing the accuracy of RDD telephone surveys and internet surveys conducted with probability and non-probability samples. Publ. Opin. Q. 75 (4), 709–747. https://doi.org/10.1093/poq/nfr020.