



Comparison of Data from a US National Survey (NHANES) with Data from a Cohort Recruited from the Internet

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ABSTRACT

Background: The range of demographic, behavioral and health characteristics of cohort subjects recruited via the Internet is not yet well established.

Objectives: To examine the distributions of characteristics of a cohort recruited via the Internet and compare to a probability-based national sample.

Methods: Prospective Obesity Cohort of Economic Evaluation Determinants (PROCEED) is an ongoing multinational observational cohort of normal weight (body mass index [BMI] 20-24 kg/m²), overweight (BMI 25-29.9 kg/m²) and obese subjects (BMI ≥30 kg/m²). Recruited through an existing Internet panel, subjects had to be 35-75 years of age; not pregnant; if overweight or obese, willing to lose weight in next 12 months; and weigh <180 kg. Recruitment was stratified to balance gender within overweight and obese categories. Respondents with BMI ≥25 kg/m² were pooled and regrouped by abdominal obesity status (AO), defined as waist circumference (WC) greater than 102cm for men and 88cm for women. We compared demographics and selected health and behavior characteristics from the PROCEED US cohort with estimates from a subset of the US National Health and Nutrition Examination Survey (NHANES) 2001-2002 who were in the same age, BMI and WC ranges and not pregnant. For the PROCEED sample, we calculated unadjusted sample means and percentages, but for NHANES we calculated weighted means and percentages taking into account the survey design.

Results: In all 3 subgroups (100 normal weight subjects, 293 without AO, and 674 subjects with AO) the PROCEED cohort was similar to the NHANES population in terms of mean age, marital

status, behavior (alcohol consumption, smoking status and physical activity) and prevalence of self-reported conditions such as high cholesterol and diabetes. All 3 subgroups were proportionally more white in PROCEED. Mixed results were seen for education, income, and hypertension (e.g., the proportion of PROCEED subjects reporting income >\$75,000 USD was lower for normal weight, higher for subjects without AO and similar for subjects with AO versus NHANES).

Conclusions: A diverse cohort with broad similarities to a national sample can be recruited via the Internet; stratified sampling of minorities may be desired in some studies.

CONFLICT OF INTEREST STATEMENT

- This study was conducted by RTI Health Solutions and Sanofi-Aventis Recherche et Développement.
- The study was fully funded by Sanofi-Aventis Recherche et Développement.

BACKGROUND

Primary Objective for the PROCEED Study

To compare the health care consumption of individuals in the US with or without abdominal obesity (AO) who are overweight or obese to the health care consumption of a normal weight group.

PROCEED Study Design

PROCEED is an ongoing multinational observational cohort study of overweight (body mass index [BMI] 25-29.9 kg/m²)

and obese (BMI ≥30 kg/m²) subjects. US PROCEED also includes a normal weight "control" group (BMI 20-24 kg/m²). Subjects were recruited through an existing Internet panel that has several million panelists in over 125 countries. The panel members are Internet users who have voluntarily registered and agreed to complete regular online surveys for research purposes in exchange for points that can be redeemed for merchandise.

A random sample of the panel members who met the age and country criteria received an e-mail invitation to participate in screening for the PROCEED study. Recruitment was designed to enroll an equal number of overweight and obese persons and an equal number of males among each BMI group (normal weight, overweight, and obese).

The range of demographic, behavioral, and health characteristics of cohort subjects recruited via the Internet is not yet well established.

OBJECTIVES

To compare characteristics from the US PROCEED cohort to a nationally representative US sample in order to understand what differences may exist between a cohort recruited via the Internet and a national probability-based sample.

METHODS

A subset of the nationally representative probability-based NHANES 2001-2002 sample was selected for comparison to the self-reported baseline demographic characteristics, health conditions and behaviors of the Internet-based PROCEED cohort according to the criteria to the right:

US PROCEED Baseline (2004)	National Health and Nutrition Examination Survey (NHANES) (2001-2002)
Inclusion Criteria	Selected subset of subjects who were:
<ul style="list-style-type: none"> Aged 35-75 years Not pregnant Willing to take action now to lose weight in the next year, if overweight or obese Weigh <180 kg English-speaking 	<ul style="list-style-type: none"> Aged 35-75 years Not pregnant
Unadjusted, based on crude sample mean and percentage	Adjusted, using weighted mean or percentage with consideration of survey design method

Group	Stratification Variable Definitions		
	Normal Weight	Non-AO	AO
Definition*	20 ≤ BMI <24	BMI ≥25 WC ≤88 cm for females and ≤102 cm for males	BMI ≥25 WC >88 cm for females and >102 cm for males

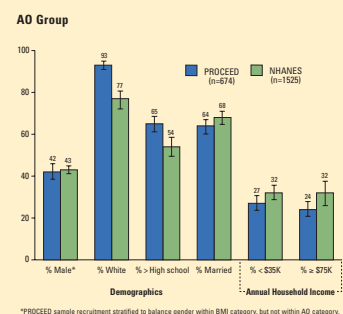
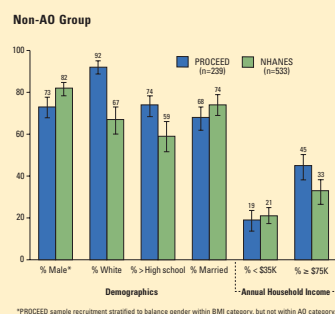
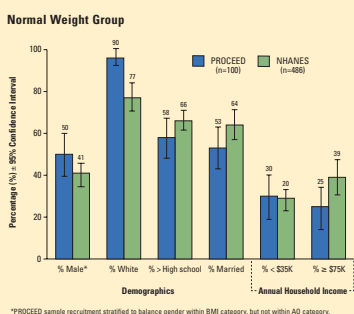
* Weight, height and waist circumference (WC) were self-measured and self-reported in PROCEED and professionally measured in NHANES. BMI = height in meters / (weight in kilograms × weight in kilograms)

Characteristics, health conditions, and behaviors compared across groups had the following definitions:

	Smoker	Alcohol Consumption	Level of Physical Activity	Presence of Hypertension, Diabetes or High Cholesterol	Dyslipidemia
PROCEED	Currently smoke cigarettes	Currently drink alcoholic beverages: (occasionally, <7 weekly, or >7 weekly)	Participated at least once a month in one or more moderate or vigorous physical activities of at least 10 minutes' duration within the past month	Self-reported response to "Have you ever been told by a doctor or health care professional that you had any of the following conditions?"	Based on self-reported lab values: • Total cholesterol >200 mg/dL • LDL ≥130 mg/dL • Triglyceride >150 mg/dL • HDL <40 mg/dL for men, <50 mg/dL for women • Self-reported history (ever told by a doctor of high cholesterol, low HDL cholesterol, abnormal lipids, or triglycerides)
NHANES	Smoked at least 100 cigarettes in the past 12 months every day or some days	Had at least one drink (12 oz beer, 5 oz wine, or 1.5 oz liquor) in the past 12 months	Over the past 30 days, did moderate or vigorous physical activities for at least 10 minutes, including house work or yard work	Self-reported response to "Have you ever been told by a doctor or health care professional that you have...?"	Based on professionally measured lab values: • Total cholesterol >200 mg/dL • LDL ≥130 mg/dL • Triglyceride >150 mg/dL • HDL <40 mg/dL for men, <50 mg/dL for women

After selecting initial NHANES subset who met the age and pregnancy status criteria of PROCEED, we next made comparisons within the three groups to the right:

RESULTS [1] – Demographics



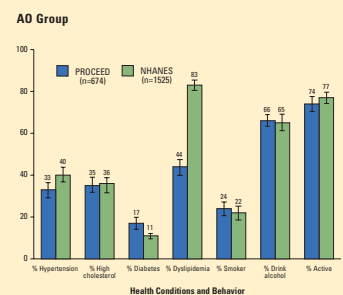
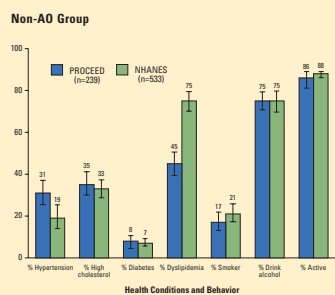
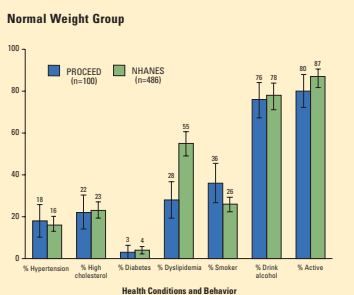
Group	US PROCEED 2004 mean (95% CI)	NHANES 2001-2002 mean (95% CI)
Normal Weight	50.3 (48.4 - 52.2)	49.0 (47.7 - 50.4)
Non-AO	50.3 (49.2 - 51.4)	47.9 (46.6 - 49.1)
AO	50.2 (49.5 - 50.9)	52.2 (51.8 - 52.6)

Group	% Male	% White	Education	Married	<\$35K	≥\$75K
Normal	—	↑	—	↓	—	↓
Non-AO	—	↑	↑	—	—	↑
AO	—	↑	↑	—	—	—

— No difference (absolute difference of <10 percentage points)
↑ PROCEED higher than NHANES
↓ PROCEED lower than NHANES

- Within normal weight, non-AO and AO groups, the PROCEED cohort had a higher proportion of white subjects compared to NHANES and there were no differences in mean age or percent of subjects with income <\$35,000 USD.
- Among the normal weight group, the PROCEED cohort had a lower proportion of subjects reporting annual household income >\$75,000 USD and a lower proportion of subjects that were married compared to NHANES.
- Among the non-AO group, the PROCEED cohort had a higher proportion of subjects reporting greater than high school education and annual household income >\$75,000 USD compared to NHANES.
- Among the AO group, the PROCEED cohort had a higher proportion of subjects reporting greater than high school education compared to NHANES.

RESULTS [2] – Health Conditions and Behavior



SUMMARY – Health Conditions and Behavior: PROCEED Compared to NHANES

Group	HTN	High Cholesterol	Diabetes	Dyslipidemia	Smoker	Alcohol Use	Active
Normal	—	—	—	↓	↑	—	—
Non-AO	↑	—	—	↓	—	—	—
AO	—	—	—	↓	—	—	—

— No difference (absolute difference of <10 percentage points)
↑ PROCEED higher than NHANES
↓ PROCEED lower than NHANES

- Prevalence of self-reported high cholesterol and diabetes were similar between PROCEED and NHANES for all three groups.
- Prevalence of self-reported dyslipidemia in the PROCEED cohort was significantly lower than professionally measured laboratory values in NHANES for all three groups.
- Among the normal weight group and AO group, the prevalence of hypertension was similar for PROCEED and NHANES; however, among the non-AO group, the prevalence of hypertension was higher among the PROCEED cohort compared to the NHANES data.

- In general, there were no meaningful differences between the PROCEED cohort and NHANES data in the proportion of current smokers in the non-AO and AO groups; among the normal weight group, more subjects reported smoking in the PROCEED cohort compared to NHANES.
- The proportion of subjects reporting at least 10 minutes of moderate or vigorous physical activity in the past month as well as alcohol use was similar for the PROCEED cohort compared to the NHANES data within all three groups.

RESULTS: Summary

In general no meaningful differences were seen in:

- mean age
- percentage married
- alcohol use, smoking status, and physical activity
- prevalence of high cholesterol or diabetes

Meaningful differences included:

- higher proportion of white subjects in PROCEED cohort (in all the three BMI and AO groups)
- lower prevalence of self-reported dyslipidemia in PROCEED

Within-BMI-group differences between PROCEED and NHANES were variable across normal weight, AO, and non-AO groups for:

- education
- income level
- hypertension

CONCLUSIONS

- A sample recruited via the Internet may under-represent minorities and over-represent persons with more than high school education.
- Self-reported medical conditions in studies that do not require all subjects to be screened and require subject knowledge of specific lab-values are likely to be under-reported, as demonstrated by the lower prevalence of self-reported dyslipidemia in the PROCEED cohort compared to dyslipidemia as defined by professionally measured laboratory values in NHANES.
- A diverse cohort with broad similarities to a national sample can be recruited via the Internet.

REFERENCE

1 Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Data. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2001-2002. <http://www.cdc.gov/nchs/about/major/nhanes/nhanes01-02.htm>.

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