

Relationship between Health Risk Behaviors and Physical Inactivity in Montana Adults

Peter D. Hart*

Health Promotion Research, Havre, MT 59501

*Corresponding author: pdhart@outlook.com

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Abstract Background: Evidence supports the interrelationships between modifiable health risk behaviors (HRBs) in adults. However, few studies have specifically examined the extent to which HRBs relate to physical inactivity (PIA). The aim of this research was to fill this aforementioned gap. **Methods:** Data for this study came from the 2020 Montana Behavioral Risk Factor Surveillance System (BRFSS). Six different binary (yes/no) HRB variables were created and included overweight (OVERWEIGHT), obese (OBESE), current smoking (SMOKING), heavy drinking (DRINKING), not always using seatbelt (SEATBELT), and driven after drinking too much (DDRIVING). PIA status was assessed from a question asking adults if they participated in any physical activities or exercises during the past month. Logistic regression was used to examine the relationship between each HRB and PIA. **Results:** Bivariate analyses indicated a significantly ($p < .001$) greater prevalence of PIA for those at high risk for all HRBs, except DRINKING. Fully adjusted regression models showed increased odds of PIA for adults at high risk for OVERWEIGHT (OR = 1.30, 95% CI: 1.06 – 1.60), OBESE (OR = 1.78, 95% CI: 1.47 – 2.16), SMOKING (OR = 1.58, 95% CI: 1.25 – 2.00), SEATBELT (OR = 1.32, 95% CI: 1.08 – 1.61), and DDRIVING (OR = 1.97, 95% CI: 1.09 – 3.55). Additionally, the OBESE \times DDRIVING interaction was significant ($p = .046$) and indicated substantially greater odds of PIA for those considered high risk for OBESE and DDRIVING (OR = 5.98, 95% CI: 2.08 – 17.18), as compared to their OBESE counterparts who are not high risk DDRIVING (OR = 1.78, 95% CI: 1.40 – 2.27). **Conclusion:** This study found that several HRBs relate to PIA in adults from Montana. Health promotion specialists concerned with increasing physical activity should consider interventions that target multiple HRBs.

Keywords: Physical activity (PA), Physical Inactivity (PIA), Health risk behaviors (HRBs)

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examine the association between several different HRBs and PIA among adults.

1. Introduction

Health risk behaviors (HRBs) are considered modifiable activities that increase the likelihood of a negative outcome [1]. Example HRBs include smoking tobacco, excessive alcohol consumption, lack of fruit and vegetable intake, overweightness, and inadequate sleep [2,3]. HRBs can lead to premature morbidity and mortality from chronic diseases like heart disease, cancer, stroke, and lung disease, as well as from acute situations such as serious injury [4,5]. Physical activity (PA) is a behavior recommended for all adults because of its health benefits and its ability to reduce chronic disease risk [6]. Thus, physical inactivity (PIA) is another HRB of major concern. Studies have shown interrelationships between many different HRBs [7]. Such relationships have public health implications by impacting policy change and health promotion intervention strategies [8]. However, few studies have examined the extent to which HRBs relate to PIA in United States (U.S.) adult populations. Therefore, the aim of this study was to

2. Materials & Methods

Data for this study came from the 2020 Behavioral Risk Factor Surveillance System (BRFSS) and methodological details can be found elsewhere [9,10]. Briefly, the BRFSS is a state-based annual telephone survey designed to collect data on HRBs and health status in noninstitutionalized U.S. adults 18 years of age and older. The Montana BRFSS data only were used for this study.

Six different binary (yes/no) HRB variables were created and used as separate independent variables. An overweight (OVERWEIGHT) variable was created from body mass index (BMI) (computed from self-reported height and weight) where participants were considered “high risk” for OVERWEIGHT if their BMI exceeded 25.0 kg/m². An obese (OBESE) variable was also created from BMI where participants were considered “high risk” for OBESE if their BMI equaled or exceeded 30.0 kg/m². A current smoking (SMOKING) variable was created

from questions asking participants if they smoked at least 100 cigarettes in their entire life and if they currently smoke every day, some days, or not at all. Participants reporting having ever smoked 100+ cigarettes and reporting currently smoking every day or some days were considered “high risk” for SMOKING. A heavy drinking (DRINKING) variable was created from questions asking participants how many days per week they consumed alcohol and how many drinks per occasion they consumed alcohol on average (in the previous 30 days). Participants who reported having more than 14 drinks per week (males) or who reported having more than 7 drinks per week (females) were considered “high risk” for DRINKING.

A seatbelt use (SEATBELT) variable was created from a question asking participants how often they use seatbelts when in a car. Participants who reported anything less than “always” (“nearly always” to “never”) were considered “high risk” for SEATBELT. A drinking and driving (DDRIVING) variable was created from a question asking participants how many times they had driven after drinking too much (in the previous 30 days). Participants who reported anything more than “none” were considered “high risk” for DDRIVING. The physical inactivity (PIA) outcome variable in this study was created from a question asking participants if they did any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise. Participants who reported “no” were considered “high risk” for PIA. Study covariates included sex, age, race/ethnicity,

income, education, marital status, and rural/urban status.

Statistical analyses included prevalence estimates (%) with standard errors (SEs) and 95% confidence intervals (CIs) for PIA overall and across each HRB. Test for difference in proportions were employed using the Rao-Scott chi-square statistic (χ^2_{RS}). Logistic regression was used to estimate the odds of PIA (compared to not) for those who have high risk HRB over the odds of PIA (compared to not) for those who do not have high risk HRB. Analyses were weighted to produce generalizations representative of noninstitutionalized adults in Montana. SAS version 9.4 and SPSS version 27 were used for all analyses [11,12,13,14].

3. Results

A total of $N = 6,315$ participants had complete physical activity data with a loss of 471, 471, 218, 311, 236, and 2,729 for OVERWEIGHT, OBESE, SMOKING, DRINKING, SEATBELT, and DDRIVING analyses, respectively. Table 1 contains prevalence of PIA overall and by HRB. Results showed greater prevalence of PIA for those at high risk for OVERWEIGHT (20.7% vs. 14.8%, $p < .0001$), OBESE (26.1% vs. 15.6%, $p < .0001$), SMOKING (29.4% vs. 16.9%, $p < .0001$), SEATBELT (22.9% vs. 17.8%, $p = .0003$), and DDRIVING (26.5% vs. 14.2%, $p = .0016$). No significant prevalence difference was seen in PIA for DRINKING (20.2% vs. 19.0%, $p = .5980$).

Table 1. Prevalence of physical inactivity (PIA) by health risk behavior (HRB) in Montana adults, 2020

Health risk behavior (HRB)	No Physical Activity					χ^2_{RS} <i>p</i>
	<i>N</i>	%	<i>SE</i>	<i>LL</i>	<i>UL</i>	
Overall	1,284	18.9	0.6	17.8	20.1	< .0001
OVERWEIGHT	1,175					< .0001
Yes		20.7	0.8	19.2	22.2	
No		14.8	1.0	12.9	16.8	
OBESE	1,175					< .0001
Yes		26.1	1.3	23.6	28.6	
No		15.6	0.7	14.3	17.0	
SMOKING	1,246					< .0001
Yes		29.4	1.9	25.7	33.1	
No		16.9	0.6	15.7	18.1	
DRINKING	1,231					.5980
Yes		20.2	2.2	15.8	24.6	
No		19.0	0.6	17.8	20.2	
SEATBELT	1,242					.0003
Yes		22.9	1.3	20.3	25.4	
No		17.8	0.7	16.4	19.1	
DDRIVING	566					.0016
Yes		26.5	4.8	17.1	35.9	
No		14.2	0.7	12.8	15.6	

Note. $N = 6,315$. % is prevalence estimate. LL and UL are the lower limit and upper limit for the 95% confidence interval estimating population %. χ^2_{RS} is Rao-Scott chi-square statistic for difference in proportions. Prevalence estimates (%) in bold are significantly ($p < .05$) larger than the opposing estimate.

Table 2. Multiple regression analyses examining the association between each health risk behavior (HRB) and physical inactivity (PIA) in Montana adults, 2020

Health risk behavior (HRB)	Models 1 thru 6			Models 7 thru 12			Model 13 thru 18		
	OR	LL	UL	OR	LL	UL	OR	LL	UL
OVERWEIGHT	1.50	1.25	1.80	1.42	1.18	1.71	1.30	1.06	1.60
OBESE	1.91	1.62	2.25	1.88	1.59	2.23	1.78	1.47	2.16
SMOKING	2.04	1.67	2.49	2.26	1.85	2.77	1.58	1.25	2.00
DRINKING	1.08	0.81	1.43	1.18	0.88	1.57	1.05	0.76	1.44
SEATBELT	1.37	1.16	1.62	1.51	1.27	1.80	1.32	1.08	1.61
DDRIVING	2.17	1.32	3.56	2.38	1.44	3.95	1.97	1.09	3.55

Note. OR is odds ratio. LL and UL are the lower limit and upper limit for the 95% confidence interval estimating population OR. ORs defined as odds of PIA (compared to not) for those who have high risk HRB (i.e., 'yes') over the odds of PIA (compared to not) for those who do not have high risk HRB (i.e., 'no'). Models 1 thru 6 are unadjusted. Models 7 thru 12 are adjusted for age and sex. Models 13 thru 18 are adjusted for age, sex, race/ethnicity, income, education, marital status, and rural/urban status. ORs in bold are significantly ($p < .05$) different from reference.

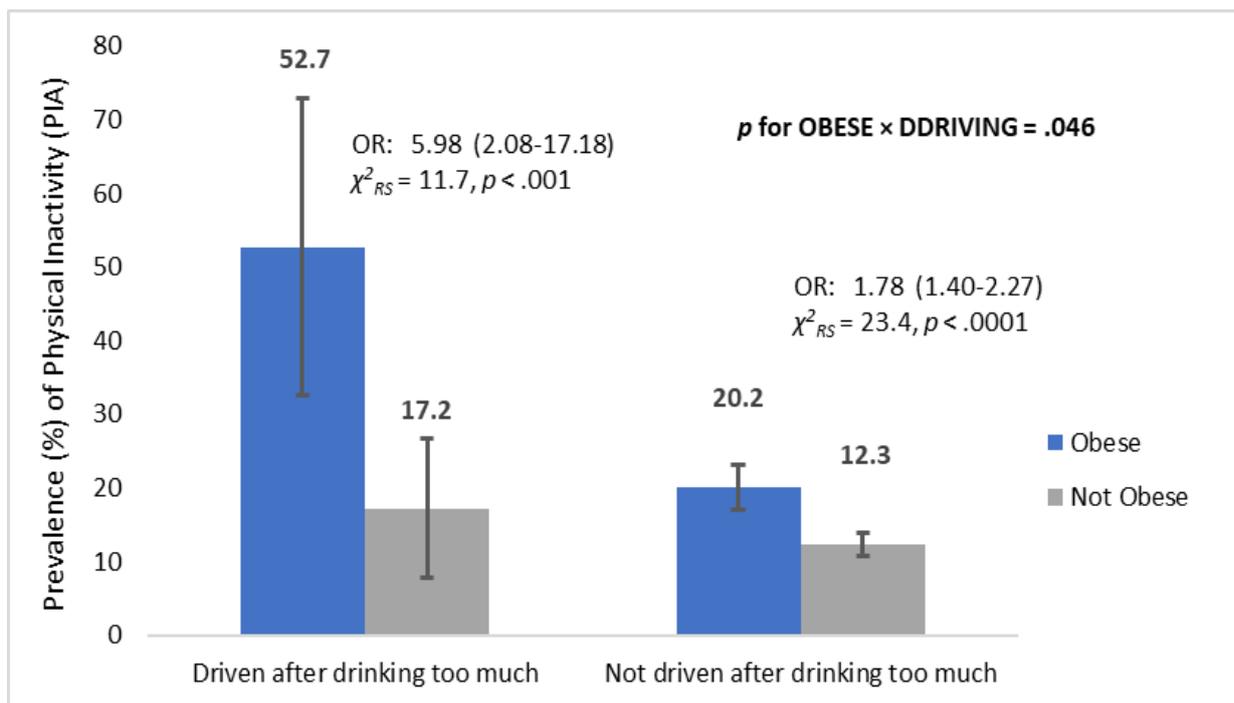


Figure 1. Prevalence of PIA by OBESSE and DDRIVING status in Montana adults, 2020 (Note. $N = 3,424$. OR (95% CI) is odds ratio defined as odds of PIA (compared to not) for those who are obese over the odds of PIA (compared to not) for those not obese. CI is confidence interval. ORs are by driven after drinking status and adjusted for age and sex. OBESSE \times DDRIVING interaction was significant ($p = .046$). χ^2_{RS} is Rao-Scott chi-square statistic for difference in proportions)

Table 2 contains the multiple regression analyses examining the association between each HRB and PIA. Each of the three sets of models (unadjusted, age and sex adjusted, and fully adjusted for age, sex, race, income, education, marital status, and rural status) indicated similar trends. Fully adjusted regression models showed increased odds of PIA for adults at high risk for OVERWEIGHT (OR = 1.30, 95% CI: 1.06 – 1.60), OBESSE (OR = 1.78, 95% CI: 1.47 – 2.16), SMOKING (OR = 1.58, 95% CI: 1.25 – 2.00), SEATBELT (OR = 1.32, 95% CI: 1.08 – 1.61), and DDRIVING (OR = 1.97, 95% CI: 1.09 – 3.55). No significant association was seen for PIA and DRINKING ($p = .7756$). Figure 1 displays simple effects analyses due to a significant ($p = .046$) OBESSE \times DDRIVING interaction. The graph shows substantially greater odds of PIA for those at high risk for OBESSE and DDRIVING (OR = 5.98, 95% CI: 2.08 – 17.18), as compared to their high risk OBESSE counterparts who are not high risk for DDRIVING (OR = 1.78, 95% CI: 1.40 – 2.27).

4. Discussion

Some of these findings have been confirmed by studies from other countries. Specifically, PIA has been found related to obesity and smoking in adults from Chile and Finland, respectively [15,16]. On the other hand, not much evidence supports the current findings relating PIA to seatbelt use or driving after drinking too much. The current null findings for PIA and heavy alcohol consumption may in part make sense since data from other studies reveal conflicting results. That is, some research indicate a positive relationship between PA and alcohol consumption [17]. Whereas other data support a negative PA and alcohol relationship [18]. Thus, more research is needed to corroborate the relationships between PIA and seatbelt use, drinking and driving, and alcohol consumption.

The major strength of this study is its use of a current and representative sample of noninstitutionalized adults in Montana. Additionally, the large number of HRBs

assessed by the BRFSS allowed for greater coverage of risky behavior as compared to other studies. The most pressing limitation of the BRFSS is its cross-sectional nature. This limitation should highlight the fact that cause-and-effect associations are not possible in this paper. As well, all variables were assessed via self-report mechanism by trained interviewers. Therefore, misclassification and measurement error cannot be ruled out. Therefore, findings from this study should be considered with caution.

5. Conclusions

Results from this study found that high risk of overweight, obesity, smoking, seatbelt use, and drinking and driving increases the likelihood of PIA among adults in Montana. Health promotion specialists concerned with increasing physical activity should consider interventions that target multiple HRBs.

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