8-12-2014

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Background

According to the Americans with Disabilities Act, an individual with a disability has a physical or mental impairment that substantially limits one or more major life activities (ADA, 2014). A large body of literature indicates a strong relationship between disability and poor health. Adults with disabilities are more likely to suffer from chronic conditions than adults with no limitations. Thus, this vulnerable population with disabilities should be targeted for health promotion efforts. Healthy People 2020 calls for the inclusion of people with disabilities in U.S. health promotion efforts (Dixon, 2014). According to the Center for Disease Control and Prevention (CDC), individuals with disabilities that begin during the developmental period and last throughout their lifetime causing impairment in physical, learning, language, or behavior areas, are defined as having developmental disabilities (DD) (CDC, 2014a). Despite the increasing prevalence of DD in the US, there is little known about the association of DD and chronic health conditions such as obesity, cancer, hypertension and diabetes mellitus. Developmental disability can impact healthy eating habits and physical activity; thus, people living with DD are a vulnerable population at risk of becoming overweight and/or obese and developing a multitude of chronic diseases. Emerging research supports an association between childhood obesity and ASD, one type of DD, documenting that the problem of overweight/obesity in children with ASD is at least as common, if not higher, than in the general pediatric population (Curtin, Anderson, Must, & Bandini, 2010). Although there are some studies that document the association of chronic diseases and intellectual disability among adults (Bhaumik, Watson, Thorp, Tyrer, & McGrother, 2008; de Winter, Bastiaanse, Hilgenkamp, Evenhuis, & Echteld, 2012b; de Winter, Magilsen, van Alfen, Penning, & Evenhuis, 2009; Melville, Hamilton, Hankey, Miller, & Boyle, 2007; Morin, Merineau-Cote, Ouellette-Kuntz, Tasse, & Kerr, 2012; Reichard & Stolzle, 2011; Rimmer & Wang, 2005), limited research has examined whether adults diagnosed with DD are more likely to become obese or have other chronic

diseases. This is increasingly important as most recent data suggest that approximately 1 in 6 children in the U.S. have been diagnosed with a DD, ranging from mild disabilities such as speech and language impairments to more pervasive DDs, such as intellectual disability, cerebral palsy, and autism spectrum disorder (ASD) (CDC, 2014a).

Based on the paucity of research examining the relationship between DDs, including ASD, and chronic diseases that emerge during adolescence and adulthood, the purpose of this study is to examine these relationships, and to provide information about the health status of children and adolescents with DDs as they transition into adulthood. In order to achieve this purpose, an evaluation project was adopted that examined a health promotion program for adults with DDs that aimed to improve or maintain current health status, increase knowledge about healthy food and exercise choices and improve overall health behavior of adults with DDs.

Literature Review

Chronic disease risks in adults with DD

Several studies have shown that compared with the general population, obesity occurs at a younger age among people with intellectual disabilities and that obesity in adults with intellectual disabilities is a significant clinical problem (Bhaumik et al., 2008; de Winter, Bastiaanse, Hilgenkamp, Evenhuis, & Echteld, 2012a; Melville et al., 2007; Morin et al., 2012; Rimmer & Wang, 2005). Rimmer et al. (2005) used data derived from a larger clinical trial examining the effects of a health promotion program for people with physical and cognitive disabilities to study adults with disabilities (18 years of age or older) and determine obesity prevalence. They used actual measurements of height and weight data and compared them with the 1999–2000 National Health and Nutrition Examination Survey (NHANES) for adults without disabilities and with two previously published self-reported datasets on people with disabilities (The Behavioral Risk Factor Surveillance System data recorded on the general

population from 1991 to 1994 and data from the 1988–1994 NHANES). They found that the prevalence of overweight, obesity, and extreme obesity were significantly higher among people with disabilities, compared with the NHANES national data set on people without disabilities. They reported that 84% of subjects with disabilities were overweight or obese (versus 65% for people without disabilities), 62% were obese (versus 31% for people without disabilities), and 22% were extremely obese (versus 5% for people without disabilities) (Rimmer & Wang, 2005).

In addition, Melville et al. (2007) conducted a literature review to research the prevalence of obesity in adults with intellectual disabilities compared to obesity prevalence data for the general population. They used electronic databases (Medline, PsychLit, Embase, Cinahl), as well as journal articles, review articles, and book chapters. Specific journals included American Journal on Mental Retardation, Journal of Intellectual Disability Research, Journal of Applied Research in Intellectual Disabilities, Mental Retardation and Journal of intellectual and Developmental Disability. Findings indicated that people with intellectual disabilities experience significant health inequalities compared with the general population, including a shorter life expectancy and high levels of unmet health needs. The authors recommended further research, in particular, to study the contributions that dietary habits, physical inactivity and socio-economic factors have on the risk of people with intellectual disabilities developing obesity. Consequently, this research would inform prevention and intervention policies (Melville et al., 2007).

De Winter et al. (2009) studied 50- to 90-year-old Dutch people with intellectual disability through a cross-sectional study of three Dutch intellectual disability care providing organizations to determine the prevalence of cardiovascular risk factors (smoking, hypertension, hypercholesterolemia, diabetes mellitus, family history of cardiovascular disease, unhealthy diet, lack of physical activity, overweight, history of cardiovascular accidents, and/or myocardial infarction) in older people with

intellectual disability. They found that healthy behavior needed improvement, with 99% of the participants having an unhealthy diet and 68% suffering from lack of exercise. They also reported abdominal overweight (70%), diabetes (9%), hypertension (37%), and hypercholesterolemia (32%) as highly prevalent in this population. They further recommended campaigns that promote health focusing on education and the introduction of preventive screening programs for cardiovascular risk factors among adults with intellectual disability who are over 50 years of age (de Winter et al., 2009).

A clinic-based study conducted by Tyler et al. (2011) used a case control design to study adults with ASD receiving primary care at Cleveland Clinic between 2005 and 2008. They found high rates of obesity, hyperlipidemia and hypertension among this population, which put them at higher risk for diabetes, cancer, and cardiovascular disease than the general adult population (Tyler, Schramm, Karafa, Tang, & Jain, 2011). Dixon-Ibarra and Horner Johnson used data from the National Health Interview Survey (2006-2012) to determine to what extent disability is a risk factor for poor health. They compared chronic conditions in adults with lifelong disabilities and adults with no limitations. Their study reported that adults with lifelong disabilities had increased odds of having the following chronic conditions: coronary heart disease, cancer, hypertension, obesity and diabetes, compared to adults with no limitations. Thus they recommended health promotion efforts to target people with disabilities in preventing chronic conditions, especially since they are at a higher risk than the general population (Dixon, 2014).

In summary, these studies show that adults with DDs are at high risk for many chronic diseases, especially cardiovascular disease (obesity, hypertension, hypercholesterolemia, diabetes mellitus). Additionally, there is mounting evidence that individuals with DDs also have a high prevalence of psychiatric conditions, such as anxiety disorders, depressive disorders, emotional difficulties and psychosis among adults with DDs (Eaves & Ho, 2008; Tyler et al., 2011). Correll et al. (2009) observed

that hyperlipidemia was related not only to obesity but also to the unfavorable metabolic consequences of psychoactive medications prescribed for an ASD cohort (Correll, 2009). Tyler et al. (2011) reported that individuals with ASD are twice more likely to be prescribed antidepressants and antipsychotic medications than the control group (Tyler et al., 2011). Eaves et al. (2008) conducted a mail and telephone interview of 76 participants born between 1974 and 1984 that were diagnosed with ASD. They found that the most common emotional and psychiatric problems were emotional difficulty (62%), obsessive-compulsive disorder (50%), anxiety (50%), depression (21%) and conduct disorder (38%) (Eaves & Ho, 2008).

Health promotion efforts for adults with developmental disabilities

Individuals with intellectual disability experience high frequency of secondary conditions associated with obesity and inactivity, such as type 2 diabetes, cardiovascular disease, and metabolic syndrome (Beange, McElduff, & Baker, 1995). Promoting and sustaining weight loss in this population is a challenge (McManus, Antinoro, & Sacks, 2001). Health promotion programs including diet, exercise, and behavior modification are needed now more than ever, to promote weight loss and reduce or prevent the chronic complications of obesity. Even modest weight loss can improve glucose and blood pressure control, lower cholesterol, and reduce risk for heart disease (Goldstein, 1992; Vidal, 2002). Health and fitness programs can have positive psychosocial outcomes on this population. Heller et al. (2004) report through their study of adults with Down syndrome that a fitness and health education program improved community integration, reduced depression (56% reduction in the intervention group vs 16% reduction in the control group) and enhanced life satisfaction rates (53% in intervention group vs 49% in control group) (Heller, Hsieh, & Rimmer, 2004). Thus, there is a need for health promotion programs that reduce the barriers to exercise participation among individuals with intellectual disabilities to reduce the onset of secondary conditions.

Mann et al. (2006) studied overweight and obesity in adults with intellectual disability who participated in a health promotion program that emphasized exercise, nutritional choices and stress reduction. The program consisted of eight classes focused on a target issue such as nutrition, exercise, stress reduction, communications, motivation to change and relapse prevention strategies. Each class was 90 minutes in length followed by an optional brisk walk. All participants were offered two home visits to establish an individual exercise program, develop a dietary plan and make a grocery store visit to identify healthy choices. Results were pertinent for a notable reduction in body mass index (BMI) among participants. Mann el al. concluded that increased knowledge about healthy diet and exercise among overweight and obese participants with intellectual disability was the most important impact of the program on BMI (Mann, Zhou, McDermott, & Poston, 2006). Accordingly, the authors recommend the need for health promotion programs that increase knowledge about healthy diet and eliminate the barriers to exercise for people with intellectual disability.

Although adults with DDs are at high risk for obesity and related chronic diseases, few community-based lifestyle interventions targeting those with DDs exist (Bazzano et al., 2009). Ewing et al. (2004) conducted an evaluation of a cardiovascular health program for participants with mental retardation and normal learners. The program was aimed at emphasizing exercise, healthy nutritional choices and stress reduction. The researchers' main objective measure of efficacy was change in BMI, which was observed in both normal and intellectually disabled participants. The authors emphasized other positive outcomes such as physical activity, stress reduction and nutrition, which also prevent future chronic diseases (Ewing, McDermott, Thomas-Koger, Whitner, & Pierce, 2004).

Most recently, Bazzano et al. (2009) conducted a pilot study of a community-based health promotion intervention for adults with DDs. The intervention included a pre- and post-test evaluation conducted from December 2005 to June 2006. The Healthy Lifestyle Change Program (HLCP), which was implemented and evaluated over a 7 months period in Los Angeles, was an education and exercise

program to increase knowledge and self-efficacy regarding nutrition, fitness and health among 431 adults with DDs. The HLCP reported success in improved healthy lifestyles, weight loss and significant participation of adults with DDs. Consequently, the authors recommended that this program be expanded and evaluated in larger populations with DDs (Bazzano et al., 2009).

In view of the aforementioned data review, this study has two purposes. The first is to examine the relationship between DDs, including ASD, and chronic diseases in adults. Findings are derived from an evaluation project called Health Power Intiative (HPI) managed by the Atlanta-based Jewish Family and Career Services (JF&CS). HPI is a health promotion program for adults living in Atlanta with developmental disabilities that aims to improve or maintain current health status, increase knowledge about healthy food and exercise choices and improve overall physical and mental health behavior. The second goal is to evaluate the efficacy of the HPI program in meeting its intended objectives.

Methods

Setting

The agency, known as JF&CS, aims to support and enhance the well-being of individuals and families across all ages, faiths, cultures and lifestyles. The primary program of interest in this study was the JF&CS' HPI program, which aims to prevent secondary disabilities and avoid accidents among its clients with developmental disabilities. HPI uses a multidisciplinary approach to assist clients and their families in leading healthy lifestyles that is funded by the United Way of Greater Atlanta. HPI is a team-based approach focused on both physical and mental health as well as healthy habits. The program team includes a registered dietician, licensed professional counsellor, holistic health coach, registered nurse and community integration specialist (JF&CS, 2014). The HPI program includes monthly educational workshops as well as healthy activities for people to do on their own. The multi-disciplinary team finds free or reduced-cost opportunities to support health, such as gym memberships, and incentives such as

movie tickets and grocery store coupons to motivate and reward change. The team's community integration specialist provides community opportunities and incentives for the clients. The dietician works with the individuals, their families and their staff person on meal plans and recipes, and the licensed professional counsellor supports implementation of the strategy and behavioral change.

Program Evaluation

As far as the logic model for the HPI 2014 program is concerned (appendix, table 1), the outputs are health education and promotion (via email, documents, and workshops), as well as nutrition intervention and counseling sessions for clients. The desired outcomes of the program are: 1) to improve or maintain current health status, 2) to increased knowledge on healthy choices (food/exercise), and 3) to improved health behavior. The indicators or Specific Measurable Achievable Realistic Time-Phased (SMART) objectives set by the logic model are: 1) 85% of participants will improve or maintain current health status as measured by client records at the end of one year. 2) 90% of participants will increase their knowledge of healthy choices for food and exercise as measured by client records at the end of one year, and 3) 90% of participants in the program for at least 6 months will improve their food and exercise choices as measured by client records at the end of one year.

Data collection

We conducted an archival review of medical records at a local agency (JF&CS of Atlanta) serving adults diagnosed with DDs. HPI client data were extracted from clients' files and team members' medical notes, mainly the registered nurse, nutritionist and volunteers. According to the Health Insurance Portability and Accountability Act (HIPAA) privacy rule, JF&CS shared the de-identified personal health information of the clients with the investigators, including demographics and characteristics of the study population, clients' medical diagnosis and prescription medication status, client's weight and hypertension status, and finally clients' physical activity levels and their engagement

in the nutrition and healthy eating behaviors. The study was reviewed per CDC protocol and determined to be public health practice and therefore no IRB review was necessary.

Participants

Participants and their families can turn to JF&CS for community information, resources and a full array of services concerning adults with developmental disabilities. Based on the HPI program nurse assessment, clients with DDs who are determined to be at high risk of developing secondary disabilities due to preventable, lifestyle-related chronic diseases or avoidable conditions are enrolled in a more intense intervention program known as HPI. These clients who fall into this high-risk group complete a nutritional assessment and then receive an individualized intervention plan. Fifty-three participants with available data were identified from Jan 2012 to May 2014.

Outcome Measures of Interest

Medical Diagnosis and Prescription Medications. Medical and psychiatric diagnoses were recorded when there was a diagnosis of a condition listed by the HPI team members and/or when clients' records showed medication use for a specific condition (Table 2).

Weight, BMI and Hypertension. Clients' weight was measured at initial enrollment in the program and the most recent weight was extracted from the clients' records. Participants' BMI was calculated as kg/m2. Initial blood pressures and most recent measurements were reviewed, as well as data as to whether or not clients were diagnosed as hypertensive. We defined hypertension as: when BP was ≥140/90 and/or when there was a diagnosis of hypertension indicated in the file, and/or they were on anti-hypertensive medication. Clients were categorized as being pre-hypertensive if any BP measurement was between 121-139/81-89 (Tables 3 & 4).

Nutrition & Physical activity. For nutrition, we gathered data according to goals set forth by the HPI team for each client. For physical activity, we analyzed data reported by the clients to the team's registered nurse. We calculated how many clients engaged in physical activity among those able to do so. We categorized the data into different types of physical activities (walking, going to the gym, basket ball, bowling, swimming, tennis, etc.) (CDC, 2014b). We then collected clients' data about the number of minutes per week of moderate physical activity. The CDC recommends at least 150 minutes per week of moderate physical exercise such as walking fast, doing water aerobics, riding a bike on level ground or with few hills, playing doubles tennis, or pushing a lawn mower (Table 5).

Results

Demographics and characteristics of the study population

Fifty-three record reviews were conducted for purposes of this study. Thirty were female and 23 were males. The majority of the clients were White, non-Hispanic (50 out of 53) with only one African American client, one Hispanic client, and one client of "other" race/ethnicity. Also, the majority of clients were aged 18 to 36 (55%), and 45 % were 37 years or older. Out of the 53 clients we studied from March 2014 to July 2014, 19% had a diagnosis of ASD, 9% had cerebral palsy (CP) 7% had speech and language disabilities, and 75% had an intellectual disability. It is noteworthy that 15% of this population had multiple developmental disabilities. Furthermore, staff members at group homes cared for 66% of the clients, while only 17% lived with parents and 17% lived by themselves. Daily support varied among the participants, with 85 % of the clients receiving greater than 15 hours of weekly support from staff, while 15% had less than or equal to 15 hours. These descriptive characteristics of the population are summarized in Table 1.

Chronic Disease of Interest and Related Medications

Data was analyzed for 51 participants (2 participants were missing data) for this outcome and results are reported in Table 2. Analyses focusing on medical diagnoses and medications indicated that 65% of the clients were diagnosed with cardiovascular disease (including hypertension, pre-hypertension and hypercholesterolemia diagnosis); 31% of the clients were taking prescription medication for hypercholesterolemia, and only 16% of them were taking hypertensive prescription medication. Furthermore, 45% of the clients were found to have respiratory disorders, and 43% of the clients were taking allergy medicine. Gastrointestinal diseases were found in 55% of the clients; 31% were taking constipation medication and 25% were taking medication for gastroesophageal reflux disease (GERD). Furthermore, 35% of the clients were reported as suffering from endocrine diseases (hypo- or hyperthyroidism and diabetes). As far as psychiatric diagnosis, 29% of clients had an anxiety disorder, followed closely by depressive disorders at 27% and psychotic disorders at 16%. As far as medication use, 35% of patients were taking anti-psychotic/anxiolytic medication and 25% of the patients were on anti-depressants.

Weight and BMI. Table 3 illustrates data on 48 clients, as data for the remaining five clients were missing. During the HPI program, 50% of the participants lost weight, 17% of them maintained weight while 33% gained weight. The median BMI for the clients following the program was 22.1 versus 23.6 at enrollment.

Hypertension and Pre-Hypertension. As shown in table 4, all 53 clients' charts were reviewed for outcomes related to hypertension and pre-hypertension. At enrollment, records showed there were only 2 and 18 participants meeting our definition of hypertension and prehypertension, respectively. At the end of the program, the number of clients that met our definition of hypertension increased to 9, while the number of clients with prehypertension decreased to 14. Among participants off medications,

2 had blood pressures in the hypertensive range at the start of the program, while 8 had blood pressures in the hypertensive range at the end of the program. Among participants on medications, none had blood pressures in the hypertensive range at the start of the program, while 1 had blood pressures in the hypertensive range at the end of the program.

Nutrition. Out of the 53 clients, 83% reported fresh foods consumption based on HPI goals, observations and workshop evaluations from January 2012 to May 2014. Eighty one percent reported increased fruit & vegetable intake as well as improved portion control. Furthermore, 77% described increased water intake. Overall, the nutritional goals were met based on clinician observations and notes in 77% of the participants (Table 5).

Physical Activity. Among 51 participants able to partake in physical activity, 86% met the physical activity goal. The majority of the participants (49%) were walking. Twenty three percent exercised at a gym, 13% played basketball, 9% did bowling, and 8% swam, while a few reported other types of physical activity (Zumba, tennis, yoga, golfing and biking). As far as number of minutes per week of moderate physical activity, 34% of the participants exercised for at least 150 minutes per week and therefore met the CDC goal, while 49% exercised for 90 to 149 minutes a week; and 17% exercised for fewer than 90 minutes per week (Table 5).

Discussion

This evaluation project of a health promotion program for adults with DDs gathered descriptive data about the status of the population, specifically in regards to the chronic disease burden these adults are facing. The data gathered also was intended to establish the program efficacy of HPI in promoting healthy outcomes. The study findings are of pressing public health matter in the US today as children are increasingly diagnosed with DDs, mainly ASD, and are at high risk for overweight and obesity

(Curtin et al., 2010; Rimmer, Yamaki, Lowry, Wang, & Vogel, 2010). Thus, it is expected that in coming decades the US will have increasing populations of adults living with DD.

Program data analyses helped describe the vulnerability of this population of adults with developmental disabilities. While the participants in the HPI program were a fairly young population (mean age = 41 years); most of them are cared for by a staff member in group-homes with 24-hour daily support. As far as this population's medical status, the study results are in alignment with findings from previous publications (Beange et al., 1995; de Winter et al., 2009; Dixon, 2014; Tyler et al., 2011), as most participants are indeed diagnosed with a multitude of chronic diseases mainly cardiovascular (65%); followed by gastrointestinal issues (55%) as well as respiratory, endocrine and neurologic issues (45%, 35% and 33% respectively) (Table 2). Morin et al. reported that the rate of hypo- or hyperthyroidism was 11.2% in the intellectual disability population versus 6.7% in the general population (Morin et al., 2012). Kohane et al. found a significantly higher prevalence of neurologic comorbidities in the ASD population when compared to the general population. For example, epilepsy and central nervous system anomalies were approximately ten times more prevalent in the ASD population (19.44% and 12.45% respectively) than in the general population (2.19% and 1.19% respectively) (Kohane et al., 2012). Furthermore, our findings relating to the prevalence of psychiatric disorders in participants with DD are in accord with Tyler et al. (2011) and Eaves et al. (2008), with almost 30% suffering from anxiety disorders and 27% suffering from depressive disorders. Similarly, Kohane et al. reported a much higher prevalence of schizophrenia among the ASD population (2.43%) compared to the general population (0.24%) (Kohane et al., 2012).

Results from this evaluation confirm that this HPI program is yielding overall positive outcomes. One of the most positive outcomes of the program was the increase in compliance with nutritional goals set by the HPI team. 77% of clients were meeting this goal following the program. The efficacy of the

program is also apparent when it comes to the physical activity goals. Most of the participants are engaging in 90-149 minutes of physical activity per week. While only 34% of these adults are fulfilling the moderate physical activity standard set by the CDC of at least 150 minutes per week; 90-149 minutes is an impressive benchmark for such a high-risk population. Thus, the program appears to be effective in increasing and/or maintaining positive behaviors related to healthy nutrition or exercise choices for this population. More to the point, the program was also successful in the participants' weight reduction and in some cases weight stabilization (table 3), thus is meeting its intended purpose of improving or maintaining current health status. As far as hypertension outcomes, our results are in alignment with previously reported literature by Tyler et al. (2011), in which individuals with ASD and hypertension were less likely to be prescribed antihypertensive medications compared to controls with hypertension. Both hypertensive and pre-hypertensive HPI participants are not achieving adequate hypertension management, possibly due to non-receipt or poor compliance with hypertension medications and lifestyle interventions. The differences and disparities in hypertension screening, management and outcomes among individuals with DD need to be examined.

Study Strengths

Previous studies looking at the association of DD with chronic illnesses focused predominantly on outcomes related to cardiovascular diseases including hypertension, hyperlipidemia, obesity and diabetes. There is a paucity of research looking at the effect of DD on other health outcomes. Studies from Morin et al and Kohane et al concluded that adults with DD had a high prevalence of thyroid disorders, inflammatory bowel disease, and diabetes mellitus compared to the general population (Kohane et al., 2012; Morin et al., 2012). An obvious strength of this research project is that it concurrently examined the correlation between DD and cardiovascular disorder, as well as other medical disorders such as gastrointestinal, respiratory, endocrine, neurologic and psychiatric issues. The high

prevalence of gastrointestinal disorders among the DD population reconfirms the need for this health promotion program as it encourages healthy eating, and nutritional habits.

Study Limitations

One of this study's limitations is the reliance on self-reported nutrition and exercise information. Another limitation is the lack of data about physical activity prior to the intervention, or a baseline measure. The researchers couldn't compare the current set of data to a pre-intervention one; hence, were unsuccessful in determining any change in physical activity. Additionally, the population studied was 94% white, non-Hispanic. This sample of participants in not representative of the American population with DDs; thus, it decreases the generalizability of our findings. Results may have varied if we had a more diverse population. The researchers also note that some participants were missing data and recommend a better documentation process going forward. Also, as far as the logic model's outcomes, the researchers recommend that they be more specific, for example in defining what is "health status" and how it will be measured from current available data. The study is based primarily on the review of data recorded by a treating healthcare professional; thus, raising the probability of reporting and/or detection bias. In order to address the needs of the growing pediatric population with DDs and prevent the exacerbations of these conditions, more research is needed among adults with DDs especially as it pertains to the chronic conditions for which they may be at risk.

Conclusions and Future Directions

In conclusion, the most important finding of this study is that participation in the HPI program resulted in increased knowledge and healthier self-reported diet as well as modest weight loss. The researchers agree with Mann et al. (2006) and Bazzano et al. (2009) that health promotion programs directed at those with DDs can be successful at influencing this population's diet, exercise and weight;

thus, potentially helping to prevent the exacerbation of chronic conditions, from hyperlipidemia to hypertension (Bazzano et al., 2009; Mann et al., 2006). Furthermore, the researchers also agree with Heller et al. (2004) that participation in such a structured health promotion program may result in the improvement of psychosocial outcomes (Heller et al., 2004). As a result, the study concludes that such health promotion initiatives are needed, now more than ever, especially with the current epidemic of both obesity and autism and other DDs in our nation's children and young adults.

More research about adults with DDs is needed in order to address their risk for developing chronic medical disorders and mental conditions. Such research would pave the way for prevention strategies aimed at children with DDs. Future interventions should focus on raising awareness about children with DDs and obesity through health education campaigns. There is a need to improve disease prevention through education efforts for individual with DDs and their caregivers, healthcare providers, researchers and administrators. It is important that DD designation does not overshadow other chronic diseases and quality of life.

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APPENDIX

Table 1- 2014 LOGIC MODEL – Health Power Initiative

INPUTS	ACTIVITIES	OUTPUTS	OUTCOMES*	INDICATORS
Resources needed to perform activities	Specific activities needed to accomplish Outcomes	Number of activities planned and persons participating	Change or benefit for program participants	The measure that shows outcome progress (SMART*)
• DD Director • Program Staff Dietician Licensed Prof. Counselor Holistic Health Coach RN/LPN • Volunteers • Committees • Offices and supplies • Assessment Tools • Memberships & Stipends • Curriculum/educational materials • Staff Training: In-service • Feedback surveys • Collaborative relationships • Adults with DD • Families of Adults with DD • JF&CS Infrastructure • Transportation • Funding: United Way **Resources Needed** iPADS/Tablets (2)Portable Printers (2)	• General Health Education • Triage for Intervention • Intake for Intervention • Assessments • Develop &/or update Client Plans (CP) with client and family • Identify and utilize community sites • Community Integration activities *Utilize Volunteers* • Build collaborations with health/other community resources • Update & Maintain client files • Nutrition assessment and intervention • Counseling • Workshops • Monitor health status • Outreach • Data Collection / Reporting • Staff education • Continuous Program Quality Improvement	• Health Education & Promotion (via email, documents, workshops) • 52 clients • 90 families • Nutrition intervention and counseling sessions for 52 clients, *staff and families as appropriate* • 10 Health and community partnerships • 20 Workshops *volunteers can be utilized to provide cooking demo's, exercise, nutrition*	Improve or maintain current health status Increased knowledge on healthy choices (food/exercise) Improved health behavior	85% of participants will improve or maintain current health status as measured by client records at the end of one year. 90% of participants will increase their knowledge of healthy choices for food and exercise as measured by client records at the end of one year. 90% of participants in the program for at least 6 months will improve their food and exercise choices as measured by client records at the end of one year. See measurement tools /Data collection below.

Table 1: Demographics & Characteristics of adults with disabilities enrolled in HPI program (n=53)

Characteristics	n (%)
Age	
18 to 36 Years Old	29 (55)
37 to 46 Years Old	10 (19)
47 to 59 Years Old	9 (17)
≥60 Years Old	5 (10)
Gender	
Female	30 (57)
Male	23 (43)
Race/Ethnicity	
White, non-Hispanic	50 (94)
Black, non-Hispanic	1 (2)
Hispanic	1 (2)
Other	1 (2)
Developmental Disability*	
Autism Spectrum Disorder	10 (19)
Cerebral Palsy	5 (9)
Intellectual Disability	40 (75)
Speech &Language	2 (4)
Hearing	2 (4)
Multiple Developmental Disabilities	
Yes	8 (15)
No	45 (85)
Dominant Caregiver	
Parent(s)	9 (17)
Self	9 (17)
Staff	35 (66)
Living environment	
Group Home	35 (66)
Family Home	10 (19)
Self Apartment	8 (15)
Support level	
≤ 15 hours weekly	8 (15)
> 15 hours weekly	45 (85)

*Multiple developmental disabilities possible; therefore, percentage adds up to more than 100%

Table 2: Medical & Psychiatric Diagnosis and Prescription Medications among adults with disabilities in the HPI program (n=51*)

Medical Diagnosis*	**n (%)**
Cardiovascular	33 (65)
Hypertension	17(33)
Pre-Hypertension	16 (31)
Hypercholesterolemia	16 (31)
Gastrointestinal	28 (55)
Respiratory	23 (45)
Endocrine	18 (35)
Diabetes	5 (10)
Thyroid	13 (25)
Neurologic	17 (33)
Dermatologic	17 (33)
Orthopaedic	8 (16)
Osteoporosis	4 (8)
Fractures/spinal issues	4 (8)
Disordered Sleep	7 (14)
Acute or Chronic Pain	7 (14)
Nephrologic	5 (3)
Ophthalmologic	4 (8)
Dental	4 (8)
Other**	5 (10)
Psychiatric Diagnosis	**n (%)**
Anxiety Disorders	15 (29)
Depressive Disorders	14 (27)
Psychotic Disorders	8 (16)
Attention Deficit Hyperactivity Disorders	5 (10)
Other ***	5 (10)
Medications	**n (%)**
Vitamin	22 (43)
Anti-histamine	22 (43)
Dermatologic	19 (37)
Anti-psychotic/anxiolitic	18 (35)
Anti-constipation	16 (31)
Lipid/Cholesterol lowering	16 (31)
Pain Reliever	15 (29)
Thyroid	14 (27)
Anti-seizure	13 (25)
Antacid	13 (25)
Anti-Depressant	13 (25)
Anti-Hypertensive	8 (16)
Sleep	7 (14)
Stimulant	6 (12)
Dental	5 (10)
Neurologic	5 (10)
Contraceptive	3 (6)
Diabetes	3 (6)
Other ****	10 (19)

*The classification in a diagnostic category may be be based on diagnosis noted in the chart, medication use for that disorder, or a medical finding consistent with the diagnosis (i.e. blood pressure in the hypertensive range)

*2 adults enrolled in program missing all medication and diagnosis information

**Hearing loss, prostate disorder, gout

*** Bipolar Disorders and Personality Disorders

****Nausea, prostate, eye, gout,osteoporosis

Table 3: Weight change among adults with disabilities in the HPI program from enrollment to the end of the reporting period (n= 48*)

	At Enrollment	Most Recent**
Median BMI (Kg/m2)	23.6	22.1
Weight Change	**n (%)**	
Weight Loss	26 (54)	
Weight Gain	14 (29)	
Stable Weight	8 (17)	

* 5 clients missing weight data

**Reporting period ended on 05/2014

Table 4: Hypertension and Pre-hypertension among participants, including medication status and initial/most recent blood pressures

Hypertension	**Ever Hypertensive* Participants**		**Ever Pre-Hypertensive** Participants**	
Medication Status	**Initial BP Hypertensive n(%)**	**Most Recent BP Hypertensive n(%)**	**Initial BP Pre-Hypertensive n(%)**	**Most Recent BP Pre-Hypertensive n(%)**
Participants On Medications	0 (0)	1 (2)	4 (8)	3 (6)
Participants Off Medications	2 (4)	8 (15)	14 (26)	11 (21)

*Hypertensive participants were included if they had a diagnosis of hypertension or had a blood pressure in the hypertensive range (systolic blood pressure (BP) >140 and/or diastolic BP >90)

**Pre-hypertensive participants were included if they had a diagnosis of pre-hypertension or had a blood pressure in the pre-hypertensive range (systolic BP 121-139 or diastolic BP 81-89)

Table 5: Program participants achieving nutrition and physical activity goals based on HPI goals, observations and workshop evaluations (n=53)

Nutrition Goals	**Meeting goal, n(%)**
Implementing healthy eating principles	42 (79)
Consuming fresh foods	44 (83)
Increasing fruit & vegetable intake	43 (81)
Avoiding processed foods	38 (72)
Improving portion control	43 (81)
Physical Activity Goals	**Meeting goal, n(%)**
Any physical activity*	44 (86)
Type of Physical Activity	
Walking	26 (49)
Gym (weights, trainer)	12 (23)
Basketball	7 (13)
Bowling	5 (9)
Swimming	4 (8)
Zumba	3 (6)
Other (tennis, yoga,bike,golf)	6 (11)
Number of minutes per week of moderate physical activity***	**Meeting goal, n(%)**
0-89 minutes	6 (17)
90-149 minutes	17 (49)
> = 150 minutes	12 (34)

*Among 51 able to participate in physical activity

**To improve overall cardiovascular health, national guidelines define physical activity as 150 minutes/week of moderate-intensity aerobic activity

***Among 35 participants with data available to calculate minutes of physical activity per week