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Funding Opportunity

Planning and Dissemination Grant– Institute Community Support 2014-02-18

ResearchNet ID 222465

Nominated Principal Applicant

Surname	Given Names	PIN
Lloyd	Meghann	178924

Project Title

Maximizing the use of Special Olympics International's Healthy Athletes Database to understand the health of individuals with intellectual disabilities

Relevant Research Area:	**Title of Priority Announcement/Funding Pools:**

Linked Programs:

Participants Signatures

The participants are in the following order when applicable: Principal Knowledge User, Knowledge Users, Principal Applicant and Co-Applicants, Primary Supervisor and Supervisors.

It is agreed that the general conditions governing grants and awards, as well as the statement "Meaning of Signatures on Application Forms" as outlined in the CIHR Grants and Awards Guide, apply to any grant or award made pursuant to this application and hereby accepted by the participant(s).

Supervisor(s) Signatures (If applicable)

It is agreed that the general conditions governing grants and awards, as well as the statement "Meaning of Signatures on Application Forms" as outlined in the CIHR Grants and Awards Guide, apply to any grant or award made pursuant to this application and are hereby accepted by the applicant's supervisor(s).

The author(s) of the Summary of the Research Project included in the candidate's application also agree that it accurately describes the training program proposed.

Consent to Disclosure of Personal Information

I understand that maintaining public trust in the integrity of researchers is fundamental to building a knowledge-based society. By submitting this application or by accepting funding from CIHR, NSERC and/or SSHRC, I affirm that I have read and I agree to respect all the policies of these Agencies that are relevant to my research, including the *Tri-Council Policy Statement: Tri-Agency Framework: Responsible Conduct of Research* (http://www.rcr.ethics.gc.ca/eng/policy-politique/framework-cadre/). In cases of a serious breach of Agency policy, the Agency may publicly disclose my name, the nature of the breach, the institution where I was employed at the time of the breach and the institution where I am currently employed.

I accept this as a condition of applying for or receiving Agency funding and I consent to such disclosure.

Surname	Given Names	Role	Signature
Foley	John	Co-Applicant	X John T Foley
Institution	**Faculty**	**Department**	**Date**
Statue University of New York, Cortland	Faculty of Physical Education		2/10/2014
Surname	**Given Names**	**Role**	**Signature**
Temple	Viviene	Co-Applicant	X
Institution	**Faculty**	**Department**	**Date**
University of Victoria (British Columbia)	School of Exercise Science, Physical and Health Ed		11 Feb, 2014
Surname	**Given Names**	**Role**	**Signature**
			X
Institution	**Faculty**	**Department**	**Date**

Signature of Institution Paid

Institution Paid Signature

It is agreed that the general conditions governing Grants and Awards, as well as the statements "Meaning of Signatures on Application Forms" as outlined in the CIHR Grants and Awards Guide, apply to any grant or award made pursuant to this application and are hereby accepted by the applicant's institution or the applicant(s) employing Institution(s).
A signature is not required at institutions outside of Canada.
If both your Program and submitting institution are using the Electronic Approval Tool on ResearchNet, a signature is not required for block 1 if the Authorized Official can bind the institution to all obligations outlined in the "Meaning of Signatures on Application Forms".
If the Authorized Official cannot bind the institution to all obligations in the "Meaning of Signatures on Application Forms", complete block 2.

1. Signature of Authorized Official: University of Ontario Institute of Technology

Print Name:	Date:
Michael Owen	February 14, 2014

Signature:

X

2. If the Authorized Official above cannot bind the institution to all obligations outlined in the "Meaning of Signatures on Application Forms", please provide additional signatures below as required.

Print Name:	Date:

Signature:

X

Print Name:	Date:

Signature:

X

Signature of Research Institution

Institution Signature at Primary Location of Research (Awards Programs Only)

It is agreed that the general conditions governing Grants and Awards, as well as the statements "Meaning of Signatures on Application Forms for the Authorized Official at the Primary Location of Research" (http://www.cihr-irsc.gc.ca/e/22630.html#1-G3) as outlined in the CIHR Grants and Awards Guide, apply to any award made pursuant to this application and are hereby accepted by the Nominated Principal Applicant's institution where the research is to be conducted.

Signature of Authorized Official: University of Ontario Institute of Technology

Print Name:	Date:

Signature:

X

Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

PROTECTED WHEN COMPLETED

Appl. #

Application Details

Funding Opportunity:
Other: Planning and Dissemination Grants – Institute Community Support (Winter 2014 Competition) (2014-02-18)

Proposed Start Date: 2014-06-01
Proposed End Date: 2014-05-30

Nominated Principal Applicant/Candidate:

Surname: Lloyd | Given Names: Meghann

Institution: University of Ontario Institute of Technology | Faculty: Faculty of Health Sciences | Department:

Telephone: 905-721-8668 ext 5308 | Fax: | E-mail: meghann.lloyd@uoit.ca

Project Title:
Maximizing the use of Special Olympics International's Healthy Athletes Database to understand the health of individuals with intellectual disabilities

Primary location where research to be conducted: University of Ontario Institute of Technology

Faculty: Faculty of Health Sciences | Department:

Institution which will administer project funds (Institution Paid):
University of Ontario Institute of Technology

Location of proposed Activity:

Period of support requested: 1 **Year(s)** _____ **Month(s)**

THE FOLLOWING SECTIONS ARE NOT APPLICABLE TO ALL PROGRAMS

Budget section - Amounts Requested from CIHR in the First Full Year:
Operating: 10000 | Equipment: 0 | Total Amount Requested: 10000

☐ New ☐ Renewal | Funding Reference Number (FRN):

Is this application a resubmission of a previously unsuccessful new application? ☐ Yes ☐ No

Is this application a resubmission of a previously unsuccessful renewal application? ☐ Yes ☐ No FRN #:

Have you applied to this program in the last two years? ☑ Yes ☐ No

Is this a multi-center study? ☐ Yes ☐ No

*** For Administrative Purposes Only**

RN #: 222465

Certification Requirements:

☐ Human subjects ☐ Human stem cells ☐ Animals ☐ Biohazards

☐ Environmental Impact ☐ Containment Level _____

☐ Clinical Trial

☐ Contains a randomized trial

☐ In order to carry out the proposed research in this application, an exemption from Health Canada under Section 56 of the Controlled Drugs and Substances Act is required. Should my application be approved, I understand that I will need to seek an exemption from Health Canada and provide this exemption to CIHR before any funding will be released for this application.

Other Project Information:

☐ For statistical purposes, does this application propose research involving Aboriginal people?

☑ Are sex (biological) considerations taken into account in this study?

☐ Are gender (socio-cultural) considerations taken into account in this study?

Please describe how sex and/or gender considerations will be considered in your research proposal:

Although this is a planning grant, one of the driving research questions is around the health of females with intellectual disabilities. Fewer females have intellectual disabilities than males, however the evidence indicates that they consistently have poorer health status. This planning grant is aimed at bringing together experts to pursue this question further.

Budget

Total Amount Requested from CIHR: $ 10000 Total Expenses of Activity: $ 0

List of Attachments

1. Other - Appendix A - participants and letters of support (337.5 KB)
2. Other - Appendix B - Regional Breakdown of screenings (77.0 KB)
3. Other - Work to date - Publications using SOI database (566.5 KB)
4. Other - References (24.4 KB)
5. Budget Module (302.3 KB)

Previous Applications

In the past, has an application been made to CIHR for funding to support this same Meetings, Planning and Dissemination Grant Activity?

Provide details of all previous applications (if applicable):

Title of Previous Activity

Competition Submitted To | Date Submitted:

Was the Application Successful? | If yes, amount received $

Request to be considered for the following Priority Announcements/Funding Pools*:

Relevant Research Area:	Title of the Priority Announcement/Funding Pool:
Institute of Gender and Health	Planning and Dissemination Grants - ICS

Linked Programs:

RELEVANCE FORM | FORMULAIRE DE PERTINENCE

Title of Research Proposal l Titre de la proposition de recherche :

Maximizing the use of Special Olympics International's Healthy Athletes Database to understand the health of individuals with intellectual disabilities

Relevant Research Area |Thème de recherche pertinent *:*	**Title of Priority Announcement/Funding Pool | Titre de la demande d'Annonce de priorités/Classe de financement :**
Institute of Gender and Health	Planning and Dissemination Grants - ICS

Description | Description :

Intellectual disabilities are conditions that result in significant limitations in both intellectual functioning and overall adaptive functioning (American Psychiatric Association, 2013). The etiology of these conditions varies and the incidence of intellectual disabilities is consistently higher in males (Boyle et al., 2011) than females. However, even though the population of females with intellectual disabilities is smaller, they experience significantly more health problems (Foley, Lloyd, & Temple, 2013; Lloyd, Temple, & Foley, 2012; Lunsky, Klein-Geltink, & Yates, 2013; Rimmer, Rowland, & Yamaki, 2007; Temple, Foley, & Lloyd, 2013). For example, data from our recent research suggest that females with intellectual disabilities have a higher prevalence of being overweight and obese than males with intellectual disabilities (Foley et al., 2013; Lloyd et al., 2012; Temple et al., 2013). Unfortunately, the unique health of women with intellectual disabilities has been overlooked and neglected to date (Walsh, Heller, Schupf, & van Schrojenstein Lantman-de Valk, 2001). Health promoting activities for women have the potential to enhance overall functioning, lower obesity prevalence, prevent secondary disabling conditions, and an increase quality of life (Walsh et al., 2001); yet more research is needed on the state of health for women with intellectual disabilities and how best to serve them in a health promoting capacity. Evidence suggests that proper nutrition, physical activity, and access to preventive healthcare can increase health and longevity in all populations; yet women with intellectual disabilities receive less preventive healthcare than women generally and have highly sedentary lifestyles (Frey, Stanish, & Temple, 2008; Temple, 2009; Walsh et al., 2001). One of the priorities of this planning/meeting grant is to build consensus around 3-5 research questions to drive a larger CIHR grant that is driven by the priorities of the stakeholders. A key research question driving the need for this collaborative meeting is why women with intellectual disabilities consistently experience poorer health than their male counterparts. Our goal is that the experts, stakeholders and knowledge users will come together facilitate further research into this critical and overlooked health inequity.

Other Applicants

Surname	Given Names	Role
Foley	John	Co-Applicant
Institution	Department	Faculty
Statue University of New York, Cortland		Faculty of Physical Education

Surname	Given Names	Role
Temple	Viviene	Co-Applicant
Institution	Department	Faculty
University of Victoria (British Columbia)		School of Exercise Science, Physical and Health Ed

Surname	Given Names	Role
Institution	Department	Faculty

Surname	Given Names	Role
Institution	Department	Faculty

Surname	Given Names	Role
Institution	Department	Faculty

Surname	Given Names	Role
Institution	Department	Faculty

Surname	Given Names	Role
Institution	Department	Faculty

Surname	Given Names	Role
Institution	Department	Faculty

Lloyd, Meghann
University of Ontario Institute of Technology
$10000

Lay title of the research

The use of the Healthy Athletes Database from Special Olympics International to promote health in people with intellectual disabilities

Abstract suitable for preparation of a press release

People with intellectual disabilities consistently experience high levels of health disparities, including overweight and obesity, and low levels of physical activity. Further, people with disabilities use health care services more than the population with typical development at a cost of approximately 3 times as much. Very little is known at the population level about the health of people with intellectual disability across the lifespan. Most people with intellectual disabilities today live in community settings and access the general health care system; therefore health professionals need accurate information on health concerns both current and future for both treatment and prevention for this population.This project will build active and meaningful collaborations amongst researchers, public health officials, community stakeholders, medical professionals, and knowledge users to promote the health of individuals with intellectual disabilities.The outcome of the meeting will be a draft of a strategic analysis and dissemination plan of available health information in the Special Olympics International Healthy Athletes Database to address existing gaps in the literature and inform a large scale secondary data analysis grant.

Project Descriptors *

intellectual disability, health disparity, sex, secondary data analysis, obesity, physical activity, health promotion, Special Olympics, nutrition, developmental disability

Areas of Research *	**Classification Codes ***
Primary POPULATION HEALTH	Primary MENTAL DISABILITY
Secondary PSYCHOSOCIAL/HEALTH BEHAVIOURAL RES.	Secondary POPULATION HEALTH

Themes *	**Categories ***
1st Social/Cultural/Environmental/Population Health	1st Gender and Health
2nd Clinical	2nd Nutrition, Metabolism and Diabetes
3rd	3rd Human Development, Child and Youth Health
4th	4th Neurosciences, Mental Health and Addiction

List of Collaborators (for purposes of avoiding conflict of interest during review assignment)*

Surname	Given Names	Institution
Krahn	Gloria	Oregon State University (Corvallis, Oregon)
Shellard	Amy	Special Olympics International

Lloyd, Meghann
Planning and Dissemination Grant– Institute Community Support/Subvention de planification et de dissémination – Programme d'appui communautaire des instituts Application/Demande 2014-02-18
Lay abstract/Résumé non scientifique

People with intellectual disabilities consistently experience high levels of health disparities, including overweight and obesity, and low levels of physical activity. Further, people with disabilities use health care services more than the population with typical development at a cost of approximately 3 times as much. Very little is known at the population level about the health of people with intellectual disability across the lifespan. Most people with intellectual disabilities today live in community settings and access the general health care system; therefore health professionals need accurate information on health concerns both current and future for both treatment and prevention for this population.This project will build active and meaningful collaborations amongst researchers, public health officials, community stakeholders, medical professionals, and knowledge users to promote the health of individuals with intellectual disabilities.The outcome of the meeting will be a draft of a strategic analysis and dissemination plan of available health information in the Special Olympics International Healthy Athletes Database to address existing gaps in the literature and inform a large scale secondary data analysis grant.

People with intellectual disabilities experience significant health disparities and have more unmet health needs than the typical population[1,2]. This project will build active and meaningful collaborations amongst researchers, community stakeholders, medical professionals, and knowledge users to promote the health of individuals with intellectual disabilities. Project collaborators (Appendix A) have been strategically selected to ensure that the project goals and objectives are met and a variety of perspectives are represented. Special Olympics International (SOI) has conducted more than 1 million health screenings on participants around the world for over 15 years,[3] (Appendix B), with limited dissemination of the results[4-7]. The outcome of the meeting will be a draft of a strategic analysis and dissemination plan that will inform future directions for the collection, analysis and dissemination of the Healthy Athletes data; and to lay the foundation (research questions) for a large scale grant to maximize the use and dissemination of the data already collected in the Healthy Athletes Database.

Health Disparities of Individuals with Intellectual Disabilities

The prevalence of people disabilities is rising[1,8] and people with intellectual disabilities **consistently experience high levels of health disparities[1,9]** including overweight and obesity[4-7], congestive heart failure, chronic obstructive pulmonary disease, diabetes and asthma[8], in addition to low levels of physical activity[10]. Females with intellectual disabilities are also noted to have even higher health risks than their male counterparts[4-6] and receive less preventative health screenings than the general population[8]. Further, people with disabilities use health care services more than the population with typical development[11,12], especially emergency rooms[8], at a cost of approximately three times as much. However, what is known about the health of people with intellectual disabilities is often based on small scale studies, from specific regions of the world[5]. **Very little is known at the population level** about the health of people with intellectual disability across the lifespan. Most people with intellectual disabilities today live in community settings and access the general health care system; therefore health professionals need accurate information to shed light on both current and future[13] treatment and prevention strategies for this population.

Importance of the issue: Reducing health inequalities is a common goal amongst many heath care agencies. Although people with intellectual disabilities are not the only group that experiences inequalities in health, the extent of the inequality is greater in this population[1,2]. The patterns of health needs, and causes of death, differ for people with intellectual disabilities[1]. There is less scientific evidence relating to the health of people with intellectual disabilities than for other groups, particularly from a public health perspective. This indicates that more research is needed at a population level to understand the health and wellness of this population. "***We need to change these inequalities. High quality research needs to be supported to develop the evidence base***"[1] (p. 415).

Existing Health Surveillance of Individuals with Intellectual Disabilities: Important health policy decisions are often informed by evidence from large cross-sectional or longitudinal surveillance. However, individuals with intellectual disabilities are often under-reported, excluded, or inaccurately identified in large-scale national and international health surveys[9]. This is particularly relevant in Canada where The Participation and Activity Limitation Survey (PALS), formerly Canada's national post-census survey that gathered information about adults and children whose daily activities are limited by a physical, mental, or other health-related condition or problem[14] is no longer employed due to the elimination of the nationally representative, mandatory, long-form census. In current large-scale health surveys people with intellectual disabilities may be significantly under-represented due to sampling strategies, for example:

CHMS: The Canadian Health Measures Survey (CHMS) only samples people "…living in private households at the time of the survey. Residents of Indian Reserves or Crown lands, institutions and

certain remote regions, and full-time members of the Canadian Forces are excluded."[15] (p.8, emphasis added). While the CHMS does not *exclude* people with intellectual disabilities, it does exclude people who live in community based assisted living homes (group homes). Many people with intellectual disabilities live in assisted living arrangements, not in private homes, particularly adults. Analysis of health records is an alternative to large scale health surveillance; however this method is also wrought with identification issues[9] and often focuses on health care utilization and specific medical conditions (e.g. Type II diabetes or emergency room visits) rather than health promotion.

The recent release of the *Atlas on the Primary Care of Adults with Developmental Disabilities in Ontario*[8] has greatly furthered our understanding of the health of Ontarians with developmental disabilities using large health databases and linking them to social services databases. This document focused on prevalence estimates in Ontario, describing the health status of Ontario adults with a developmental disability, health care utilization, and examined how consistent their health care is in relation to the primary care guidelines. However this document has focused on adults only, is limited in its scope to Ontario and does not examine health promotion initiatives outside of medical screenings[8].

Special Olympics International (SOI) Healthy Athletes Database: For more than 15 years SOI has been conducting free Healthy Athletes screenings, providing education, and referrals for follow-up care for Special Olympics athletes with intellectual disabilities at local, national and international events. Healthy Athletes also provides training for health care professionals. Approximately 1.4 million health screenings have been conducted in over 100 different countries through the Healthy Athletes program[3,5]. The Healthy Athletes program conducts screenings in seven areas: *Fit Feet* (podiatry), *Healthy Hearing* (audiology), *Special Smiles* (dentistry), *Opening Eyes* (vision), *FUNfitness* (physical therapy), *Med Fest* (general checkups) and *Health Promotion* (health and wellbeing)[3] (Appendix B). Trained health professionals conduct these screenings at local, regional, national and international events around the world. After each screening event, data are entered into the Healthy Athletes Software in Washington, DC. Before participation in Special Olympics events, athletes and/or their guardians sign a consent form which includes consent for the de-identified data to be used to report on the health of Special Olympics athletes.[4,5]

The Healthy Athletes database is the **largest known <u>international</u> database** on the health of people with intellectual disabilities and the data is strengthened by the fact that most of the data is **directly measured**. There is a dearth of information about the health status of people with intellectual disabilities in North America, but the data is even more scarce in the developing world[16] (e.g. Africa and the Middle East). SOI reports that they have conducted approximately 4,000 "Special Smiles" screenings in Africa and approximately 13,000 in Latin America for example (Appendix B). This type of **data does not exist in other databases.** A limitation of this database is that it only surveys *Special Olympics participants*. This sub-set of the population could be considered to be amongst the healthiest in this population due to their ongoing participation in sport[4,5]. Therefore, those who do not participate in Special Olympics will be under-represented in existing health surveillance. However, **SOI has extensive reach among people with intellectual disabilities**. In 2011, more than 4 million persons with intellectual disability participated in Special Olympics making SOI the organization with the single largest potential to both measure and have a positive impact on the health of individuals with intellectual disabilities.

<u>Work completed to date:</u>

Drs. Lloyd, Temple and Foley have been working collaboratively with Special Olympics International for the past 3 years to analyse and disseminate a portion of these data. Four peer-reviewed papers

(attached) describing the BMI status of Special Olympics athletes from around the world have been published between 2012 and 2014 (Foley, Lloyd & Temple 2013; Foley, Lloyd, Vogl & Temple, 2014; Lloyd, & Foley 2012; Temple, Foley & Lloyd, 2013). These studies have the largest *international* sample sizes ever published on the BMI of individuals with intellectual disabilities with samples of 11,643 for adults[4] and 9,678 for children and youth[5]. These publications demonstrate the potential to use the SOI Healthy Athletes Database, and the relative under-utilization of the database to date in relation to how much data has already been collected and the reach of SOI around the world.

Our work, to date, has illustrated a commitment on the part of the research, sporting, and health promotion communities to gather and disseminate these data on individuals with intellectual disabilities. But our work has also identified several areas for potential improvement, in particular: linking the 7 different SOI screening area databases, adding unique participant identifiers, and resolving some issues related to data cleaning and data entry and the need to collect the same data on non-athletes with intellectual disabilities. Our collaboration with SOI has also highlighted the potential to collect data on non-athletes with intellectual disabilities as well as care-providers, siblings and parents. Our intent is that the CIHR sponsored meeting will provide SOI with valuable feedback to enhance future data quality and inform the nature and direction of future data collection and research efforts.

Specific Objectives of Meeting

1. Engage a multi-disciplinary group of key stakeholders to identify and prioritize 3-5 specific research priorities related to the health of individuals with intellectual disabilities.
    a. Identify where the data might already exist - specifically within the SOI Healthy Athletes Database
2. Facilitate a plan to enhance the existing processes of data collection, data entry, database linkages, and analysis and dissemination strategies for the SOI Healthy Athletes Database.
3. Lay the foundation for a large secondary data analysis grant to maximize the use of the Healthy Athletes Database built upon the research priorities identified.

Project Timeline

Activity	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Planning Stakeholder Meeting											
Stakeholder Meeting											
Preparation of "white paper"											
Grant Preparation and submission											

Project Activities

Key Stakeholder Meeting (1 day): A planning meeting will be held in Toronto in August 2014. The meeting will be facilitated by Stephen Grundy of Life Unplugged (see quote attached), who has expertise and extensive experience in developing consensus guidelines, documents and procedures in the health and disability sectors. Given the context of the database (sport participants) and the data collected, the focus of much of the work will be around health promotion, not disease reporting.

Strategic Research Priorities White Paper: One of the outcomes of the meeting will be the identification of 3-5 research priorities which will be circulated in a "white paper" to key stakeholders (e.g. Statistics Canada, Centers for Disease Control and Prevention, Canadian Association for Research and Education in Intellectual Disabilities, International Association for the Scientific Study of Intellectual Disabilities, International Federation of Adapted Physical Activity, and Special Olympics International itself). The white paper will provide 1) a lively *state of knowledge summary* of

population-level evidence on health behaviours and health outcomes of individuals with intellectual disability, 2) a précis designed to help researchers *visualize the possibilities of using population-level data and databases* to address health promotion priorities of persons with intellectual disability, and 3) a description of *3-5 strategic research areas* to assist researchers, organizations serving the needs of persons with intellectual disability, policy makers and funders plan and prioritize research decisions.

Grant Preparation and Submission: The primary goal of the stakeholder meeting is to identify 3-4 actionable research questions to drive the development of a large CIHR grant.

Draft Agenda of Stakeholder Meeting

Time	Activity
8:00-8:30	Continental Breakfast
8:30-8:45	Welcome and Introductions – **Drs. Lloyd, Temple and Foley**
8:45-9:30am 9:30-10:00	*Presentation #1* – **Dr. Gloria Krahn** "The importance of health surveillance for people with intellectual disabilities" with Discussion
10:00-10:15	Break
10:15-11:00 11:00-11:30	*Presentation #2* – **Special Olympics International** – "Healthy Athletes Database" Discussion
11:30-12:30pm	Identifying the Priority Areas/Priority Questions – Gaps in our knowledge - Discussion
12:30-1:15pm	Lunch
1:15-1:30	Recap and summary of morning work
1:30-2:30	How can the Healthy Athletes Database be used to address the gaps in the literature? Discussion
2:30-3:15	Other sources of information, and how could it be linked to the Healthy Athletes Database?
3:15-3:30	Break
3:30-4:20	Consensus building on 3-5 Primary research questions to drive grant submission
4:20-4:30	Wrap-up and conclusions

Collaborators:

Gloria Krahn, PhD, MPH, Endowed Chair in Family Policy, University of Oregon

Dr. Krahn is the former the Director of the Division of Human Development and Disability at the National Center on Birth Defects and Developmental Disabilities. Dr. Krahn is widely regarded as a national and international expert in the field of disability and public health. Her publications and lectures have bridged the fields of child development, childhood-onset disability, health status measurement and health promotion among adults with disabilities. Dr. Krahn is the author of numerous publications related to disability and child development, and she is the co-editor of the first major textbook on Disability and Public Health. Dr Krahn brings a wealth of expertise and experience.

Amy Shellard, MPH - Special Olympics International

Ms. Amy Shellard is Director of Research and Evaluation at SOI. Her role is to manage the Healthy Athletes data – both internal and external requests. She leads Special Olympics' health research and evaluation projects. Ms. Shellard will present on the scope and details of the Healthy Athletes Database, detailing what data is available and any logistical information for meeting participants to be fully informed.

Planning Grant Outcomes

1. The formulation of 3-5 research priorities driven by the stakeholders.
2. Preparation of the strategic research priorities white paper.
3. Research proposal to be submitted for funding to maximize the use of the Healthy Athletes Database.
4. Written feedback to Special Olympics International on how to improve their practices in collecting, inputting, analysing and sharing their data.

Appendix A.
List of proposed attendees.

Attendees have been chosen with the budget in mind to include researchers, stakeholders, and policy makers.

Name	Affiliation	Role	Stakeholder group
Dr. Meghann Lloyd	University of Ontario Institute of Technology	Primary Investigator	Researcher
Dr. Viviene Temple	University of Victoria	Co-applicant	Researcher
Dr. John Foley	State University of New York at Cortland	Co-applicant	Researcher
Dr. Gloria Krahn	Oregon State University	Collaborator	Policy Maker/Researcher
Amy Shellard	Director of Research and Evaluation, Special Olympics International	Collaborator	SOI Stakeholder
Darcie Mersereau	Special Olympics International	Participant	SOI Stakeholder
Dr. Yona Lunsky	Centre for Addiction and Mental Health (CAMH)	Participant	Researcher
Tom Davies	Special Olympics Canada	Participant	Special Olympics Canada Stakeholder
Sharon Bollenbach	CEO, Special Olympics Canada	Participant	Special Olympics Canada Stakeholder
Dr. William Sullivan	Surrey Place Centre Toronto - St. Michael's Hospital	Participant	Knowledge user – Medical doctor specializing in people with IDD
Dr. Robert Balogh	University of Ontario Institute of Technology	Participant	Researcher
Dr. Carolyn Hunt	Grandview Children’s Centre	Participant	Knowledge user – Medical doctor specializing in children with IDD
Dr. John Cairney	McMaster University	Participant	Researcher

Special Olympics

February 12, 2014

To: Planning Grants Program Delivery Team, Canadian Institutes of Health Research

RE: Letter of Support for CIHR Planning Grant Application Titled: *"Maximizing the use of Special Olympics International's Healthy Athletes Database to understand the health of individuals with intellectual disabilities"*

As Vice President of Health Programs for Special Olympics International, I am pleased to submit this letter of support for the Planning Grant Application being proposed by Dr. Meghann Lloyd, Viviene Temple, and John Foley in collaboration with Dr. Gloria Krahn. Individuals with intellectual disabilities experience significant health disparities and have greater unmet health needs, yet there are significant gaps in our understanding of the health of this population. To help address these health needs, Special Olympics started Healthy Athletes, which has provided Special Olympics athletes with free health screenings, education, and referrals for follow-up care for over 15 years. Data from these screenings have been aggregated into the world's largest database on the health of people with intellectual disabilities. It is imperative that these data are analyzed and disseminated and used to influence health policy and practice for people with intellectual disabilities.

I have reviewed an overview of the Planning Grant Application and believe that the proposed initiative will build active and meaningful collaborations among medical professionals, researchers, public health professionals, and community-based knowledge users in order to identify strategic priority areas for Special Olympics Healthy Athletes data. The interdisciplinary research connections and proposed outcomes at this meeting will benefit Special Olympics in many ways, including helping us maximize the impact of our data, identify key collaborations for our work moving forward, and help prioritize different aspects of our health work. We fully support this meeting and look forward to ongoing collaboration with the organizers and other participants.

Sincerely,

Darcie Mersereau
Vice President, Health Programs
Special Olympics International

Special Olympics
1133 19th Street NW, Washington, DC 20036-3604, USA Tel +1 202 628 3630 Fax +1 202 824 0200
www.specialolympics.org Email info@specialolympics.org Twitter @specialolympics
Created by the Joseph P. Kennedy Jr. Foundation for the benefit of persons with intellectual disabilities

Special Olympics
Olympiques spéciaux
Canada

To: Planning Grants Program Delivery Team, Canadian Institutes of Health Research

RE: Letter of Support for CIHR Planning Grant Application Titled: *"Maximizing the use of Special Olympics International's Healthy Athletes Database to understand the health of individuals with intellectual disabilities"*

As Director, Program Development for Special Olympics Canada, I am pleased to submit this letter of support for the Planning Grant Application being proposed by Dr. Meghann Lloyd, Viviene Temple, and John Foley in collaboration with Dr. Gloria Krahn. Individuals with an intellectual disability experience significant health disparities and have greater unmet health needs, yet there are significant gaps in our understanding of the health of this population surveillance perspective. There is a critical need for more large scale health surveillance for people with an intellectual disability. Special Olympics International has been conducting Healthy Athletes screening for over 10 years and the data represents one of the largest health records database for people with intellectual disabilities. It is imperative that this information is analysed and disseminated so it can be used to positively influence health policy and practice for people with an intellectual disability.

I have reviewed an overview of the Planning Grant Application and believe that the proposed initiative will build active and meaningful collaborations among medical professionals, researchers, public health professionals, and community-based knowledge users in order to identify strategic priority areas As a As a stakeholder in the disability sector, this meeting, the interdisciplinary research connections and proposed outcomes will benefit my work by my work by providing Special Olympics Canada data to support current projects and work that is being undertaken within the organization.

Healthy Athletes is a program that Special Olympics Canada currently offers nationally therefore the organization has an invested interest in both the results of the research and future collaboration opportunities for ensuring that athletes with an intellectual disability are receiving necessary health screenings and surveillance. Special Olympics Canada will continue to use the information, findings and key lessons through this research and collaboration to connect with individuals in the healthcare field and strive to support athletes with an intellectual disability.

I feel this proposed application supports a much needed collaboration opportunity and in-depth look at a source of data that can play a major role in helping outline, develop and shape programs in the future for individuals with intellectual disabilities.

Sincerely,

Tom Davies
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UOIT
CHALLENGE INNOVATE CONNECT

FACULTY OF HEALTH SCIENCES

February, 2014

Planning Grants Program Delivery Team, Canadian Institutes of Health Research

RE: Letter of Support for CIHR Planning Grant Application Titled: **"Maximizing the use of Special Olympics International's Healthy Athletes Database to understand the health of individuals with intellectual disabilities"**

As an Assistant Professor at the University of Ontario Institute of Technology who has helped to organize health screening events for Special Olympics, I am delighted to submit this letter of support for the Planning Grant Application being proposed by Drs. Meghann Lloyd, Viviene Temple, and John Foley in collaboration with Dr. Gloria Krahn. Individuals with intellectual disability experience significant health disparities and have greater unmet health needs, yet there are significant gaps in our understanding of the health of this population. There is a critical need for more large scale health surveillance for people with intellectual disability. Special Olympics International has been conducting Healthy Athletes screening for over 10 years and the data represents one of the largest health records database for people with intellectual disabilities. The data generated from Special Olympics databases has the potential to provide the badly needed evidence to make good clinical and health policy decisions. Special Olympics is collecting data from all over the world meaning that it has implications for better health for persons with intellectual disability in developed as well as developing countries.

I have reviewed an overview of the Planning Grant Application and believe that the proposed initiative will build active and meaningful collaborations among medical professionals, researchers, public health professionals, and community-based knowledge users in order to identify strategic priority areas. As a physiotherapist and university based researcher, this meeting will benefit my work by enriching existing and creating the opportunity for new interdisciplinary research collaborations. I have used large databases in my past research on health and health services for persons with intellectual disability and look forward to the opportunity to share my knowledge in this area as it applies to the Special Olympics databases. The inclusion of a focus on women's health issues is timely as well with some findings accentuating the additional barriers to health services they face. I also expect that this meeting will lead to a firm plan for funding applications for research that uses the data generated by Special Olympics events.

Sincerely,

R Balogh

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APPENDIX B

Healthy Athletes screening results 2007-2012 (data entered as of 6/30/12)

	All Regions	Africa	Asia Pacific	East Asia	Europe/Eurasia	Latin America	Middle East North Africa	North America
Special Smiles	83,293 screenings	3,902 screenings	5,006 screenings	6,662 screenings	14,435 screenings	13,577 screenings	696 screenings	39,015 screenings
Fit Feet	41,121 screenings	1,193 screenings	2,825 screenings	4,160 screenings	10,115 screenings	5,806 screenings	431 screenings	16,591 screenings
Opening Eyes	83,172 screenings	6,096 screenings	8,196 screenings	6,937 screenings	13,230 screenings	9,007 screenings	1,224 screenings	38,482 screenings
Healthy Hearing	44,990 screenings	2,709 screenings	2,571 screenings	3,841 screenings	11,513 screenings	1,596 screenings	803 screenings	21,957 screenings
Health Promotion	52,866 screenings	3,830 screenings	1,062 screenings	5,805 screenings	9,848 screenings	13,331 screenings	679 screenings	18,311 screenings
FUNfitness	50,076 screenings	994 screenings	1,588 screenings	5076 screenings	11,635 screenings	8,482 screenings	595 screenings	21,706 screenings

For more information, please contact Amy Shellard at 202-824-0217 or ashellard@specialolympics.org

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International BMI comparison of children and youth with intellectual disabilities participating in Special Olympics

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ABSTRACT

The purpose of this study was to describe the BMI status of children and youth with intellectual disabilities by world region, gender and age. A total of 9678 children and youth records were available from the Special Olympics International Health Promotion database after data cleaning (6084 boys and 3594 girls). Children were defined as 8–11 year olds (n = 2035), and youth were defined as 12–18 year olds (n = 7643). BMI prevalence rates were computed using the International Obesity Task Force (IOTF) cut-points, and logistic regression was used to determine if either age or gender was associated with being overweight or obese. Approximately 30% of the sample was overweight or obese; however, the prevalence rates in North America were much higher, particularly among girls. Fifty-four percent of girls (95% confidence interval [CI], 51.4–57.2%) were overweight or obese. Logistic regression revealed that both age and gender were significant predictors in North America; however this pattern was not consistent throughout the world regions. BMI status is a significant indicator of health, and these findings suggest that overweight and obesity are significant health concerns for children and youth with intellectual disabilities around the world. Obesity rates in this population are particularly high in North America, and the odds of becoming overweight or obese increased with age in North America. It is critical that health professionals increase Health Promotion efforts, including physical activity and healthy eating behaviors for children and youth with intellectual disabilities.

1. Introduction

Obesity is one of the biggest challenges currently facing health professionals and health care systems around the world (Janssen et al., 2005; World Health Organization, 2009). One population that consistently experiences high levels of health disparities (Allerton, Welch, & Emerson, 2011; CDC/NCBDDD, 2009; Krahn, Hammond, & Turner, 2006), including high rates of overweight/obesity, is individuals with intellectual disabilities (CDC/NCBDDD, 2009; De, Small, & Baur, 2008; Maïano, 2011; Mikulovic et al., 2011); however, most of the literature on obesity rates in individuals with intellectual disabilities has been conducted on adults, not children (Emerson, 2005; Sohler, Lubetkin, Levy, Soghomonian, & Rimmerman, 2009; Stedman & Leland, 2010).

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Children and youth with intellectual disabilities are often under-reported, excluded, or inaccurately identified in large-scale national and international health surveys (CDC/NCBDDD, 2009). Consequently, relatively little is known about the overweight/obesity status of children and youth with intellectual disabilities around the world (Maïano, 2011). What little data are available on the prevalence of obesity in children and youth with intellectual disabilities, is often based on small regional samples (i.e. $n \leq 1000$) from high-income countries such as Australia (De et al., 2008; Emerson & Robertson, 2010), France (Mikulovic et al., 2011), USA (Rimmer, Yamaki, Lowry, Wang, & Vogel, 2010), Japan (Suzuki et al., 1991) and the United Kingdom (Stewart et al., 2009). An exception is a paper from Japan in 1994 (Takeuchi, 1994) which had a very large sample ($n = 20{,}031$) of children and youth who attended special schools in Japan. They too found high rates of obesity; however, this study did not use BMI, they calculated obesity using a standard weight formula and the data was based on proxy responses by teachers (Takeuchi, 1994). Our literature search of the major databases revealed only one published study using an international sample of children and youth with intellectual disabilities (Harris, Rosenberg, Jangda, O'Brien, & Gallagher, 2003). This study, from Special Olympics International (SOI), included 539 athletes younger than 18 years of age; however, only 11 of these athletes were younger than 12 years of age and the USA was the only country with a sufficiently large sample ($n = 119$) to allow for more specific geographical estimates of BMI prevalence. The limited literature that has been published consistently shows that children and youth with intellectual disabilities have higher rates of overweight and obesity than children with typical development in their respective countries (Allerton et al., 2011; De et al., 2008; Emerson & Robertson, 2010; Mikulovic et al., 2011; Rimmer, Rowland, & Yamaki, 2007; Takeuchi, 1994). Unfortunately, a significant gap remains in our understanding of global obesity rates of children and youth with intellectual disabilities. For example, there is no published literature on the incidence of overweight and obesity in children and youth with intellectual disabilities in regions such as Africa or the Middle East; and small sample sizes and methodological concerns in the available studies has limited the examination of factors that may predict BMI such as age and gender.

The purpose of this study is to describe the prevalence of overweight and obesity among an international sample of children and youth with intellectual disabilities who participated in Special Olympics Healthy Athletes screenings (including directly measured height and weight) around the world. We also examined if age and gender were associated with the likelihood of being an unhealthy weight (overweight/obese).

2. Materials and methods

2.1. Special Olympics Health Promotion programs

The Special Olympics movement started in 1968; Special Olympics aims to provide year-round sports training and athletic competition for children and adults with intellectual disabilities, giving them continuing opportunities to develop physical fitness and all the associated benefits of participation in sport (Special Olympics International, 2010). All participants in Special Olympics have an intellectual disability however the spectrum of functioning is wide.

For over 10 years SOI has been conducting free Healthy Athletes screenings at local, national and international sporting events. Over 1 million health screenings have been conducted in over 100 different countries through the Healthy Athletes program. The Healthy Athletes program conducts screenings in seven areas, e.g. Fit Feet (podiatry), Healthy Hearing (audiology), and Health Promotion. For the purposes of this paper data from the Health Promotion screenings was used. SOI has seven world-region offices: Africa, Asia-Pacific, East Asia, Europe/Eurasia, Latin America, North America, and Middle East-North Africa (Special Olympics International, 2010). In this study, data from Africa and Middle East-North Africa were combined due to relatively low sample sizes in those regions. After each screening event, data is entered into the SOI Healthy Athletes databases at the SOI head office in Washington, DC. The following variables were extracted from the Health Promotion database for this study: gender, date of birth, date of event (age calculated), height, weight, and geographic region. Personal participant characteristics about the 9678 participants included in this analysis were not available from the de-identified SOI database (e.g. diagnosis, Special Olympics event, or any co-morbid conditions). For analysis, children were defined as 8–11 year olds and youth were defined as 12–18 year olds. Eight years of age was the youngest age included in this analysis because Special Olympics programs traditionally start at the age of eight.

2.2. Data collection procedures

To ensure consistency in the Healthy Athlete screenings there are very specific protocols and training for personnel conducting the assessments (Special Olympics International, 2007). All measurements were conducted by trained volunteer clinicians (e.g. nurses, doctors, exercise physiologists). A digital weight scale measuring to 0.1 kg was used; a stadiometer for height measuring to 0.1 cm. For height and weight all athletes removed his or her shoes and were wearing light clothing (Special Olympics International, 2007). The data presented here were collected between 2004 and 2010.

2.3. Research ethics and consent

Before participation in Special Olympics events, athletes and/or their guardians sign a medical release/consent form to participate in their respective event(s). As part of this document, separate consent is given for the Healthy Athletes screening which includes consent for the de-identified data to be used to report on the health of Special Olympics athletes. Research

ethics approval was granted by the three primary institutions of the authors to conduct a secondary data analysis of the de-identified data in the SOI database.

2.4. Data cleaning and inclusion criteria

The initial database from SOI included 11,336 children and youth ranging in age from 8 to 18. Cleaning of the database was necessary in order to ensure conservative inclusion of data (e.g. outliers, data entry errors) before proceeding with the analysis. Anthropometric values were flagged using the who2007.ado macro for Stata (World Health Organization, 2007). Flagged data were values outside the "biologically plausible": height between −6 *z*-score and 6 *z*-score, and weight between −6 *z*-score and 5 *z*-score. The flagged data were then crossed checked with the Stata extension zanthro which references the 2000 CDC Growth Charts for the United States. List wise deletions were used when anthropometric, gender, age or regional data was missing ($N = 1375$) or determined to be extreme ($N = 283$); a total of 1658 entries were excluded. The Stata extension zbmicat (Vidmar, Carlin, Hesketh, & Cole, 2004) was used to classify the children and youth based on gender and age in months into three categories: non-overweight/obese, overweight, and obese based on the IOTF BMI curves for children and youth (Cole, Bellizzi, Flegal, & Dietz, 2000). Since the database was de-identified from SOI; we cannot assume all cases were independent of each other. To adjust for potential lack of independence of the data, confidence intervals and standard errors were estimated by bootstrapping with 1000 replications in both the prevalence rates and logistic regressions (Stata, 2007).

Prevalence rates were calculated for each region along with 95% confidence intervals. A series of binary logistic regressions were used to examine whether age (as a continuous variable) or gender (as a dichotomous variable; female = 0 and male = 1) were associated with the likelihood of being overweight or obese in each region. Data were analyzed using Strata/MP version 10.1 for windows (StataCorp LP, College Station, TX).

3. Results

A total of 9678 children and youth remained in the dataset after data cleaning (males $n = 6084$, females $n = 3594$). Mean age for the 8–11 year old girls ($n = 783$) was 9.7 ± 1.1 years, and for the 8–11 year old boys ($n = 1252$) mean age was 9.8 ± 1.1 years. The mean age for the 12–18 year old girls ($n = 2811$) was 15.3 ± 1.9 years, and for the 12–18 year old boys ($n = 4832$) was 15.4 ± 1.9 years. Table 1 presents the BMI prevalence data for all participants by gender, age and world region. On average, approximately 30% of this global sample of children and youth with intellectual disabilities was either overweight or obese. The overweight/obesity rates in North America were higher than other regions: overall 54.3% (95%CI, 51.4–57.2%) of female 8–18 year olds, and 47.7% (95%CI, 45.2–50.2%) of male 8–18 year olds from North America participating in Special Olympics events, were overweight or obese (Table 1).

Table 1
Prevalence of non-overweight, overweight and obesity (percent and 95% confidence intervals) by gender, age and region.

	Percent of youth (95% confidence level)[a]					
	NA[b]	AF&MENA	LA	EE	EA	AP
Boys						
8–11 year old	($N = 264$)	($N = 173$)	($N = 599$)	($N = 41$)[d]	($N = 126$)	($N = 49$)[d]
Non OW/OB[c]	53.8% (47.6–60.0)	55.5% (48.0–63.0)	76.5% (73.1–79.8)	75.6% (61.9–89.3)	76.2% (68.6–83.7)	81.6% (71.0–92.3)
OW	20.1% (15.1–25.1)	24.3% (17.9–30.6)	12.5% (9.8–15.3)	19.5% (7.0–32.0)	16.7% (10.0–23.3)	4.1% (0–9.6)
OB	26.1% (20.7–31.5)	20.2% (14.3–26.2)	11.0% (8.6–13.5)	4.9% (0–11.6)	7.1% (2.6–11.7)	14.3% (4.6–24.0)
12–18 year old	($N = 1311$)	($N = 605$)	($N = 767$)	($N = 708$)	($N = 1285$)	($N = 156$)
Non OW/OB	52.0% (49.2–54.8)	76.9% (73.5–80.2)	78.5% (75.6–81.4)	78.2% (75.2–81.3)	77.1% (74.8–79.4)	76.3% (69.3–83.3)
OW	21.1% (18.9–23.2)	18.5% (15.5–21.5)	15.6% (13.1–18.2)	15.0% (12.4–17.6)	15.5% (13.5–17.5)	13.5% (7.9–19.0)
OB	26.9% (24.4–29.4)	4.6% (3.0–6.3)	5.9% (4.3–7.5)	6.8% (4.9–8.7)	7.4% (6.0–8.8)	10.3% (5.4–15.1)
Girls						
8–11 year old	($N = 190$)	($N = 90$)[d]	($N = 353$)	($N = 19$)[d]	($N = 93$)[d]	($N = 38$)[d]
Non OW/OB	61.1% (54.1–68.0)	52.2% (41.9–62.6)	73.9% (69.5–78.4)	57.9% (35.9–79.9)	83.9% (76.4–91.4)	81.6% (69.1–94.1)
OW	16.3% (11.1–21.5)	20.0% (11.8–28.2)	17.8% (14.0–21.7)	26.3% (6.9–45.7)	10.8% (4.6–16.9)	5.3% (0–12.7)
OB	22.6% (16.6–28.6)	27.8% (18.4–37.2)	8.2% (5.3–11.1)	15.8% (0–32.2)	5.4% (0.6–10.1)	13.2% (2.2–24.1)
12–18 year old	($N = 960$)	($N = 336$)	($N = 432$)	($N = 369$)	($N = 598$)	($N = 116$)
Non OW/OB	42.7% (39.6–45.8)	69.3% (64.5–74.2)	74.5% (70.5–78.6)	69.6% (64.9–74.4)	79.1% (75.9–82.3)	75.9% (68.0–83.7)
OW	24.7% (21.9–27.4)	22.6% (18.3–27.0)	19.9% (16.2–23.7)	21.1% (17.0–25.3)	14.9% (12.1–17.7)	15.5% (8.9–22.1)
OB	32.6% (29.7–35.6)	8.0% (5.1–10.9)	5.6% (3.4–7.7)	9.2% (6.2–12.3)	6.0% (4.1–8.0)	8.6% (3.4–13.8)
Boys						
OW/OB	47.7% (45.2–50.2)	27.9% (20.8–35.1)	22.4% (20.3–24.5)	21.9% (19.0–24.8)	23.0% (20.8–25.1)	22.4% (16.8–28.1)
Girls						
OW/OB	54.3% (51.4–57.2)	34.3% (29.9–38.9)	25.7% (22.6–28.9)	30.9% (26.3–35.6)	20.3% (17.3–23.2)	22.7% (16.0–29.5)

[a] If the confidence interval included a negative number it was replaced with a 0.
[b] NA, North America; AF&MENA, Africa and Middle-East/North Africa; LA, Latin America; EE, Europe/Eurasia; EA, East Asia; AP, Asia Pacific.
[c] Non OW/OB, non over-weight/obese; OW, overweight; OB, obese according to IOTF cut-offs for children and youth.
[d] Due to small sample sizes in these cells, caution should be taken in interpreting these prevalence rates.

Table 2
Odds ratios (and 95% confidence intervals) from logistic regression analyses predicting the effects of age and gender on the likelihood of being overweight/obese by world region.

World region	Predictor variables	Odds ratio	95%CI	*p*
North America (*N* = 2725)	Age	1.06	1.03–1.09	0.01
	Gender (1 = boys, 0 = girls)	0.77	0.66–0.90	<0.001
Africa/Middle East-North Africa (*N* = 1204)	Age	0.89	0.85–0.93	<0.001
	Gender (1 = boys, 0 = girls)	0.74	0.57–0.95	0.020
Latin America (*N* = 2151)	Age	0.98	0.95–1.02	0.317
	Gender (1 = boys, 0 = girls)	0.83	0.68–1.03	0.093
Europe/Eurasia (*N* = 1137)	Age	1.01	0.94–1.08	0.838
	Gender (1 = boys, 0 = girls)	0.63	0.47–0.83	0.001
East Asia (*N* = 2101)	Age	1.03	0.98–1.08	0.205
	Gender (1 = boys, 0 = girls)	1.16	0.92–1.46	0.216
Asia Pacific (*N* = 359)	Age	1.02	0.94–1.10	0.704
	Gender (1 = boys, 0 = girls)	0.98	0.61–1.58	0.935

Logistic regression results varied by world region; age was significant predictor only for North America and Africa/Middle East-North Africa. Age was associated with lower rates of overweight and obesity in the Africa/Middle East-North Africa region, but higher rates in North America. Results for gender were more consistent. Girls were more likely to be overweight or obese in Europe/Eurasia, North America, and Africa/Middle East-North Africa. Neither age, nor gender were significant predictors of overweight/obesity in East Asia, Latin America or the Asia Pacific regions (Table 2).

4. Discussion

The extremely high obesity rates of all children and youth around the world are one of the most important and critical health challenges of our time (Lobstein, Baur, & Uauy, 2004). The aim of this research was to describe the BMI status of 8–18 year old Special Olympics athletes by world region, age and gender; and we also examined whether age and gender were predictors of weight status. The results indicate that overweight and obesity is a significant concern for this population with the overall prevalence of overweight ranging from 4.1% to 26.3%, and obesity from 4.6% to 32.6% (Table 1). The prevalence of overweight and obesity was highest in North America with 54.3% of the girls, and 47.7% of the boys being overweight or obese. The East Asia, Asia Pacific and Latin America regions had the lowest overall overweight and obesity rates ranging from 20.3% to 30.9% in this sample; however these prevalence rates are still higher than the published literature on children with typical development (Uauy, Albala, & Kain, 2001; Wang & Lobstein, 2006).

The combined regions of Africa and North Africa/Middle East had an overweight and obesity prevalence of 27.9% for boys and 34.3% for girls. This finding was higher than expected given previously published prevalence rates of 1.2% being overweight and 0.2% obese (Wang & Lobstein, 2006) in the general population. It has been hypothesized that there is a physical activity and nutritional transition emerging in this region of the world (Adamo et al., 2011; Mokhtar et al., 2001; Prentice, 2006) as modern advances in lifestyle such as television, computers and cars contribute to a more sedentary lifestyle, especially in urban areas. Our data indicate that 27.9% of boys and 34.3% of girls with intellectual disabilities in Africa and the Middle East-North Africa regions are overweight or obese. Although we know "virtually nothing about the social and economic status of intellectual disability populations" (Fujiura, Park, & Rutkowski-Kmitta, 2005, p. 298); Fijiura et al., report that 97% of individuals with intellectual disability in South Africa are not working, compared to 55% of the general population of South Africans; and many children have limited access to education (Njenga, 2009). It is possible that even though the participants from this region are participating in Special Olympics sporting events, they do not engage in occupational physical activities that are traditional to this region such as farming, walking to school or household chores that would increase their energy expenditure. Given the relatively small sample size for this region ($n = 1204$) it is unclear why obesity rates would drop as the children age, more research is needed to determine why obesity rates are so high in this region. Additionally, why children in Africa/Middle East-North Africa are more likely to be overweight or obese than their adolescent counterparts is not clear. More research is needed to explain why this pattern was observed in Africa/Middle East-North Africa but nowhere else in the world. The only other region where age was a factor was North America, where the odds of becoming overweight or obese increased with age. This pattern was not found anywhere else in the world in the present study; but is consistent with Maïano's (2011) recent review of the literature. This suggests that early intervention and prevention may be particularly important in North America.

Our analysis also demonstrated that girls were more likely to be overweight or obese. The gender differences we found are consistent with the adult literature (Emerson, 2005; Rimmer & Yamaki, 2006) but are infrequently reported in the child and youth literature (Maïano, 2011). This pattern was found in North America, Africa–Middle East/North Africa and Europe/Eurasia. It is possible that this finding is related to girls being consistently less active than boys in both the literature on

children with typical development (Colley et al., 2011; Troiano et al., 2008) as well as those with intellectual disabilities (Lorenzi, Horvat, & Pellegrini, 2000).

Our data indicate that in a population that already experiences significant health disparities (Krahn et al., 2006), the prevalence of overweight/obesity is high. The prevalence rates in this study are also relatively consistent with overweight/obesity prevalence rates from other smaller regional studies on children and youth with intellectual disabilities; for example, France (19–22.5%) (Mikulovic et al., 2011), Australia (23%) (De et al., 2008), Japan (14.3–21.2%) (Suzuki et al., 1991), United Kingdom (36%) (Stewart et al., 2009) and a smaller Special Olympics International sample (47%) (Harris et al., 2003). In a recent review, Maïano (2011) reported the prevalence of overweight to be 11–24.5% and obesity to be 7–36% in children and youth with intellectual disability based on the 10 studies included in the review. Maïano's results are similar to our findings (prevalence of overweight 4.1–26.3%, and obesity 4.6–32.6%) indicating that obesity is a significant problem in this population.

Janssen et al. (2005) examined the overweight and obesity prevalence of school aged children and youth with typical development from 34 countries. They found that globally overweight prevalence ranged from 5.1% to 25.4% and obesity ranged from 0.4% to 7.9% (Janssen et al., 2005). We found that in a large global sample of children and youth with intellectual disabilities the prevalence of overweight ranged from 4.1% to 26.3%, and obesity ranged from 4.6% to 32.6%. This suggests that compared to an international sample of children and youth with typical development, Special Olympics athletes (with intellectual disabilities) are more overweight overall, but particularly, they have higher rates of obesity. Possible explanations as to why children and youth with intellectual disabilities have such high obesity rates include: genetic disorders (e.g. Prader Willi syndrome, Down syndrome), medication use, low physical activity levels, or unhealthy nutritional habits (e.g. food used as a reward).

It is a limitation of these results that we are not able to report on the prevalence of obesity based on specific diagnoses (e.g. Down syndrome, Autism Spectrum Disorder, Prader Willi Syndrome, etc.), or severity of intellectual disability. This information is not collected as part of the Health Athletes Screening as all Special Olympics athletes participate together regardless of diagnoses. All athletes who participate in Special Olympics have an intellectual disability (Special Olympics International, 2007); however the data in the Healthy Athletes database are Special Olympics athletes and therefore the results may not represent the full spectrum of children and youth with intellectual disabilities. It is possible that because all the participants in this sample were competing at local, national and international sporting events these results may actually under-estimate the overweight and obesity of children and youth with intellectual disabilities. It is reasonable to assume that these athletes are more physically active than their peers with intellectual disabilities who do not regularly participate in Special Olympics; however we do not have corresponding data of daily physical activity to draw any conclusions, nor do we have data on nutritional habits. Additionally, whether or not any of the participants had any physical disabilities was not available from the database. Many individuals with intellectual disabilities often have a physical disability as well, and those with both a motor impairment and an intellectual disability may in fact be more at risk for overweight and obesity due to increased mobility limitations. A final limitation of this study is the lack of independence due to the de-identified nature of the dataset. To adjust for this lack of independence, in the standard errors and confidence intervals we used bootstrapping which has been shown to provide accurate estimates when a reasonable amount of data is resampled around 1000 times (Chernick, 2008). It is important to note that this is the largest global health database for this population. Additionally, the sizeable group of children and youth with intellectual disabilities reported in this paper represents the largest known sample in the literature with directly measured height and weight, and this sample also includes children and youth from all regions of the world. Much of the published literature on this topic is from developed countries and includes participants from higher socio-economic conditions.

Our data comes from the largest known international database on the health of people with intellectual disabilities (Special Olympics International, 2007), and all regions of the world are represented. Thus, a major contribution of this study is to our knowledge of patterns of overweight and obesity in this population from a global perspective. This is particularly important because children and youth with intellectual disabilities are often excluded by national and international health surveys (CDC/NCBDDD, 2009). Confidence in our data is also bolstered by the direct measurement of height and weight, by trained health professionals, rather than self-report (Janssen et al., 2005). Self-reported or proxy-reported height is consistently overestimated, weight underestimated, and consequently BMI is consistently underestimated compared to directly measured height and weight (Gorber, Tremblay, Moher, & Gorber, 2007; Shields, Gorber, & Tremblay, 2008). Our findings provide a weight of evidence that supports the relatively small scale studies showing high rates of overweight and obesity among children and youth with intellectual disability. Further, our results are derived from direct measurement of height and weight of children and youth in six world regions. Compared with recently published international rates of overweight for children and youth with typical development (Janssen et al., 2005); children and youth with intellectual disability are experiencing greater prevalence of obesity. Our findings highlight the need for this issue to be brought to the forefront of health policy, health promotion and primary medical care initiatives for children and youth with intellectual disabilities.

These data indicate that children and youth with intellectual disabilities have high levels of overweight/obesity; and that girls from many world regions appear particularly at risk. Obesity associated secondary health conditions have the potential diminish the independence and overall functioning and participation of children and youth with intellectual disabilities (Rimmer et al., 2007). It is clear that examination of factors contributing to this trend needs to occur; and it is likely that early interventions targeting healthy eating behaviors and increased physical activity opportunities for children and youth with

intellectual disabilities are needed to prevent excess weight gain and all the associated chronic health conditions over the lifespan.

Conflict of interest statement

None of the three authors have a conflict of interest to declare.

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Body mass index of adults with intellectual disability participating in Special Olympics by world region

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Abstract

Background People with intellectual disability (ID) experience poorer health and have more unmet health needs compared with people without ID, and they are often absent from population health surveillance. The aim of this study was to describe the body mass index (BMI) status of adult Special Olympics participants by world region and gender. Additionally, the general influence of age and gender on overweight/obesity of all participants was explored.

Method A total of 11 643 (7150 male and 4493 female) Special Olympics BMI records were available from the Special Olympics International Health Promotion database. BMI was compared by gender and world region. Logistic regression was used to examine whether age and gender were associated with the likelihood of being overweight/obese (BMI $\geq$ 25.0).

Results Overall, 5.5% of the sample was underweight, 36.1% in the normal range, 24.7% overweight and 32.1% obese, and levels of overweight/obesity were very high in North America. Both age and gender were significant predictors of overweight/obesity (odds ratios 1.06 and 0.59, respectively).

Conclusions Our findings demonstrate that adult Special Olympics participants have high levels of overweight and obesity; particularly among women and those from North America. It is crucial that those who work with, care for, coach and live with adults with ID who participate in Special Olympics increase efforts to promote healthy weight status.

Keywords adults, BMI, intellectual disability, obesity, overweight, world region

Introduction

Compared with people without intellectual disability (ID), people with ID experience poorer health (Scheepers *et al.* 2005; Krahn *et al.* 2006), have more unmet health needs (Krahn *et al.* 2006) and are '. . . largely undetected in population health surveillance' (CDC/NCBDDD 2009, p. 1). One of the difficulties in monitoring the health status of adults with ID is that they tend to be unidentifiable or missing from health surveillance systems after they leave school (CDC/NCBDDD 2009). The Special Olympics International Health Promotion database has been identified by the US Centers for Disease

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Control and Prevention as a potential source of health surveillance data for adults with ID, including those with mild cognitive impairment (CDC/NCBDDD 2009).

High rates of obesity have been documented among adults with ID (Emerson 2005; Sohler *et al.* 2009; Stedman & Leland 2010; Stancliffe *et al.* 2011); however, the vast majority of studies are small in scale and derived almost entirely from countries with economies defined by the World Bank as high income (Emerson 2005; Melville *et al.* 2005, 2008; Merriman *et al.* 2005; Stanish & Draheim 2007; Dudley *et al.* 2008; Wallace & Schluter 2008; Stedman & Leland 2010) or upper middle income (Molteno *et al.* 2000; Batistaa *et al.* 2009). One exception is a study of Special Olympics athletes ($n = 1210$) attending the 1999 and 2001 World Games (Harris *et al.* 2003). Harris and colleagues found that athletes from the USA were significantly more overweight and obese than the non-USA athletes (65% vs. 33%, respectively). The non-USA data, representing athletes from 150 countries, were not stratified by country or world region; therefore, no further international comparisons were made. One other study has made international comparisons of body mass index (BMI) classification among persons with ID (Dudley *et al.* 2008). Dudley and colleagues found that persons with Prader–Willi syndrome from France had significantly higher rates of obesity than those from the UK or the USA. These discrepancies were attributed to differences in clinical management approaches (Dudley *et al.* 2008).

In the general population worldwide, BMI increased by 0.4 kg/m^2 among men and by 0.5 kg/m^2 among women between 1980 and 2008 (Finucane *et al.* 2011). However, the rate of increase in BMI has been most noticeable in developing countries where epidemics of obesity have been recently documented (Popkin *et al.* 2012). In concert with social, economic and technological development, many low-income and middle-income countries have experienced a 'nutrition transition' (Popkin 2002; Prentice 2006; Finucane *et al.* 2011). The nutrition transition is characterised by increases in the consumption of energy-dense diets, sweetened foods, edible oils and animal source foods; reductions in work-related and leisure-time physical activity; and changes in body composition (Prentice 2006; Popkin *et al.* 2012). The nutrition transition has also been directly linked to increases in non-communicable diseases in low- and middle-income countries (Prentice 2006). The World Health Organization (2005) reported that 80% of deaths from non-communicable diseases such as cardiovascular diseases and diabetes occur in low- and middle-income countries, and these deaths occur at a younger age than in high-income countries. Virtually nothing is known about the body composition of individuals with ID in these transitional economies.

Body mass index has been identified as a key indicator of health for adults with ID (van Schrojenstein Lantman-de Valk *et al.* 2007). In this population, BMI is a significant predictor of cardiometabolic risk (Sohler *et al.* 2009) including hypertension (Bhaumik *et al.* 2008; Sohler *et al.* 2009), hypercholesterolemia (Sohler *et al.* 2009) and type 2 diabetes (Sohler *et al.* 2009). Given the importance of BMI as an indicator of health and nutrition status and the dearth of BMI data from most world regions, our first aim was to describe the BMI status of adult Special Olympics participants by world region and gender. Our second aim was to examine whether age and gender were associated with the likelihood of being overweight/obese.

Materials and methods

Data source

Special Olympics International (SOI) is a global not-for-profit sporting organisation serving people with ID around the world. SOI has seven world-region offices [Africa, Asia–Pacific, East Asia, Europe/Eurasia, Latin America, Middle East/North Africa (MENA) and North America] and programmes in over 170 countries. In 1997, SOI began offering free health screenings at local, State/Provincial, National and World Games. Data from these screenings are entered into SOI databases. For the present study, SOI provided access to the following variables from their Health Promotion database: gender, age, event, location, delegation (world region), height, and weight. Anthropometric measures were assessed directly by trained personnel at Special Olympics events using protocols developed by SOI (Special Olympics

2007). Weight was measured to 0.1 kg using digital scales and height was measured to the nearest 0.1 cm using portable stadiometers. The data for this analysis were collected over the period 2003 to 2009 at 147 different events. Ethics approval for this secondary analysis was provided by the institutional ethics review committee of each author's university.

Data cleaning and analyses

The initial data of 14 168 available entries aged 19–65 years were examined and filtered to remove extreme or missing values. The values for inclusion were height between 121.9 cm and 238.8 cm and weight between 30.0 kg and 317.5 kg as identified in previous work (Das *et al*. 2005; ALSWH 2007). Listwise deletions were used when anthropometric, gender, age or region data were missing or determined to be extreme; total number of cases excluded were 2525. Individual identifiers were not present in the database and therefore we cannot assume all cases are independent of each other. Due to relatively low numbers of women from Africa and MENA, these regions were combined in the analyses.

Body mass index has been shown to be a valid predictor of total body fat for adults with ID (R^2 = 0.83) (Temple *et al*. 2010). Participants in the Temple *et al*. study ranged in age from 19 to 60 years; height and weight ranged from 133.0 to 191.0 cm and 46.0 to 116.0 kg, respectively; and 37% had Down syndrome. Consistent with international classification of BMI cut points (WHO Expert Consultation 2004), four BMI categories were computed by gender and world region: underweight <18.5, normal range 18.5–24.9, overweight 25.0–29.9 and obese ≥30 (World Health Organization 1995). Prevalence rates were calculated for each region along with confidence intervals. Binary logistic regression was used to examine whether age (as a continuous variable) or gender (as a dichotomous variable; female = 0, male = 1) were associated with the likelihood of being overweight/obese (BMI ≥ 25.0). Separate binary logistic regression analyses were performed for each world region. To adjust for any bias that may be associated with the potential lack of independence of the data, standard errors were estimated with bootstrapping (1000 replications) in both the prevalence rates and logistic regressions (Stata 2007). Data were analysed using Stata/MP version 10.1 for windows (StataCorp LP, College Station, TX, USA).

Results

A total of 11 643 (7150 male and 4493 female) Special Olympics participant BMI records were available. Mean age was 29.6 years (SD = 9.9) for men and 30.4 years (SD = 10.2) for women. Table 1 presents height and weight data and Table 2 presents BMI data for all participants by gender and world region. Both age and gender were significant predictors of overweight/obesity (Table 3): the odds of being overweight/obese was greater with increasing age (odds ratio, 1.06) but was significantly lower for men (odds ratio, 0.59).

Discussion

The aim of this study was to describe the BMI status of adult Special Olympics participants by world region and gender. Additionally, the general influence of age and gender on overweight/obesity of all participants was explored. Consistent with the high rates of overweight/obesity worldwide (Finucane *et al*. 2011), we found high levels of overweight and obesity for men and women from all world regions, with the exception of men from East Asia and Africa/MENA. Compared with the most recent population data from the WHO Global Database on BMI (World Health Organization 2006) shown in Table 2, levels of overweight/obesity in this sample were higher for both men and women from North America and lower for men from Africa/MENA and Latin America. Where BMI data have been published regarding persons with ID, e.g. South Africa (Molteno *et al*. 2000), Asia–Pacific (Wallace & Schluter 2008; Stedman & Leland 2010), Europe (Emerson 2005; Bhaumik *et al*. 2008; Dudley *et al*. 2008; Melville *et al*. 2008; de Winter *et al*. 2012), and United States and Canada (Rimmer & Wang 2005; Sohler *et al*. 2009; Stancliffe *et al*. 2011), our data generally show similarly high levels of overweight/obesity. However, we found higher levels of overweight/obesity than Harris *et al*.' (2003) previous study of Special Olympics participants. The Harris *et al*. findings were based on data from the

Table 1 Descriptive statistics of measured height and weight by world region and gender

		Female				Male			
		Mean	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
Africa/MENA	Height (cm)	155.41	9.68	129.00	175.00	168.53	9.88	125.00	195.00
	Weight (kg)	62.57	18.39	31.00	172.00	64.82	13.73	33.20	133.00
Asia–Pacific	Height (cm)	151.81	10.10	131.10	177.00	165.32	9.52	140.00	193.30
	Weight (kg)	56.01	17.19	32.20	124.40	66.04	17.63	35.40	156.00
East Asia	Height (cm)	155.93	8.65	127.40	178.50	168.16	8.84	133.00	205.00
	Weight (kg)	57.32	12.81	30.50	112.70	65.01	13.94	32.60	124.50
Europe/Eurasia	Height (cm)	156.97	9.80	130.00	189.80	170.13	10.45	130.00	200.00
	Weight (kg)	67.03	18.66	30.00	173.20	73.62	16.57	30.00	164.00
Latin America	Height (cm)	150.27	9.40	126.50	181.00	163.57	10.20	134.40	195.00
	Weight (kg)	57.41	13.05	30.00	123.00	64.22	14.94	30.00	168.00
North America	Height (cm)	157.06	10.10	122.00	195.00	170.16	10.70	123.00	205.00
	Weight (kg)	78.22	22.37	32.00	181.00	84.07	22.78	34.00	230.00

MENA, Middle East/North Africa.

1999 and 2000 World Games. Our sample includes regional, state, national as well as international events and may therefore reflect a more diverse and less active group. It is also possible that it reflects broader trends of escalating overweight/obesity in the last decade (Finucane *et al.* 2011).

Results of the logistic regression analysis support the gender-based effect evident in smaller-scale studies conducted in the USA, UK and South Africa (Molteno *et al.* 2000; Emerson 2005; Bhaumik *et al.* 2008; Melville *et al.* 2008; Sohler *et al.* 2009) and one larger study conducted in 20 US states (Stancliffe *et al.* 2011). Our findings, based on the likelihood of being overweight/obese, show large differences between men and women (OR = 0.59), although this was not the case for the Asia–Pacific and East Asia regions where levels of overweight/obesity for women were relatively low.

Age-related differences in overweight/obesity among adults with ID have received little attention in the literature, although there is some evidence of increasing BMI with age (Emerson 2005; Moran *et al.* 2005). Historically, persons with ID have experienced shorter life expectancies than the general population (Yang *et al.* 2002). Advances in health care and nutritional status have increased average life expectancy, thus increasing the need to examine age-related changes. In this study, age was a significant predictor of overweight/obesity (OR = 1.06), although the odds ratios for East Asia and Latin America were not significant ($P = 0.069$ and $P = 0.071$, respectively). This may reflect that only a small proportion of participants in each of these world regions were ≥40 years of age: 4% in East Asia and 9% in Latin America, respectively. As a variable, age has not often been examined in studies involving adults with ID. However, Peterson *et al.* (2008) noted that age was a significant confounding variable in an analysis of physical activity (steps per day) and level of ID. More recently, de Winter *et al.* (2012) found high rates of overweight and obesity among older adults with ID, particularly for individuals using atypical antipsychotics and those who were physically inactive. Prospective research has shown significantly higher mortality rates among adults in the general population who were overweight or obese during mid-life (Adams *et al.* 2006). Our findings suggest overweight/obesity is a health concern that increases with age. Research focusing on the medical sequelae, determinants and management of overweight/obesity as individuals with ID age is needed to more fully understand this problem and to design effective interventions.

Major strengths of the current study are the size and diversity of the sample, that BMI was measured directly rather than relying on self- or proxy-reports of BMI and that more robust confidence intervals were constructed using bootstrap. With the

Table 2 Body mass index (BMI) (percentage and confidence intervals) of male and female Special Olympics participants by world region

	Africa/MENA	Asia–Pacific	East Asia	Europe/Eurasia	Latin America	North America
Female	*n* = 180	*n* = 111	*n* = 367	*n* = 657	*n* = 288	*n* = 2890
Underweight	13.9% (8.4–19.3)	18.0% (10.7–25.4)	9.8% (6.6–13.0)	4.4% (2.7–6.1)	7.3% (4.0–10.6)	2.7% (2.2–3.3)
Normal range	36.7% (29.5–43.8)	42.3% (33.4–51.3)	58.0% (52.2–63.9)	39.0% (35.2–42.8)	42.0% (36.4–47.7)	20.9% (19.5–22.3)
Overweight	23.9% (17.1–30.7)	24.3% (16.3–32.3)	21.3% (16.8–25.7)	26.3% (22.8–29.8)	33.7% (28.6–38.8)	24.0% (22.3–25.7)
Obese	25.6% (18.8–32.3)	15.3% (9.1–21.6)	10.9% (7.4–14.4)	30.3% (26.4–34.2)	17.0% (12.8–21.2)	52.4% (50.5–54.3)
Male	*n* = 626	*n* = 214	*n* = 776	*n* = 1138	*n* = 503	*n* = 3893
Underweight	14.7% (12.2–17.2)	13.6% (8.9–18.2)	12.2% (10.1–14.4)	4.7% (3.5–6.0)	8.3% (5.7–11.0)	3.1% (2.6–3.7)
Normal range	59.6% (55.6–63.6)	49.5% (42.9–56.2)	61.0% (57.7–64.2)	47.5% (44.5–50.4)	57.3% (52.8–61.7)	28.7% (27.2–30.1)
Overweight	17.7% (14.8–20.6)	23.4% (17.3–29.5)	18.9% (16.5–21.4)	31.4% (28.6–34.1)	24.9% (20.9–28.8)	29.7% (28.3–31.1)
Obese	8.0% (6.0–10.0)	13.6% (8.8–18.3)	7.9% (6.0–9.7)	16.4% (14.2–18.7)	9.5% (6.9–12.1)	38.5% (37.0–40.1)
BMI ≥ 25						
Female	49.5% (42.4–56.5)	39.6% (30.1–49.1)	32.2% (27.3–37.0)	56.6% (52.7–60.5)	50.7% (44.7–56.6)	76.4% (74.9–77.9)
Male	25.7% (22.3–29.1)	37.0% (30.7–43.1)	26.8% (23.5–30.1)	47.8% (44.9–50.7)	34.4% (30.1–38.6)	68.2% (66.7–69.7)
Global database[†]	35.4–72.5%	5.2–62.7%	18.9–32.1%	35.0–66.5%	40.6–67.4%	59.1–66.9%

[†] Range of overweight (BMI ≥ 25) prevalence rates for countries within each world region, extracted from the WHO global database on BMI of adults without disabilities (19).
MENA, Middle East/North Africa.

Table 3 Odds ratios [and 95% confidence intervals (CI)] from logistic regression analyses predicting the effects of age and gender on the likelihood of being overweight/obese, by world region

World region	Predictor variables	Odds ratio	95% CI	*P*
All	Age	1.058	1.053 to 1.063	<0.001
	Gender (1 = male, 0 = female)	0.591	0.547 to 0.638	<0.001
Africa/MENA	Age	1.041	1.010 to 1.074	0.010
	Gender (1 = male, 0 = female)	0.342	0.239 to 0.490	<0.001
Asia–Pacific	Age	1.073	1.033 to 1.115	<0.001
	Gender (1 = male, 0 = female)	0.871	0.533 to 1.423	0.582
East Asia	Age	1.018	0.999 to 1.037	0.069
	Gender (1 = male, 0 = female)	0.778	0.592 to 1.023	0.073
Europe/Eurasia	Age	1.069	1.057 to 1.082	<0.001
	Gender (1 = male, 0 = female)	0.727	0.594 to 0.889	0.002
Latin America	Age	1.017	0.999 to 1.036	0.071
	Gender (1 = male, 0 = female)	0.513	0.382 to 0.691	<0.001
North America	Age	1.035	1.028 to 1.041	<0.001
	Gender (1 = male, 0 = female)	0.653	0.585 to 0.728	<0.001

MENA, Middle East/North Africa.

exception of one study from South Africa (Molteno *et al*. 2000) and another from Brazil (Batistaa *et al*. 2009), this study is the first to report BMI status of adults with ID from Africa, the Middle East/North Africa, Latin America and East Asia. It is also the largest study of BMI among adults with ID. By estimating the standard errors with bootstrapping for both the regression and prevalence rates we have increased the precision of the estimates of the available data. There are also several limitations to this study that should be noted: (1) We did not directly compare rates of overweight/obesity by world region using inferential statistics because the distribution of age varied between regions. Consequently, it is not appropriate to draw conclusions about differences between world regions. Rather, the findings of this study demonstrate the extent of underweight, overweight and obesity in each SOI world region. (2) Data from the Africa and MENA regions were combined in this study due to relatively low numbers of women from these areas. It may be possible to analyse the Africa and MENA data separately in the future as the SOI health promotion database develops over time. (3) The generalisability of the findings is limited because information about the aetiology of ID, co-morbidities and associated health conditions was not included in the database. Despite these acknowledged limitations, the findings indicate that overweight and obesity are significant health concerns for people with ID. Given that all participants in this study were Special Olympics athletes participating at large-scale regional, national or international sporting events it is reasonable to assume they represent a more active segment of this population. Therefore, obesity rates among adults with ID in general may, in fact, be higher than this study suggests. More research is needed with representative samples to determine if this is the case.

Overall we found that adult Special Olympics participants have high levels of overweight and obesity, particularly women and those from North America. Research is needed to explain these heterogeneous findings and to understand the policy implications. For example, what explains such high levels of overweight/obesity in North America? Why are women with ID more overweight/obese than men? Questions such as these need to be answered in a broad context that considers social influences such as poverty, access to health care and health promotion, and living circumstance.

Competing interests

The authors declare that they have no competing interests.

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Obesity trends of 8–18 year old Special Olympians: 2005–2010

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ABSTRACT

Obesity is a worldwide health problem. Individuals with intellectual disabilities (ID) experience health disparities, including higher rates of obesity than their peers with typical development; however, there has been no tracking of the obesity rates of children and youth with ID over time. The objective of this study was to compare the BMI of children and youth (8–<19 years of age) with and without ID in the USA, measured overtime; and determine differences between the two groups. This study is a secondary analysis of BMI derived from the Special Olympics International (SOI) Healthy Athletes database. Data were available for 2541 (1527 male) American SOI participants. Using BMI cut-offs from the CDC growth curves the BMI data were stratified into two age bands: 8–11 years ($n = 429$) and 12–<19 years ($n = 2112$), and comparisons were made between SOI participants' BMI data and published NHANES data from the years 2005–2006, 2007–2008, and 2009–2010. SOI participants (12–<19 years) had significantly higher levels of obesity than the national average in 2007–2008 and 2009–2010; there were no differences in the children (8–11 years). Males in the 8–11 years age group were more likely to be obese than females in the same age group (OR = 1.62, $p = .035$). These results highlight that an obesity disparity exists in the USA for children and youth with ID, particularly as they get older and there is a need for further physical activity and healthy eating interventions and overall health promotion activities targeted at this population.

1. Introduction

Healthy People 2010 had two overarching goals, one of which was to eliminate health disparities across the nation between many subpopulations (United States Department of Health and Human Services, 2000). Unfortunately this goal was not met and still remains an overarching goal for Healthy People 2020 (NCHS, 2012). One population that consistently experiences high levels of health disparities (Krahn, Hammond, & Turner, 2006), including high rates of overweight and obesity, is individuals with intellectual disabilities (ID) (De, Small, & Baur, 2008; Lloyd, Temple, & Foley, 2012; Maïano, 2011; Mikulovic et al., 2011; Stewart et al., 2009). Individuals with ID are a heterogeneous group who experience cognitive difficulties and deficits in conceptual, social and practical domains; and these difficulties appear before adulthood (APA, 2013). The etiology of ID can be the result of a genetic condition, an acquired condition, or the etiology is sometimes unknown (APA, 2000); individuals with ID also often have more than one health condition.

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Obesity is a growing public health concern around the world (World Health Organization, 2010). Obesity is also an important health indicator for individuals with ID (van Schrojenstein Lantman-de Valk, Linehan, Kerr, & Noonan-Walsh, 2007). High rates of obesity have been documented among adults with ID (Sohler, Lubetkin, Levy, Soghomonian, & Rimmerman, 2009; Stedman & Leland, 2010; Temple, Foley, & Lloyd, 2013); adults with ID also have higher rates of underweight (Bhaumik, Watson, Thorp, Tyrer, & McGrother, 2008; Emerson, 2005). In children, the limited literature that has consistently demonstrated that children and youth with ID have higher rates of overweight and obesity than children with typical development (Allerton, Welch, & Emerson, 2011; De et al., 2008; Emerson & Robertson, 2010; Lloyd et al., 2012; Mikulovic et al., 2011; Takeuchi, 1994); however, the trends over time have not been examined in this population. In the United States of America (USA) obesity rates in children and youth with typical development have risen at alarming rates over the past 20 years as documented by Ogden and colleagues through the NHANES data (Ogden & Carroll, 2010; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden et al., 2006; Ogden, Carroll, Kit, & Flegal, 2012; United States Department of Health and Human Services, 2010). More research is needed to fully understand whether the same pattern of temporal increases in obesity is happening for children with ID.

Children and youth with ID are often under-reported, inaccurately identified, or purposely excluded from large-scale national health surveys (CDC/NCBDDD, 2009). Even so, the Centers for Disease Control and Prevention and the National Center on Birth Defects and Developmental Disabilities have both indicated that understanding the relative health status of individuals with ID, including children, is a high priority (CDC/NCBDDD, 2009). Most of the research on obesity rates in individuals with ID has also been conducted on adults, not children (Emerson, 2005; Sohler et al., 2009; Stedman & Leland, 2010; Temple et al., 2013). What little is known about the overweight and obesity status of children and youth with ID in the USA suggests that they are more likely to be overweight or obese (Foley, Lloyd, & Temple, 2013; Lloyd et al., 2012; Rimmer, Rowland, & Yamaki, 2007; Rimmer, Yamaki, Lowry, Wang, & Vogel, 2010), particularly among girls (Bandini, Curtin, Hamad, Tybor, & Must, 2005; Lloyd et al., 2012; Maïano, 2011). Lloyd et al. (2012) found that the prevalence of obesity in a sample of 2725 North American 8–18 year olds with ID was approximately 50%. However, a direct comparison to the general population in the USA, over time, has not been conducted.

In 2010 the National Institute of Child Health and Human Development hosted a multi-disciplinary meeting focusing on obesity in children with developmental and/or physical disabilities. Two priorities identified during this meeting were tracking the disparity in the prevalence of obesity between those with and without disability over-time, and examining age of onset of obesity (NICHD, 2010). It is not known whether the temporal trends over time differ for children with ID from children with typical development where the data is clear that obesity rates have risen (Ogden et al., 2010). In adults, Foley et al. (2013) compared the BMI of US adult Special Olympians to published NHANES data between 2005 and 2010. They found that the rates of obesity in adults with ID participating in Special Olympics in the USA were relatively stable over time, albeit very high. They also found that there was a significantly higher prevalence of obesity (BMI $\geq$ 30) in women with ID during each NHANES cycle.

Consistent with these priorities, and the gaps in the literature, this study compared the BMI of children and youth with and without ID in the USA; and for children and youth with ID, we examined temporal trends in the prevalence of obesity and the influence of age and gender on obesity (Foley et al., 2013).

2. Materials and methods

2.1. Special Olympics health promotion programs

This study was a secondary data analysis of the Healthy Athletes database. Research ethics approval was granted by the three primary institutions of the authors. Special Olympics International (SOI) has conducted free health screenings at local, national and international events for more than 10 years with funding and support from the Centers for Disease Control and Prevention (SOI, 2007). This data is entered into the SOI Healthy Athletes database after the screenings. The Healthy Athletes database was made available to the researchers upon request to SOI. The following variables were extracted from the Healthy Athletes database for this study: sex, date of birth, date of event (age calculated), height, weight, waist circumference and geographic region (USA). For analysis, children were defined as 8–11 year olds (due to Special Olympics age requirements) and youth were defined as 12–<19 year olds.

2.2. Data collection procedures

All measurements of height, weight, and waist circumference were conducted by trained Special Olympics volunteer clinicians (e.g. nurses, doctors, dieticians) using specific protocols designed to ensure consistency in the SOI Healthy Athlete screenings (SOI, 2007). A digital scale measuring to 0.1 kg was used to measure body weight; a portable stadiometer was used for height measuring to 0.1 cm; and a soft measuring tape to measure around to abdomen at the level of the iliac crest was used to measure waist circumference to 0.1 cm (SOI, 2007). All athletes and/or their legal guardians signed consent before participation in all Special Olympics events; including consent for the Healthy Athlete data to be used for research purposes.

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2.3. Data cleaning and inclusion criteria

The initial database from SOI included 3744 children and youth with a USA affiliation ranging in age from 8 to <19 years for the NHANES years of interest (2005–2006, 2007–2008, 2009–2010). Data cleaning procedures were as follows: (1) identified multiple entries for one individual and deleted duplicate or redundant entries ($n = 753$). This was done by filtering data by sex, birthday, state, and name. For individuals who had multiple entries in one year and/or entries over multiple years, the last entry (most recent data collected) for an individual was retained. (2) List-wise deletions were used when anthropometric data or sex was missing ($n = 400$); and (3) The remaining data were examined and filtered to remove extreme values as identified in previous work (ALSWH, 2007; Das et al., 2005). The Stata extension zanthro (Vidmar, Carlin, Hesketh, & Cole, 2004) was used to identify values greater than 5 standard deviations from the mean referenced in the 2000 CDC Growth Charts for the United States (Kuczmarski et al., 2000) that were determined to be extreme and deleted ($n = 50$) leaving a final sample of 2541. BMI was calculated from the height and weight data, kg/m^2. A modified version of the Stata extension zbmicat (Vidmar et al., 2004) was used to classify the participants based on sex and age in months into three categories: non-overweight (<85 percentile), overweight (>85 percentile to <95 percentile), and obese (≥95 percentile) based on the 2000 CDC Growth Charts for the United States (Kuczmarski et al., 2000). To facilitate comparison with the published NHANES data (Ogden & Carroll, 2010; Ogden et al., 2012), the SOI data were stratified by sex and the NHANES age band cut-offs 8–11 years ($n = 429$) and 12–<19 years ($n = 2112$). The NHANES range for children is 6–11, however Special Olympics only enrolls participants starting at 8 years of age which is why they age band is 8–11 years for this study. Waist circumference for 18 year olds was checked for extreme values based off previously published data (McDowell, Fryar, Ogden, & Flega, 2008). Extreme data was considered 3 standard deviations below the mean and 4 standard deviations above the mean, no participants were excluded. The database was de-identified from SOI, and data collection happened at multiple events (Table 1).

To describe the obesity status among children and youth with ID, prevalence rates were calculated with 95% confidence intervals for each age group by gender within a NHANES collection cycle. To test for significance differences in the prevalence of obesity between the SOI data and previous published NHANES data (2005–2006, 2007–2008) (Ogden & Carroll, 2010), and (2009–2010) (Ogden et al., 2012), and if the prevalence in the SOI data changed over the time periods, a series of chi-squared test were employed. To examine whether age (as a continuous variable) or gender (as a dichotomous variable; female = 1 and male = 0) were associated with the likelihood of being obese, the SOI data from the six years (2005–2010) were combined and a logistic regression was employed. A series of Mann–Whitney tests were used to compare waist circumference between BMI categories. Data were analyzed using Stata/MP version 10.1 for windows (StataCorp LP, College Station, TX) and R version 2.12.2. (RDCT, 2011).

3. Results

Prevalence estimates for non-overweight weight, overweight, and obesity among children and youth with ID from the SOI database are presented in Table 2. The prevalence of overweight/obesity levels (combined) was over 35 percent in the 8 through 11 year olds with ID and over 45 percent among the 12 through <19 year olds with ID. Fig. 1 illustrates that compared with previously published United Stated national data (Ogden et al., 2010), rates of obesity for 8–11 year-olds with ID were not different from the published NHANES data on a nationally representative sample at any time point. However, a pattern emerges for the 12–<19 year-olds with ID who had a significantly higher rate of obesity than the national average in 2007–2008 ($\chi^2 = 5.70$, df = 1, $p = .017$) and 2009–2010 ($\chi^2 = 6.04$, df = 1, $p = .014$). There were no significant differences in obesity prevalence among both children and youth with ID over the three time cycles.

Logistic regression models for both age bands were fitted with age and sex as predictor variables of being obese. In the 8–11 year old age band results indicate that males are at 1.62 (95% CI 1.04–2.54) times greater risk of being obese than females ($Z = 2.11$, $p = .035$) while holding age constant. In the 12–<19 year old age band neither age nor sex predicted one's being obese.

To investigate if high BMI in participants with ID may be a result of increased fat mass or muscle mass, we examined the waist circumference in a subsample of 18 year olds with available data. The results showed that waist circumference significantly increased between BMI classifications, see Table 3.

Table 1
The proportion of BMI records obtained from each event type.

Event type	Frequency	Percent	Cumulative percent
Local	1319	51.91	51.91
State	995	39.16	91.07
National	197	7.70	98.82
World	30	1.18	100.00
Total	2541	100.00	

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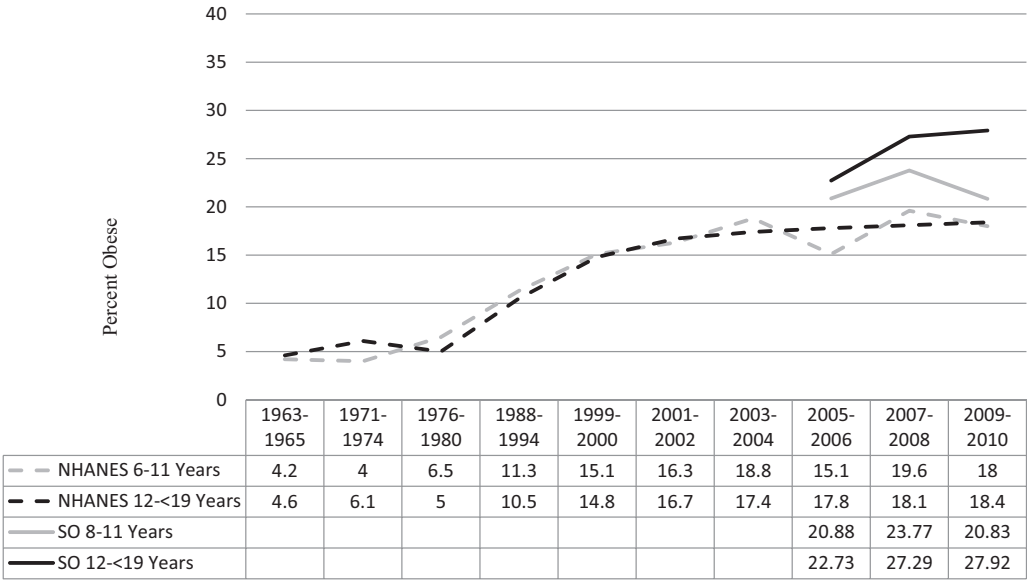
Table 2
BMI (percent and confidence intervals) of male and female Special Olympics International children and youth from 2005 to 2010.

	2005–2006		2007–2008		2009–2010	
	Observed (n = 685; 282 female)	95% CI	Observed (n = 734; 292 female)	95% CI	Observed (n = 1122; 440 female)	95% CI
Non-overweight						
12–<19 female	48.18%	41.92–54.43	41.13%	34.98–47.28	48.15%	42.91–53.39
12–<19 male	57.35%	52.13–62.57	53.85%	48.71–58.98	49.72%	45.56–53.90
8–11 female	71.43%	56.22–86.64	61.36%	46.79–75.94	56.18%	45.80–66.56
8–11 male	51.79%	38.56–65.01	50.00%	38.81–61.19	53.54%	45.80–66.56
Overweight						
12–<19 Female	24.29%	18.92–29.66	27.83%	22.22–33.42	23.07%	18.66–27.50
12–<19 male	23.34%	18.88–27.81	21.43%	17.20–25.66	22.88%	19.39–26.38
8–11 female	8.57%	0.00–17.99[a]	18.18%	6.63–29.73	24.41%	16.90–31.92
8–11 male	26.79%	15.06–38.51	24.36%	14.76–33.96	24.72%	15.70–33.74
Obese						
12–<19 female	27.53%	21.94–33.12	31.05%	25.27–36.82	28.77%	24.02–33.52
12–<19 male	19.31%	15.14–23.47	24.73%	20.28–29.17	27.39%	23.67–31.10
8–11 female	20.00%	6.53–33.47	20.45%	8.38–32.53	19.10%	10.88–27.32
8–11 male	21.43%	10.57–32.29	25.64%	15.87–35.41	22.05%	14.80–29.29

[a] If the confidence interval included a negative number it was replaced with a 0.



	1963-1965	1971-1974	1976-1980	1988-1994	1999-2000	2001-2002	2003-2004	2005-2006	2007-2008	2009-2010
NHANES 6-11 Years	4.2	4	6.5	11.3	15.1	16.3	18.8	15.1	19.6	18
NHANES 12-<19 Years	4.6	6.1	5	10.5	14.8	16.7	17.4	17.8	18.1	18.4
SO 8-11 Years								20.88	23.77	20.83
SO 12-<19 Years								22.73	27.29	27.92

Fig. 1. Obesity prevalence of young SO Athletes (SO) and the general population (NHANES). In both the 2007–08 and the 2009–10 data cycles there were a significant differences between the 12 and <19 year old SO participants and representative data from NHANES.

4. Discussion

This is the first study to investigate BMI trends over time of children and youth with ID. Overall, the prevalence of overweight and obesity was high among children and youth with ID during the period 2005–2010. Compared with the last six years of NHANES data (2005–2006, 2007–2008 and 2009–2010) (Ogden et al., 2010, 2012); children with ID aged 8–11

Table 3
Waist circumference (cm) by BMI status of 18-year-olds with ID.

	Non-overweight		Overweight		Obese	
	Mean	SD	Mean	SD	Mean	SD
Female (n = 60)	65.07**	24.51	79.31	20.25	97.79***	28.93
Male (n = 79)	72.49**	19.21	88.71	23.46	93.88	34.93

** p = <.01 non-overweight vs overweight.
*** p = <.01 non-overweight vs obese.

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years had similar rates of obesity; whereas the prevalence of obesity among youth aged 12 through <19 with ID was significantly higher than the general population. With the current prevalence of overweight/obesity levels (combined) over 35 percent in the 8 through 11 year olds with ID and over 45 percent among the 12 through <19 year olds with ID, there is reason for concern (Lloyd et al., 2012). These high levels of obesity can have serious health consequences (Ball & McCargar, 2003; Tremblay et al., 2010); and children and youth with ID aged 12 through <19 years may be at even more risk for secondary health conditions than the general population (e.g. fatigue, pain, deconditioning, social isolation, difficulty performing activities of daily living) (Rimmer et al., 2010). This result indicates that there is a need for health promotion initiatives, including healthy nutrition practices and a physically active lifestyle for individuals with ID, and their caregivers, starting at a very young age to attempt to prevent the onset of overweight, obesity and overall promotion of health.

In terms of trends over time, the population with ID were similar to the general population demonstrating possible stabilization of high BMI rates in recent years (Ogden et al., 2012). There was no difference in the prevalence of obesity for children and youth with ID across the time-frame – neither a significant increase, nor decrease. Of concern though, is the high incidence of obesity overall. The logistic regression revealed that age was not a predictor of obesity, contrary to other studies (Lloyd et al., 2012); however the youth in this study were significantly more obese than the general population from the NHANES data. Boys (8–11 years) were more likely to be obese than girls in this study which is also not consistent with previous findings where girls and women with ID are more likely to be overweight and obese in international samples (Lloyd et al., 2012; Temple et al., 2013). This might be explained by the overall small sample in the child group in this analysis ($n = 429$), and subsequently smaller sample of girls. More research is needed to further understand why boys or girls might be more likely to be obese and to understand the relatively low numbers of girls and women participating in Special Olympics.

The participants with ID in this study were Special Olympics athletes, and therefore it is possible that the higher BMI's could be attributed to higher muscle mass due to continued participation in sport. However, our analysis of the waist circumference on a sub-set of the sample indicates that the waist circumferences increased along BMI categorization (Table 3). Therefore it can be concluded that the high BMI's found in this sample are likely not associated with high muscle mass. The high waist circumferences of participants in the overweight and obese categories in this sample put them at increased risk for other cardio-metabolic health conditions (Taylor & Hergenroeder, 2011).

It is a limitation of this study that the participants were all Special Olympics athletes and therefore likely represent the higher end of the physical activity spectrum; suggesting that the obesity problem in this population may in fact be greater than reported here. However, height and weight were directly measured by trained professionals increasing the confidence in the data. Additionally the NHANES data on a national representative sample of American children and youth could also include children with ID; it is not possible to know how large this sample is. However, people with ID are often under-reported, excluded or not purposefully sampled in large national health surveys (CDC/NCBDDD, 2009); therefore it is not likely that the NHANES sample included many children and youth with ID. Despite the limitations, this is the first study to examine BMI trends overtime in children and youth with ID in the USA over time.

One of the Healthy People 2010 goals was to eliminate health disparities (United States Department of Health and Human Services, 2000). This study provides evidence that for people with ID, who experience high rates of health disparities (Krahn et al., 2006), this goal was not met in terms of obesity. Although our data indicates that obesity rates have not significantly increased from 2005 to 2010 for children and youth with ID, the prevalence of obesity is higher than the rest of the population in the USA. It is clear that more health initiatives that target obesity prevention and health promotion strategies are needed for people with ID; particularly children and youth with ID, and their caregivers if we are to prevent this trend from continuing.

Conflict of interest statement

None of the 4 authors have a conflict of interest to declare.

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RESEARCH

Body Mass Index Trends Among Adult U.S. Special Olympians, 2005–2010

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This study examined temporal trends in body mass index (BMI) among United States adults with intellectual disability (ID) participating in Special Olympics from 2005 to 2010. In addition, the prevalence of obesity was compared with published National Health and Nutrition Examination Survey (NHANES) statistics. After data cleaning, 6,004 height and weight records (male = 57%) were available from the Special Olympics International Healthy Athletes Health Promotion database for the calculation of BMI. Rates of overweight and obesity were very high but generally stable over time. Compared with NHANES statistics, the prevalence of obesity was significantly higher for Special Olympics female participants in each data collection cycle. Integrated efforts to understand the social, environmental, behavioral, and biological determinants of obesity and among Special Olympics participants are needed.

Keywords: obesity, overweight, adults, temporal trends, intellectual disability

Body Mass Index (BMI) is an important health indicator and determinant of health for people with intellectual disabilities (ID; Sohler, Lubetkin, Levy, Soghomonian, & Rimmerman, 2009; van Schrojenstein Lantman-de Valk, Linehan, Kerr, & Noonan-Walsh, 2007). The relationship between BMI and mortality has been described as U-shaped; with elevated mortality rates among individuals with low and high BMIs (NHBLI, 1998). At the higher end, a BMI of ≥ 30 is used to denote obesity because this cut-off point is associated with high to very high disease risk (e.g., type 2 diabetes, hypertension, cardiovascular disease, impaired mobility)

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relative to normal weight individuals (McTigue, Hess, & Ziouras, 2006; NHBLI, 1998). Both high rates of obesity (Emerson, 2005; Rimmer & Wang, 2005; Sohler et al., 2009; Stedman & Leland, 2010; Temple, Foley, & Lloyd, 2013) and underweight (Bhaumik, Watson, Thorp, Tyrer, & McGrother, 2008; Molteno, Smit, Mills, & Huskisson, 2000) have been documented among adults with ID.

The Centers for Disease Control and Prevention and the National Center on Birth Defects and Developmental Disabilities have indicated that determining the relative health status of persons with ID in the United States (U.S.) is in important priority (CDC/NCBDDD, 2009). For BMI, the relative health status is unclear. In the U.S., rates of obesity in people with ID have been reported as higher than (Sohler et al., 2009) or equivalent to (Stancliffe et al., 2011) the general population. However, evidence from other parts of the world (e.g., the United Kingdom) suggests that adults with ID are more likely to be underweight than the general population (Bhaumik et al., 2008; Emerson, 2005) and that only women with ID have higher rates of overweight and obesity than the general population (Bhaumik et al., 2008; Melville, Cooper, McGrother, Thorp, & Collacott, 2005; Melville et al., 2008).

The available evidence on BMI status of adults with ID has been generally derived from small data sets, indirect measures, and one-time cross-sectional data. The largest study examining BMI derived from directly measured height and weight for U.S. adults with intellectual disabilities in the 1990s involved 329 participants (Rimmer, Braddock, & Marks, 1995) and since 2000, the largest sample has been 109 participants (Dixon-Ibarra, Lee, & Dugala, 2013). Studies with larger sample sizes have relied on medical or individual records or proxy reports from families, support providers or administrators (Henderson et al., 2008; Levy, Botuck, & Rimmerman, 2007; McDermott, Moran, Platt, & Dasari, 2006; Sohler et al., 2009; Stancliffe et al., 2011); and only one of these studies involved more than 700 participants (Stancliffe et al., 2011). Epidemiological evidence shows that height and weight are not regularly recorded by primary care physicians, even for patients who are obese (Booth, Prevost, & Gulliford, 2013) and that only 35% of the measurements of height and weight in family medicine clinics are obtained using a protocol (Greenwood, Narus, Leiser, & Egger, 2011). Evidence also shows that proxy respondents tend to underrate morbidity (Grootendorst, Feeny, & Furlong, 1997) and that self-report height and weight dramatically underestimate the prevalence of obesity among persons with disabilities (Rimmer & Wang, 2005). In addition to concerns about the lack of measured height and weight to calculate BMI, data collected at only one point in time precludes examination of temporal patterns and variations. Data that represents a snapshot at one time point limits our ability to examine the persistence or desistence of underweight, overweight, and obesity; and our ability to forecast future BMI status that may inform policy and practice (Chen, Coull, Waterman, Schwartz, & Krieger, 2008; Majer, Mackenbach, & van Baal, 2013).

For the U.S. general population, temporal trends in overweight and obesity have been examined from 1960 to the present (Flegal, Carroll, Kit, & Ogden, 2012; Flegal, Carroll, Kuczmarski, & Johnson, 1998; Flegal, Carroll, Ogden, & Curtin, 2010). These studies show that the prevalence of obesity changed little in the U.S. from 1960 to 1976–1980, but increased markedly for both sexes from 1976 to 1980–2000. Obesity prevalence estimates from the 1976–1980 National Health and Nutrition Examination Survey (NHANES) were 12.3% for men and 16.5% for

women; by 1999–2000 these estimates were 27.5% for men and 33.4% for women. More recently, the trend toward increasing obesity in the U.S. general population has leveled off (Flegal et al., 2012). Flegal and colleagues reported there was no significant increase in obesity in the U.S. adult population between the period 2003–2008 and 2009–2010; however the prevalence of obesity remained high in 2009–2010 (35.5% for men and 35.8% for women).

Special Olympics International (SOI) is a global not-for-profit sporting organization serving more than four million participants worldwide and half a million participants in the U.S. annually (Special Olympics, 2011). A person is eligible to participate in Special Olympics if he/she has an ID and is at least eight years of age (Special Olympics Inc., 2012); there is no upper age limit. An individual is considered to have an ID for purposes of determining his or her eligibility for Special Olympics if they meet any of the following requirements: (1) they have a cognitive delay as determined by standardized measures such as an intelligence quotient (IQ), (2) an agency or professional has determined the person has an ID in accordance with local policies, or (3) the person has functional limitations in both general learning (such as IQ) and in adaptive skills (Special Olympics Inc., 2012). An individual with ID may also have other mental or physical disabilities; however individuals' "whose functional limitations are based solely on a physical, behavioral, or emotional disability, or a specific learning or sensory disability, are not eligible to participate as Special Olympics athletes" (Special Olympics Inc., 2012, p.18).

SOI began offering free health screenings in 1997 called 'Healthy Athletes' at local, State/Provincial, National, and World Games. The BMI of adult Special Olympics participants derived from the Healthy Athletes database has been reported in two studies (Harris, Rosenberg, Jangda, O'Brien, & Gallagher, 2003; Temple et al., 2013). Temple and colleagues' cross-sectional study examined the BMI of adult Special Olympics participants by world region. These authors reported that among North American women ($n = 2890$), 24% were overweight and 52% were obese; and among North American men ($n = 3893$), rates of overweight and obesity were 30% and 39%, respectively. However, these North American data included data of athletes from Canada; and rates of overweight and obesity were not examined over time. The earlier cross-sectional study by Harris and colleagues examined the BMI of 1,749 Special Olympics athletes attending the 1999 and 2001 World Games. Thirty-three percent of adult athletes with a U.S. affiliation ($n = 443$) in the Harris et al. study were overweight and 32% were obese. These data were not stratified by sex and although Harris and colleagues reported that the majority of participants were 20–39 years of age, they did not specifically report the proportion of athletes who were 40 years or older or the upper age limit of participants.

The available evidence suggests that adults with ID in the U.S. and U.S. Special Olympics participants have high rates of overweight and obesity. However, it is unclear whether these rates are higher than the general population or whether rates have been stable over time. Identifying the relative prevalence of obesity among a sample of U.S. adults with ID compared with the general population is important because disparities may suggest systematic differences in health behaviors and health status. In keeping with these concerns, the aim of this study was to examine temporal trends in the prevalence of overweight and obesity among adult U.S. Special Olympics participants from 2005–2010, and these rates were compared with published NHANES statistics (Flegal et al., 2012; Flegal et al., 2010).

Method

This study was a secondary analysis of a de-identified SOI health promotion database. Data for this database were collected during free health screenings by volunteer clinicians using established SOI protocols (Special Olympics, 2007) at local, state, national, and international SOI events (see Table 1). The standard protocol for the height and weight station during the screenings requires one professional (e.g., physical therapist, kinesiologist, nurse, teacher) and two general volunteers. The professional is responsible for obtaining both the height and weight measures. For both measures, shoes, boots, caps, back packs, jackets, hair accessories, and other bulky items that interfere with measurement are removed, and the scale and stadiometer are placed on a flat and firm uncarpeted surface. Height is measured using a portable stadiometer to the nearest 0.1 cm. The stadiometer has a vertical rod with metric rule and a horizontal headboard that is easily moveable. Athletes are instructed or positioned so that they stand with their back against the measuring surface with feet flat on the floor and heels comfortably together; they are also asked to look straight ahead. Weight is measured using a digital weight scale to 0.1 kg.

The following variables were extracted from the database for U.S. participants: sex, date of birth, date of event (age calculated), height, and weight. BMI was calculated using the Quetelet index (kg/m^2) with the following descriptive cut-points: underweight <18.5, normal range 18.5–24.9, overweight 25.0–29.9, and obese ≥ 30 (World Health Organization, 2006). For community-dwelling adults with intellectual disability, BMI has been shown to have adequate concurrent validity with adiposity measured via dual-energy radiograph absorptiometry, accounting for 83% of the variance in total body fat (Temple, Walkley, & Greenway, 2010).

Data Cleaning and Analyses

Initially the database from SOI included 8,937 records of 20–59 year old adult athletes with a U.S. affiliation for the period 2005–2010. Data cleaning procedures, illustrated in Figure 1, were as follows: (1) identify multiple entries for one individual and delete duplicate or redundant entries. This was done by filtering data by sex, birthday, state, and name. For individuals who had multiple entries in one year and/or entries over multiple years, the last entry for an individual was

Table 1 The Proportion of BMI Records Obtained from Each Event Type

Event Type	Frequency	Percent	Cumulative Percent
Local	3,494	58.19	58.19
State	1,568	26.12	84.31
National	811	13.51	97.82
World	131	2.18	100.00
Total	6,004	100.00	

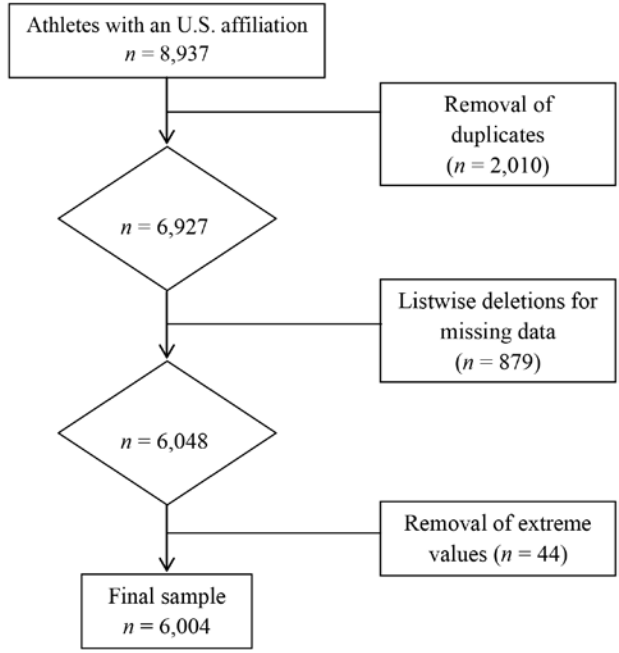


Figure 1 — Data cleaning procedure.

retained; (2) Listwise deletions were used when anthropometric, sex, or age was missing; and (3) The remaining data were examined and filtered to remove extreme values as identified in previous work (ALSWH, 2007; Das et al., 2005). The values for inclusion were height between 121.9 cm and 238.8 cm, and weight between 30.0kg and 317.5 kg.

A total of 6,004 (male = 57.01%) BMI records with a U.S. affiliation were available after data cleaning. To facilitate comparison with the published NHANES data (Flegal et al., 2012; Flegal et al., 2010), the SOI data were stratified by sex and the NHANES age band cut-offs (20–39 years and 40–59 years) were replicated. Sample sizes for the younger and older age-bands of SOI men were $n = 2{,}509$ and $n = 914$, respectively; and for the younger and older SOI women were $n = 1{,}916$ and $n = 665$, respectively. The NHANES sample sizes for those strata range from 883 to 1019 (Flegal et al., 2012).

Prevalence rates were calculated with confidence intervals for underweight, normal weight, overweight, and obesity for SOI men and women in both age bands within the following NHANES collection cycles: 2005–2006, 2007–2008, and 2009–2010. For SOI participants, chi-squared analyses and fisher exact test (when percentages were below 5) were used to examine temporal trends within each age band stratified by sex over the three 2-year cycles. Differences in BMI status among male and female SOI participants for each data collection cycle were also examined. Another series of chi-squared tests were employed to examine potential differences

in the prevalence of obesity between SOI data and the published NHANES data (Flegal et al., 2012; Flegal et al., 2010) for 2005–2006, 2007–2008, and 2009–2010. Data were analyzed using Strata/MP version 12 for windows (StataCorp LP, College Station, TX) and R version 2.12.2 (R Development Core Team, 2011).

When athletes register to participate in a Special Olympics games, they and/or their guardians sign a medical release/consent form (Special Olympics, 2007). As part of this document, separate consent is given for the Healthy Athletes screening which includes consent for the de-identified data to be used to report on the health of SOI athletes. Research ethics approval was also granted by each author's institution to conduct a secondary analysis of the de-identified data in the SOI database.

Results

BMI prevalence rates, stratified by age band and sex, are presented in Table 2. A 4 × 3 chi-square analysis was used to determine whether the proportion of SOI participants classified as underweight, normal weight, overweight, or obese differed between the three NHANES cycles. The obtained $\chi^2 = 26.62$, $df = 6$ for the overall model was significant at $p < .001$. There was no difference across time for men ($\chi^2 = 11.42$, $df = 6$, $p = .076$); although one specific difference was detected. Older men were significantly more obese in the 2009–2010 period compared with the 2005–2006 period (see Table 2). For women, the model (i.e., weight status by time) was significant ($\chi^2 = 19.30$, $df = 6$, $p = .004$). Fisher's exact tests revealed that compared with 2005–2006, the proportion of women classified as underweight was lower in 2007–2008 ($p = .004$) and in 2009–2010 ($p = .001$). Specific differences in underweight and normal weight for women by age band are shown in Table 2. There were no significant differences in overweight and obesity for women across time.

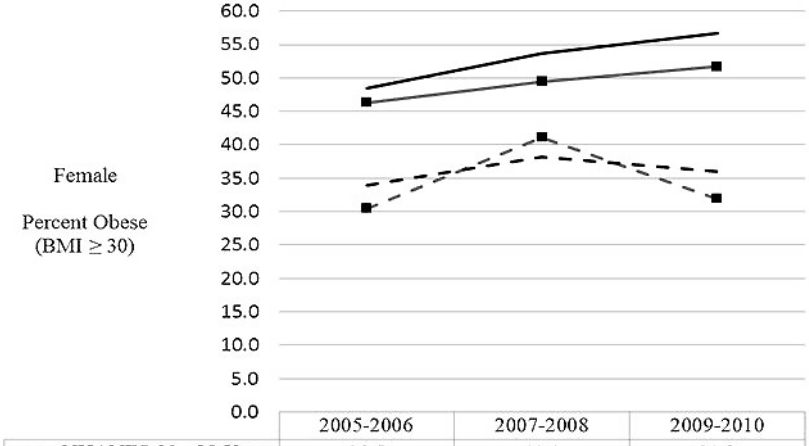
The BMI profile of female SOI participants differed appreciably from male Special Olympics participants (see Table 2). Women in both the younger and older age bands were significantly more obese than men in those age bands ($\chi^2 = 67.42$, $df = 1$, $p < .001$ and $\chi^2 = 24.15$, $df = 1$, $p < .001$; respectively). These sex-based differences in obesity were evident for both age bands in each data collection cycle. In contrast, the prevalence of overweight was significantly higher for men in both age bands: 20–39 years ($\chi^2 = 18.87$, $df = 1$, $p < .001$) and 40–59 years ($\chi^2 = 6.80$, $df = 1$, $p = .009$). However, these differences were not significant for the older adult group in 2005–2006 and 2009–2010 and the younger adult group in 2007–2008. With the exception of the younger adult group in 2005–2006 ($\chi^2 = 0.84$, $df = 1$, $p = .360$) and the older adult group in 2007–2008 ($\chi^2 = 0.0001$, $df = 1$, $p = .994$), the prevalence of normal weight was also significantly higher for males. A Fisher's exact test revealed there was no overall sex-based difference in the prevalence of underweight ($p = .410$).

Figure 2 compares rates of obesity of SOI participants with published the NHANES data (Flegal et al., 2012; Flegal et al., 2010). Chi-square analyses revealed that the prevalence of obesity was significantly higher among Special Olympics females compared with the national data in both age bands for each data collection cycle, except for the younger group of women in 2007–2008 ($p = .088$). Among males, only two differences between SOI participants and the published NHANES data were noted. The prevalence of obesity was significantly higher among SOI males aged 20–39 years in the 2005–2006 and 2007–2008 data collection periods ($p = .039$ and $p = .004$, respectively).

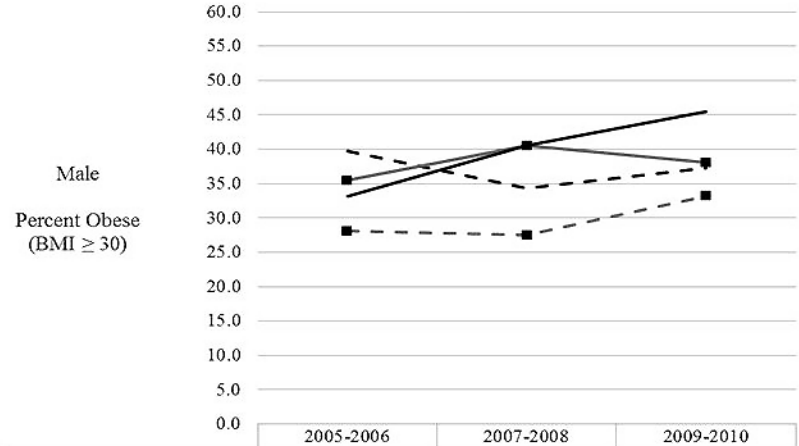
Table 2 BMI (Percent and Confidence Intervals) of Male and Female Special Olympics International Adults From 2005 to 2010

	2005–2006		2007–2008		2009–2010	
	Observed (*N* = 1,242)	95% CI	Observed (*N* = 1,617)	95% CI	Observed (*N* = 3,145)	95% CI
Underweight						
20–39y Male	4.20%	2.51–5.89	2.73%	1.49–3.98	2.92%	2.00–3.83
20–39y Female[ab]	4.71%	2.69–6.72	2.03%	0.78–3.27	2.30%	1.37–3.24
40–59y Male	3.52%	0.48–6.57	1.40%	0.03–2.76	1.03%	0.13–1.93
40–59y Female[b]	3.91%	0.53–7.28	0.56%	-0.05–1.65	0.56%	-0.02–1.33
Normal Weight						
20–39y Male	28.52%	24.73–32.31	28.83%	25.37–32.30	27.63%	25.20–30.06
20–39y Female	25.88%	21.71–30.06	21.50%	17.87–25.13	22.34%	19.76–24.93
40–59y Male	28.17%	20.74–35.60	22.38%	17.54–27.22	21.81%	18.13–25.49
40–59y Female[c]	16.41%	9.96–22.85	22.35%	16.22–28.47	14.80%	11.11–18.49
Overweight						
20–39y Male	31.81%	27.90–35.72	27.92%	24.49–31.35	31.40%	28.87–33.91
20–39y Female	23.06%	19.05–27.07	26.98%	23.05–30.90	23.65%	21.01–25.29
40–59y Male	35.21%	27.32–43.10	35.66%	30.10–41.23	31.69%	27.54–35.83
40–59y Female	31.25%	23.18–39.32	23.46%	17.23–29.69	27.93%	23.28–32.59
Obese						
20–39y Male	35.47%	31.45–39.48	40.52%	36.76–44.27	38.07%	35.43–40.70
20–39y Female	46.35%	41.60–51.10	49.49%	45.07–53.91	51.70%	48.60–54.81
40–59y Male[b]	33.10%	25.32–40.87	40.56%	34.85–46.26	45.47%	41.04–49.91
40–59y Female	48.44%	39.74–57.14	53.63%	46.30–60.96	56.70%	51.56–61.85

Note. [a] Significant difference ($p < .05$) between the 2005–2006 and 2007–2008 data collection cycles; [b] Significant difference ($p < .05$) between the 2005–2006 and 2009–2010 data collection cycles; [c] Significant difference ($p < .05$) between the 2007–2008 and 2009–2010 data collection cycles.



	2005-2006	2007-2008	2009-2010
NHANES 20 - 39 Years	30.5	41.1	31.9
NHANES 40 - 59 Years	34.0	38.2	36
SO 20 - 39 Years	46.4	49.5	51.7
SO 40 - 59 Years	48.4	53.6	56.7



	2005-2006	2007-2008	2009-2010
NHANES 20 - 39 Years	28.1	27.5	33.2
NHANES 40 - 59 Years	39.7	34.3	37.2
SO 20 - 39 Years	35.5	40.5	38.07
SO 40 - 59 Years	33.1	40.6	45.47

Figure 2 — Prevalence of obesity among U.S. Special Olympics participants compared with U.S. NHANES adult data.

Discussion

Our aim was to examine temporal trends in the prevalence of overweight and obesity among male and female U.S. Special Olympics participants from 2005–2010, and compare the rates of obesity to published NHANES statistics. The prevalence of obesity was high among U.S. Special Olympics participants in each time period, but similar to the general population (Flegal et al., 2012) there were very few changes across the three data collection cycles examined. These findings are both encouraging and disappointing. Encouraging in the sense that rates of underweight, overweight, and obesity among SOI participants have not increased over the 2005–2010 period, but discouraging because the prevalence rates for overweight and obesity are very high.

Compared with published NHANES data, female SOI participants had significantly higher rates of obesity (BMI ≥ 30) than the U.S. national data for each time period (Flegal et al., 2012; Flegal et al., 2010) except for younger women in 2007–2008. The prevalence of overweight and obesity among male Special Olympics participants were similar to the NHANES national sample (Flegal et al., 2012); although higher rates of obesity were evident among 20–39 year old male Special Olympics participants in 2005–2006 and 2007–2008 time periods (Flegal et al., 2012). These findings support U.S. (Cotugna & Vickery, 2003; Stancliffe et al., 2011) and international studies (Bhaumik et al., 2008; Lahtinen, Rintala, & Malin, 2007; Melville et al., 2005; Melville et al., 2008; Temple et al., 2013) that demonstrate higher rates of overweight and obesity among women with ID. It is unclear why female U.S. Special Olympics participants, but not male participants, have a higher prevalence of overweight and obesity than the general population. Participation in physical activity tends to be low among a majority of adults with ID (Temple, Frey, & Stanish, 2006), but there is no evidence to suggest sex-based differences in the U.S. for adults with ID (Peterson, Janz, & Lowe, 2008) or internationally (Temple, 2010). On the intake side of the energy-balance equation, unbalanced dietary intake (Draheim, Stanish, Williams, & McCubbin, 2007; Sohler et al., 2009; Soler Marin & Xandri Graupera, 2011) and eating dysfunction (Hove, 2007; O'Brien & Whitehouse, 1990) have been documented in among adults with ID. Hove (2007), for example, reported that 27.7% of adults with ID ate too fast, 25% 'bolted' their food, and 18% ate excessively. But as with physical activity, differences in eating patterns of men and women with ID have not been detected; nor have sex-based differences in overall energy balance been investigated. As Rimmer and Hsieh noted for the 2011 State of Science Conference on Lifespan Health and Function of Adults with Intellectual and Developmental Disabilities " . . . there are no studies that have examined the potential causative factors associated with this higher rate of obesity in women with ID" (Rimmer & Hsieh, 2011, p.14). A comprehensive research paradigm is needed to understand the determinants of obesity (Bouchard, 2007). Bouchard's hierarchical model of the relationships among four major classes of determinants of energy-balance (built environment, social environment, behavior, and biology) may assist in efforts to comprehensively investigate this problem. Bouchard posits that an obesogenic environment (both social and built)

influences the adoption and maintenance of obesogenic behaviors; and these behaviors are influenced and mediated by biological traits. This suggests that research investigating obesity among adults with ID in general, and sex-based differences in particular, should concomitantly consider the living circumstance, physical activity and eating behaviors, and aspects of biological functioning such as medication use, satiety, and metabolic rate.

There are limitations to this study that should be noted. Information such as the etiology of ID, levels of support needed, comordities, associated health conditions, and living arrangement were not part of the health promotion database; therefore these factors could not be examined. This is consistent with the philosophy of Special Olympics where all individuals regardless of diagnosis or level of functioning compete together. It is also important to mention that the data for this study were not randomly selected from the general population of adults with ID, but derived from measured height and weight during Special Olympics health screenings. The participants in this study were largely competing at local and state events; however 15% of the sample was derived from national or international events. It is therefore possible our findings are more positive than for adults with ID who do not participate in Special Olympics. This inference is consistent with Draheim, Williams, and McCubbin's (2003) findings that the cardiovascular disease risk profile of active Special Olympics participants was more favorable (lower diastolic blood pressures, percent fat, triglycerides, and insulin) than active adults with ID who were not Special Olympics participants. Finally, although there is a standard SOI protocol for measuring height and weight; the Clinical Director's guide (Special Olympics, 2007) does not mandate a particular manufacturer for the digital scale or the stadiometer. However, as the Healthy Athletes database includes only measured height and weight, the concern about measurement error from this source is somewhat outweighed by Rimmer and Wang's (2005) finding that self-report BMI data underestimate the prevalence of obesity among persons with a disability by 60%.

Notwithstanding these limitations, it is evident that the prevalence of overweight and obesity were persistently high among U.S. Special Olympics participants and efforts to understand the determinants of obesity and ways to promote healthy weight status must increase, particularly for women. Health professionals, including primary care physicians, public health officials, and health professionals in schools and residential settings all have a role to play in the health promotion of adults with ID. SOI also has the potential to play an important role in such health promotion efforts. As an organization, SOI has extensive reach within the community and the capacity to connect directly with participants, coaches/volunteers, and families to deliver targeted primary or secondary health promotion interventions focusing on healthy weight status. Alternatively, SOI could be part of a more integrated approach to reducing obesity and the risk of obesity. The World Report on Disability (World Health Organization, 2011) recommends enhancing the integration and coordination of education, community-based, and social services to improve health outcomes for individuals with disabilities. Although the integration of services presents logistical challenges that are still begin developed (World Health Organization, 2011), approaches to obesity prevention that take into account the multiple social contexts of adults with ID are more likely to be enduring.

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Budget (funds requested from CIHR: $10,000)

Expense	Description	Amount requested from CIHR
Meeting Room and catering 1 day	Room with breakfast, lunch, and 2 snacks +13% HST	$904
Meeting Facilitation	Stephen Grundy, Life Unplugged Inc. Preparation, Facilitation, Report	$3060
Air Fare to Toronto for Meeting	$1000 x 5 participants from outside Central Canada	$5,000
Mileage	$0.40/km for participants from within 2 hour driving distance of Toronto : approximately 450km total	$180
Hotel	5 rooms x $105/night + 13% HST	$593.25
Ground Transportation	Free 24/7 shuttle from airport to hotel	$0
Food	Per diem for food - 2 dinners (2 x $50) x 5 people who flew to meeting)	$500
	Total requested from CIHR	$10,000
	Dr. Lloyd’s research funds to cover balance	$237
Total Budget		$10,237

Budget Justification

Meeting Room $904
Please see quote from the 4 Points Sheraton Toronto Airport Hotel. The room for the one day meeting includes breakfast, lunch and 2 snacks in addition to the room. The hotel provides free wifi in the entire hotel and all audio visual equipment will be supplied by UOIT.

Meeting Facilitation $3060
Life Unplugged Inc. is a consulting firm specializing in meeting facilitation whom we (Dr. Lloyd) have worked with effectively in the past. Steve Grundy has provided a detailed quote outlining the services his company will provide. Note takers will be supplied by UOIT at no cost.

Air Fare to Toronto $5,000
It is expected that 5 people will be travelling to Toronto for the meeting from outside central Canada Approximate airfare is estimated at 5 x$1000. Participants will be coming from several locations including Corvallis, Oregon; Victoria, British Columbia; Washington, DC; and several from the Toronto Region.

Mileage $180
Several participants will be travelling within a 2 hour driving distance from Toronto (e.g. McMaster University) and will therefore be reimbursed for their mileage at $0.40/km.

Participants from Toronto will also have their mileage to the hotel by the airport reimbursed. We have budgeted for a total of 850km.

Accommodations (Hotel) $ 593.25
It is expected that 5 participants will require 1 night in the hotel ($105/night) due to the distance travelled to Toronto. Other participants are residents of the Toronto area and will not require accommodation. Please see quote from the 4 Points Sheraton Toronto Airport Hotel. The hotel also provides a 24/7 airport shuttle negating the need for ground transportation.

Food $500
Several meals are included in the meeting room package; however there will be meals that are not included. A $50.00 per Diem/day for 5 participants is budgeted for (2 dinners while travelling) ($500).

February 10, 2014

Meghann Lloyd, PhD
Assistant Professor, Faculty of Health Sciences, UOIT
Research Associate Grandview Children's Centre
2000 Simcoe St N
Oshawa ON
L1H 7K4

Re: Request for Quotation – Facilitation and meeting report

Dear Dr. Lloyd

In follow-up to your request for a quotation, LifeUnplugged Inc. is pleased to submit this proposal to assist in efforts facilitate the your meeting.

Understanding of the Requirement

The "Maximizing the use of existing health databases for individuals with intellectual disabilities: Special Olympics International Healthy Athletes data" project will build active and meaningful collaborations amongst researchers, public health officials, community stakeholders, medical professionals, and knowledge users to promote the health of individuals with intellectual disabilities.

The first step of this project will be a comprehensive environmental scan to identify a) all sources of public health information on individuals with intellectual disabilities, and b) what gaps exist in current large-scale health surveillance for people with intellectual disabilities. The results of the environmental scan will provide the foundation for a meeting to discuss how to maximize the use of *available* large-scale health information – namely, the Special Olympics International Healthy Athletes database.

Special Olympics International has conducted more than 1 million health screenings on participants around the world for over 10 years with limited dissemination of the results. The outcome of the meeting will be a draft of a strategic analysis and dissemination plan that will inform future directions for the collection, analysis and dissemination of the Healthy Athletes data; and to draft recommendations regarding questions to be included in large-scale health surveys that would more accurately capture people with intellectual disabilities; and finally, draft at least one large scale secondary data analysis grant to disseminate the data already collected in the Healthy Athletes Database.

As part of these efforts, a consensus, planning meeting will be held in Toronto in 2014. The meeting requires an experience facilitator, who has expertise and extensive experience in developing consensus guidelines, documents and procedures in the health and disability sectors.

LIfeUnplugged is able, and enthused, to support you in this initiative. Should LifeUnplugged Inc. be selected to facilitate this project, we understand the following to be the key objectives:

- an initial scoping session with project leaders
- development of a detailed meeting agenda
- meeting preparation
- 1 day facilitation of the meeting
- Meeting summary deck

LifeUnplugged is committed to providing its clients with exceptional value. Our estimated level of effort is 3.6 days based on options below. The details of this estimated project cost are as follows:

		Level of effort in days	
Deliverable:	Sub Task	($850)	Total by Phase
Scoping of project	• meeting and discussion with project leaders	0.3	255
Develop Facilitation Approach and Agenda	• Draft facilitation approach and agenda	0.6	510
Meeting preparation	• Review relevant information as provided • Prepare delivery	0.5	425
Facilitation	• Leadership and moderation of agenda	1.0	850
Meeting review and debrief	• Meet with clients to reach consensus on approach and major content for the report	0.2	170
Meeting summary deck	• Draft • Receive client input • Revise and finalize summary deck	1.0	850
Total Fees (Excluding HST)	•	3.6	3060

Our consulting fee excludes HST, materials, travel, and accommodation costs. Travel, will be subject to your prior approval and travel expenses will be billed separately or paid for directly by the client. Translation is not included.

ASSUMPTIONS AND DEPENDENCIES

This proposal is based on the following assumptions and dependencies:

- The client will designate one person as the Project Authority. They will be responsible for the review and acceptance of all project deliverables and payment of invoices. As appropriate, the Project Authority will also provide ongoing direction and guidance and function as the key interface between the consultant and the Program.

- The client will assign someone to record the detailed notes from the meeting

- All deliverables will be produced in English unless specified in the level of effort above. Any additional translation costs will be borne by the client.

- The costs we have estimated are based on the described level of effort. Should the scope of work change, our estimated cost will be adjusted accordingly based on prior written agreement with you and current LifeUnplugged per diem rates. We have assumed that the project authority will be available to source specific information required by the consultant in a timely manner; if this is not possible, additional consulting level of effort may be required so as not to compromise the results of the assignment.

- Invoices will be submitted monthly. Travel – where required – is additional and is subject to the prior approval of the Project Authority, or will be paid directly by the Project Authority.

I would like to, again, extend my appreciation for the opportunity to offer our services and look forward to working with you and your colleagues.

Best Regards,

Stephen B. Grundy
President
LifeUnplugged

Four Points Toronto Airport
6257 Airport Road
Mississauga, ON L4V 1E4
Canada
Tel: 905-678-1400 Fax: 905-678-9130

Bill To:

University of Ontario Institute of Technology

Date: 06-Feb-14

Invoice No: PRO013114

Pro-Forma Invoice

REF:		Description			Amount	
		Accommodations	# Rms	Rate		
Thurs	21/08/2014	**Guest rooms**	5	105.00	$	525.00
Fri	22/08/2014	**Catering & Room Rental**			$	800.00
					$	1,325.00
		HST	13%		$	172.25
				TOTAL CHARGE:	**$**	**1,497.25**
				BALANCE DUE:	**$**	**1,497.25**

PROPOSAL FOR University of Ontario Institute of Technological

Friday, February 07, 2014

PROPOSAL FOR UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGICAL

Ms. Meghann Lloyd
Assistant Professor
University of Ontario Institute of Technological
2000 Simcoe St. N
Oshawa, ON L1H 7K4, Canada
905-721-8668

RE: University of Ontario Institute of Technological
Date: August 21st-22nd, 2014

Dear **Ms. Lloyd**,

Thank you for your interest and support of the Four Points by Sheraton Toronto Airport. We are delighted to have the opportunity to provide you with a proposal for your upcoming ***University of Ontario Institute of Technological Meeting*** on ***August 21st -22nd, 2014.***

The Four Points by Sheraton Toronto Airport is located conveniently across from Toronto Lester B Pearson International Airport, Terminal 3, Four Points by Sheraton Toronto Airport is the perfect full service hotel for business, convention and leisure guests.

As requested, the following has been held for your group until: February 26th, 2014

ARRIVAL: *August 21st, 2014.*
DEPARTURE: *August 22nd, 2014*

ROOMS:

	Thu 08/21
Non -Smoking Room	5

RATE:

Room	Single Rate	Double Rate
Non -Smoking Room	105.00	105.00

- Above rates are per room per night in Canadian Funds and do not include applicable taxes of 13% HST.

VALUE ADDS:

- Starwood Preferred Planner Points are applicable
- Discount on meeting room rental
- Free Wireless Internet access in all Guest Rooms, Meeting Spaces and Public Areas.
- Free local and 800/888 telephone calls.
- Free use of the Business Center (Outgoing Faxes will be charged).
- Free transportation to and from the Airport via our dedicated 24-hour shuttle service.
- Free use of our up-to-date recreational facilities that include an indoor pool, whirlpool, sauna, and fitness centre.

EVENT/MEETING AGENDA:

Please note the following meeting space has been reserved for your event. Please double check that all is in accordance to your needs and as per the discussion with the Sales Manager.

Date	Start Time	End Time	Function	Room	Setup	Agr	Room Rental
8/22/2014	12:00 AM	1:00 PM	Lunch Buffet Room	Niagara		15	
8/22/2014	7:15 AM	8:00 AM	Breakfast	Niagara		15	
8/22/2014	7:30 AM	8:00 AM	Meeting	Niagara	Boardroom	15	**$300.00 (Regular Price - $400.00)**
8/22/2014	3:15 PM	3:45 PM	Coffee Break	Niagara		15	

Based on your requirements for your upcoming meeting, the above space would be an ideal fit for your meeting on *August 22nd, 2014.*

Meeting Packages are available from $50.00 per person per day plus taxes and gratuities. The package includes breakfast, morning/afternoon break, lunch, flip chart, markers, ice water, note pads and pens. À la carte menus are also available.

Should the above meet your expectations, please sign this proposal back to our attention by February 19th, 2014 and we will proceed with a formal contract to your attention.

We thank you once again for the opportunity to host your upcoming event. Should you require any additional information please feel free to contact me and I will be happy to assist. Looking forward to working with you in the not too distant future.

Sincerely,

_____

Elisabete Rodrigues
Director of Sales and Marketing
D. 905-362-3659; Cell 647-330-8652

_____

Meghann Lloyd
Assistant Professor

_February 7, 2014_____

DATE

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