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Teeth and heavyset kids: Intervention similarities between childhood obesity and oral health interventions within Native American societies

Dental related disease is an increasing concern among minority and vulnerable populations and as a result a growing number of oral health interventions are emerging for ethnic minority populations, including Indigenous, Native American, and First Nations Peoples (Nash & Nagel, 2005). Childhood obesity is a growing concern in the U.S. and across the world. Heavyset youth are at increased risk for chronic health problems such as type 2 diabetes and for psychological problems associated with reduced social acceptance within their respective communities (Henson, 2005). Literature shows the co-prevalence and conceptual modeling of obesity and oral health interventions, yet very few have been implemented with Native American societies. Therefore, few investigations show potential. The purpose of this systematic review was to identify commonalities between obesity prevention and oral health interventions in Native American youth populations.

Oral health & Obesity: Native American youth

Oral health and dental related diseases are also becoming problematic among many minority and vulnerable populations (Nash & Nagel, 2005). The World Health Organization (WHO) defines good oral health to be a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the oral cavity. The WHO further indicated that risk factors for oral diseases include unhealthy diet, tobacco use, harmful alcohol use, and poor oral hygiene (http://www.who.int/topics/oral_health/en/).

Lewis et al (2002) conducted a study which revealed the prevalence of caries and associated risk factors for oral health in rural Alaska Native communities were a health problem. Nearly 60% of the children had evidence of tooth decay. These results parallel the east coast Native American population which showed that of Native youth surveyed from 21 tribes nearly 60% of 2 to 5 year olds experienced tooth decay and 75% of 8 to 10 year old had experienced dental decay. These figures have slightly improved compared to the Centers for Disease Control and Prevention National Center for Health Statistics (1997) which found that Native American children between the ages of 6-14 years of age had 78% untreated tooth decay.

These statistics are alarming given children are suffering with pain and often missed school days, ultimately impacting their opportunity for a sound education. The Indian Health Services Oral Health Survey (1999) showed that Native American population has the highest tooth decay rate of any population cohort in the country and statistics indicate that it is 5 times the US average for children between 2 and 4 years of age. 79% of children have tooth decay with 60 percent with severe childhood caries. Further, Native American youth experience oral health problems at a disproportionate rate; 68% of Native American children have untreated tooth decay; 25% indicate they do not laugh or smile because of the way their teeth look. Left untreated, infection caused by oral diseases can have a significant negative impact on quality of life and ultimately lead to problems in eating, speaking, and learning (Murphey & Rew, 2007). Other consequences of poor oral health include heart and lung disease, stroke, poor pregnancy outcomes, preeclampsia, diabetes (Murphey & Lew, 2007) and oral cancers (Watt, 2005).

This review paper also examines childhood related *obesity* interventions designed for Native and First Nations youth, their families, and communities. The American College of Preventive Medicine clinical reference indicates that adolescent obesity is measured by Body

Mass Index (BMI) and a panel of experts from national organizations and federal departments recommend that obesity in youths be defined as BMI of 95th percentile or BMI of ≥30 kg/m2, whichever is lower (http://www.acpm.org/?adobesity_clinref). The American College of Preventive Medicine (ACPM) also suggests using a different terminology when communicating with patients. These include more neutral terms such as weight, excess weight, BMI, or risk for diabetes and heart disease can reduce the risk of stigmatization or harm to self-esteem. Synonymous with these terms is the word "heavy set"

Both obesity and "heavyset" will be used interchangeably throughout this article. Eichner, et al., (2008) discovered that nearly 54% of the Native American students participating in their study were overweight and heavyset. Another study conducted with Native Hawaiian children discovered the prevalence of heavyset body types among Native Hawaiian youth to be double that of same-age youth from a national survey (DeRenne, Maeda, Chai, Ho, Kaluhiokalani, & Braun, 2008). Rates of obesity and its health related consequences in Native people are higher than in non-Native populations; prevention and treatment options are lacking and ineffective (Henson, 2005).

Impacting nearly one-third of the US population, obesity is a significant health concern across the country. It is a significant risk factor for developing type 2 diabetes, heart disease, and various types of cancer. It may also be a risk factor for gum disease. Heavyset individuals' bodies produce cytokines, proteins with inflammatory properties. These cytokines may injure the gum tissues and promote the development of oral health related disease (Krejci & Bissada, 2013). The authors of this article provide a refined picture of the intervention commonalities between childhood obesity and oral health care in Native Americans. The intention is to provide

meaningful information for tribal communities, Native health centers, and urban Native American organizations.

Historical background: Native American translations

Historic influences of colonialism have set the stage for the challenges facing many Native groups. Eurocentric diets available to conquered tribes and to children in boarding schools were, according to many historians, a shock to the dietary systems of people who, heretofore, consumed no processed sugars, meats, or beverages. Initial post-colonial diets were often based on government commodities documented as having a heavy fat content.

Inherent to many Native cultures is living in balance and harmony with nature and how this practice may interplay with wellness—including healthy eating and dental wellness. An example of this mindset and philosophy is held among the Haudenosaunee (People of the Longhouse) also known as the Iroquois. The Haudenosaunee have a viewpoint that reflects these relationships of well-being, respect for nature, and the caring of mankind through a passage of words known as the Gan:non:yok, "giving of thanks", or the "Thanksgiving Address".

This passage, practiced daily, or utilized in events as an opening address, shares these important relationships. It begins giving thanks for the well-being of people to do meaningful, thankful, and healthy things. It goes on to give thanks for various parts in daily living and existence. These include the earth we walk upon, and plants, the animals that provide a means of food, medicinal plants for providing healing properties, the water which sustains life, and our celestial figures which provide warmth (sun), evening light (moon), and navigation (stars). These among many relationships are thanked daily for continued co-existence (Six Nations Indian Museum and the Tracking Project, 1993). The Gan:non:yok has a direct relationship with

this systematic review. It can be a platform for assisting "western science findings" translate into community-based and culturally attuned interventions.

Research methodology

Specific question guiding the systematic review was "*What, if any, are the associations and common elements in both oral health and obesity interventions for Native American youth populations?"* The approach used explicit selection criteria to:

a) identify relevant studies

b) assess the intervention methodology of the selected studies

The dataset consisted of peer-reviewed articles available in public and university databases. The review identified all studies reporting outcomes of childhood obesity and oral health interventions in Native American populations published between 1985 to 2010. Studies prior to 1985 were excluded in order to have studies from both the obesity and oral health literature that were conducted during the same time frame—the initiation of obesity and oral health intervention work with Native American youth (Bothwell, Eberling & Reifel, 1994).

Data collection

To increase methodological rigor, a team of five separate reviewers representing various disciplines independently collected articles. The following key words were used for the search criteria: American Indian, Native, First Nations, Aboriginal, Indigenous, childhood obesity, childhood diabetes (obesity related), oral health disparity, gum disease, periodontal disease, diabetes, intervention, Indians, North American, weight gain, children, adolescents, intervention, dental, newborn, infant, preschool, diabetes, obesity, dental caries, Indigenous, patient education, prevention, tx, and treatment. Articles were collected from each researcher's databases, personal library, collections, and gatherings from networking, colleagues, research, and conferences.

Specific databases utilized were Native Health Database (University of New Mexico), PubMED, EMBASE, CINAHL Plus, ProQuest Digital Dissertations, Compendix, NTIS, GeoRef, GeoBase, Inspec, EBSCOHost, OAISTER, MEDLINE, and PsychInfo.

Saturation of collection occurred when independent searches began to submit duplicate articles. Finally, a scoring sheet was developed and two authors independently reviewed abstracts (and entire studies if needed) for appropriateness of inclusion. Any discrepancies were discussed with the study team. The research design consisted of a systematic review and used grounded theory (Strauss & Corbin, 1998), a form of qualitative analysis, to compare and contrast intervention commonalities among studies.

Results

A total of 120 articles were collected and sorted into three categories: background and prevalence studies only (n= 94), qualitative orientated studies (n=6), and quantitative studies (n= 20). The data collection for the qualitative studies included individual interviews, focus groups, and case study reviews. Although small in number, the qualitative results were used to inform the subsequent comparison of results from the larger number of quantitative studies (n=20). The qualitative results analysis helped identify best practices found within studies of obesity and oral health interventions for Native American youth. The best practices were examined from the perspective of the quantitative studies which had a greater diversity of obesity and oral health interventions.

This paper focuses on outcomes related to key *intervention components and similarities.* These intervention commonalities were the best practice techniques among intervention studies related to both oral health improvements and obesity prevention and treatment. Descriptive characteristics include the incorporation of culturally tailored activities with a focus on physical

activity, family involvement in intervention planning, drinking and eating in good ways, and intervention length planning.

Intervention Commonalities

Culturally tailored activities

Interventions included culturally tailored and tribe or region specific activities (Cabellero et al., 2003; Davis et al., 1993). One study interviewed 131 tribal community members as part of a qualitative investigation for intervention development in the fields of diabetes prevention and health promotion. Results indicated that the incorporation of cultural activities into physical or academic/learning exercise was important to the community members. Examples of activities that included healthy movement included berry-picking, horseback riding, improving access to nutritious foods (home and non-school environments), mind-set about eating healthy, and physical activity including both organized sports, traditional activities (Brown, 2010). Another study that exemplified culturally tailored activities was conducted with a school and community intervention that included intergenerational and other culturally appropriate activities designed to promote exercise and a healthful diet. These activities included bringing in elders to describe the proposed initiative and to provide healthful information to enhance the acceptability of home intervention materials designed to share with family members. Results of the study showed a significant increase in overall knowledge ($p<0.001$) for student in the intervention group ($n=674$) compared to control schools ($n=375$) (Davis et al., 1993).

A ***property*** of <u>culturally tailored means</u> is *physical activity*. In relation to obesity related concerns, physical movement and action were noted as key features of most interventions. Worries of how to motivate youth to become active were indicated as well as the incorporation of physical activity and exercises revolving classroom instruction, exercise breaks, and guided

play (Cabellero, 2003; Perry & Hoffman, 2010). One tribal youth indicted that sports were seen as fun and sociable and stated, "youth do sports; they just don't exercise" (Perry & Hoffman, 2010). Physical activity was also a main component of another intervention which included a cardiovascular health behavior change module (exercise, nutrition, obesity, tobacco use, habit change, and social influences). Students in the intervention schools (n=738) exhibited a significant ($p<0.001$) increase in exercise compared to those in the control schools (n=411) (Davis et al., 1993).

Figure 1. Cultural means of physical activity utilized by Native and First Nations youth, ranging from the traditional game of lacrosse or stickball to contemporary activities such as basketball and soccer.

Family component

In both the obesity prevention and oral health intervention literature a number of programs indicated that inclusion of a family component, family intervention, or family involvement was an integral part of program success. These activities included family fun nights, workshops, and events promoting family involvement and education (Caballero, 2003; Stevens, 2003) as well as a home-visiting program (Harvey-Barino & Rouke, 2003). Programs indicated that family-based interventions which promoted breastfeeding and reduction in the consumption of sugar-sweetened beverages helped reduce Body Mass Index (BMI) while others noted that trained parent volunteers and direct intervention with parents was effective (Karanja,

2010; Bruerd, 1989). A qualitative study affirmed this outcome, stating, "[t]he positive thing with the parents was that the intervention program forced them to learn along-side their children, supported their children's efforts for healthier lifestyles, which was meaningful" (Gittelsohn, 2003).

Healthy diet

Primary results showed a relationship between sensible eating and drinking was necessary to produce an overall healthy diet. Intervention elements included educational approaches used to teach healthy consumptive practices. These approaches included teaching feeding babies properly with a bottle, awareness of children's eating habits, and healthy food preparation. Other programs included, educational means targeting decreased consumption of high sugar drinks, increasing healthy foods such as fruits and vegetables in school lunches, and enhancing the education of good nutrition practices in after school programming (Ritenbaugh, 2003; Bachar, 2006). One ***property*** of healthy diet was *food preparation and education.* These included training front line food staff to measure and serve healthy proportions, becoming familiar with healthy portion-size distributions and external dietician support for school staff (Weber et al., 1999; Caballero et al., 2003; Stevens et al., 2003; Story, et al., 2003; Cunningham et al., 2003; Snyder et al, 1999).

Intervention lengths

From a community perspective, multi-year, culturally tailored interventions with a strong family component made a positive impact. This format was represented in multiple studies (Perry & Hoffman, 2010; Patrick 2006; Brown et al., 2010; Karanja et al., 2010; Bachar et al., 2006; Bruerd et al., 1989; Macnab, 2008). Overall lengths of programs were between three to five years of implementation. One ***property*** of the multi-year interventions that emerged were

the inclusion of *intervention length* (weeks) along with suggested session time allocations (hours). For those receiving individual interventions, session length administration was found to be most effective when programming ranged between 8 to 24 weeks and nestled within in a multi-year framework (Caballero et al., 2003; Going et al., 2003; Stevens et al., 2003; Teufel et al., 1999; Ritenbaugh et al., 2003; Saksvig et al., 2005; DeRenne et al., 2008). Examples included a program that implemented a set of 12 week programs, one included physical education (PE) curriculum following the Exemplary PE Curriculum model and the second was implemented by a PE instructor for a total of 50 minutes per session (DeRenne et al., 2008). Another program utilized a 16 week intervention program delivered via home-visiting to pre-school children with 43 Native mothers and child pairs. The intervention focused on obesity prevention plus parenting skills that would promote healthy eating and exercise (Harvey-Barino & Rourke, 2003). While another tribal program implemented a 24 week intervention which consisted of twice weekly classes with supervision for both nutrition (making healthy snacks for 30 minutes) and exercise (45 minutes) per session (Carrel, Meinen, Garry & Storandt, 2005). Overall, these programs were multi-week intervention doses which, on average, showed session length to be from 30 to 45 minutes.

Oral health focus

To shift focus to oral health interventions in the Native American landscape we need to briefly discuss co-occurring conditions and the intervention work completed with Native youth. A policy brief by the Children Now organization for the Oral Health Access Council (2011) shared co-occurring concerns between childhood obesity and dental disease. The brief encompassed common causes and common solutions which showcased both risk factors and intervention recommendations. In particular the brief intertwines the role of sugar-sweetened

beverages which plays a role in both becoming obese and getting cavities. The report also encourages connecting with K-12 programs for prevention and screening.

At a macro level, the report recommends advocating for policy redesign to include both oral health and obesity interventions. Another key recommendation was strategizing to address these co-occurring conditions via policy for the promotion of increased fruit and vegetable consumption, support breast-feeding (to help reduce baby bottle tooth decay), dietary counseling, and the reduction of consumption of sweetened beverages. Lastly, the brief shared potential policy considerations through innovative planning using the Affordable Care Act via the use of public health funding for policy development to address childhood obesity and dental disease. As noted in the brief there is a growing interest in addressing co-occurring conditions simultaneously. This was evident in the systematic review which highlighted that although interventions had similar features—few focused on both conditions and their relationships.

Oral health interventions techniques showed similarities to obesity interventions in a number of articles. These included Macnab (2008) which indicated that working with a Native community to improve oral health and knowledge among school children via a school-based program with daily brush-ins, fluoride application, educational presentations were helpful. Specifically, daily school based teeth brushing after lunch, weekly fluoride rinses, fluoride varnish application three times in 10 days every four months, dental health guidance during well-child visits and classroom presentations by pediatric residents about a variety of health topics, including oral health were effective. Results showed that, prior to intervention, 8% of children were cavity free. Following the 3 year intervention, 32% were cavity free. Intervention components commonly included educational approaches which taught healthy eating and drinking in either school or home environments (Ritenbaugh, 2003). Other studies supported

components by enhancing knowledge of good food choice during and after school (Bachar, 2006) as well as school food service modifications such as measures to monitor food preparation process for making healthy foods for school children (Caballero, 2003).

An observational study within a Native American community which collaborated with the Head Start program showed that all Head Start children that received 4 or more fluoride varnish treatments had a 35% decrease in overall caries (Holve, 2008). Although caries decrease is an important finding, the commonality between this study shared with the obesity literature is the environmental setting and delivery system. Head start or school based collaboration was an important feature for intervention delivery. Another oral health report showcased similar recommendations. The Nashville Area Oral Health Screening survey developed by the United Southern Eastern Tribes (2009) recommended that oral health guidance be supportive to parents in health and social service settings such as early head start and head start centers and the expansion of preschool and school-based dental prevention programs. Mofidi, Zeldin, & Rezier, (2009) also supported Head Start and early Head Start programming for oral health intervention. The Nashville Area Oral Health Screening survey developed by the Dental Support Center of the United Southern Eastern Tribes (2010) also supported family inclusion in oral health interventions. USET recommended that interventions teach parents how to use dental health care systems and encourage them to establish a dental home for their children in the first year of life.

Two other ***properties*** are intervention means related to *media and policy*. Media intervention became an underlying part of many studies. Although not well supported throughout the literature, enough information was present to make a strong note for future study and investigation. Media was used in various formats. These included media related interventions specific to food preparation (Story et al., 2003) to food preparation training and information

shared through a radio show (Sakvig et al., 2005) and social media marketing through a television series showcasing Native community members engaged in health activities (Bachar, 2006). Most studies were related to those in the obesity literature. However, one oral health study worked within an Indian Head Start school program included a community-wide media campaign designed to raise awareness and knowledge about baby bottle tooth decay (Breurd, 1989).

A second ***property*** which emerged from the category of healthy consumption and diet included *policy intervention*. Policy changes at the school or organizational level was an important first step in implementing intervention and healthy change. Another important aspect of policy change was the incorporation of community based methods and forums to shape policies. This was reflected in case studies in British Columbia (Canada) for oral health promotion for Native children revealed the importance of collaboration with community partners (Harrison, 2003). Another study indicated an 18-month program used to influence policy change in nutrition and staff training guidelines and kitchen and nutrition staff education (Snyder, et al., 1999). Another initiative at the policy level was a 2011 National Congress of American Indians resolution in support offer federal and state policies to make oral health care more accessible among tribal communities through the integration of dental therapist models.

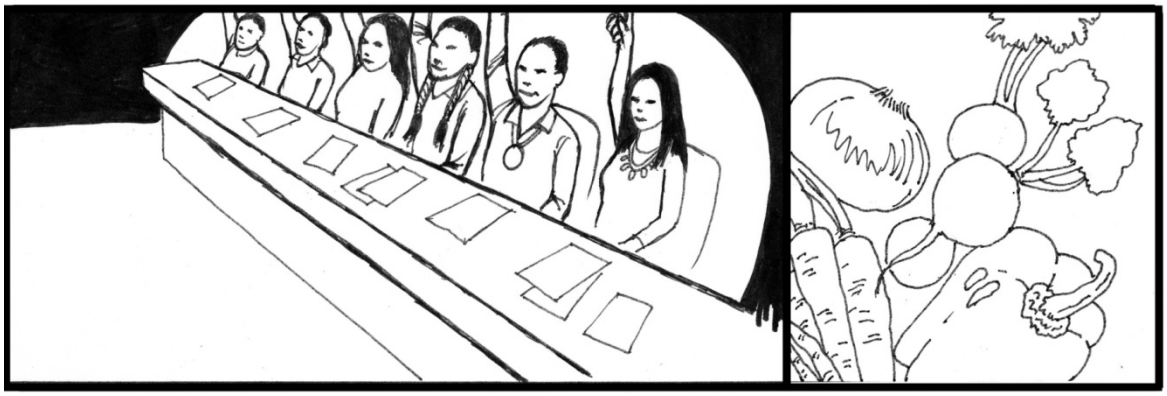

Figure 2. Tribal council members voting to make change for a healthy diet.

Discussion

The aims of the systematic review and analysis were to find intervention commonalities between obesity prevention and oral health. The main function of the review was to detail results related to specific intervention details, times, and frameworks. Commonalities among studies included multi-year intervention planning, culturally tailored promotion of healthy eating in school and community based delivery systems which included a focus on healthy food preparation via education, inclusion of family, and structured physical education. Two over-arching content categories emerged: healthy food consumption and environment modification. Healthy food consumption included food choices, portion size and low sugar beverages. Overall, there was a need for more intervention studies related to both health disparities with Native and First Nations peoples. A greater need for rigorous oral health intervention studies in the behavioral sciences was evident based on the lack of empirical studies found.

The findings are also an important blend of understanding the relationships between science of systematic review, findings of multiple intervention studies, and the translation of these discoveries into meaningful perspectives for Indigenous communities. On one side, this project looks at the intervention commonalities of two prominent health disparities evident among Native and First Nations youth. Findings provide a framework for intervention development which promotes culturally tailored activities, family incorporation, teaching of healthy food preparation and consumption, intertwined in multi-year programming.

On the other side, the project shapes and discusses how results translate into culturally attuned practices for Native societies. This is exemplified by the holistic relationships with environment and within traditional cultural practices which guide the implementation of results

in a meaningful way. Another consideration of emphasis is on the obligation of schools and related public entities such as daycare providers to provide healthful eating options or for modification of the food pyramid within certain cultural settings. Hence, the importance of action orientated means to carry forward both health research that can be translated and shared with communities for incorporation.

The Gan:non:yok has the ability to help guide Indigenous community science which relates directly to the health and well being of Native peoples. The project further revealed that incorporating culturally tailored activities into programming is beneficial. One example of this process is the traditional activity of planting to remain physically active, being able to consume the fruits of their efforts, and a means to remain connected with the natural environment. Further, the process of harvesting vegetables, preparing, and cooking is also a means of physical activity and family bonding.

From an oral health standpoint, the incorporation of water is key. In fact, water has his historical routes in many Native cultures as the core of life. This is represented in early European encounter writings that stated, "The common drink of Indians at their meals is nothing but broth of the meat they have boiled, or spring water" (Loskiel, Hist. of the Mission of the United Brethren, pt. I, p.74 in Waugh, 1916/1991). Lastly, the final product of eating not only brings healthy eating but overall life satisfaction of being part of the course of action from seed to healthy consumption. This process of the translation of results into Native science is relevant for healthy practices and is easily recognized and accepted by Native people who make efforts to adhere to the message of the Gan:non:yok.

It is an important means to recognize the process of community-oriented activities and their relationship to the natural environment, food preparation, drinking, and eating for healthy

mind and body. In philosophical terms of the Haudenosaunee, people must use their "Good Mind". When people work for peaceful health, they develop a Good Mind, a good way of thinking. When they work for peaceful health and a Good Mind, they develop strength to eat and drink better, exercise more, and take back their health with good intentions and well-being.

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