The Effects of Perceived Body Weight on Dieting Behaviors and Physical Activity in Overweight and Obese American Indian and Alaska Native Adolescents

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A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Public Health

University of Washington

2014

Committee:

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Program Authorized to Offer Degree:

Public Health—Health Services

University of Washington

Abstract

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Background: Self-perception of body weight is an important issue among adolescents, a group at risk for body dissatisfaction and negative diet-related behaviors related to weight perception. The aim of our study was to evaluate weight perception among American Indian and Alaska Native (AI/AN) overweight and obese adolescents and examine the associations between the accuracy of perceived body weight and dieting and physical activity behaviors.

Methods: Using American Indian Alaska Native data from the national Youth Risk Behavior Surveillance System (2007-2011), we performed a cross sectional analysis of weight perception and dieting and physical activity among overweight and obese youth. Respondents' self-described weight status was matched with their body mass index (BMI) percentile using self-reported weight and height. Youth were classified as accurate perceivers if self-perception and BMI percentile coincided or misperceivers if the two were discordant. We evaluated the association between accurate perception versus misperception

of weight and diet and physical activity outcomes using logistic regression to estimate prevalence odds ratios (aPOR) and 95% confidence intervals (CI), adjusting for sex.

Results: Misperceivers were more likely to be male and 15-16 years old than accurate perceivers. Misperceivers were 80 % (95% CI: 0.13-0.31) less likely to be trying to lose weight and 36% (95% CI: 0.40-1.03) less likely to be fasting to lose weight than accurate perceivers. Misperceivers were 48% (95% CI: 1.00-2.17) more likely to engage in ≥60 minutes of physical activity on ≥5 days per week 69% (95% CI: 1.15-2.48) more likely to attend physical education classes ≥3 days per week, and 95% (95% CI: 1.34-2.85) more likely to have played on ≥1 sports teams during the previous year than accurate perceivers. Misperceivers were also 64% (95% CI: 1.11-2.43) more likely to consume the recommended daily servings of fruit than accurate perceivers.

Conclusion: The finding that misperceivers were more likely than accurate perceivers to engage in physical activity and less likely to engage in unhealthy fasting behavior suggests that adolescents' self-perceived weight status should be considered when designing weight-related interventions in this population and warrants further investigation in future studies.

Introduction

The prevalence of overweight and obesity is higher for American Indian and Alaska Native (AI/AN) children than for children of other races.[1,2] Among AI/AN adolescents, various national studies estimate a 40% or greater prevalence of overweight and obesity. The majority of overweight and obesity research among AI/AN youth investigates elementary school-aged children, with fewer studies concentrating on adolescents.[1] Among this older group of youth, self-perception of body weight is significant because they are at greater risk for body dissatisfaction and negative diet-related behaviors in which weight perception plays an important role.[3, 4] Measures of weight perception are included in some questionnaires that gather data on dietary behaviors and weight.[5,6,7]

A mismatch between weight perception and reported or measured Body Mass Index (BMI) is referred to as Distorted Weight Perception (DWP).[5] Both weight perception and DWP have been shown to predict health outcomes, independent of BMI.[8] Adolescents' own reports of their perceived body weight are even more important for understanding their weight related behaviors given that the prevalence of DWP among this age group is approximately 30%.[6] Previous research has documented an association between overestimation of weight and disordered eating among adolescents.[9] However, because overweight and obese adolescents frequently underestimate their weight status, studies that investigate the impacts of weight underestimation on adolescent health are also important.[5,7] Weight underestimation is likely to have implications for dietary choices and physical activity patterns. Recent research has documented significantly higher odds of reporting some healthy diet and physical activity behaviors among overweight and obese adolescents who inaccurately perceive their weight.[6] Underestimation may be more common among Latino, Black, and Native American youth than youth of other races, although evidence is limited.[7] Because AI/AN youth were not included as a distinct racial group in this or similar analyses, data on the impact of weight perception on health behaviors in this population remain extremely limited. Our study evaluated the association between the accuracy of perceived body weight and dieting and physical activity behaviors among AI/AN overweight and obese adolescents.

Methods

We performed a cross sectional analysis of overweight and obese high school-aged AI/AN youth utilizing the data from the 2007-2011 Youth Risk Behavior Survey (YRBS), a national school-based survey that collects self-reported health risk behavior data from adolescents in the high school setting. [10] National YRBS data is representative of all public and private school students in grades 9-12 in the 50 states and the District of Columbia. Our analysis evaluated the subpopulation of this sample who self-reported as American Indian/Alaska Native and who are overweight and obese. BMI was calculated from self-reported height in feet and inches and weight in pounds. BMI percentile categories, based on standard growth charts, classify youth above the 95th percentile for their age as obese and those from the 85th to 95th percentiles as overweight.[11] This research was determined to be to be exempt by the University of Washington Institutional Review Board.

The YRBS survey includes a question asking youth to describe their weight as "very overweight," "slightly overweight," "about the right weight," "slightly underweight," or "very underweight." Self-reported weight perception was matched with respondents' weight status according to BMI percentile. Youth who were overweight or obese based on BMI percentile were classified as accurate perceivers if they described their weight as "slightly" or "very overweight." They were classified as misperceivers if they described their weight as "about the right weight," "slightly underweight," or "very underweight."

YRBS classified sex as male or female; age into the categories 13-14, 15-16, and 17 years and older; and grade as 9th, 10th, 11th, or 12th. The question "Which of the following are you trying to do about your weight?," measured efforts to lose weight. Response options included "lose weight," "gain weight," "stay the same weight," and "I am not trying to do anything about my weight." YRBS measured dieting behaviors through the questions "During the past 30 days, did you go without eating for 24 hours or more (also called fasting) to lose weight or to keep from gaining weight?," "During the past 30 days, did you take any diet pills, powders, or liquids without a doctor's advice to lose weight or to keep from gaining weight?," and "During the past 30 days, did you vomit or take laxatives to lose weight or to keep from gaining weight?" Students could respond to these survey items with "yes" or "no."

Several activity-related questions measured physical activity. YRBS asked participants "During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?" We dichotomized youth into those who were active on 5 or more days per week and those who were active on fewer than five days per week, consistent with national physical activity guidelines for adolescents.[12]

YRBS asks several questions related to fruit, vegetable, and beverage intake. These items asked about intake during the past seven days. We created a binary variable for fruit intake based upon the daily recommended value of 2 servings of fruit per day for adolescents.[13] Similarly, we created a binary variable for vegetable intake by combining the weekly intake of salad, carrots, and other vegetables to determine whether or not they consumed the recommended three servings per day of vegetables for males and two-and-a-half servings for females.[13] To measure beverage consumption, we created a binary milk variable based on the daily recommended value for adolescents of three servings per day or more, and we also created a binary variable for soda intake comparing students who consumed soda more than once per day with those who consumed soda once per day or less.[13]

We compared accurate and misperceivers on demographic characteristics, using chi square tests of association for the sex, age, and grade variables. We evaluated the association between accurate versus misperceived weight and diet and physical activity outcomes using logistic regression to estimate prevalence odds ratios (POR) and 95% confidence intervals (CI). We weighted our regression models and other analyses to account for the survey design and YRBS sampling methods. We excluded youth who did not fall into the overweight or obese BMI categories and used a subpopulation statistical analysis to restrict our study sample to survey respondents who self-identified as American Indian alone or in combination with any other race. We evaluated for potential confounding by sex and age. Final models remained unadjusted unless there was a greater than 10 percent change in the POR after adjusting for age and/or sex. Based on these criteria, the models of association between weight perception and each of the following variables were adjusted for sex: trying to lose weight, trying to lose

or stay the same weight, taking pills to lose weight, vomiting or using laxatives to lose weight, playing video games >2 hours per day, and playing video games ≥5 hours per day. None of the final models were adjusted for age. Because we hypothesized differences in behavior by sex and by overweight versus obese weight status, we performed stratified analyses by sex and weight status. All analyses were performed using Stata 12 software.

Results

Our initial study population consisted of 1,060 individuals. After excluding 240 respondents with missing values for weight perception and/or BMI our analysis includes 820 individuals. Misperceivers were more likely to be male and 15-16 years old than accurate perceivers. (Table 1). Among accurate perceivers, 44% were overweight and 56% were obese. Among misperceivers, 70.5% were overweight and 29.5% were obese.

Regarding dieting behaviors, misperceivers were 80% less likely to be trying to lose weight (aPOR: 0.20, 95% CI: 0.13-0.31) and 36% less likely to be fasting to lose weight (POR: 0.64, 95% CI: 0.40-1.03) than accurate perceivers [Table 2]. The effect of weight perception on dieting behaviors differed by weight status, with overweight misperceivers 61% less likely than accurate perceivers to use vomiting or laxatives to lose weight (aPOR: 0.39, 95% CI: 0.16-0.93) compared to no association among obese misperceivers [Table 2].

Our evaluation of physical activity behaviors showed that misperceivers were 48% more likely than accurate perceivers to engage in ≥60 minutes of physical activity on ≥5 days per week (POR: 1.48, 95% CI: 1.00-2.17), 69% more likely to attend physical education classes ≥3 days per week (POR: 1.69,95% CI: 1.15-2.48), and 95% more likely to have played on ≥1 sports teams during the previous year (POR: 1.95, 95% CI: 1.34-2.85) [Table 3]. The effect of weight perception on physical activity behaviors differed by weight status, with obese misperceivers 2.7 times as likely to report playing on $\geq$1 sports team during the previous year (POR: 2.69, 95% CI: 1.33-5.45) and no association among overweight youth (aPOR: 1.20, 95% CI: 0.71-2.01). The association between weight perception and engaging in ≥60 minutes of physical activity on ≥5 days per week differed by sex. Female misperceivers were 42% less likely to report this behavior than female accurate perceivers (POR: 0.58, 95% CI: 0.32-1.05), whereas male misperceivers were 85% *more* likely to report engaging in ≥60 minutes of physical activity on ≥5 days per week than male accurate perceivers (POR: 1.85, 95% CI: 1.11-3.10) [Table 3].

Regarding nutrition, misperceivers were 64% more likely than accurate perceivers to consume the recommended daily servings of fruit (POR: 1.64, 95% CI: 1.11-2.43). The data also suggest that misperceivers were more likely to consume the recommended daily servings of vegetables (POR: 1.52, 95% CI: 0.96-2.41). No associations were found between accuracy of weight perception and milk or soda consumption.

Discussion

Weight misperception was more common among male than female adolescents in our sample. Compared with accurate perceivers, misperceivers were less likely to be trying to lose weight, less likely

to be fasting to lose weight, more likely to attend physical education classes ≥3 days per week, and more likely to consume the recommended daily servings of fruit. Among obese youth, misperceivers were more likely to have played on ≥1 sports teams during the previous year. Among overweight youth, misperceivers were less likely to be using vomiting or laxatives to lose weight. Male misperceivers were more likely to engage in ≥60 minutes of physical activity on ≥5 days per week than male accurate misperceivers, but the opposite was true for females.

In our sample, misperceivers were less likely both to be trying to lose weight and to be fasting to lose weight. Overweight misperceivers were less likely than accurate perceivers to use vomiting or laxatives to lose weight. This did not hold true for obese youth. Edwards et al. conducted a study similar to ours among YRBS respondents of all races. Our results are consistent with their finding that misperceivers were less likely to be trying to lose weight and to engage in unhealthy dieting behaviors; however, Edwards et al. did not find any significant associations between the accuracy of weight perception and fasting or using vomiting/laxatives for weight control.[6] A potential explanation for the difference in our findings is a higher incidence of vomiting/laxative use among American Indian youth. In fact, a study by Story et al. found that vomiting to lose weight was higher for American Indians than any other racial group and lowest for whites. The most plausible reason for our findings is that youth who see themselves as normal or underweight do not feel the need to lose weight whereas those who see themselves as overweight do feel such a need. Our results also suggest that, although a falsely low estimation of one's weight may be an obstacle to making efforts to lose weight among adolescents, this misperception may be protective against unhealthy weight loss behaviors like fasting and vomiting/laxative use. It is clearly important to ascertain the types of weight loss methods overweight and obese adolescents are undertaking and to explain healthy approaches.

Compared with accurate perceivers, misperceivers were more likely to attend physical education on three or more days per week. Obese misperceivers were more likely than obese accurate perceivers to have played on one or more sports teams during the previous year, and male misperceivers were more likely than male accurate perceivers to engage in 60 or more minutes of physical activity on five or more days per week. Edwards et al. also found that male misperceivers were significantly more likely to engage in the recommended amount of physical activity but did not report findings for physical education attendance or sports team participation.[6] One possible explanation for our results is that youth who see themselves as normal or underweight feel more confident and comfortable participating in physical activity. Lubans and Cliff found an association between physical self-perception and physical strength among their sample of adolescents.[14] Another possibility is that overweight and obese youth who are physically active develop a view of themselves as falling into a lower weight category. A recent literature review of the benefits of sports participation for youth by Eime et al. found that the most commonly reported benefit of sports participation in the scientific literature is improved self-esteem.[15]

Fruit consumption was the only dietary factor that differed significantly between accurate and misperceivers. Misperceivers were more likely than accurate perceivers to consume the recommended daily servings of fruit. No significant difference in vegetable consumption was found between accurate and misperceivers. Edwards et al.'s analysis combined fruit and vegetable consumption into a single variable and, similar to our analysis, determined that misperceivers were more likely to get the

recommended servings.[6] As with physical activity, we hypothesize that these results suggest either that lower weight perception is leading to healthier behaviors among these youth, or that eating healthfully is leading to lower weight perception. In their study of high school students, Rabiei et al. found that higher self-concept was predictive of healthy eating but did not specifically address weight perception. [16]

Our finding that misperceivers behave more healthfully than accurate perceivers coincides with the results of previous studies .[17,18] It is conceivable that body satisfaction explains this trend. Overall, the overweight and obese youth in our sample who saw themselves as normal or underweight, the "misperceivers," were more likely to engage in healthy behaviors like frequent physical activity and higher fruit consumption and less likely to engage in unhealthy fasting behavior to lose weight. In contrast, those youth who saw themselves as overweight or obese showed the opposite tendencies. This suggests an association between possessing a view of oneself as normal or underweight and healthy weight-related behaviors, a pattern that could be explained by a greater willingness to care for one's physical health among those with a more positive body image or, alternately, by a more positive body image resulting from engaging in a healthier lifestyle. Either explanation indicates that a view of oneself as overweight, although it may be accurate, is not beneficial for promoting a healthier lifestyle.

Gender differences exist in weight perception, accuracy of weight perception, and the relationship between weight perception and weight-related behaviors. In their analysis of YRBS data of the general overweight and obese adolescent population, Edwards et al. reported that males were more likely to be misperceivers as did three additional studies using other datasets.[6,19-21] A study of California adolescents showed an age-sex interaction associated with weight misperception and reported that older male adolescents were, the most likely group of adolescents to be misperceivers.[7] Our research supports the finding that male adolescents are more likely than female adolescents to misperceive their weight status; however our analysis did not confirm Edwards et al.'s finding that overweight and obese male accurate perceivers were more likely to attempt weight loss than female accurate perceivers. Differences in body satisfaction by sex are thought to explain sex differences in weight perception, as female adolescents tend to report both lower body satisfaction and heavier perceived weight status.[22]

Differences in body satisfaction by race have been reported in several studies. The only study evaluating body satisfaction among American Indians found that American Indian females were more likely to be satisfied with their bodies than White and Hispanic females.[23] Other studies have focused on associations among overweight and obese Black female adolescents.[24] These differences are likely due to variations in cultural ideals of body image.[25] Such variations have been investigated from socio-cultural and environmental perspectives for Latino and African American youth, but to our knowledge, no studies have evaluated these issues among American Indian youth.[25-30] Further research into cultural ideals of body image among American Indians would be beneficial for informing the interpretation of our results. Despite this gap in the literature, researchers and clinicians implementing obesity prevention or treatment programs with American Indian adolescents should avoid stigmatizing overweight and obese body types as well as community attitudes about those body types that may or may not characterize bodies clinically-labeled overweight as problematic. A recent qualitative study employing community-based participatory research methodology found that American Indian high

school students in New Mexico defined physical health much more on the basis of ability to be physically active than on weight status.[31]

There are several limitations to our study. Our measure of BMI is based on self-reported height and weight, measures which are known to be reported inaccurately. In general, individuals tend to underestimate their weight and overestimate their height, leading to underestimates of BMI. Approximately one out of every six to seven obese individuals is misclassified as normal weight because of inaccurate self-report, a bias which may be worse for younger individuals. [32,33] In addition, subjects who underestimated their weight and height were likely to be misclassified as accurate perceivers. Selective non-response has also been documented among adolescents, with obese adolescents being less likely to report their height and weight on survey questionnaires. This selective non-response was more pronounced in younger than in older adolescents.[34] This trend could result in selection bias on our study sample. An additional limitation is the absence of data on potential confounding factors, such as socioeconomic status, that are not captured by YRBS. If such variables are indeed confounders, our results would be biased in an unknown direction depending upon the direction of the association between the confounders and our variables of interest. Finally, the cross-sectional data used for this analysis limit conclusions about the direction of the association between weight perception and the health behaviors.

In conclusion, we found that accuracy of weight perception is associated with dieting, physical activity, and nutrition in this study population. Weight perception, in addition to actual weight status, appears to be an important factor in understanding the behaviors of overweight and obese AI/AN youth. Clinicians and public health practitioners designing interventions for the treatment and prevention of obesity must account for weight perception among adolescents. It is also important to consider that misperceivers engaged in healthier behaviors in our sample, suggesting practitioners should be cautious in communicating to adolescents any concerns about their weight. Labeling youth as overweight or obese may not be beneficial for encouraging healthier behavior. Finally, our results regarding the behaviors of AI/AN misperceivers differed from previous studies' findings about misperceivers of other races. These differences need further confirmation but point to the need for a more comprehensive study on overweight and obesity issues that specifically addresses the traits and behaviors of AI/AN youth.

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Table 1—Demographic Characteristics of American Indian/Alaska Native Adolescent respondents to the Youth Risk Behavior Survey who Accurately Perceive and Misperceive their weight, 2007-2011

	Accurate Perceivers N=522 Number(%)	Misperceivers N=298 Number(%)
Sex		
Female	271 (49.4)	95 (29.1)
Male	251 (50.6)	203 (70.9)*
Age		
13-14	66 (14.0)	34 (10.7)
15-16	251 (49.6)	178 (65.6)
17+	205 (36.4)	85 (23.1)**
Grade		
9^{th}	159 (33.0)	108 (42.0)
10^{th}	132 (26.7)	77 (27.2)
11^{th}	120 (22.0)	63 (19.5)
12^{th}	108 (18.0)	50 (11.3)***

* $p<0.0001$

** $p<0.01$

*** $p=0.0969$

Table 2—Association Between Accuracy of Perceived Body Weight and Dieting Behaviors among American Indian/Alaska Native Adolescent respondents to the Youth Risk Behavior Survey, 2007-2011

Dieting Behaviors	**Accurate N=522 %**	**Misperceivers N=298 %**	**Prevalence Odds Ratio (95% Confidence Interval)**
Trying to lose weight	85.0	50.7	0.20 (0.13-0.31) †
Trying to lose or stay same weight	89.2	70.4	0.33 (0.20-0.55) †
Fasting to lose weight	24.8	17.5	0.64 (0.40-1.03)*
Taking pills to lose weight	12.5	9.0	0.81 (0.45- 1.46) †
Vomiting or using laxatives to lose weight	8.5	5.9	0.87 (0.43-1.75) †
Dieting behaviors stratified by BMI category			
Trying to lose weight			
Overweight	88.2	69.2	0.36 (0.20-0.63)†
Obese	88.8	77.0	0.32 (0.13-0.81)*
Trying to lose or stay same weight			
Overweight	86.0	46.5	0.18 (0.10-0.32)†
Obese	83.7	55.2	0.22 (0.11-0.45)*
Fasting to lose weight			
Overweight	21.5	13.3	0.61 (0.27-1.38)†
Obese	23.8	27.6	1.01 (0.52-1.98)*
Taking pills to lose weight			
Overweight	9.7	8.5	1.00 (0.51-1.96)†
Obese	14.3	8.1	0.69 (0.26-1.86)*
Dieting behaviors stratified by sex			
Trying to lose weight			
Female	90.0	63.5	0.19 (0.10-0.38)
Male	80.1	45.5	0.21 (0.12-0.37)
Trying to lose or stay same weight			
Female	93.3	81.3	0.31 (0.14-0.72)
Male	85.2	65.9	0.34 (0.18-0.64)
Fasting to lose weight			
Female	27.8	20.7	0.68 (0.36-1.28)
Male	21.8	16.2	0.69 (.35-1.37)
Taking pills to lose weight			
Female	17.8	9.7	0.49 (0.18-1.39)
Male	7.2	8.8	1.24 (.64-2.44)
Vomiting or using laxatives to lose weight			
Female	14.2	8.1	0.53 (0.18-1.56)
Male	2.9	5.0	1.76 (0.63-4.93)

† Adjusted for sex

*Crude odds ratio

Table 3— Association Between Accuracy of Perceived Body Weight and Physical Activity Behaviors among American Indian/Alaska Native Adolescent respondents to the Youth Risk Behavior Survey, 2007-2011

Physical activity Behaviors	**Accurate N=522 %**	**Misperceivers N=298 %**	**Prevalence Odds Ratio (95% Confidence Interval)**
≥60 min. PA on ≥5 Days	37.3	46.7	1.48 (1.00-2.17)*
Watch TV >2 hrs./day	42.0	35.6	0.76 (0.53-1.10)*
Watch TV ≥5 hrs./day	14.2	12.0	0.83 (0.45-1.51)*
Play video/computer games >2 hrs./day	27.7	22.7	0.68 (0.45-1.02)†
Play video/computer games ≥5 hrs./day	13.9	11.9	0.73 (0.42-1.27)†
Attends PE ≥3 days/week	41.4	54.3	1.69 (1.15-2.48)*
Played on ≥1 sports team during last 12 mos.	49.2	65.5	1.95 (1.34-2.85)*
Physical Activity Behaviors stratified by BMI category			
≥60 min. PA on ≥5 Days			
Overweight	39.5	45.0	0.99 (0.58-1.66)†
Obese	34.4	46.0	1.65 (0.86-3.18)*
Watch TV >2 hrs./day			
Overweight	35.1	35.1	0.93 (0.59-1.47)
Obese	42.2	35.6	0.63 (0.32-1.26)
Watch TV ≥5 hrs./day			
Overweight	10.1	10.4	0.85 (0.37-1.98)†
Obese	14.3	14.9	1.32 (0.53-3.28)*
Play video/computer games >2 hrs./day			
Overweight	26.8	22.8	0.67 (0.35-1.27)†
Obese	28.2	28.7	0.86 (0.44-1.68)*
Play video/computer games ≥5 hrs./day			
Overweight	11.8	9.5	0.85 (0.40-1.80)*
Obese	12.2	13.8	0.97 (0.40-2.33)*
Attends PE ≥3 days/week			
Overweight	37.7	48.3	1.78 (1.11-2.85)*
Obese	43.9	50.6	1.80 (0.97-3.33)*
Played on ≥1 sports team during last 12 mos.			
Overweight	49.6	59.2	1.20 (0.71-2.01)†
Obese	47.6	63.2	2.69 (1.33-5.45)*
Physical Activity Behaviors stratified by sex			

≥60 min. PA on ≥5 Days			
Female	32.1	25.3	0.58 (0.32-1.05)
Male	41.4	54.7	1.85 (1.11-3.10)
Watch TV >2 hrs./day			
Female	40.6	39.0	0.87 (0.49-1.55)
Male	37.5	33.5	0.71 (0.42-1.19)
Watch TV ≥5 hrs./day			
Female	12.6	16.8	1.05 (0.47-2.34)
Male	12.4	9.4	0.74 (0.32-1.73)
Play video/computer games >2 hrs./day			
Female	22.9	22.1	0.77 (0.41-1.46)
Male	32.7	25.6	0.64 (0.39-1.06)
Play video/computer games ≥5 hrs./day			
Female	9.6	9.5	0.90 (0.33-2.43)
Male	14.7	11.3	0.68 (0.35-1.32)
Attends PE ≥3 days/week			
Female	36.5	43.2	1.58 (0.90-2.78)
Male	46.2	51.7	1.61 (0.97-2.67)
Played on ≥1 sports team during last 12 mos.			
Female	40.2	51.6	1.47 (0.84-2.60)
Male	57.4	64.5	1.96 (1.20-3.19)

† Adjusted for sex

*Crude odds ratio