

Community Specific Daily Activity in Northern Plains American Indian Youth

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ABSTRACT

Overweight and obesity affect almost half of all reservation based Native American youth. One causative factor may be low levels of physical activity. The purpose of this study was to compare Native American physical activity in adolescents living on reservations to their urban dwelling counterparts. We examined physical activity using an automated Audience Response System that deployed the validated International Physical Activity Questionnaire (I-PAQ) in 689 children; 377 reservation-based Native American adolescents, 213 (urban) Native American adolescents and in 99 non-Native urban adolescents. Results indicated that overall reservation-based Native American adolescents were NOT less active than their urban counterparts. However, reservation-based Native American adolescents were more active than their urban counterparts for medium intensity outdoor household activity (mean activity minutes per week 243 (SD 297) versus 186 (255), $p = 0.02$), for heavy intensity outdoor household activity (mean 209 (SD 264) versus 160 (223), $p < 0.03$), and for medium intensity indoor household activity (mean 210 (SD 246) versus 169 (211), $p = 0.05$). Compared to the Native urban adolescents, the non-Native urban adolescents were more active by half an hour/day for medium intensity activity (mean minutes per week 1208 (SD1209) versus 949 (909) min/wk, $p = 0.05$) for any physical activity and were leaner by 2 Body Mass Index (BMI) units (mean BMI 20.8 (SD 4.4) versus 22.4 (SD 5.3) kg/m², $p=0.008$). Low levels of physical activity occur similarly in reservation-based Native American and urban Native American 10-14 year old children. Physical activity levels were low in both reservation-based and urban Native American adolescents; improving physical activity in Native American adolescents is an opportunity for community participatory research.

KEY WORDS: *Physical Activity, Non-exercise Activity Thermogenesis, Community Based Participatory Research, Audience Response System, Childhood obesity, Obesity.*

Nationally, two-thirds of all Americans are obese or overweight, and the prevalence of these two conditions is even greater among the American Indian population (U.S. Department of Health and Human Services, 2002). Researchers have examined factors that contribute to obesity and to chronic diseases in American Indians (Nelson, Moon, Holtzman, Smith, & Siegel, 1997; Schweigman, Eichner, Welty, & Zhang, 2006). In fact, some reservation areas served by the Indian Health Service report a 54% increase in type II diabetes among 15 to 19 year old

American Indians over the past 12 years (Nelson et al., 1997). Although food quality and consumption are factors (Byers, 1996; Curran et al., 2005), diet alone does not explain the increase in obesity. Physical activity, community factors, and environment also play critical roles (Fischer et al., 1999). Obesity is the consequence of sustained positive energy balance whereby food intake consistently exceeds energy expenditure. Furthermore, both food intake and physical activity (the only volitional component of energy expenditure) has both biological and environmental drivers. In this

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work, we tackle physical activity but recognize that it is only one component in a complex adaptive system.

Physical activity is not only important in obesity but also in cancer, diabetes, hypertension, hypercholesterolemia, cardiovascular disease, mental illness and mood . This appears to be equally true regardless of age, race and country of origin (Bauman et al., 2012; Heath et al., 2012; Kohl et al., 2012; Pratt et al., 2012). High levels of daily physical activity are associated with decreased morbidity, increased quality of life and prolongation of life-span whereas low levels of physical activity, or “sedentariness,” are associated with greater morbidity and shortening of life . Furthermore, spontaneous physical activity decreases with aging and so may be important in sarcopenia. For the last forty years, expert panels have unanimously called for improved methods and tools for measuring physical activity in order to clarify the role of physical activity in health and disease and to better define the effectiveness of strategies to increase physical activity.

Previously it was thought that measuring the amount of exercise people undertake was the cornerstone to relating human activity to health. However, more recent analyses suggest that sedentariness is harmful and that any type of physical activity beneficial. The majority of physical activity that people undertake, in fact (especially the overweight), is accounted for by many low amplitude movements rather than bouts of high exertion exercise. What is more, most Americans do not undertake regular, purposeful exercise and so for them, non-exercise activity represents the vast majority of total daily activity (Blair & Brodney, 1999; Blair et al., 1995).

Community-based participatory research (CBPR) is a community-needs-based approach to collaboratively investigate health issues in a community. In CBPR community members partner with academic experts in a shared purpose to improve the health of the community. The community representatives partner with the scientists in all aspect of the research mission; from concept planning through execution and delivery. The knowledge gained to given to the community to improve health outcomes and then shared with the scientific community to allow for scalability and shared knowledge. CBPR therefore is an ideal platform to enable Native American communities to address childhood obesity, which implicitly involves the interface between communities and individuals (Fischer et al., 1999).

Approximately 1 in 5 American Indians and Alaska Natives live on reservations or other trust lands. About 60% American Indians and Alaska Natives live in urban/metropolitan areas . To understand the role of habitat on the physical activity levels of Native American youth, we compared levels of physical activity between communities of Native children, aged 10-14 years old, living in reservations and urban communities. To compare the data from the Native children with Non-native children, we included urban non-Native children too. The hypothesis was that there are significant differences in reported daily physical activity between the three residential groups of adolescents.

METHODS and SUBJECTS

We surveyed 689 male and female children aged 10-14 years old, in three reservations (N=377), three urban (N=213) communities, and one (non-Native) urban community.

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We adapted the International Physical Activity Questionnaire (IPAQ), a validated questionnaire among cultural specific populations, to gather the community-specific data on physical activity (Craig et al., 2003; Hallal & Victora, 2004; Kolbe-Alexander, Lambert, Harkins, & Ekelund, 2006). The IPAQ is a multiple-choice questionnaire that assesses physical activity across a variety of activities, including: leisure time, domestic (chores, yard), school/work related, and transportation. The IPAQ categorizes these activities based on metabolic-equivalents as high, medium or low intensity.

Age, gender, Native American Status, height, and weight data were gathered first. Then, in order to render the CBPR process scalable and reproducible across multiple communities, we automated the IPAQ survey using the Audience Response System (ARS) (Option Technologies Interactive; Orlando, Florida) (Lee & Dapremont, 2012; Tregonning, Doherty, Hornbuckle, & Dickinson, 2012). The ARS is an electronic system whereby each participant is provided with a hand-held keypad. This enables audience-selected answers to be immediately imported into a database. Confidentiality is assured using unique identifiers. Using ARS we were able to gather IPAQ data in up to 131 participants at one time in either a gymnasium or lunchroom.

Specifically, all subjects were trained on how to use the ARS keypad prior to the assessment. Each question was projected onto an overhead screen one at a time; and participants were asked to submit answers. To overcome variance in reading skills, each question and the multiple choice answers were read aloud. We tested comprehension and the system with sample questions before start-

ing the actual IPAQ survey. When responses from the younger students lagged, the pace of question-presentation was slowed. In general, the IPAQ required approximately 30 minutes to complete. In addition to the IPAQ data, we requested qualitative information from our subjects in order to provide the communities feedback specific to their population needs.

We were mindful of not introducing bias in our research approach and so all processes were standardized. In particular, the researcher team was consistent when setting up and describing the study in each setting. Also, each member of the researcher team was introduced and subsequently identified, their tribal identity, their role at Mayo Clinic, the purpose for being in their school, and the study design.

Relevant tribal councils, individual Tribal Review Boards (where existing) gave their approval for this study, and the Indian Health Service National Review Board served as a “review board” for those communities that did not have an established Review Boards. The school principals and the Mayo Clinical IRB also approved this study.

Statistical Analysis:

The hypothesis was that there are significant differences between the three residential groups of adolescents for reported daily physical activity. Questionnaire data were summarized using means and standard deviations. We examined individual demographic and activity-based questions from the survey as well as a set of composite medium and heavy physical activity variables. These latter variables were created by effectively aggregating responses from individual medium and heavy activity questions, respectively, into four inde-

pendent themes: school, outdoor household, indoor household (medium activity only), and other recreational physical activity. We compared activity-based attributes across levels of residency and race using independent simple t-tests. Two sets of pair-wise comparisons were made: urban vs. reservation-based Native Americans, and urban Native Americans vs. urban non-Native Americans. To account for the possibility of imbalances in groups across levels of gender and age, we re-assessed all comparisons using analyses of covariance, treating gender and age as covariates in each model. All statistical tests were two-sided, and all analyses were carried out using the SAS (SAS Institute, Cary, NC) software system.

RESULTS

Comparisons of physical activity levels across the three groups are reported in Table 1. Results indicated that reservation-based Native American adolescents were not less active than their urban counterparts as a part of any physical activity for medium intensity activity ($p = 0.19$), nor were they less active for heavy intensity activity ($p = 0.50$). However, reservation-based Native American adolescents were more active than their urban counterparts for medium intensity outdoor household activity (mean activity minutes per week 243 (SD 297) versus 186 (255), $p = 0.02$), for heavy intensity outdoor household activity (mean 209 (SD 264) versus 160 (223) minutes per week, $p < 0.03$), and for medium intensity indoor household activity (mean 210 (SD 246) versus 169 (211), $p = 0.05$). Interestingly, compared to the Native urban adolescents, the non-Native urban adolescents were more active by half an hour/day for medium intensity activity (mean minutes per week 1208 (SD1209) versus 949 (909), $p = 0.05$) for any physical activity and

were leaner by 2 Body Mass Index (BMI) units (mean BMI 20.8 (SD 4.4) versus 22.4 (SD 5.3), $p=0.008$, Figure 1). Notably, such as the reservation-based Native American adolescents, the non-Native urban adolescents were more active for medium intensity for outdoor household activity ($p = 0.04$) than their urban Native counterparts. The non-Native urban adolescents were also more active for medium intensity activity as a part of school minutes/week than their urban Native counterparts ($p < 0.04$). No statistically significant differences in recreational physical activity were observed across the three groups. Sensitivity analyses adjusting for the potential confounding effects of age and gender yielded similar results to the unadjusted results (data not shown).

DISCUSSION

Obesity is a symptom of imbalance between dietary and physical activity associated factors. It is influenced by biological and environmental factors. Obesity is more common in the American Indian populations than the general U.S. population (U. S. Department of Health and Human Services 2002). Prior studies suggest that increased physical activity may offset and perhaps prevent unhealthy and risky lifestyle choices (Anderson-Lewis et al., 2011; Backman et al., 2011; Davis, Goldmon, & Coker-Appiah, 2011; Eisenmann et al., 2011) that disproportionately afflict American Indians (Hassin, Joe, & Young, 2010; Ritenbaugh et al., 2003; Whitt-Glover, Crespo, & Joe, 2009). Successful promotion of culturally attuned physical activity programs (Hassin et al., 2010; Ritenbaugh et al., 2003; Whitt-Glover et al., 2009) may lead to decreased metabolic disease, decreased cancer, improved mobility, improved mental health and decreased mortality. While the importance of obesity on American

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Indian health is agreed and the role of poor quality diet and food proportion has been well studied, little is understood about the interplay between reservation and urban environments with respect to physical activity participation in American Indian youth (U. S. Department of Health and Human Services, 2002). This project was conducted with Native American and non-Native communities to examine physical activity in Native American youth living on reservations and in urban centers. We can conclude that urban and reservation-based environments were associated with similar levels of LOW physical activity in Northern Plains Native American youth. Our findings suggest, that Native American youth in the same environment as their non-Native cohorts expend less physical activity.

Low levels of physical activity are known to be of concern in Native American communities. For example, The Bemidji, Minnesota, area Red Lake Band of Chippewa and the White Earth Band of Chippewa were participants in the “leisure time physical activity study” (Fischer et al., 1999), which revealed that the tribes in Minnesota (as well as, the Menominee tribe in Wisconsin) had statistically significant lower “leisure time physical activity” than that of their non-Native counterparts. While these findings addressed the role of Physical Activity in adults when compared to non-Native adults, this study did not look at Physical Activity among American Indian populations nor did it address the role of Physical Activity in the adolescent population. The purpose of our study was to examine Physical Activity in adolescents because data demonstrate that adolescence is a critical time in a person’s life when lifestyle choices are made (Hassin et al., 2010; Ritenbaugh et al., 2003; Whitt-Glover et al., 2009). Adolescents are particularly impressionable and influenced by

what’s available in their immediate surroundings. A recent study has shown that simply promoting activity while participating in otherwise sedentary activities, such as watching TV or playing video games, adolescents more than doubled energy expenditure (Lanningham-Foster et al., 2009). We decided, therefore, to quantify daily physical activity in Northern Plains American Indian adolescents and compare reservation-based and urban populations.

There were several limitations to the study that we recognize. First, the data were gathered using a questionnaire albeit via a fully automated Audience Response System. However, for the number of children we included (about 700), this was the only feasible approach for us to address our hypothesis. In future studies we hope to use electronic tools such as triaxial accelerometers (Lanningham-Foster et al., 2006). Second, self-reporting limitations occur. One explanation is that retrieving and/or processing the idea of how much time is spent performing an activity may be a novel concept and challenging to comprehend for the younger students. In our studies we found this; especially where younger students would occasionally delay the session and as a result, might have experienced a sense of urgency from older students to hurry. To address this in future, we suggest breaking out the test groups according to age/grade level. Nonetheless, although this phenomenon may have had an effect on some of the responses, age- and gender-adjusted analyses produced similar results to unadjusted analyses, indicating no systematic biases due to these effects. Third, the IPAQ was not specifically adapted for this population and we recognize this as a limitation. However, this would not have added bias to our examination of urban Native and reservation-based Native youth; our principal question. Despite these limitations,

we conclude that urban and reservation-based Native American children in these groups were similar in their levels of physical activity.

While this project was conducted in order to examine environment on Native American youth physical activity, we also sought to demonstrate the feasibility of conducting physical activity research conducted with Native American communities in Native American Communities. Our goal was to devise, test and validate tools that could be used by community-trained research associates. While the scientific community may benefit from data such as ours, we argue that it is communities themselves might most benefit from participation in and designing locally-based, locally-used, locally-interpreted research protocol. The tools we used (Audience Response System) (Lee & Dapremont, 2012; Tregonning et al., 2012) allowed not only for school students to answer the questionnaires in real-time but also for the community to receive analysis and feedback in real time. Linking data gathering to data response; we believe can improve the derivation and delivery of useful data; gathered and used by the community itself – the essence of Community Based Participatory Research (Anderson-Lewis et al., 2011; Backman et al., 2011; Davis et al., 2011; Eisenmann et al., 2011). This is borne out by the work of others; for instance, if the community is invested in the development of the design of the study, it leaves little room for translational gaps when addressing the findings (Burhansstipanov, Christopher, & Schumacher, 2005). Devising and delivering models for locally devised and conducted research may be a powerful tool for community change.

With respect to obesity (and potentially other sensitive health issues), concern might be

raised that the issues germane to body weight are too 'sensitive' to be discussed in an intra-community research model. Our experience argued against this. Specifically, when discussing body weight the message, that energy out (physical activity) must exceed energy in (caloric consumption), in order to lose weight or to reach a healthy body weight; was well received and precipitated active and involved discussion. Moreover, it was understood at the community level that, (A) energy in must equal energy out, in order to maintain a healthy body weight and (B) such health interventions are not a cultural challenge, (C) decreased obesity and its contribution to the diseases a population disproportionately suffers from, will result in preserving the culture, (D) addressing the issues affecting the current generation does not have to depend on outside food resources or even science (i.e.; the intra-community research model discussed above), (E) modifying traditionally healthy behaviors such as gathering of food sources, food preparation, cooking, collecting, honoring ceremonies through dance, story telling, and socializing can lead to a decrease in unhealthy, non-traditional sedentary activities and lifestyle choices. These messages, we found, were welcomed and positively received in what became an internal and two-way dialogue.

These studies demonstrate an intra-community model for conducting Community Based Participatory Research (Figure 2), whereby the entire process of research-question-though-outcome is centered on community-perceived need. Here the community not only asks the pertinent question but conducts the research and owns the output. The data in this study underscore a concern that Native American youth may be less active than is healthy. This concern does not, we discovered,

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depend upon whether the child lives on a reservation or in an urban environment.

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Prior research experience includes her work as co investigator and research coordinator responsible for the recruitment of all the subjects in the studies performed in Dr. James Levine's Non-Exercise Activity Thermogenesis (NEAT) laboratory.

Ms. Baukol is often invited to present at local and national forums to discuss performing research in Native communities that is culturally appropriate and respectful. She is a proud member of Turtle Mountain Band of Chippewa.

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