



5500 North St. Louise Avenue
Chicago, IL 60625-4699

Office of Research Development

NIH Pilot Grant



Applicant Information

Personal Information

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Department: Economics

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E-mail: c-ciecierski@neiu.edu

Project Information

Title: Determinants Of College Student Physical Activity

Recommended Reviewer: Lisa Powell, Phd Email: powelll@uic.edu

Recommended Reviewer: Amy Wolaver Email: awolaver@bucknell.edu

Recommended Reviewer: John Tauras Email: tauras@uic.edu

DESCRIPTION: See instructions. State the application's broad, long-term objectives and specific aims, making reference to the health relatedness of the project (i.e., relevance to the **mission of the agency**). Describe concisely the research design and methods for achieving these goals. Describe the rationale and techniques you will use to pursue these goals.

In addition, in two or three sentences, describe in plain, lay language the relevance of this research to **public** health. If the application is funded, this description, as is, will become public information. Therefore, do not include proprietary/confidential information. **DO NOT EXCEED THE SPACE PROVIDED.**

This project will investigate individual and peer-level lifestyles, health behaviors and campus environment as determinants of physical activity among US college students. The proposed project will accomplish the following aims: (1) investigate the extent to which college physical activity patterns are related to socioeconomic privilege; (2) carefully examine student lifestyles (including area of residence, greek-membership, allocation of time outside of the classroom, diet and physical fitness activities) as well as health-behaviors (heavy alcohol use and smoking) that result in different rates of college physical fitness across gender, racial, and ethnic groups in college; (3) examine the effects of the campus environment including campus peer-lifestyles (peer frequency and degree of physical fitness activities and peer diet) and health behaviors (peer substance use, specifically smoking and binge drinking incorporating local beer and tobacco prices and policies) on an individual student's physical activity; (4) identify and interpret factors related to college physical activity patterns and use this information to suggest modifications to the campus environment as a means for strengthening health among all students and altering lifestyles and health-behaviors of affected and/or at-risk students. Bi-annual survey data from the 2000 through 2003 waves of the National College Health Assessment (NCHA) will be used to evaluate the impact of campus environment, individual lifestyles and health behaviors on college student physical activity. Continuous and dichotomous choice models, which control for individual and peer-level factors and campus descriptors will be used to estimate various exercise patterns.

College campuses represent a setting that emphasizes the importance of a community on good health. Although certain health outcomes are often perceived as individual issues, the college campus forms a specific environment that allows students to influence each other's behavioral choices and therefore, leads to mutual or shared health challenges for the entire college campus. Findings will provide critical information for obesity control advocates, school administrators and policy makers that will help define strategies and guide public health policy across US college campuses.

PERFORMANCE SITE(S) (organization, city, state)

Northeastern Illinois University, Chicago, IL

Principal Investigator/Program Director (Last, First, Middle): Rueckert, Linda/Ciecierski, Christina

KEY PERSONNEL. See instructions. Use continuation pages as needed to provide the required information in the format shown below. Start with Principal Investigator(s). List all other key personnel in alphabetical order, last name first.

Name	eRA Commons User Name	Organization	Role on Project
Christina Ciecierski		Northeastern II Univ	Principal Investigator

OTHER SIGNIFICANT CONTRIBUTORS

Name	Organization	Role on Project
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Human Embryonic Stem Cells No Yes

If the proposed project involves human embryonic stem cells, list below the registration number of the specific cell line(s) from the following list: <http://stemcells.nih.gov/registry/index.asp>. Use continuation pages as needed.

If a specific line cannot be referenced at this time, include a statement that one from the Registry will be used.

Cell Line

The name of the principal investigator/program director must be provided at the top of each printed page and each continuation page.

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Appendix *(Five collated sets. No page numbering necessary for Appendix.)*

Check if Appendix is Included

Number of publications and manuscripts accepted for publication *(not to exceed 10)* _____

Other items (list): _____

DETAILED BUDGET FOR INITIAL BUDGET PERIOD DIRECT COSTS ONLY						FROM 07-01-08	THROUGH 06-30-09	
PERSONNEL (<i>Applicant organization only</i>)		Months Devoted to Project			INST.BASE SALARY	DOLLAR AMOUNT REQUESTED (<i>omit cents</i>)		
NAME	ROLE ON PROJECT	Cal. Mnths	Acad. Mnths	Summer Mnths		SALARY REQUESTED	FRINGE BENEFITS	TOTAL
Christina Ciecierski	Principal Investigator	3	-	-	-0	0	0	0
To be appointed	Research Assistant		2.4	0	1,200	2,880	0	2,880
To be appointed	Research Assistant		2.4	0	1,200	2,880	0	2,880
To be appointed	Research Assistant		2.4	0	1,200	2,880	0	2,880
SUBTOTALS →								8,640
CONSULTANT COSTS								
EQUIPMENT (<i>Itemize</i>)								
Computer and printer								
3,750								
SUPPLIES (<i>Itemize by category</i>)								
Data storage (readable writeable CD and/or flash drive(s))								
Software (SPSS, STATA and SAS)								
1,100								
TRAVEL								
Travel to a Professional/Academic Conference								
1,500								
PATIENT CARE COSTS		INPATIENT						
		OUTPATIENT						
ALTERATIONS AND RENOVATIONS (<i>Itemize by category</i>)								
OTHER EXPENSES (<i>Itemize by category</i>)								
CONSORTIUM/CONTRACTUAL COSTS					DIRECT COSTS		0	
SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD (<i>Item 7a, Face Page</i>)								\$ 14,990
CONSORTIUM/CONTRACTUAL COSTS					FACILITIES AND ADMINISTRATIVE COSTS		0	
TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD								\$ 14,990

Budget Justification

Personnel

TBA, will be the three research assistants on the proposed project. The research assistants will share responsibility for cleaning and preparing the NCHA data as well as conducting preliminary descriptive and empirical analyses of the data. The undergraduate research assistant fringe benefits do not include funds for tuition remission. As undergraduates, the research assistants will be paid \$7.50 per hour and will be required to work 12 hours per week beginning September 1st, 2008 through April 30th, 2009 (8 months). 12 hours per week = .3 time X 8 mos = 2.4 person months.

Equipment

Computer and printer, a total of \$3750.00 has been allocated towards the purchase of a computer and printer for project team use in Dr. Ciecierski's office at NEIU.

Supplies

Data Storage devices, \$500 has been allocated towards the purchase of a combination of disk and flash drive storage devices on which back-ups of the data, analyses modules and manuscripts may be stored.

Software, \$600 has been allocated towards the purchase of the SAS, STATA and SPSS statistical software packages under the NEIU site license.

Travel

Participation in an academic/professional conference, \$1500.00 in funds are requested for a two-day trip by the research team to present the findings from this research at various academic and/or other conferences.

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Christina Ciecierski	POSITION TITLE Assistant Professor		
eRA COMMONS USER NAME			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
University of Illinois at Chicago	B.A.	1994	History, Economics
Jagiellonian University, Krakow, Poland	Native Speaker Certification	Summer 1994	Polish Language
University of Illinois at Chicago	M.A.	1996	Economics
Catholic University of Lublin, Rome, Italy	Electives	Summer 1996	Social Science Coursework
University of Illinois at Chicago	Ph.D.	2000	Economics

A. Positions and Honors.**Positions**

Department of Economics, College of Business Administration, University of Illinois at Chicago, Teaching Assistant, 1994-1995
 Department of Education, College of Education, University of Illinois at Chicago, Research Assistant and Pre-doctoral Fellow, 1996-1998
 Department of Social Sciences, Oakton College, Adjunct Lecturer, 1997
 Health Research and Policy Centers, School of Public Health, University of Illinois at Chicago, Research Assistant, 1998-2000
 World Health Organization, Tobacco Free Initiative and Global Program on Evidence for Health Policy, Consultant, 2001-2002.
 Health Research and Policy Centers, School of Public Health and the International Tobacco Evidence Network, University of Illinois at Chicago, Senior Research Specialist, 2000-present
 Department of Economics, College of Arts and Sciences, Northeastern Illinois University, Assistant Professor, 2007-present

Honors

Chicago Intercollegiate Council, College Scholarship, 1992
 Kosciuszko Foundation, Summer Abroad Scholarship, 1993
 University of Illinois Watt Scholarship, 1994
 Center for Urban Educational Research and Development (CUERD) Pre-Doctoral Fellowship, 1996-1998
 UIC Graduate College Graduate Student Foreign Travel Award, 1999
 UIC Graduate College Graduate Student Foreign Travel Award, 2000
 Nomination, UIC Department of Economics, 2001 Outstanding Dissertation Award, 2002

Committee and Other Academic Work

2002-2007: Conference papers in the last 5 years at: 3rd European Conference on Tobacco or Health, (Warsaw, Poland), 2002; 12th World Conference on Tobacco or Health (Helsinki, Finland); 2004 Midwest Economics Association Annual Conference (Chicago, IL).
 2002 Co-organized three sessions on the Economics of Tobacco and Tobacco Control for the 3rd European Conference on Tobacco or Health held in Warsaw, Poland.

- 2004 Reviewed manuscripts for: The bulletin of the World Health Organization, 12th World Conference on Tobacco or Health.
- 2004-2006 Reviewed grant applications for Robert Wood Johnson Foundation, Substance Abuse Policy Research Program.

B. Selected peer-reviewed publications

“The Impact of Prices and Control Policies on Cigarette Smoking Among College Students,” (with Rosalie Liccardo Pacula, Frank Chaloupka and Henry Wechsler), Contemporary Economic Policy, Volume 19, Number 2 (April 2001), pages 135-149.

“Tobacco Control in Developing Countries,” (with Frank Chaloupka, Prabhat Jha and Hana Ross), Development Bulletin, Volume 54, Number 14 (April 2001) pages 15-16.

“Taxing Tobacco: The Impact of Tobacco Taxes on Cigarette Smoking and Other Tobacco Use,” (with Melanie Wakefield and Frank Chaloupka), in Regulating Tobacco, edited by Robert L. Rabin and Stephen D. Sugarman, Oxford University Press, 2001, pages 39-71.

“Data for Economic Analysis”, World Bank Economics of Tobacco Toolkit, edited by Ayda Yurekli and Joy de Beyer. Available on the World Bank Website at <http://www.worldbank.org/>, 2002

“Global Efforts for Reducing the Burden of Smoking,” (with Prabhat Jha, Marlo A. Corrao, Vera Luisa da Costa e Silva, Hana Ross, Christina Czart, and Derek Yach), Disease Management and Health Outcomes, June 23, 2001

“The World Health Report 2002: Reducing Risks, Promoting Healthy Life”, Chapter 5, “Some Strategies to Reduce Risk”, contributing author, World Health Organization, Geneva Switzerland, October 2002.

“WHO Framework Convention on Tobacco Control: development of an evidence based global public health treaty”, (with K. Shibuya, Emmanuel Guindon, Douglas Bettcher, David Evans and Christopher Murray), British Medical Journal, 327: 154-157, July 2003

“The Market for Legal and Illegal Cigarettes in Poland: A Closer Look at Demand and Supply-Side Characteristics”, IDRC Working Paper Series No.1, September 2007

C. Research Support.

Ongoing Research Support

Ciecierski, Christina, PI
Southern Illinois University

7/1/2007-6/30/2008

“Live-Free Tobacco Free at Northeastern Illinois University”

This project will design, pilot and administer an on-line health behavior survey to a sub-sample of full-time students at Northeastern Illinois University. Survey data will be analyzed for disparities in smoking behaviors across select subpopulations of the representative sample of the student body.

Role: Principal Investigator

Ciecierski, Christina, PI
Bloomberg Family Foundation

7/1/2007-5/15/2008

“A Proposal for the Development of a Report on the Economics of Tobacco and Tobacco Taxation in Poland”

This project will author a detailed report concerning tobacco taxation and its supply and demand side implications for both Poland’s economy and the public health status of its citizens. One synthesized, the report will be translated into Polish and released to the Ministerial Departments of Poland’s government so as to provide economic evidence supporting the continued need for aggressive tobacco tax policy in Poland.

Role: Principal Investigator

Chaloupka, Frank, PI 7/1/2007-6/30/2008
Illinois Department of Public Health
“Economic, Policy, Program and Other Environmental Issues Related to Cigarette Smoking in Illinois: A Focus Group Approach to Evaluating County-Level Cessation Programs”,
The project addresses various economic, policy, and program issues related to cigarette cessation activities in Illinois and extends the research team’s earlier efforts also funded by the Illinois Department of Public Health .
Role: Investigator

Completed Research Support

Ciecierski, Christina, PI 10/1/2005-2/28/2007
Roswell Park Transdisciplinary Tobacco Use Research Center (TTURC) Developmental Research Grant Program
“Collection and analysis of cross-sectional, individual-level tobacco control survey data in Poland”
The overall research goal of the study was to provide a longitudinal evaluation of the population impacts of Poland’s tobacco control policies and to assess how they compare to the effects of policy in other TTURC-studied countries.
Role: Principal Investigator

Ciecierski, Christina, PI 4/1/04-12/31/05
Robert Wood Johnson Foundation
“The Role of Peer Effects in Problem Drinking and Tobacco Use Across American College Campuses.” RWJF, Substance Abuse Policy Research Program Grant. This project will extend the literature on college student tobacco and alcohol demand by examining the significance of peer effect influences as determinants of college student smoking and drinking behaviors in the context of price and non-price policies.
Role: Principal Investigator

Ciecierski, Christina, PI 10/1/04-12/31/05
Research International for Tobacco Control (RITC)
“The Market for Legal and Illegal Cigarettes in Poland: A Closer Look at Demand and Supply-Side Characteristics.”
This project investigates both the legal and illegal markets for cigarettes in Poland and tests an innovative methodology for measuring levels of smuggled cigarette availability and use among smoker households in Poland. The characteristics, penetrations and overall extent of smuggled versus legal cigarette sales and use across Poland will be thoroughly examined.
Role: Principal Investigator

Ciecierski, Christina, PI 9/1/04-2/28/05
International Research and Exchanges Board
This project investigates the relationship between Poland’s tobacco control policies and cigarette smuggling and focuses on the health implications for Poland given the relationship between current tobacco market interventions and crude estimates of smuggling activity
Role: Principal Investigator

Ciecierski, Christina, PI 6/1/04-3/30/05
Canadian Tobacco Control Research Initiative
American Cancer Society
Research International for Tobacco Control (RITC)
“Cigarettes and E-commerce: Implications for Comprehensive Tobacco Control in Poland and a Pressing Challenge for the Framework Convention on Tobacco Control (FCTC).”
This project builds capacity in research and tobacco control policy advocacy on the issue of internet tobacco sales in Poland. Data on internet-based cigarette sales and marketing is being collected and analyzed in order to determine the extent to which this venue violates tobacco control laws currently required by Polish law

including tobacco tax laws, advertising regulations and youth access laws. Study findings will provide scientific evidence to local and European tobacco control policy advocates and policy makers to help stimulate increased activity in internet-based tobacco control.

Role: Principal Investigator

Ciecierski, Christina, PI

11/1/04-7/31/04

J. William Fulbright Foreign Scholarship Board

“Tobacco and Health in Poland - A Look at Consumer Use, Producer Privatization, Sales and Trade

This project applied an empirical approach to studying key economic issues surrounding the tobacco market and tobacco-related policies in Poland. Estimates of the price elasticity of cigarette demand among adult smokers were derived and the impacts of globalization of the tobacco industry through Poland’s liberalization of trade and privatization of its tobacco monopoly.

Role: Principal Investigator

Chaloupka, Frank, PI

9/30/01-4/30/04

Centers for Disease Control and Prevention

“Coordinating Center, International Tobacco Evidence Network.”

This project supports the development of the International Tobacco Evidence Network which aims to provide technical assistance for economic research on tobacco control issues in low and middle-income countries and to conduct regional and global research on the economics of tobacco use and tobacco control.

Role: Investigator

RESOURCES

FACILITIES: Specify the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe capacities, pertinent capabilities, relative proximity, and extent of availability to the project. If research involving Select Agent(s) will occur at any performance site(s), the biocontainment resources available at each site should be described. Under "Other," identify support services such as machine shop, electronics shop, and specify the extent to which they will be available to the project. Use continuation pages if necessary.

Laboratory:

Not Applicable

Clinical:

Not Applicable

Animal:

Not Applicable

Computer:

The Economic's Department computing environment that is available for project-related data analyses is limited to a laptop computer located in office SCI 340B; this is the university computer and office of Dr. Christina Ciecierski.

Office:

The Economics Department resides in 3-story multipurpose building (classroom, laboratory and office). Faculty and staff have access to limited communications technology (phone, fax) and high-speed Internet,

Other:

In fiscal year 2007-2008, the Economics Department generated approximately \$100,000 in research dollar expenditures from grant activity.

MAJOR EQUIPMENT: List the most important equipment items already available for this project, noting the location and pertinent capabilities of each. The Economics Department Office is equipped with a desktop computer, printer and fax. The university maintains a Unix server on which all employees have an account. The university maintains its own e-mail system. It may be accessed via the Web or by using PINE on the university's Unix machine.

Determinants of Physical Activity Among College Students

A. Specific Aims

This project will investigate individual and peer-level lifestyles, health behaviors and college campus environment as determinants of physical activity among US college students. The overall goals of this research are: 1) to investigate both individual and peer-level factors that impact an individual college student's physical activity and 2) to provide critical information for college health advocates, school administrators and policy makers that will help define strategies and guide policy across US college campuses and other comparable subgroups of the population including high school youths and non-college young adults. Bi-annual survey data from the 2000 through 2003 waves of the National College Health Assessment (NCHA) will be used to evaluate the impact of campus environment, individual lifestyles and health behaviors on college student physical activity and weight/obesity. The proposed project will accomplish the following aims:

- Investigate the extent to which college physical activity patterns are associated with socioeconomic privilege (including, the impacts of being under or uninsured and/or having personal credit debt).
- Provide a careful examination of the association between lifestyle (including but not limited to, area of residence, Greek-membership, allocation of time outside of the classroom, diet) as well as health-related consumer behaviors (substance use including heavy alcohol use and smoking) and rates of college physical fitness across gender, racial, and ethnic groups in college.
- Examine the effects of the campus environment including campus peer-lifestyles (i.e. peer frequency and degree of physical fitness activities and peer diet) and peer health behaviors (i.e. peer substance use, specifically smoking and binge drinking) on an individual student's physical activity patterns.
- Identify and interpret factors related to college student physical activity patterns and use this information to suggest modifications to the campus environment as a means for strengthening health among all students and altering lifestyles and health-behaviors of affected and/or at-risk students.

B. Background and Significance

The public health challenge that stems from physical inactivity and obesity has been well-documented. For instance, research shows that regular physical activity is associated with reduced mortality. In particular, regular physical activity has been found to reduce the risk of coronary heart disease, diabetes, colon cancer, hip fractures, high blood pressure, and obesity (USDHHS 1996, 2002). Also, the health risks associated with obesity are numerous, including premature death, type 2 diabetes, heart disease, stroke, hypertension, gallbladder disease, osteoarthritis, sleep apnea, asthma, breathing problems, cancer, high blood cholesterol, complications of pregnancy, menstrual irregularities, hirsutism, stress incontinence, and depression (USDHHS 2001).

Despite the evidence on the health benefits associated with regular physical activity and the maintenance of moderate weight levels, physical inactivity rates remain high and obesity rates have reached record levels in the United States among both adults and youths. Overweight and obesity statistics reveal a current epidemic among the US population. Recent data from the National Health and Nutrition Examination Survey (NHANES) 1999-2000 found that 64.5% of the US adult population is overweight and almost one in three is obese (30.5%) (Flegal, et al. 2002). Data reveal that there is a clear upward life-cycle trend in weight and obesity among the population. The 1995 National College Health Risk Behavior Survey (NCHRBS) reports that 20.5% of students were overweight as determined by their BMI greater than or equal to 27.8% for men and greater than or equal to 27.3% for women. (Douglas et al. 1997). The prevalence of overweight college students reflects an overall increase from the rates among middle-school and high-school students. Data from NHANES 1999-2000 showed that the prevalence of being overweight (age- and gender-specific BMI greater than or equal to the 95th percentile) among children aged 12-19 reached 15% by 1999-2000.

(<http://www.cdc.gov/nchs/products/pubs>). Physical activity patterns among college students are also lower compared to their high-school counterparts. The 1995 NCHRBS reports that only 37.6% of college students participated in vigorous physical activity in the last week whereas the Youth Risk Behavior Survey conducted in the same year shows that 64.7% of 10th, 11th and 12th graders participated in vigorous activity over the same time period (Douglas et al. 1997 and Kann et al. 1996).

A goal of Healthy People 2010 is to "increase the quality, availability, and effectiveness of educational and community-based programs designed to prevent disease and improve health and quality of life" (USDHHS, 2000). In particular, for the college student population, there are several relevant priority health risk behaviors including: inadequate dietary patterns, physical inactivity, as well as tobacco and alcohol use. Physical activity

and dietary behavioral patterns established by college students during a transition period from adolescence to adulthood are likely to influence long-term health behaviors into adulthood.

B.1. Physical Activity

Physical activity patterns among college students have been described by Douglas et al. (1997) who report the findings from the 1995 NCHRBS which shows that 36% of college students did not engage in adequate amounts of physical activity and that 19.5 % and 37.6% of students participated in moderate and vigorous physical activity, respectively, over the previous seven days. Pinto et al. (1995) relate demographic characteristics to college students' physical activity patterns and Suminski et al. (2002) report that levels of physical activity differ by gender, race, and ethnicity among the college student population. Female college students, in particular those from minority groups, were reported to be significantly less physically active. Among males, Asian men reported lower levels of activity compared to their White and Hispanic counterparts.

Physical activity among college students has also been linked to other health-related behaviors that include suicide (Brown and Blanton 2002), substance abuse, nutrition, sexual behaviors, and BMI (Dinger and Vesley 2001). These studies confirm the broader health related benefits found to be associated with increased physical activity among adolescents. For example, higher levels of physical activity among youths have been associated with reduced risky behaviors such as smoking and drug use (Escobedo et al. 1993; Kulig, Brener and McManus 2003). Higher levels of physical activity have also been positively associated with young people's mental health by increasing self-esteem levels and reducing stress (USDHHS 1996) – and limited evidence reveals that it may even lead to improved academic performance (Sallis et al. 1999). In an investigation of stages of exercise behavior among college students, Wallace et al. (2000) show that controlling for demographic characteristics, friend and familial support for physical activity is an important factor for the precontemplation through maintenance stages of physical activity among males and females. This study highlights the importance of examining the potential role of broader peer-level influences on college student physical activity and BMI.

B.2. The importance of Eating Behavior

A limited body of research has examined dietary behaviors as determinants of physical activity and BMI among the college population. This research will extend the limited existing literature that focuses on college student physical activity by examining the association between dietary intake and physical inactivity. Existing evidence reveals that college students' dietary intake behaviors reflect an unhealthy diet (Dinger and Waigandt 1997 and Lowry et al. 2000). Nielson et al. (2002) show that the portion of total energy coming from restaurant and fast food places among adolescents and young adults has been increasing over time. Existing research further shows that excessive energy intake is a primary risk factor for the development of obesity. Fat intake and vegetable and fruit (V&F) consumption are two important dietary factors that affect energy intake. Other dietary factors such as snacks, sugar-rich foods and soft drinks, are also found to be associated with obesity. Several studies show a significant association between alternative types of food (i.e. V&F) and food-away-from-home consumption patterns and BMI (Lin and Morrison 2002; Binkley et al. 2000). Numerous studies show that increased fat intake promotes weight gain and obesity (Astrup 2001; Bray and Popkin 1998).

B.3. The Importance of Peer Effects

A growing body of literature suggests that social interactions may be important determinants of many youth behavioral outcomes. It is hypothesized that an increase in the prevalence of a given behavior at the peer level may lead to an increased probability of such behavior at the individual level. In this regard, the importance of peer effects have been examined empirically in the context of several behaviors including educational outcomes (Case and Katz 1991, Borjas 1994, Aaronson 1998, Sacerdote 2000, Kremer and Levy 2002), crime (Sah, 1991; Glaeser, Sacerdote, and Scheinkman, 1996), teenage pregnancy (Evans, Oats, and Schwab, 1992; Crane 1991; Anderson, 1991); and, youth substance use (Norton et al. 1998; Gaviria and Raphael, 2001, Powell et al. 2002, Wolaver et al. 2006, 2007).

This research will extend the limited existing literature that focuses on college student physical activity and dietary behaviors by incorporating the importance of peer influences on college student physical (in)activity. Previous studies that have analyzed the effects of peer influences among college student have not examined the impact of peers on physical activity. This careful analysis of peer effects will allow us to review the potential effects of social norming policies in the context of the campus environment. Further, this work will provide a rigorous analysis of the relationship between physical activity and substance use. Finally, the data will allow for a description of the practices among college students related to weight management in terms of dietary behaviors and physical fitness activities.

College campuses represent a setting that emphasizes the importance of a community on good health. Although certain health outcomes such as physical activity, cigarette use and obesity are often perceived as personal or individual issues, the college campus forms a specific environment that allows students to influence each other's behavioral choices and therefore, leads to mutual or shared health challenges for the entire college campus. On-campus advertising, social and cultural norms, campus traditions and campus media may influence student attitudes and behaviors. These tools for changing social norms at the college campus may be particularly important given that, for example, college curriculums do not include physical education requirements and so peer-level behaviors in this area may be particularly important.

C. Preliminary Studies

Dr. Ciecierski (nee Czart) is a relatively new researcher, with considerable experience in the analysis of lifestyles and health behaviors specifically, on the issues of substance use among American young adults. The majority of this research has focused on the determinants of young adult smoking and drinking behaviors and specifically, on the relative impact of price and policies on substance use behaviors (see Czart et al. 2001a and Czart 2001b). Czart et al. (2001a) extended the work of Chaloupka and Wechsler (1997) to include the effects of campus based tobacco control efforts on college student smoking. Czart (2001b) was the first to examine the effects of campus-specific average alcohol prices on college student alcohol use behaviors. Unlike earlier studies, Dr. Ciecierski's work captures a wide range of campus, local and state level laws governing alcohol use among the young adult population and allows for a more accurate assessment of the effects of prices on alcohol consumption among college students. Findings reveal that policies, which directly impact the price of alcoholic beverages, (i.e. restrictions on pitcher sales and restrictions on happy hours) have significant, discouraging effects on college student alcohol use. Recently, Dr. Ciecierski has also undertaken analyses of college peers on individual college student smoking and binge drinking participation. (Ciecierski et al, 2003; Wolaver et al, 2006 and 2007) Dr. Ciecierski has a large degree of experience with college student data samples and has devoted a considerable amount of time to the re-coding, cleaning and analysis of the College Alcohol Studies (CAS) survey conducted by the Harvard School of Public Health. Finally, Dr. Ciecierski has also analyzed the impact of state-level tobacco control spending on various types of tobacco use as well as smoking cessation among college students. This work finds that higher tobacco program expenditures are associated with lower rates of smokeless tobacco and cigar use among college students. (Ciecierski et al, 2006) Dr. Ciecierski's experience using college sample data and her previous work in the area of modeling various student health behaviors will be of great value as this research builds on the existing literature to incorporate peer effects into the analysis of the correlates and determinants of physical activity behaviors among US college students.

D. Research Design and Methods

D.1. Data

The primary data that will be employed by this analysis will be derived from the American College Health Association's (ACHA) NCHA surveys. The first wave of the NCHA began in 2000 and continues to be conducted bi-annually. To date, fifteen waves of data have been collected. This pilot study has gained access to data from the first seven waves. These have collected information from across 179 colleges and universities and a total of 106,096 individual college respondents. The NCHA is a national, non-profit research effort designed to assist various college-related professionals including health providers/educators, campus counselors and school administrators collect data about the health of their students. The NCHA database represents many US geographical regions, all the Carnegie Classifications and various types of colleges - including both urban and rural campuses. Because the participating colleges are self-selecting, the NCHA data cannot be said to be representative across all US schools/students. However, the generalizability of three NCHA pilots (1998, 1999) and the Spring 2000 data was assessed against other national surveys of the college population (including the National College Health Risk Behavior Survey and the CAS). The survey contains approximately 300 questions designed to evaluate student health status, health problems, access to health information, obstacles to academic performance and perceived campus norms on issues such as substance use, weight, nutrition, exercise and mental health. These data contain detailed information about student lifestyles, student demographics, school-identifiers (which allow for the generation of campus peer health behaviors/lifestyles such as smoking, heavy drinking, physical fitness activities and diet). Finally, the survey includes important questions about student environment such as living arrangement and Greek membership that make it possible to investigate physical activity patterns and weight/obesity among particular friendship networks and in turn, allows us to differentiate between the impact of the average health

behaviors/lifestyles such as of close peers versus general campus level peer effects. The following paragraphs describe the measures available through the NCHA data. The dependent variable of interest, individual and campus peer descriptors and other control variables for the proposed analysis are discussed.

Individual Student Lifestyle and Health Behavior Measures: A number of individual level student measures that reflect individual student lifestyles and health behaviors will be constructed from the following NCHA questions: (a) "Are you trying to do any of the following about your weight?" (nothing, stay at the same weight, lose weight, gain weight), (b) "Within the last 30 days, did you do any of the following?" (exercise, lose weight, vomit/take laxatives, take diet pills, none); (c) "How do you describe your weight?" (very underweight, slightly underweight, about right weight, slightly overweight, very overweight) (d) "How many servings of fruits and vegetables do you usually have per day?" (none, 1 to 2 (median 1.5), 3 to 4 (median 3.5) and 5 or more (5)); (e) "On how many of the past 7 days did you": (answers range across 0 to 7 days) – "participate in exercise for at least 20 minutes or moderate exercise for at least 30minutes"; "do exercise to strengthen/tone muscles such as push-ups, sit-ups or weight lifting; get enough sleep so that feel rested in the morning"; "get enough sleep so that you felt rested when you woke up in the morning". Dichotomous 0-1 measures for individual student lifestyles will be derived from points (a) through (e) to include indicators for: good nutrition (3 or more servings of fruits and vegetables per day), vigorous exercise and moderate exercise. Our measures of smoking behaviors among American college students will be based on the answer to the question: Within the last 30 days, on how many days did you use cigarettes?". Possible answers are: "Never used", "Have used but not in the last 30 days", "1-2 days", "3-5 days", "6-9 days", "10-19 days", "20-29 days" and "All 30 days". Student responses will be used to construct a continuous measure reflecting the number of occasions upon which a student smoked cigarettes during the 30 days prior to taking the survey. A second measure reflecting smoking participation among American college students will be constructed as a 0-1 dichotomous indicator of smoking participation. Students will qualify as current smokers if they report smoking on at least 1 or more days. In terms of heavy alcohol use, the NCHA survey identifies heavy drinkers with the question: "Think back over the last two weeks. How many times, if any, have you had five or more alcoholic drinks at a sitting?" Possible responses include: "none", "1 time", "2 times", "3 times", "4 times", "5 times", "6 times", "7 times", "8 times" and "9 times or more". Student responses to this binge drinking-related question will be used to construct dichotomous indicators of binge drinking participation and ordered measures of the frequency of binge drinking participation.

Campus Peer Measures of Lifestyle and Health Behaviors: Our analyses will examine several alternative college peer influences including peer physical activities, peer diet, peer smoking and peer drinking. These campus-based peer measures for each student will be constructed as the prevalence of smoking, heavy drinking, vigorous/moderate exercise, and diet at the individual student's campus (not including the given individual in the calculation). That is, for each student, the prevalence of campus peer smoking/drinking/exercise/diet is the average prevalence of smoking/drinking/exercise/diet among other respondents on their campus.

Campus Policy Measures: The discouraging effects of two categories of campus-based health policies on college student physical activity will be investigated. First, a set of variables indicating whether or not a college/university provides health-related information and its impacts on physical activity will be included. These are derived from the survey question: "On which of the following health topics have you ever received information from your college or university" and include: (a) tobacco use prevention, (b) alcohol and other drug use prevention, (c) suicide prevention, (d) dietary behaviors and nutrition as well as (e) physical activity and fitness. A second set of measures indicating the presence and effectiveness of various forms of delivering health-related information will also be reviewed. These are derived from the questions: "Do you usually get health-related information from any of the following sources?" and "Use the scale below to record the believability of each source of health information?". Forms of relaying information that are most relevant to our project include: (a) campus newspaper articles, (b) health center medical staff, (c) friends, (d) resident assistants/advisors, (e) campus peer educators, (f) leaflets/pamphlets, flyers, (g) parents.

Other Control Variables: The NCHA surveys collect a variety of demographic and socioeconomic data. Several potential determinants of college student physical activity patterns will be constructed from these data. These include: the age of the respondent, his/her gender, year in school, race and ethnicity (White, non-Hispanic; African American, non-Hispanic; Hispanic or Latino; Asian, Native American, other), college enrollment status (full-time), marital status (never married, married, committed, divorced, separated, widowed), area of residence (dormitory, sorority/fraternity house, other university housing, off campus housing, with

parent, other), sorority or fraternity membership, student employment (hours per day spent working for pay) and hours spent in volunteer work, extent of credit card debt and presence of health insurance.

A mix of women, minorities and underage youth are contained in the NCHA college student sample. We believe this to be a strength of our proposed research as our findings are likely to be quite representative of various key and at-risk US subpopulations. Approximately half of the college student sample (56.39% or 59,833 students) is between the ages of 18 to 20. The remainder of the sample (43.6% or 46,263 students) is of legal adult age. Age-specific data is missing for 5855 students of the 106,096 respondents (5.52% of the total sample). Over half of the sample (57%) is female and 34% is male. Gender information is missing for approximately 9% (9,431 observations) of the total sample. Hispanic females constitute 4% of the total sample and 7.2% of all student females contained in the data. Hispanic males represent 2.2% of the total sample and 6.4% of all male students present in the NCHA sample. The definable racial categories contained in the NCHA data include: American Indian/Alaskan Native, Asian, African American and those students who are of one or more races. The Asian category captures those students who are Asian as well as Native Hawaiian and/or Pacific Islander.

D.2. Empirical Models and Estimation Methods

Our empirical analysis will examine the impact of individual student as well as campus peer health behaviors and lifestyles on the physical activity of individual college students. We will conduct the empirical analysis using econometric estimation techniques such as multiple linear regression analysis, non-linear estimation methods such as probit and logit models, ordered logit models, bivariate probit models, and two-stage instrumental variables estimation, with appropriate clustering methods (Greene 2003; Maddala 1983). The implementation of a given model(s) will depend on: a) the specification of the outcome measures (i.e. continuous versus dichotomous measures); and, b) whether we estimate a single-equation versus multi-equation models. The large sample sizes in the survey data set will provide ample power to detect small effects, to estimate separate samples by socioeconomic status (household income), race, ethnicity, and gender, and to precisely identify the effects of local area variables. Based on the survey sample size of the data set proposed in this study (observations in the thousands) a review of data size requirements in Chapter 9 of Cohen (1988) suggests that we have more than adequate sample sizes.

A. Individual Level Determinants of Physical Activity

The individual level models of physical activity will estimate the probability of a college student engaging in vigorous and/or moderate exercise, E_{ic} (a 0-1 dichotomous indicator of student i engaging in exercise), and is given by the equation:

$$E_i = \beta_0 + \beta_1 L_i + \beta_2 H_i + \beta_3 X_i + \beta_4 C_i + \beta_5 A_i + \beta_6 P_i + \varepsilon_i \quad (1)$$

where L_i is a vector of personal lifestyle characteristics for student i , H_i is a vector of personal health behaviors of student i , X_i is a vector of personal demographic characteristics belonging to student i , C_i is a vector of campus-based health policies, A_i is a vector of measures reflecting access to physical fitness activities/facilities on campus and P_i is a vector containing alcohol/cigarette prices and alcohol/tobacco control policies relevant to student i 's campus location. Results from these individual level models will indicate the extent to which college student physical activity is related to a student's socioeconomic privilege (impacts of being under or uninsured and/or in personal credit debt), his/her personal demographics (age, year in school, etc) and/or campus-based health policies and will reveal how an individual college student's access to organized physical fitness activities/facilities on-campus, individual student lifestyles (area of residence, Greek-membership, allocation of time outside of the classroom, nutrition and sleeping habits) and individual health-behaviors (cigarette/heavy alcohol use) result in different levels of college student physical activity across gender, racial and ethnic groups in US college campuses.

B. Campus-Based Peer Determinants of Student Physical Activity

The peer effect specification for individual student physical activity will incorporate a campus-based peer lifestyle variable (based on one of three physical activity patterns available through the NCHA data: moderate exercise, vigorous exercise and moderate and/or vigorous exercise) in addition to each student's own unique set of personal characteristics, lifestyle and health behaviors. This physical activity specification will incorporate campus based peer lifestyle measures in its estimation of the probability of an individual student engaging in vigorous exercise and/or moderate exercise, E_{ic} (a 0-1 dichotomous indicator of student i engaging in exercise on campus c), given by equation:

$$E_{ic} = \beta_0 + \beta_1 L_i + \beta_2 H_i + \beta_3 X_{ic} + \beta_4 PA_{ic} + \varepsilon_{ic} \quad (2)$$

where L_i is a vector of personal lifestyle characteristics for student i , H_i is a vector of personal health behaviors of student i , X_i is a vector of personal demographic characteristics belonging to student i , PA_{ic} defines our campus-based peer physical activity measure for individual i in college c excluding i who share in a given lifestyle. Therefore, specification 2 will be used to examine the effects of the campus environment as defined by campus-based peer-physical activity on an individual student's physical activity (regular, moderate and/or vigorous exercise).

In the empirical estimation of equation (2), two potential sources of endogeneity may arise and bias our results if the estimation of this equation directly assumes that PA_{ic} is exogenous. First, our analyses must account for the fact that an individual student can affect the behavior of his/her peers, while at the same time the student's peers affect his/her own behavior. Here, an individual student's error term and that of his/her peer group may be correlated. Second, another potential source of endogeneity may occur if students have similar unobserved characteristics. In the context of our specification, college students may endogenously sort themselves across college campuses based on physical activity patterns. In order to control for the potential endogeneity between our physical activity peer measure and our dependent variable of college student exercise/physical activity, we will estimate a two-staged generalized least squares model. More specifically, we will implement the Amemiya Generalized Least Squares (AGLS) estimator for our models with dichotomous dependent variable. In this model, the endogenous regressor (here, the peer lifestyle, and specifically, the physical activity measures) are treated as a linear function of the instruments and other exogenous variables (Newey, 1987). This two-stage estimation procedure requires the inclusion of identifying variables that are an exogenous source of variation in our peer lifestyle (physical activity) measures but do not directly affect individual student's lifestyle (physical fitness activities). Assuming that there are no contextual effects (meaning, that the background characteristics of an individual student's peer group do not have a direct effect on his/her lifestyle, that is, physical fitness activities), we will employ the average of the peer group's measure of characteristics X_{ic} as identifying instruments. Next, in order control for the fact that correlation may exist in the unobservable characteristics of the individual student and his/her peer group, namely the endogenous sorting of students across college campuses, we will include two different sets of instruments. First, the analyses will employ as instruments a measure of the student's use of a seatbelt when riding a car. This information will be provided by the NCHA survey question: "Within the last school year, how often did you: wear a seatbelt when you rode in a car?" (where possible answers include: Did not do this within the last school year; never; rarely; sometimes; most of the time; always). A second instrument will be derived from the question: "Do you usually get health-information from: your parents?" (possible answers include: yes or no).

In the first stage, the project will estimate an ordinary least squares regression of the dependent variable E_{ic} , the prevalence of exercise/physical activity among the peer group of individual i , as a function of exogenous regressors from the estimating equation (3) and two sets of identifying regressors. In order to account for potential endogeneity of the peer measure in the estimating equation, the actual peer measure will then be replaced by a predicted peer measure based on the results of the first-stage regression. Next, in the second stage regression, the estimating equation above is estimated as a probit equation. Within the two-stage instrumental variable estimation, the research team will formally test the exogeneity of the peer exercise measures using the Smith and Blundell (1986) exogeneity test. An overidentification test of the instruments will also be employed. A similar methodology will be used in analyses of select subgroups (i.e. by gender, ethnicity and race) in order to extract differential implications for these specific college campus subpopulations. In the cases where the dependent variable is a continuous measure reflecting individual physical activity measures, a two-stage least squares estimator will be implemented.

Results from these studies will inform about the extent to which social norming policies at a college would be useful as a means of reducing physical inactivity on US college campuses. In addition, results generated by the reduced form models that incorporate drinking/smoking, will further define the intricate relationship between peer influences, control policies and levels of physical activity among America's college students. If peer influences are found to exist, our findings will help to inform college administrators and health advocates about the potential effectiveness of control policies including social norming policies enhancing physical activity among college students and limiting obesity/overweight.

D.3. Workplan

The proposed research will take 12 months to complete. Data preparation will take approximately 4-5 weeks. The empirical analysis of the full sample and estimation of comparable models on pertinent subpopulations will be completed during the following 5 months. The final six months will be spent completing

publishable manuscripts and presenting key findings at academic and/or professional conferences. Findings from the project will be disseminated through a variety of channels. First, preliminary versions of these papers will be presented at professional conferences and/or seminars, such as the NEIU annual Student Research Symposium and the annual meetings of the American College Health Association. Second, final versions of all completed manuscripts will be submitted to peer-reviewed journals, such as *Journal of American College Health*. Third, our papers will appear on several webpages at the University of Illinois including, the ImpacTeen/Yes! Research Paper Series and the UIC Health Policy Center/ImpacTeen Policy Briefs Series designed to reach state and federal legislators, relevant coalitions, and other interest groups. The research team will also request that these outputs be linked to the ACHA's web page.

E. Human Subjects

Because this research involves the analysis of existing, secondary data that is both publicly available and provided to us without identifiers (all observations are anonymous and no observations can be linked directly to an individual subject), we claim this research as exempt from human subjects regulations, per exemption #4. The data set that will be utilized for this research has been collected prior to the proposed use of the data. Furthermore, we will not: recruit nor enroll subjects for our research; conduct any interventions; or perform any long-term follow-up investigations. Finally, because we will not engage in any form of contact with any individual subject who is part of the data there is no risk of harm from this research.

F. Vertebrate Animals

Not applicable.

G. Select Agent Research

No select agents will be used in the proposed study.

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H. Consortium/Contractual Arrangements

Not applicable.

I. Letters of Support

Not applicable.



Human Subjects Committee

NOTICE OF EXEMPTION FROM IRB REVIEW

Principal Investigator: Christina Ciecierski
Department of Economics

IRB Identification Number: 08-029

Title of Project: "Determinants of College Student Physical Activity"

This notification certifies that the proposed research described above is exempt from IRB review based on the following 45CFR 46.101(b).

- 1) Educational setting involving normal educational practices.
- 2) Educational tests, survey procedures, interview procedures or observation of public behavior UNLESS (a) subjects can be identified AND (b) disclosure of subject's response results in risk to the subject AND (c) research deals with sensitive aspects of the subject's behavior.
- 3) Educational tests, survey procedures, interview procedures or observation of public behavior not exempt under 2) if subjects are public officials or where confidentiality required by federal statutes.
- 4) Study of existing data where (a) sources are publicly available OR (b) subjects cannot be identified.
- 5) Research and demonstration projects designed to examine public service programs.
- 6) Taste and food quality/consumer acceptance.

The Human Subjects Committee must be notified immediately of any significant changes in the study.

For the study, use **only** the NEIU Human Subjects Committee **approved** Informed Consent Form to make copies for distribution.

Signature of Chair or Designee Selva Ayzman-Nalley Date 4/02/08