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Comparison of recruitment and retention among demographic subgroups in a large diverse population study of diet

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ABSTRACT

Objective: We examined the feasibility of conducting a longitudinal study of diet among diverse populations by comparing rates of response throughout recruitment and retention phases by demographic and other characteristics.

Methods: Using quota sampling, participants were recruited from 3 geographically and demographically diverse integrated health systems in the United States. Overall, 12,860 adults, ages 20–70, were invited to participate via mail. Participation first required accessing the study's website and later meeting eligibility criteria via telephone interview. Enrollees were asked to provide two 24-h dietary recalls, either interviewer-administered or self-administered on the web, over 6 weeks. Stepped monetary incentives were provided.

Results: Rates for accessing the study website ranged from 6% to 23% (9% overall) across sites. Site differences may reflect differences in recruitment strategy or target samples. Of those accessing the website, enrollment was high (≥87%). Of the 1185 enrollees, 42% were non-Hispanic white, 34% were non-Hispanic black, and 24% were Hispanic. Men and minorities had lower enrollment rates than women and non-Hispanic whites, partially due to less successful telephone contact for eligibility screening. Once enrolled, 90% provided 1 recall and 80% provided both. Women had higher retention rates than men, as did older compared to younger participants. Retention rates were similar across race/ethnicity groups.

Conclusions: While study recruitment remains challenging, once recruited most participants, regardless of race/ethnicity, completed two 24-h dietary recalls, both interviewer-administered and self-administered on the web. This study demonstrates the feasibility of collecting multiple 24-h recalls including less expensive automated self-administered recalls among diverse populations.

1. Introduction

Dietary intake is assessed in the ongoing National Health and Nutrition Examination Survey with the 24-h dietary recall (24HR). The current state-of-the-art protocol for conducting the 24HR is the interviewer-administered Automated Multiple Pass Method (AMPM) [1]. However, a major limitation of this protocol is cost, due to the requirement for trained interviewers and coders. The Automated Self-Administered 24-h Assessment Tool (ASA24) [2] is a web-based, automated data collection and processing instrument developed by the National Cancer Institute in conjunction with Westat [3]. ASA24 is an adaption of the AMPM, developed to be a convenient, self-administered and low-cost alternative.

The Food Reporting Comparison Study (FORCS) compared the self-administered ASA24 recall to the interviewer-administered AMPM recall with respect to mean nutrient and food group intakes and

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Abbreviations

24HR	24-h dietary recall
AMPM	Automated Multiple Pass Method
ASA24	Automated Self-Administered 24-h Recall
BMI	body mass index
FORCS	Food Reporting Comparison Study
HFHS	Henry Ford Health System/Health Alliance Plan
KPNC	Kaiser Permanente Northern California
MC	Marshfield Clinic
U.S.	United States

participant preferences. Thompson et al. found that mean nutrient and food group intakes for AMPM recalls and ASA24 recalls were similar; participants strongly preferred the ASA24 to the AMPM [4], citing the convenience of the web-based instrument, consistent with other studies [5].

While challenges with accrual to research studies are well known [6–9], few report participation and retention rates throughout the course of the enrollment and retention processes [6,10,11], particularly in dietary recall surveys. The purpose of this analysis is to examine the recruitment and retention rates in FORCS by study site, demographic group and data collection method in order to inform strategies for the design of large population studies collecting multiple administrations of dietary recalls. We also provide cost comparison data for the 2 different recruitment strategies used.

2. Materials and methods

2.1. Study sample

The FORCS sample was drawn from 3 integrated health systems that are diverse geographically and by race/ethnicity: Kaiser Permanente Northern California (KPNC) in California, Henry Ford Health System/Health Alliance Plan (HFHS) in Michigan, and the Marshfield Clinic (MC) Security Health Plan in Wisconsin. A quota-sampling plan enacted in 2012 at each site ensured a final diverse study sample. Using available demographic information, sites randomly selected current members between ages 20 and 70 years and assigned them to sampling strata defined by sex, age (20–34, 35–54, and 55–70 years), and race/ethnicity (non-Hispanic white, non-Hispanic black, and Hispanic).

2.2. Study design and procedures

Selected individuals were sent an invitation letter, on center-specific letterhead, signed by the site investigator and postmarked locally using metered postage to increase the recipient's confidence in the invitation [12]. The letter explained the purpose, procedures, and incentive structure of the FORCS study and provided a link to access the FORCS website. On that website, interested individuals consented to a telephone interview to assess their eligibility. Reminder letters were sent 10–14 days after the initial mailing to those not accessing the FORCS website (HFHS and MC) or to all invitees (KNPC). Additional waves of invitations were initiated as needed (1 additional wave for HFHS and MC, and 2 additional waves for KPNC), at 3- to 7-week intervals. In Wave 2, reminder letters were sent to nonresponders by HFHS and MC;

Table 1
Enrollment status of invitees by demographic characteristics for each study site: FORCS, 2012.

Site and demographic characteristics	Invited N (1)	Invitees accessing website N (% of [1]) (2)	Agreed to telephone interview N (% of [2]) (3)	Successfully reached N (% of [3]) (4)	Eligible N (% of [4])	Enrolled eligible and consented N (% of [2]; % of [1])
KPNC						
Total	8712	504 (5.8)	491 (97.4)	406 (82.7)	381 (93.8)	371 (73.6; 4.3)
Sex						
Males	5082	243 (4.8)	232 (95.5)	193 (83.2)	181 (93.8)	177 (72.8; 3.5)
Females	3630	261 (7.2)	259 (99.2)	213 (82.2)	200 (93.9)	194 (74.3; 5.3)
Age group, y						
20–34	3253	171 (5.3)	165 (96.5)	136 (82.4)	129 (94.9)	129 (75.4; 4.0)
35–54	2515	143 (5.7)	142 (99.3)	116 (81.7)	104 (89.7)	101 (70.6; 4.0)
55–70	2942	188 (6.4)	182 (96.8)	152 (83.5)	148 (97.4)	141 (78.7; 4.8)
Race/ethnicity[a]						
Non-Hispanic white	668	86 (12.9)	85 (98.8)	77 (90.6)	74 (96.1)	74 (86.0; 11.1)
Non-Hispanic black	903	40 (4.4)	40 (100.0)	33 (82.5)	31 (93.9)	31 (77.5; 3.4)
Hispanic	7132	369 (5.2)	357 (96.7)	287 (80.4)	269 (93.7)	261 (70.7; 3.7)
HFHS						
Total	2540	579 (22.8)	557 (96.4)	471 (84.6)	443 (94.1)	433 (74.8; 17.1)
Sex						
Males	1466	289 (19.7)	272 (94.1)	225 (82.7)	212 (94.2)	209 (72.3; 14.3)
Females	1074	290 (27.0)	285 (98.3)	246 (86.3)	231 (93.9)	224 (77.2; 20.9)
Age group, y						
20–34	849	179 (21.1)	174 (97.2)	145 (83.3)	137 (94.5)	135 (75.4; 15.9)
35–54	819	182 (22.2)	179 (98.4)	154 (86.0)	148 (96.1)	144 (79.1; 17.6)
55–70	872	218 (25.0)	204 (93.6)	172 (84.3)	158 (91.9)	154 (70.6; 17.7)
Race/ethnicity[a]						
Non-Hispanic white	225	75 (33.3)	71 (94.7)	58 (81.7)	58 (100.0)	54 (72.0; 24.0)
Non-Hispanic black	2296	485 (21.1)	467 (96.3)	394 (84.4)	377 (95.7)	371 (76.5; 16.2)
Total: HFHS and KPNC	11,252	1083 (9.6)	1048 (96.8)	877 (83.7)	824 (94.0)	804 (74.2; 7.1)
MC[b] **(total)**	1608	–	485 (—)	430 (88.7)	395 (91.9)	381 (96.5; 23.7)
Total all sites[b]	12,860	–	1533 (—)	1307 (85.3)	1219 (93.3)	1185 (97.2; 9.2)

FORCS, Food Reporting Comparison Study; HFHS, Henry Ford Health System; KPNC, Kaiser Permanente Northern California; MC, Marshfield Clinic.

[a] Those with race/ethnicity classified as other/mixed (n = 9 in KPNC and n = 19 in HFHS) are not included. Sex, age, race/ethnicity created from screener data and, if unavailable, from site data.

[b] Data were not available from MC (—) to estimate the number of people accessing the website and the relevant rates.

Table 2
Yield[a] for initial and reminder mailing: KPNC and HFHS, FORCS 2012.

Number of weeks post-mailing	KPNC N = 8712 Initial mailed invitation letters						HFHS N = 2624 Initial mailed invitation letters							
	Wave 1				Waves 2 and 3		Wave 1				Wave 2			
	Wave 1 (N = 2908) Date: 3/16/2012		Reminder mailing (N = 2874) Date: 4/2/2012 (pre 4/4 response assigned to initial letter)		Wave 2 (N = 2904) Date: 4/6/2012 Mail 3 (N = 2900) Date: 4/18/2012		Wave 1 (N = 1542) Date: 2/13/2012		Reminder mailing (N = 1290) Date: 2/28/2012 (pre 3/1 response assigned to initial letter)		Wave 2 (N = 1082) Date: 4/6/2012		Reminder mailing (N = 903) Date: 4/25/2012 (pre 4/27 response assigned to initial letter)	
	Accessed web (1) (% of total responding)	Signed up (% of (1))	Accessed web (2) (% of total responding)	Signed up (% of [2])	Accessed web (3) (% of total responding)	Signed up (% of [3])	Accessed web (4) (% of total responding)	Signed up (% of [4])	Accessed web (5) (% of total responding)	Signed up (% of (5))	Accessed web (6) (% of total responding)	Signed up (% of [6])	Accessed web (7) (% of total responding)	Signed up (% of [7])
1 week (Days 0–6)	96 (69.6)	93 (96.9)	61 (51.7)	60 (98.4)	160 (64.5)	157 (98.1)	137 (60.0)	134 (97.8)	55 (40.1)	54 (98.2)	110 (69.2)	106 (96.4)	30 (54.5)	30 (100.0)
2 weeks (Days 7–13)	28 (20.3)	27 (96.4)	33 (28)	32 (97.0)	69 (27.8)	66 (95.7)	70 (30.7)	67 (95.7)	50 (36.5)	47 (94.0)	38 (23.9)	38 (100.0)	25 (45.5)	24 (96.0)
3 weeks (Days 14–20)	14 (10.1)	13 (92.9)	17 (14.4)	17 (100.0)	13 (5.2)	13 (100.0)	14 (6.1)	13 (92.9)	9 (6.6)	8 (88.9)	10 (6.3)	10 (100.0)	0	0
≥4 weeks (after day 20)	0	0	7 (5.9)	7 (100.0)	6 (2.4)	6 (100.0)	7 (3.1)	5 (71.4)	23 (16.8)	20 (87.0)	1 (0.6)	1 (100.0)	0	0
Total number (%)	138	133 (96.3)	118	116 (98.3)	248	242 (97.6)	228	219 (96.1)	137	129 (94.2)	159	155 (97.5)	55	54 (98.2)
Response rate of initial mailing (%)^	**4.7**		**4.1**		4.3		**14.8**		**8.9**		14.7		14.3	

FORCS, Food Reporting Comparison Study; KPNC, Kaiser Permanente Northern California; HFHS, Henry Ford Health System.
^Bold percentages in Response rate of initial mailing (%) illustrates higher yield per wave with reminder mailing; 256/2908 = 8.8% at KPNC, 365/1542 = 23.7% at HFHS.
[a] Assumption: 2-day postal delivery.

no reminder letters were sent by KPNC in Waves 2 and 3.

After agreeing online to a telephone eligibility interview, up to 6 attempts were made to contact the respondent. Eligibility criteria included ages 20–70 years, access to high-speed internet for personal use, ability to read English, not pregnant, not currently on a weight loss diet, and no history of bariatric surgery. Following confirmation of eligibility and verbal consent, enrolled participants in each sampling cell were randomly assigned to 1 of 4 study groups: 1) two self-administered ASA24-version 2011 recalls; 2) two telephone interviewer-administered AMPM recalls; 3) one ASA24-2011 recall followed by 1 AMPM recall; and 4) one AMPM recall followed by 1 ASA24-2011 recall.

All recalls were conducted without prior scheduling. Those who failed to complete an ASA24 or AMPM recall on their assigned dates were recontacted 3–6 days later. On the assigned recall day, participants assigned to complete the ASA24 received 2 telephone messages notifying them to look for an e-mail. The e-mail included a link to ASA24 and requested that they complete by midnight a recall on foods and drinks consumed the previous day. For the AMPM, up to 6 telephone contact attempts were made for each assigned recall day. The same procedures were used for the second dietary recall, about 4–6 weeks after the first. Following completion of the final 24HR, participants were asked to complete an online demographics/preference questionnaire.

Respondents received up to $52 in incentives for participation. At HFHS and MC, invitation letters contained a $2 cash incentive. Due to system restrictions, KPNC did not include the $2 incentive in the invitation letter. Following successful eligibility screening and consent,

Table 3
Participation and retention status of enrolled participants by characteristic: FORCS 2012.

Characteristic	Enrolled (eligible and screened) N [1]	Completed first recall N (% of [1])	% Reached by number of call attempts	Completed both first and second recalls N (% of [1])	% Reached by number of call attempts	Completed only 1 recall (either)
Total	1185	1054 (89)	66: 1; 88: 2	949 (80)	67: 1; 85: 2	132
Site						
KPNC	371	316 (85) *a*	70: 1; 90: 2	283 (76) *c*	64: 1; 82: 2	47
HFHS	433	387 (89)	64: 1; 86: 2	345 (80)	67: 1; 85: 2	51
MC	379	351 (93) *b* *ab***	66: 1; 89: 2	321 (85) *d* ***cd*	66: 1; 87: 2	34
Sex						
Males	568	495 (87) *a*	69: 1; 89: 2	435 (77) *c*	63: 1; 84: 2	76
Females	615	559 (91) *b* **ab*	64: 1; 87: 2	514 (84) *d* ***cd*	68: 1; 85: 2	56
Age group, y						
20-34	383	329 (86) *a*	69: 1; 92: 2	286 (75) *c*	65: 1; 83%: 2	53
35-54	396	355 (90)	63: 1; 84: 2	323 (82) *d* **cd*	63: 1; 86: 2	41
55-70	404	370 (92) *b* **ab*	68: 1; 89: 2	340 (84) *e* ****ce*	69: 1; 84: 2	38
Race/ethnicity[a]						
Non-Hispanic white	504	463 (92) *a*	67: 1; 90: 2	422 (84) *d*	66: 1; 86: 2	50
Non-Hispanic black	403	361 (90) *b*	65: 1; 85: 2	322 (80)	67: 1; 85: 2	46
Hispanic	265	221 (83) *c* ****ac*; **bc*	70: 1; 90: 2	197 (74) *e* ***de*	63: 1; 82: 2	35
Self-reported health status						
Excellent	270	241 (89) *a*	69: 1; 89: 2	222 (82) *c*	63: 1; 84: 2	4
Very good	508	460 (91) *a*	66: 1; 89: 2	412 (81) *c*	69: 1; 86: 2	58
Good	319	286 (90) *a*	64: 1; 87: 2	258 (81) *c*	64: 1; 83: 2	36
Fair	77	60 (78) *b*	68: 1; 85: 2	52 (68) *d*	58: 1; 79: 2	12
Poor	9	7 (78) *b* ****ab*	57: 1; 86: 2	5 (56) *d* ****cd*	80: 1; 100: 2	3
BMI[b] **category**						
Normal	332	298 (90)	64: 1; 87: 2	267 (80)	66: 1; 85: 2	36
Overweight	430	377 (88)	68: 1; 89: 2	344 (80)	64: 1; 86: 2	42
Obese	421	379 (90)	67: 1; 88: 2	338 (80)	68: 1; 83: 2	54

BMI, body mass index; FORCS, Food Reporting Comparison Study; HFHS, Henry Ford Health System; KPNC, Kaiser Permanente Northern California; MC, Marshfield Clinic.
Z test of 2 population proportions used to compare pair-wise proportion of responses within subgroup categories. Comparisons are non-significant unless noted.
The *a, b, c, d, e* letters indicate the cell data that are compared to the other: e.g., *a* compared to *b* with significance as *ab*, and * indicates statistical significance (*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$).

[a] Those with other or multiple race/ethnicity (n = 11) are not included.

[b] BMI was calculated from self-reported weight and height: (pounds * 0.45359237)/(inches * 0.0254)^2.

participants received $5 ($7 for KPNC) for enrolling. After completing the first and second 24HRs, participants received $15 and $25, respectively, and received $5 after completing the online questionnaire.

All study procedures and informed consent forms were approved by the respective institutional review boards of the National Cancer Institute, Westat, KPNC, HFHS, and MC, and the U.S. Office of Management and Budget.

2.3. Analytic variables and analysis

The principle analytic variables were site, age, sex, and race/ethnicity, classified as non-Hispanic white, non-Hispanic black, Hispanic, and Other (for those reporting another race or multiple races). Additional variables of interest included study group, self-rated health status (5 categories, poor to excellent) and body mass index (BMI) calculated from self-reported height and weight (kg/m^2). Data were analyzed using SAS (version 9.3, SAS Institute Inc, Cary, NC). Z tests of differences in proportions across subgroups were used. Statistical significance was evaluated at the $p < 0.05$ level.

3. Results

3.1. Recruitment

Invitation letters were mailed to 12,860 individuals, 8712 from KPNC, 2540 from HFHS, and 1608 from MC (Table 1). Information about individuals who responded to the invitation letter was not available for MC. For the other sites, the response rate, i.e., the percentage of those who accessed the FORCS study website after initial invitation, was 6% at KPNC and 23% at HFHS, 10% overall for these sites. Within KPNC and HFHS, females responded at a higher rate than males (7% vs. 5% and 27% vs. 20%, respectively); the response rates tended to increase with age. At KPNC, response rates were greatest for non-Hispanic whites (13% vs. 5% for Hispanics and 4% for non-Hispanic blacks). Similarly, within HFHS, response rates were greater among non-Hispanic whites than non-Hispanic blacks (33% vs. 21%). Of those responding, 97% indicated online that they were willing to complete an eligibility screener by telephone. Rates of agreement for phone eligibility screening were above 90% among all subgroups, defined by sex, age, and race/ethnicity, at KPNC and HFHS.

Of those responders to the website who agreed to screening, 15% were not reached by telephone. The failure-to-contact rate was lowest at MC (11% vs. 15% at HFHS and 17% at KPNC). Within KPNC and HFHS, follow-up contact rates for men and women and across age groups were similar. Within KPNC, non-Hispanic whites had a higher contact rate than non-Hispanic blacks and Hispanics (91% vs. 83% and 80%, respectively). Within HFHS, non-Hispanic blacks had a similar contact rate to that of non-Hispanic whites (84% vs. 82%).

Overall, 93% of screened individuals were eligible for the study; 97% of the eligible individuals consented and enrolled, totaling 9% of all invited. Final overall enrollment rates (% of invited) were similar by age and differed by site, sex, and race/ethnicity. At KPNC, the oldest age group (55–70 years) and non-Hispanic whites were more likely to enroll compared to younger age groups and other race/ethnicity groups. At HFHS, while at least 70% of responders from each subgroup enrolled, females, middle-age group responders (35–54 years), and non-Hispanic blacks were more likely to enroll compared to males, younger or older adults, and non-Hispanic whites.

For both KPNC and HFHS and in all mailing waves, the response (website access) to the invitation letter was highest during the first 2 weeks after the mailing date, yielding 525 or over 90% of those who responded within 4 weeks (Table 2). The reminder mailings increased the yield per wave with an additional 310 responses. Of responses, 82% were received within 2 weeks of their mailing dates. Response decreased over time, yielding less than 6% of all responders after 4 weeks. The enrollment rate of responders, regardless of time span between mailing date and response, was similarly high.

The relative costs of recruiting participants varied for each site as their incentive practices and recruitment goals differed. Because of a higher recruitment goal and lower response, KPNC mailed twice as many letters as did HFHS and about 9 times as many letters as did MC. KPNC did not include the $2 incentive in the initial mailing but sent consenting participants $7 (rather than $5). Mailing costs were higher for KPNC than for HFHS and MC, but incentive payments were lower. Based on mailing and incentive costs only, an estimate of the cost per enrolled respondent was $16.03 for KPNC, $17.53 for HFHS, and $10.34 for MC.

3.2. Initial dietary recall completion rates and retention

Of the 1185 enrollees, 1054 (89%) completed the first 24HR recall (Table 3). For 66% of these recalls, only 1 attempt was needed; 88% of first recalls were obtained with no more than 2 attempts. First recall completion rates varied by site, ranging from 85% at KPNC to 93% for MC ($p < 0.01$), and were similar by assigned study group (data not shown) and BMI status. First recall completion rates were somewhat higher for women than for men (91% vs. 87%, $p < 0.05$). The oldest age group had higher completion rates than the youngest (92% for 55–70 years vs. 86% for 20–34 years, $p < 0.05$). The completion rates for non-Hispanic white and non-Hispanic black participants were similar but were lower for Hispanics (92% for non-Hispanic whites and 90% for non-Hispanic blacks vs. 83% for Hispanic, $p < 0.05$). First recall completion rates were higher for those who reported better vs. worse health (90% for good or better health and 78% for fair or poor, $p < 0.001$).

Retention, defined as completion of both recalls, was 80% overall (Table 3). Retention rates differed by site, with MC reaching 85% compared to KPNC at 76% ($p < 0.01$). Similar to the first survey completion rates, overall retention of women was higher than men (84% women vs. 77% men, $p < 0.01$), and younger participants had lower retention than both middle ($p < 0.05$) and older ($p < 0.01$) age group participants. Retention rates for Hispanic participation (74%) were lower than those of Non-Hispanic whites (84%). Rates did not vary by BMI category, but those who reported excellent, very good, and good health had higher retention rates (89–91%) than those who reported fair or poor health (78%; $p < 0.001$).

4. Discussion

This paper describes recruitment and retention strategies and outcomes among adults in a dietary assessment study requiring completion of 2 dietary recalls over 4–6 weeks. Participants were recruited from 3 geographically and ethnically diverse integrated health care systems. The comprehensive electronic databases maintained by each health system allowed researchers to identify and invite targeted population subgroups by age, sex, and race/ethnicity. Tracking study progress allowed characterization of those responding throughout the study.

While response rates varied substantially across health systems, the average response overall was low, at about 9%, similar to other health or nutrition studies using web-based enrollment [13,14]. Reasons for low enrollment may include lack of topic saliency, invitees feeling “over-surveyed”, or participants feeling it not worth the time required [6,15–17]. Differences in enrollment by demographic characteristics were evident and varied across enrollment stages. A greater proportion of women than men responded by accessing the website at both KPNC and HFHS, but there were only minor differences between women and men at other enrollment stages. There were even fewer differences in rates of progressing through the enrollment stages across age groups. Although data indicate that younger adults prefer web-based over other modes of data collection [18], there was a small tendency for higher response rates in successively older age groups. Enrollment differences were greatest between whites and minorities primarily based on the

difference in the rates of initial response. A less consistent factor was successful telephone contact to assess eligibility; contact rates at HFHS were slightly higher among non-Hispanic blacks than non-Hispanic whites, while contact rates at KPNC were substantially higher for non-Hispanic whites and lower for both non-Hispanic blacks and Hispanics.

KPNC had a lower enrollment rate than HFHS and MC, possibly due, in part, to KPNC's larger proportional target of minority groups. Recruitment of non-Hispanic whites was less successful at KPNC than at HFHS, 11% vs. 24%, respectively, indicating presence of other factors affecting participation. Unlike the other 2 sites, KPNC did not include the $2 incentive in the initial mailing, a feature offering novelty and immediate reward to the request for participation and found to enhance enrollment [19,20]. Unfortunately, the effect of a pre-incentive cannot be disentangled from the effect of site in our study design.

Although HFHS and MC used reminder mailings for their initial letter waves, KPNC used a reminder mailing only for their first invitation letter wave. At HFHS and KPNC, the reminder letter generated similar response rates to the initial mailing, doubling the response at KPNC (256/2908 = 8.8%) and nearly doubling at HFHS (365/1542 = 23.7%). The response rates at KPNC in later waves without reminder mailings were similar, at just under 5%. The optimal strategy for using reminder mailings may depend on scientific and feasibility considerations. A study that requires a higher yield from the intended sample or has a limited sample to draw from may be better served with reminder mailings. KPNC's strategy of targeting new potential participants rather than sending reminders to those already invited illustrates an alternative scenario. Our study design called for a random sample of eligible adults within each sampling cell, with the presumption that anyone selected in that cell would be equally acceptable. KPNC had a large pool of potential respondents and sending a reminder letter to nonresponders would be costlier, requiring tracking of respondents and coordination with the data collection site, than sending initial letters to additional people.

Success in conversion from interest to study enrollment reflected the clear advantage of incorporating personal contact, similar to other studies comparing personal to other modes of contact [21]. Other factors found to increase participation, e.g., low participation burden and short study duration (2 surveys over 4–6 weeks) [6,22], may have enhanced enrollment in FORCS. A disadvantage of completing the recruitment process by telephone was evident, however. Even with responders providing their best contact information and multiple attempts to reach them, 15% of those agreeing to be interviewed were not reached.

Longitudinal study design, which allows tracking behaviors within a participant panel, is subject to threats of validity due to attrition [23]. For dietary assessment, collection of multiple 24HRs allows more precise estimation of diet than a single 24HR [24]. Little research exists on rates of retention in community studies using 24HRs. One study among about 2800 adults in Massachusetts found that 76% of those who completed a first AMPM recall also completed a second AMPM recall about 5 months later [25], similar to the 80% retention rate in FORCS which collected two 24HRs within 4–6 weeks. Importantly, FORCS establishes the feasibility of collecting multiple self-administered web-based 24HRs in a large community field study.

The accuracy of dietary recall has been associated with BMI status, with poorer accuracy among overweight and obese than among normal weight groups [26]. If diet study participation is influenced by BMI status, selection bias could further compromise study results. In FORCS, we were unable to examine initial response by BMI group and self-rated health status since we did not have that information for those not responding. However, once enrolled, there were no differences in the rates of completion of a first recall or of retention by BMI status. Initial completion and retention did vary by self-rated health status, with those reporting fair or poor health having a far lower completion rate than those with better health.

By design, our study population was diverse with respect to geographical location, race/ethnicity and age. However, participants were drawn from members of integrated health systems, were English speaking, and comfortable with using the internet. Therefore, our results may not generalize to the overall adult U.S. population. For example, health system members may be healthier than the general public, and because the initial invitation to participate originated from the health systems' centers using center letterhead, responders may have identified more with this health community than nonresponders or others not affiliated with the centers [10,27,28]. Finally, the effect of incentives on response rates could not be examined and thus is unknown.

Strengths of this study include large sample size and fidelity to the protocol to reach diverse composition [29]. Study protocols utilized previously successful recruitment strategies [10,20] and provided several opportunities to participate at times convenient to participants likely contributed to the high retention rate. Finally, tracking of participation throughout the study allowed comparisons of the invited, responded, enrolled, and retained sample.

While recruitment to population studies remains challenging, FORCS demonstrates that it is feasible to recruit and retain a diverse population willing to complete multiple self-administered 24HRs. In our study, minority subgroups had lower participation rates than non-Hispanic whites, primarily because of nonresponse to the initial invitation, and for those who did respond, lower successful contact for eligibility screening. These findings point to the need for multiple recruitment strategies, with special attention to cultural preferences required to interest minority populations in participating, and collection of extensive contact information. However, once enrolled, there were no race/ethnicity differences in retention. Large studies with diverse populations using multiple ASA24s have the potential to enhance our knowledge of dietary intake at relatively little expense.

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Conflicts of interest

No conflict of interest was declared by the authors of this paper.

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