ARIC Manuscript Proposal #616 - revised

PC Reviewed: 05/06/04	**Status: A**	**Priority: 2**
SC Reviewed: 05/07/04	**Status: A**	**Priority: 2**

1.a. Full Title:
Associations of television watching with physical activity, diet, and weight status

Abbreviated Title (Length 26 characters):
TV, PA, diet, and weight

2. Writing Group (list individual with lead responsibility first):

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3. Timeline:
Summer 2004 drafting of methods and analysis plan
Fall 2004 begin data analysis
Winter 2004 First draft of results
2005 Submit manuscript for ARIC approval, prior to submitting to journal

4. Rationale:
Obesity is increasing dramatically in the United States [1-3]. At the same time participation in any leisure activity, measured from national surveillance, shows no meaningful change over almost two decades [4]. There is, however, some evidence that total caloric intake may be increasing [5-7]. Given the methodological limitations in estimating energy balance in surveillance studies, there is little understanding about which end of the energy equation is fueling the obesity epidemic: energy intake, energy output, or both? Cohort studies may employ more comprehensive methods of energy balance and may lead to a better understanding of the behaviors that contribute to obesity and how they are associated with each other is needed.

Although both physical activity and inactivity are likely to be highly correlated (inversely) components of energy expenditure, there is evidence that these behaviors act as independent determinants of health [8]. It is possible for an individual to be classified as both inactive and active, depending on the definitions used. One commonly used marker of inactivity in epidemiologic studies has been television watching, America's favorite leisure activity [9-11].

Television watching is a very popular leisure activity and contributes a large proportion of daily inactive time. There is approximately one television set per person in American households [12]. Viewing on average (depending on age) is approximately three or four hours per day [12]. As a result, since the average adult only has between three or four hours a day for leisure activities, the vast majority of free time may be spent in front of the television, which results in a more physically inactive lifestyle [13]. This amount of time in such an inactive pursuit may have a direct

impact on health. Indeed, the steady increase in number of televisions and hours of watching in the last 10-20 years has seemed to parallel the increase in obesity [14].

Cross-sectional Evidence: Cross-sectionally, television watching has been positively associated with body mass index (BMI), sum of skinfolds, smoking, and barriers to physical activity. It has been negatively associated with physical activity, cardiorespiratory fitness, education, academic performance, employment, and income [11, 12, 15-18]. In a cross-sectional study of Australian adults, significant interactions were also observed between the amount of television and physical activity on body weight [19]. Within each category of physical activity (low, medium, high), there was a significant association between increased television watching and increased BMI [19].

Because television watching exposes individuals to targeted food advertising, it has recently been suggested that television has a direct impact on eating behavior and is associated with diet [20]. Cross-sectional associations have also shown that television watching is associated with increased snacking and caloric intake in adults [20, 21]. Food-related advertisements on TV tend to promote very high calorie, fat, sugar and sodium foods. Therefore, amount of television exposure may directly cue certain eating behaviors [20].

Longitudinal Evidence: There have been no longitudinal studies of the effect of television watching on physical activity, and only one short-term (one year) longitudinal study on television watching and caloric intake [22]. The effect of television watching on weight status has been examined in two cohort studies, the Health Professionals Follow-up Study and the Nurses Health Study. First, Ching et al. [23] examined approximately 18,000 men in the Health Professionals Follow-up Study and found that after two years, higher television watching was independently associated with higher risk of becoming overweight. Each 10-hour/week increase in television corresponded to one-third of a pound gained during the study period. In a follow-up study on the same cohort, Fung et al. [24] found independent associations between hours of television watching and biomarkers of obesity and cardiovascular disease [24]. Second, in the Nurses Health Study each 2-hour increase in television watching per day was associated with a 23% increase in obesity and a 14% increase in diabetes. The authors concluded that 30% of incident cases of obesity and type 2 diabetes could be prevented by reducing television to < 10 hrs/wk and engaging in >=30 min of walking [14].

Purpose: Better insight into the underlying associations between television and other behaviors, which lead to increased inactivity and potential weight gain, would be valuable for public health practitioners. For example, amount of television viewing may be directly related to time spent in physical activity such as sport, leisure time physical activity, or walking. Television may also have a direct impact on nutrients consumed (e.g. total calories consumed, amount of saturated or unsaturated fat, sodium, caffeine, glucose, and alcohol), as well as food choices (e.g. number of fruits and vegetables consumed as well as desserts or sweets and carbonated beverages).

The relationships between television watching and physical activity, diet, and weight status have not been thoroughly described in adults. The Atherosclerosis Risk in Communities (ARIC) Study provides an excellent opportunity to examine the changes in television watching longitudinally and the resulting relationships with physical activity, diet, and weight status.

5. Study Questions/Main Hypotheses:

First, analyses will examine baseline television viewing and the corresponding changes over time (between visit 1 and visit 3), by a number of covariates before exploring the three study questions.

Study Question 1: What are the cross-sectional relationships between television watching (dependent variable) to physical activity, nutrients (examples: total calories, fat, sodium), food choices (examples: fruits and vegetables, desserts) and body weight status (BMI, waist-to-hip ration (WHR) or waist circumference) at baseline (Visit 1).

1) We hypothesize that at baseline, individuals who report watching television “often” or “very often” will have lower levels of physical activity, inferior nutrient / food choices, and a higher BMI, WHR, or waist circumference than individuals who watch television, “never”, “seldom” or “sometimes”.

Study Question 2: What are the longitudinal relationships between television watching at baseline and 6-year changes in physical activity, nutrients, food choices and body weight status?

2) We hypothesize that people who watch television "often" or "very often" at baseline will have a more pronounced 6-year decline in physical activity, nutrients, food choices, and higher changes in BMI, WHR , waist circumference than people who watch television "never", "seldom" or sometimes" at baseline

Study Question 3: Does change in television viewing behavior longitudinally parallel a change in physical activity, nutrients/food choices or subsequent body weight? Previous analyses show that television increases with retirement [25], and we expect a number of participants to increase their television exposure during this time period.

3) We hypothesize that 6-year changes in television watching will be associated with a corresponding 6-year change in physical activity, nutrients/food choices, and body weight. An increase in television will result in less physical activity, inferior diet and excess body weight. A decrease in television viewing will result in more activity, better diet, and less weight gain.

6. Data (variables, time window, source, inclusions/exclusions):
The study population will include any individual who completed the Baecke questionnaire, dietary assessment, and measured weight and height at visit 1.

Excluded will be:
- Participants who are missing TV at Visit 1
- Participants who are missing TV at Visit 3, for longitudinal analyses only
- Participants with race other than African American or White
- Age not 45-64 yrs
- African Americans not residing in Forsyth County, NC or Jackson, MS
- Prevalent disease at Visit 1 (cardiovascular, cancer, diabetes)

Main exposure variable:
Amount of television estimated from the Baecke questionnaire which asks; "During leisure time do you watch television never, seldom, sometimes, often or very often". This exposure was assessed during Visit 1 and Visit 3.

Main outcomes variables:
Body weight status assessed by body mass index (kg/m2) and waist-to-hip ratio (WHR).

Nutrients: total kilocalories, saturated, monounsaturated and polyunsaturated fat, alcohol intake, carbohydrate, protein, caffeine, sucrose, sodium and dietary fiber.

Food Choices: Total number of servings in sections B (fruits), & C (vegetables). Total number of servings from questions # 39-47 in section E (sweets), questions #53-54 in section F (chips and fries), and questions #63-65 in section G (sweetened beverages).

Physical activity: Estimated from the Baecke questionnaire and including all three derived indexes, Sport, Work and Leisure activity. Other questions which will be examined individually are, frequency of walking, use of non-motorized transport, sport participation, sweating during leisure time, and leisure activity compared to peers.

Covariates to consider
Race
Sex
Age
Education
Smoking
General Health
Study Center

7.a. Will the data be used for non-CVD analysis in this manuscript? ____ Yes __X__ No

b. If Yes, is the author aware that the file ICTDER02 must be used to exclude persons with a value RES_OTH = "CVD Research" for non-DNA analysis, and for DNA analysis RES_DNA = "CVD Research" would be used? ____ Yes ____ No
(This file ICTDER02 has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript? ____ Yes __X__ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER02 must be used to exclude those with value RES_DNA = "No use/storage DNA"? ____ Yes __X__ No

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: http://www.cscc.unc.edu/ARIC/search.php

___X___ Yes _____ No

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?

I have spoken with authors from the following papers:
616 Kelly Evenson (original proposal that this one is being revised from)
333 Kelly Evenson
#333A Occupational PA and LTPA
#333C Retirement LTPA
#598 Juhaeri & June Stevens

11. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

1. Flegal, K.M., et al., *Prevalence and trends in obesity among US adults, 1999-2000.* Jama, 2002. 288(14): p. 1723-7.
2. Freedman, D.S., et al., *Trends and correlates of class 3 obesity in the United States from 1990 through 2000.* Jama, 2002. 288(14): p. 1758-61.
3. Ogden, C.L., et al., *Prevalence and trends in overweight among US children and adolescents, 1999-2000.* Jama, 2002. 288(14): p. 1728-32.
4. *From the Centers for Disease Control and Prevention. Physical activity trends--United States, 1990-1998.* Jama, 2001. 285(14): p. 1835.
5. Hill, J.O., et al., *Obesity and the Environment: Where do we go from here?* Science, 2003. 299: p. 853-860.
6. Nielsen, S.J. and B.M. Popkin, *Patterns and Trends in Food Portion Sizes, 1977-1998.* JAMA, 2003. 289: p. 450 - 453.
7. *Trends in Intake of Energy and Macronutrients -- United States, 1971-2000.* MMWR, 2004. 53(04): p. 80-82.
8. Martinez-Gonzalez, M.A., et al., *Physical inactivity, sedentary lifestyle and obesity in the European Union.* Int J Obes Relat Metab Disord, 1999. 23(11): p. 1192-201.
9. Jakes, R., et al., *Television viewing and low participation in vigorous recreation are independently associated with obesity and markers of cardiovascular disease risk: EPIC-Norfolk population-based study.* Eur J Clin Nutr, 2003. 57(9): p. 1089-96.
10. Center, A.P.P., *Median in the Home 2000: Fifth Annual Survey of Parents and Children*, University of Pennsylvania: Philadelphia.

11. Williams, C.D., et al., *Psychosocial and demographic correlates of television viewing.* Am J Health Promot, 1999. 13(4): p. 207-14.
12. Sidney, S., et al., *Television viewing and cardiovascular risk factors in young adults: The CARDIA Study.* Ann Epidemiol, 1996. 6(2): p. 154-159.
13. Bouchard, C., *Physical inactivity.* Can J Cardiol, 1999. 15 Suppl G: p. 89G-92G.
14. Hu, F.B., et al., *Television watching and other sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in women.* Jama, 2003. 289(14): p. 1785-91.
15. Tucker, L. and G. Friedman, *Television viewing and obesity in adult males.* Am J Public Health, 1989. 79(4): p. 516-518.
16. Tucker, L. and M. Bagwell, *Television viewing and obesity in adult females.* Am J Public Health, 1991. 81(7): p. 908-911.
17. Gortmaker, S.L., W.H. Dietz, Jr., and L.W. Cheung, *Inactivity, diet, and the fattening of America.* J Am Diet Assoc, 1990. 90(9): p. 1247-52, 1255.
18. Kronenberg, F., et al., *Influence of leisure time physical activity and television watching on atherosclerosis risk factors in the NHLBI Family Heart Study.* Atherosclerosis, 2000. 153(2): p. 433-43.
19. Salmon, J., et al., *The association between television viewing and overweight among Australian adults participating in varying levels of leisure-time physical activity.* Int J Obes Relat Metab Disord, 2000. 24(5): p. 600-6.
20. Gore, S.A., et al., *Television viewing and snacking.* Eating Behaviors, 2003. 4: p. 399-405.
21. Crawford, D.A., R.W. Jeffery, and S.A. French, *Television viewing, physical inactivity and obesity.* Int J Obes Relat Metab Disord, 1999. 23(4): p. 437-40.
22. Jeffery, R.W. and S.A. French, *Epidemic obesity in the United States: are fast foods and television viewing contributing?* AJPH, 1998. 88(2): p. 277-280.
23. Ching, P.L., et al., *Activity level and risk of overweight in male health professionals.* Am J Public Health, 1996. 86(1): p. 25-30.
24. Fung, T., et al., *Leisure-time physical activity, television watching, and plasma biomarkers ofobesity and cardiovascular disease risk.* Am J Epidemiol, 2000. 152(12): p. 1171-8.
25. Evenson, K., et al., *The influence of retirement on leisure-time physical activity: The Atherosclerosis Risk in Communities Study.* Am J Epidemiol, 2002. 15(8): p. 692-9.