Examining the Use of the 2006 and 2007 World Health Organization Growth Charts by Family Physicians in British Columbia

by

Emily Marie Nicholson Rand
Bachelor of Science, Queen's University, 2010
Bachelor of Physical and Health Education, Queen's University, 2010

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Supervisory Committee

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Dr. Patti-Jean Naylor (School of Exercise Science, Physical and Health Education)
Supervisor

Dr. Kathy Gaul (School of Exercise Science, Physical and Health Education)
Departmental Member

Abstract

Supervisory Committee
Dr. Patti-Jean Naylor (School of Exercise Science, Physical and Health Education)
Supervisor
Dr. Kathy Gaul (School of Exercise Science, Physical and Health Education)
Departmental Member

Introduction: The epidemic of overweight and obesity both worldwide and in Canada is indicative of the need for proper growth monitoring beginning at birth. This study evaluated Family Physician's (FP) Level of Use (LoU) of the recommended 2006 and 2007 World Health Organization (WHO) Growth Charts for monitoring their paediatric patients' growth. It explored factors influencing LoU, utilizing the Diffusion of Innovations (DOI) theory and Ecological Framework for Effective Implementation (EFEI) as guiding models. FPs' awareness of resources to support paediatric weight management was also assessed.

Methods: A survey was distributed to FP in British Columbia (BC), Canada ($N = 2853$). The survey addressed provider and innovation characteristics, prevention delivery and support system factors, and barriers and facilitators to chart use. Correlations and multiple linear regression were used to determine correlates and predictors of LoU.

Results: Sixty-two surveys were returned (2.2%). WHO Growth Chart LoU was 80.4%. Six variables significantly predicted LoU, including age ($\beta = -.28$, $t = -3.15$, $p < .05$), practicing in Fraser Health Authority region ($\beta = -.24$, $t = -2.67$, $p < .05$), assessing head circumference of birth to two year olds ($\beta = .23$, $t = 2.45$, $p < .05$), perceived growth chart accessibility ($\beta = .39$, $t = 4.22$, $p < .05$) and compatibility ($\beta = .47$, $t = 5.27$, $p < .05$), and innovativeness ($\beta = -.37$, $t = -4.11$, $p < .05$). These variables accounted for 69% of the variance in LoU. The most commonly identified barrier and facilitator to chart use was related to the Electronic Medical Record (EMR) system. FPs' awareness of resources to support overweight paediatric patients was low.

Conclusion: The majority of FP in BC in this sample had adopted the WHO Growth Charts. The results showed partial support for DOI theory and EFEI derived factors. Despite a small sample size, the findings highlighted the importance of installing the charts in the EMR systems, and can provide a foundation for future public health dissemination efforts and research on medical guideline implementation.

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1.0 Introduction

1.1 Overview

The alarm surrounding the worldwide epidemic of unhealthy weights is indicative of the need for proper growth monitoring beginning at birth (Lau et al., 2007). It also necessitates the provision of efficacious programs to support those who may be at an increased health risk due to overweight or obesity (World Health Organization [WHO], 2000). Overweight and obesity, defined as "abnormal or excessive fat accumulation that may impair health" (WHO, 2013), are commonly classified by a weight-for-height measurement known as body mass index (BMI). While BMI may not correspond to the same degree of fatness in different individuals, it is the simplest and most useful population-level measure of growth status. In adults, a BMI of 25kg/m^2 or greater is considered overweight, and 30kg/m^2 or greater is considered obese (WHO, 2013). In general, worldwide obesity has more than doubled since 1980 (WHO, 2013), and in Canada, 59.9% of men and 45.0% of women aged 18 years and older had a self-reported BMI of 25kg/m^2 or greater in 2012 (Statistics Canada, 2013a).

Further cause for concern is the estimate of 40 million children worldwide under the age of five who were overweight in 2011 (WHO, 2013). According to the Canadian Health Measures Survey, 31.5% of Canadian children between the ages of five and 17 years old were overweight (19.8%) or obese (11.7%) between 2009 and 2011 based on the WHO BMI-for-age cut-off points (Roberts, Shields, de Groh, Aziz, & Gilbert, 2012). While these prevalence estimates were higher than those based on the International Obesity Task Force (IOTF) BMI-for-age cut-off points, at 16.4% for overweight and 8.4% for obesity (Roberts et al., 2012), and the United States (US) Centers for Disease Control and Prevention (CDC) cut-off points, at 28% combined (Shields & Tremblay, 2010), such estimates illustrate the urgent need for both the prevention and

management of childhood overweight and obesity.

Prevention and management of this issue is fundamental based on the number of physical and psychosocial health risks associated with unhealthy paediatric weights, such as diabetes mellitus type II, dyslipidemia, musculoskeletal disorders, asthma, sleep apnea, depression, increased stress and anxiety, and poor self-esteem (Dietz, 1998). A systematic review by Singh, Mulder, Twisk, Van Mechelen, and Chinapaw (2008) indicated that youth who are overweight or obese were at an increased risk of becoming overweight adults. Studies have shown a consistent tracking of higher BMI and adiposity in childhood to the presence of adulthood obesity in terms of both BMI and adiposity measures (Clarke & Lauer, 1993; Freedman et al., 2005; Reilly et al., 2003). It has been suggested that 40-70% of obese pre-pubertal children will become obese adults (Reilly et al., 2003). Obesity in adulthood can then increase the risk of numerous co-morbidities, such as gallbladder disease, diabetes mellitus type II, cardiovascular disease, osteoarthritis, respiratory dysfunction, chronic back pain, and a variety of cancers (Guh et al., 2009; Pi-Sunyer, 1993; Wellman & Friedberg, 2002).

In addition to these individual health risks, the estimated total national indirect and direct cost of obesity in Canada in recent years, including the costs associated with the chronic diseases that are consistently linked to obesity, has ranged from $4.7 to $7.1 billion (Public Health Agency of Canada and the Canadian Institute for Health Information [CIHI], 2011). The cumulative negative effects of this epidemic at both the micro and macro level therefore requires a change to, or an improvement in, what is currently being done to manage overweight and obesity.

Conducting proper growth assessments beginning at birth is a fundamental step in ensuring the attenuation of the complications of unhealthy, excessive weights later on in life.

Growth monitoring enables early identification of potential lifestyle or medical problems and allows for prompt action before a child's health is seriously compromised (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). It has also been recognized that addressing weight status and promoting healthy lifestyle habits in childhood continues to be the most viable option for controlling excessive weight, based on the evidenced difficulty of maintaining weight loss over time (Lyznicki, Young, Riggs, & Davis, 2001). As such, it appears prudent to do routine screening and monitoring of children's growth patterns.

A primary care practice is a critical setting in which to provide routine screening and monitoring, especially given the extensive contact that Family Physicians (FP) make with the general public. For instance in 2009, approximately 85% of Canadians over the age of 12 had a regular FP (Statistics Canada, 2009a), and in British Columbia (BC) specifically, approximately 46% of the population 12 years or older had consulted a FP three or more times in the previous year (Statistics Canada, 2005). In addition to these visits that can allow for routine growth monitoring, physicians serve as a particularly vital communication channel for disseminating important health and weight related information based on the large proportion of the public that they reach.

In addition to their widespread contact, it is also within a FP's scope of practice to monitor growth, discuss weight-related issues, and provide recommendations on health behaviours and weight management (Burke & Fair, 2003). Moreover, FP are perceived as highly credible sources for addressing and delivering health information, and patients want and expect to be counseled on issues related to weight control (Elley, Dean, & Kerse, 2007). The intimate nature of the primary care setting, which allows for trust and respect to be built between the patient and physician, is also particularly important (Lau et al., 2007). It has been shown that

overweight and obese youth were more likely to have negative perceptions of their physical appearance and felt less comfortable discussing weight-related issues with others that they were not at ease with (Breat, Mervielde, & Vandereycken, 1997). Thus, when a patient-provider relationship is established it can help foster discussions on weight and health behaviours that may otherwise be neglected. As noted by Rao (2008), "Family Physicians often have a longstanding relationship with patients built on trust and a knowledge of what makes each family unique. Therefore, they are in an ideal position to help children and families through the slow, incremental process of achieving or maintaining a healthy weight" (p. 61).

Despite the numerous potential benefits of paediatric growth monitoring by FP, national and international research indicates that there is an inadequate number of health professionals routinely assessing their patients' weights and growth status (Lau et al., 2007). As a result, they are unlikely to be well equipped to respond to or manage the paediatric overweight and obesity epidemic. Furthermore, it has been shown that even those who are screening are generally using inappropriate tools or guidelines to conduct these assessments (He, Clarson, Callaghan, & Harris, 2010; Huang et al., 2011). Thus, it has been suggested that effective assessment tools, referral resources, and system-level changes are urgently needed to address this health problem (He et al., 2010).

Several different sets of growth charts with reference cut-off points have been created to assess and monitor paediatric growth, and help determine the growth status of the individual (i.e. underweight, stunting, wasting, overweight, obesity). Growth charts are a simple tool to evaluate if children or youth are growing as they should, and are typically generated from population-level data allowing for a comparison of individuals of the same age and sex (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). While many countries have

created their own growth charts that represent the growth of children and youth in their nation, the CDC, IOTF, and WHO have produced separate references that have been most commonly adopted throughout the world. Despite the widespread use of these charts and cut-off points, a major limitation in their design was that they were all created as growth references as opposed to standards of optimal growth. As noted by de Onis (2011),

> A growth reference provides a basis for making comparisons but deviations from the pattern it describes are not necessarily evidence of abnormal growth. A standard, on the other hand, embraces the notion of a norm or desirable target, a level that ought to be met, and therefore is a more effective guide to, and evaluator of, interventions to improve healthy development and growth. (p. 250)

This limitation therefore warranted the creation of new growth charts and cut-off points that represent the optimal growth of children and adolescents. The WHO responded to this need by developing the 2006 Growth Standards for tracking the growth of children aged five years and younger (WHO, 2006). These charts are based on children raised according to current international health and nutrition recommendations, and are considered to be the gold standard for assessing the growth of young children as they represent the optimal growth pattern of healthy children. The WHO also produced the 2007 Growth References for tracking the growth of youth between the ages of five and 19 years old. These are considered to be closer to the optimal growth standards as data points for youth with measurements of high adiposity measurements were eliminated during chart development, thereby reducing the influence of rising obesity rates over time (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). Since both sets of these WHO Growth Charts are more representative of the current Canadian population, the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada, and Community Health Nurses of Canada

have recommended the adoption of these new charts by all Canadian primary care providers (PCP; Dietitians of Canada and Canadian Paediatric Society, 2010).

Examining the Level of Use (LoU) and the factors influencing the use of these recommended WHO Growth Charts by FP is important, as it will help describe common practice. The findings from this investigation could serve to direct these clinical practice guidelines (CPG), which represent standardized paediatric growth assessments. As noted by Field and Lohr (1992) "carefully developed guidelines for clinical practice can become part of the fabric of health care in this country and serve as important tools for many desirable changes" (p. 24). The benefits of CPG extend beyond their ability to decrease the financial costs associated with unnecessary, inappropriate or dangerous care. They also have the potential to improve the quality and measurement of clinical care and to support informed patient decision-making. Additionally, guidelines allow the opportunity to bring scientific evidence into practice and help enhance the provision of standardized care (Field & Lohr, 1992). However, research has shown that many guidelines are not widely adopted or implemented after passive diffusion to the appropriate health organizations and intended users (Field & Lohr, 1992). Furthermore, only a small amount of research findings are transferred to practice and policy in order to influence population health (Woolfe, 2008, as cited in Tabak, Khoong, Chambers, & Brownson, 2012).

Several studies have examined the dissemination, adoption, and LoU of CPG by PCP in various health care settings (e.g. Harder et al., 2007; Harting, Rutten, Rutten, & Kremers, 2009; Scott, Plotnikoff, Karunamuni, Bize, & Rodgers, 2008). In these studies, the CPG are typically viewed as an innovation, which refers to "an idea, practice, or object that is perceived as new by an individual or other unit of adoption…newness of an innovation may be expressed in terms of knowledge, persuasion, or a decision to adopt" (Rogers, 2003, p. 12). An innovation can also be

seen as "the intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society" (West, 1990, p. 309). In terms of the WHO Growth Charts, which are believed to represent an innovation, de Onis et al. (2012) surveyed health authorities globally to understand the worldwide implementation of the 2006 WHO Growth Standards. According to their results, 125 out of 180 countries had adopted the standards by April 2011, while an additional 25 countries were considering their adoption. While Canada was among one the 125 adopting countries, the reasons for adoption are less clear. There is currently a lack of research examining the implementation and LoU of the 2006 and 2007 WHO Growth Charts, specifically by FP in Canada as a nation and within each province. Although the 2006 and 2007 WHO Growth Charts were developed over seven years ago, it is believed that the intended users may view them as a new set of guidelines as they were recommended for national use by PCP in 2010 (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010).

Several large-scale reviews have examined a wide range of studies that are based on a number of different theories, frameworks, and models, and have identified common factors or constructs that affect the dissemination and implementation of an innovation (e.g. Damschroder et al., 2009; Durlak & DuPre, 2008; Tabak et al., 2012). While these reviews have categorized and labeled the influencing factors in various ways, typical classifications have included provider characteristics, innovation characteristics, community factors, organizational factors, specific practices and processes, and inner and outer settings.

In order to identify and understand the factors influencing FPs' LoU of the WHO Growth Charts, two models highlighted in the aforementioned reviews were chosen to guide the current

study. The Diffusion of Innovations (DOI) theory, which was popularized by Everett Rogers in 1962 and has had subsequent editions published in 1971, 1983, 1995, and 2003, was chosen as it aims to understand how, why, and by whom new ideas or practices are disseminated and adopted; it also focuses on specific innovation and provider characteristics that affect the diffusion process (Rogers, 2003). Previous studies examining the use of CPG in health care settings have used this theory to guide their research questions and data analysis, and found that it served as a useful and effective framework for providing in-depth insights into health professionals' opinions, attitudes, and behaviours in regards to CPG (Harder et al., 2007; Harting et al., 2009; Scott et al., 2008).

Durlak and DuPre's (2008) Ecological Framework for Effective Implementation (EFEI) was also used to guide this study as it aims to understand additional factors that may contribute to the level of innovation adoption, and captures the interaction between more of the influencing micro and macro level factors. Not only does this framework incorporate constructs found within the DOI theory, but it also encompasses the broader contextual factors that affect levels of adoption in a bidirectional manner such as community factors (i.e. policies, funding, incentives, and politics), the prevention delivery system (i.e. features related to organizational capacity), and the prevention support system (i.e. training and technical assistance). It is essential to consider these contextual factors and the interaction between the organizational factors, individual, and innovation characteristics based on the varied and difficult-to-generalize results that studying only adopter characteristics and role-specific influences can produce (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004). Although FP could be perceived as individual adopters/providers of care, they are to some extent still part of a larger organization whether that is the specific Health Care Team (HCT), Network, or Group Practice they belong to, or the

health care system at large. As such, it will be important to explore the influences that certain organizational factors have on the adoption and LoU of the WHO Growth Charts.

In BC, Canada, the 2006 and 2007 WHO Growth Charts were printed and distributed to Public Health (PH) units by the Ministry of Health (MOH) in Spring 2011, as well as to physician offices for uptake in January 2012 (M. Day, personal communication, March 19, 2012). Online training materials were also developed to support the uptake of these charts by the PH nurses and physicians, and were created collaboratively by Dietitians of Canada, in partnership with the Canadian Paediatric Society, the College of Family Physicians of Canada, Community Health Nurses of Canada, National Aboriginal Health Organization, Canadian Obesity Network, and NutriSTEP® (Dietitians of Canada, 2012). However, the MOH has no way to monitor the number of FP utilizing these growth charts in practice. Furthermore, there will not be a second print run of the growth charts and as such, health professionals that do not have the WHO charts embedded in their Electronic Medical Record (EMR) system will need to access and print out their own once the first print round has been exhausted. A low level of awareness of the locally, provincially, nationally, and internationally available overweight and obesity management resources may also be a major barrier to the adoption and utilization of these charts. In order to address this issue, a working group in BC has been developing a pathway for the identification, assessment, and management of overweight and obese children and youth, and the information gathered in this current study could help further inform the development of this pathway (Child Health BC, 2013).

1.2 Purpose of the Research

The purpose of this study was to evaluate the LoU of the 2006 and 2007 WHO Growth Charts by FP in BC, and to explore the major factors influencing their LoU by utilizing Rogers's

(2003) DOI theory and Durlak and DuPre's (2008) EFEI. This study also aimed to assess FPs' awareness of resources and initiatives that are available to support children and youth who are currently at, or at-risk of being, an unhealthy weight. This information is critical as it can provide insight into what needs to be done to ensure that the recommended WHO Growth Charts, and relevant referral programs, are available and utilized by FP across the province. If this is then accomplished, it will ideally increase the number of correct paediatric growth assessments and ongoing monitoring by FP, which is the necessary first step towards the prevention of overweight or obesity and identifying and addressing lifestyle behaviours that may need to be modified for optimal lifelong health.

1.3 Research Questions

1) What is the current LoU of the 2006 and 2007 WHO Growth Charts for assessing and monitoring paediatric growth by FP in BC?
2) What factors influence and predict LoU of the 2006 and 2007 WHO Growth Charts? These may include and be categorized (according to the DOI theory and EFEI) as:
    - Provider characteristics (i.e. FPs' demographics, practice information, concerns about paediatric overweight/obesity, innovativeness, cosmopoliteness, efficacy and outcome expectations, and barriers to use which include some community factors)
    - Perceived characteristics of the WHO Growth Charts (i.e. relative advantage, complexity, observability, trialability, compatibility, and accessibility)
    - Factors related to the prevention delivery system (i.e. general organizational factors, specific practices and processes, and specific staffing considerations)
    - Factors related to the prevention support system (i.e. training)
3) What are FPs' awareness levels of community, provincial, national, and international

resources and initiatives available to support paediatric patients who are currently at, or at-risk of being, an unhealthy weight?

1.4 Hypotheses

1) There will be no significant relationship between LoU and FPs' demographics and practice information.
2) There will be a significant, positive relationship between LoU and the following factors: FPs' concerns about the health consequences of paediatric overweight/obesity, efficacy and outcome expectations regarding paediatric growth and weight management, innovativeness, cosmopoliteness, the degree of perceived characteristics of the WHO Growth Charts (specifically relative advantage, observability, trialability, compatibility, and accessibility), the integration of new programming and shared decision-making within the HCT, the presence of an innovation champion, and engagement in pre-use training about the WHO Growth Charts.
3) There will be a significant, negative relationship between LoU and the following factors: the degree of perceived complexity of the WHO Growth Charts and the number of barriers to use of the WHO Growth Charts.

1.5 Operational Definitions

1) **Paediatric Population** (including terms such as infants, children, adolescents, and youth): Refers to those from birth to 19 years old; reflecting the ages encompassed in the WHO Growth Charts.
2) **Level of Use**: The extent to which the FP use the WHO Growth Charts in their practice, as measured by an adapted version of the Level of Use scale (Steckler, Goodman, McLeroy, Davis, & Koch, 1992).

3) **Innovation:** "An idea, practice, or object that is perceived as new by an individual or other unit of adoption…newness of an innovation may be expressed in terms of knowledge, persuasion, or a decision to adopt" (Rogers, 2003, p. 12)

4) **Provider Characteristics**:

Demographic and practice information: This includes gender, age, years practicing medicine, Health Authority (HA) region and community of primary practice, type of practice, approximate percentage of paediatric patients seen per week, measurements used to assess/monitor growth, use of an EMR system in practice, and the type(s) of growth charts used for measuring/monitoring paediatric growth.

Concerns about the health consequences of paediatric overweigh and obesity.

Innovativeness: The degree to which a FP is relatively earlier in adopting new ideas than other FP (Rogers, 2003).

Adopter categories: The classifications of FP on the basis of innovativeness, which includes: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards (Rogers, 2003).

Cosmopoliteness: The degree to which a FP is oriented outside of a social system, as determined by the number and type of communication channels and sources of information used (Rogers, 2003).

Efficacy expectations: FPs' confidence in educating their paediatric patients and their families on weight and growth-related issues (i.e. proper nutrition, physical activity [PA], and sedentary behaviours), and confidence in awareness of appropriate resources and programs for healthy weight management that are available for their patients.

Outcome expectations: FPs' confidence that their patients and families will be interested

in weight management advice if the patient is leaving the healthy weight trajectory, and confidence that educating their patients and families on healthy weight management will have a positive impact on their knowledge and attitudes about healthy weight practices (i.e. nutrition, PA, and sedentary behaviours).

Barriers to use: This includes community factors (i.e. policies, funding, and incentives) and personal factors (i.e. time, priorities, feasibility, relevance, and knowledge of the WHO Growth Charts).

5) **Perceived Characteristics of the WHO Growth Charts:**

Relative advantage: The degree to which the charts are perceived as better than other available growth charts (Rogers, 2003).

Complexity: The degree to which the charts are perceived as relatively difficult to understand and use (Rogers, 2003).

Observability: The degree to which the results of using the charts are visible to others (Rogers, 2003).

Trialability: The degree to which the charts may be experimented with on a limited basis (Rogers, 2003).

Compatibility: The degree to which the charts are perceived as consistent with existing values, past experiences, and needs (Rogers, 2003).

Accessibility: The degree to which the charts are easy to access for use in practice.

6) **Factors Related to the Prevention Delivery System:**

General organizational factors: The integration of new programming is the extent to which the organization/HCT can incorporate the WHO Growth Charts into its existing practices and routines (Durlak & DuPre, 2008).

Specific practices and processes: This refers to shared decision-making, which is the extent to which relevant parties (e.g. FP, administrators, researchers, and HCT leaders) collaborate in determining how the WHO Growth Charts will be implemented. It also includes communication, which refers to the effective mechanisms for encouraging frequent and open communication within and between health care organizations/HCTs (Durlak & DuPre, 2008).

Specific staffing considerations: This refers to the presence of an innovation champion, which is an individual who throws his or her weight behind an innovation (e.g. a new idea, practice, or object such as the WHO Growth Charts) by actively and enthusiastically promoting its progress through the critical organizational stages, thus overcoming indifference or resistance that the innovation may provoke (Rogers, 2003).

7) **Factors Related to the Prevention Support System:**

Training: Includes approaches to ensure FPs' proficiencies in the skills necessary to use the WHO Growth Charts and to enhance FPs' sense of self-efficacy (Durlak & DuPre, 2008).

1.6 Delimitations

1) The study was delimited to registered, practicing full or part-time FP in BC who self-identified as having paediatric patients in their practice.

1.7 Limitations

1) The use of self-report measures to collect data from the surveys could have resulted in recall or response bias (Thomas, Nelson, & Silverman, 2005).
2) There was the potential for response bias when assessing FPs' LoU of the WHO Growth Charts, as the FP were provided with a rationale for the development and use of these

charts in the Invitation to Participate.

3) The results of the study may only be generalizable to FP in BC.

1.8 Assumptions

1) Participants provided honest, truthful, and open answers to the survey.
2) That the sample of FP that responded was representative of the FP in BC.

2.0 Literature Review

2.1 Introduction

This chapter is composed of three major sections, and examines the importance of, and trends in, paediatric growth assessments and monitoring conducted by FP both nationally and internationally, the development and importance of utilizing the new WHO Growth Charts compared to other available growth charts, and the guiding frameworks used including Rogers's (2003) DOI theory and Durlak and DuPre's (2008) EFEI.

2.2 Growth Monitoring and Assessment Trends

According to the collaborative statement put forth by the Dietitians of Canada, the Canadian Paediatric Society, the College of Family Physicians of Canada, and the Community Health Nurses of Canada (2010), "growth monitoring is the single most useful tool for defining health and nutritional status in children at both the individual and population level" (p. 1). The reasoning for this is that disturbances in health and nutrition, regardless of their etiology, almost always affect growth. When these disruptions are detected early on, the individual and family can make small changes, which are likely to help prevent or attenuate further health complications from occurring. This collaborative statement also highlighted the core objectives and main activities linked to growth monitoring and the promotion of optimal health at the individual level. The overarching objectives include: (a) providing a tool for nutrition and health

evaluation of individual children; (b) initiating effective action in response to abnormal patterns of growth; (c) teaching parents how nutrition, PA, genetics, and illness can affect growth, in addition to motivating and facilitating individual initiative and improved child-care practices; and (d) providing regular contact with primary health care services and facilitating their utilization. The major activities needed to meet these goals include: (1) accurately measuring weight, length or height, and head circumference; (2) precisely plotting measurements on the *appropriate, validated growth chart*; (3) correctly interpreting the child's growth pattern; (4) discussing the child's growth pattern with the parent(s)/caregiver and agreeing on subsequent action when required; and (5) providing on-going monitoring and follow-up, when required, to evaluate the response to the recommended action to improve the child's growth.

Despite the importance of these objectives and activities, it has been found that they are usually not met or completed by PCP, and that patterns of weight gain and abnormal growth generally go undetected and undiagnosed for a variety of reasons (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). These reasons include: some infants and children are not routinely weighed and measured at their regular health care visits, while others see a health professional only for acute care and may not be measured at all; measurements that are taken incorrectly, plotted on a growth chart inaccurately, or not plotted at all may lead to flawed interpretation of growth patterns and missed or unwarranted referrals; and that regular growth assessments are ineffective for improving a child's health unless what is revealed by the growth monitoring is discussed with the family, and information about departures from the typical growth pattern is used to reinforce or motivate positive nutritional and healthy lifestyle practices.

Previous research investigating growth assessment and monitoring trends by FP and other

PCP has provided evidence supporting the aforementioned reasons for incomplete or inaccurate assessments, monitoring, and counseling. Overall, the majority of these studies have found that an insufficient number of health care providers use the proper screening techniques and/or provide the necessary behavioural and lifestyle counseling to their paediatric patients that are classified as overweight, obese, or at-risk (Lau et al., 2007). Huang et al. (2011) evaluated the counseling and management of diet, PA, and weight status among paediatric patients through a cross-sectional National Survey of Energy Balance-Related Care among Primary Care Physicians (EB-PCP) that was sent to a systematic stratified sample of American PCP in family practice, internal medicine, obstetrics/gynecology, and paediatrics. While findings indicated that 97.9% of all PCP measured patients' weight and height regularly, only 38.5% of FP and 68% of the paediatricians regularly assessed obesity status by BMI percentile. Overall, paediatricians were more likely than FP to provide obesity-related behavioural counseling or specific guidance on nutrition and PA for their patients. However, only 18.3% of all PCP reported always or often referring patients for further evaluation and management, and only 42.0% reported systematically tracking patients over time. The PCP also indicated a need for increased provision of clinical guidelines and physician training, as these along with discomfort about weight related issues and stigma, time constraints, and reimbursement concerns, were all cited as potential barriers to assessing and managing unhealthy weights in their paediatric population.

Another American study conducted by Rausch, Perito, and Hametz (2011) sent a cross-sectional, self-administered survey to 117 eligible general paediatric, family medicine attendings (i.e. fully-licensed physicians who have completed all clinical training and oversee medical students, residents, and fellows [American Medical Association, n.d.]) and resident physicians to examine their attitudes, practices, and knowledge of obesity screening, prevention, and

treatment. The authors specifically wanted to see if current practices were consistent with the 2007 American Medical Association (AMA) and CDC Expert Committee Recommendations to use the CDC Growth Charts and guidelines. They also wanted to determine if there were differences between providers at different levels of training and in different primary specialties. Results showed that of the 96 respondents, all reported checking height and weight at least yearly. The majority also indicated checking BMI and BMI percentile, at 90% and 78%, respectively, and it was found that these percentages did not differ based on year of training or specialty. Despite the high reported use of BMI, there was a very low percentage of providers accurately quoting BMI percentiles and using the correct BMI percentile cut-off points for overweight and obesity identification; less than half of the attending physicians and less than 10% of interns and residents used the recommended CDC criteria for identifying children who were overweight (24.7%) and obese (34.4%). Furthermore, although most providers felt comfortable counseling patients and their families on the prevention of overweight and obesity, the majority felt that their counseling was ineffective. There was also considerable variability in reported practices of lab screening and referral patterns of overweight and obese children and as such, it was recommended that more efforts were warranted to standardize providers' approaches to overweight and obese children.

These findings share similarities and differences with a Canadian study conducted by He et al. (2010). In this study, a stratified random sample of 1200 Canadian FP and 1200 community paediatricians (CP) were surveyed about their views, practices, challenges/barriers, and needs regarding obesity identification and management. The results revealed that of the 464 FP and 396 CP respondents, almost all considered the issue to be very important, however, unlike in the previous American studies, only a small proportion of the FP routinely assessed weight or

monitored their patient's growth. It was also found that professional judgment influenced if, when, or how the weight assessment was conducted 90% of the time, and similar to the previous research, only approximately 30% of the FP used the recommended CDC's BMI-for-age reference to guide their assessments. Another similar finding was that although more than 85% and 98% reported providing dietary and exercise advice, respectively, less than 22% perceived their advice to be successful in treating paediatric obesity. Furthermore, at least 50% of practitioners indicated that too few government-funded dietitians, a lack of success in controlling paediatric patients' weights, time constraints, and limited training were key barriers to their success. They also identified the need for office tools, patient educational materials, and system-level changes in order to help deal with this issue.

Although these studies are limited by their self-report measures and have conflicting results in the number of FP regularly assessing and monitoring their paediatric patients' weights and growth, an underlying commonality has been the use of inappropriate guidelines to accurately identify children and adolescents who are overweight or obese. As noted by Rausch et al. (2011), it is important to have clinical standardization because providers are typically not good at estimating overweight and obesity based on clinical judgment. Since no studies have specifically examined the use and awareness of the newly recommended 2006 and 2007 WHO Growth Charts by Canadian FP, it will important to understand their views and attitudes towards paediatric overweight/obesity, and the key determinants influencing the LoU of these charts.

2.3 The 2006 & 2007 WHO Growth Charts

Prior to the development of the 2006 and 2007 WHO Growth Charts, two other sets of sex- and age-specific reference values have been most frequently used in Canada to assess weight and growth patterns in children and adolescents (Shields & Tremblay, 2010). The growth

curves developed by the American CDC in 2000 were derived from five nationally representative cross-sectional surveys conducted in the US between 1963 and 1994. According to the associated cut-off points for children and adolescents between the ages of two and 19 years old, overweight was defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex, and obesity was defined as a BMI at or above the 95th percentile (CDC, 2011). In 2000, the IOTF also gathered an expert committee to develop sex- and age-specific BMI curves that were based on data collected between 1963 and 1993 from nationally representative cross-sectional surveys of children and youth in Brazil, Great Britain, Hong Kong, the Netherlands, Singapore, and the US (Shields & Tremblay, 2010). Due to the uncertainty of BMI measures associated with health risks in youth compared to those known in adults, the paediatric curves and corresponding cut-off points for overweight and obesity were then developed by extrapolating the adult cut-off points of 25 and 30 kg/m^2, and ensuring that the youth curves were plotted in order to intersect these adult points at age 18.

The 2006 WHO Growth Standards and the 2007 WHO Growth References have important differences compared to the approaches used to develop the previous CDC and IOTF growth charts and reference values/data sets. The 2006 WHO Growth Standards were created from data collected in the Multicentre Growth Reference Study (MGRS), which was conducted between 1997 and 2003, and based on a sample of children up to the age of five from designated areas of Brazil, Ghana, India, Norway, Oman, and the US. Children in this study were intentionally exposed to conditions that promote optimal growth and development such as access to health care, basic immunizations, breastfeeding, transition to a proper diet, and a non-smoking mother (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). As such, the curves represent a desired standard of growth as opposed to a description of a

reference population, which was used to develop the other charts and cut-off points (Shields & Tremblay, 2010). While the data was collected on children from birth to five years old, the actual growth charts are divided into two age categories of birth to 24 months, and two to 19 years old. For birth to 24 month olds, there are sex-specific charts for the measurements of weight-for-age, length-for-age, head circumference, and weight-for-length. For two to 19 year olds, there are sex-specific charts for the measurements of weight-for-age (up to 10 years old), height-for-age, and BMI-for-age. Appendix A provides examples of the WHO weight-for-length charts for girls between birth and 24 months old, and the WHO BMI-for-age charts for girls between two and 19 years old. According to the cut-off points for the Growth Standards, which are to be used as guidance for additional assessment, referral, or intervention and not used as specific diagnostic criteria, children of the same sex between birth and 24 months old with a weight-for-length between the 85th and 97th percentile could be at-risk for overweight, while those between the 97th and 99.9th percentile could be overweight, and those above the 99.9th percentile could be obese (Dietitians of Canada and Canadian Paediatric Society, 2010). Appendix B contains the percentile cut-off points using the appropriate measurement indicators for both growth chart age categories. The rationale for now recommending the 2006 WHO Growth Standards compared to the existing ones can be summarized by the advantages in that they were developed based on: longitudinal growth monitoring versus cross-sectional data, an international sample population, having breastfeeding as the norm, eliminating the influence of the obesity epidemic by excluding data points in the extreme percentiles which skewed the curves, validation with subjective assessments by health care professionals, and being growth standards versus growth references (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010).

As it was acknowledged that a similar study to the MGRS would be impossible to conduct with older children based on the challenges in controlling the environmental dynamics, the WHO constructed the 2007 Growth References for pre-adolescents and adolescents using the best available historical data, which was deemed to be from the 1977 American National Centre for Health Statistics (NCHS; Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). The reconstruction of these references included addressing their shortcomings and linking the references to the 2006 WHO Growth Standards in order to produce smooth and well-transitioned growth curves between these age categories. In addition to the large sample size of 22,917 children that was used to generate the curves, data points for children and adolescents with measurements of high adiposity were eliminated, thereby reducing the influence of rising obesity rates over time. Thus, the construction of these charts were based on healthy growth which moves the curves closer to a standard as opposed to a reference, and is of particular importance based on the current childhood obesity epidemic. According to the cut-off points for these growth references, children and adolescents of the same sex between the ages of two and 19 years old with a BMI between the 85th and 97th percentile could be overweight, while those between the 97th and 99.9th percentile could be obese, and those above the 99.9th percentile could be severely obese (Dietitians of Canada and Canadian Paediatric Society, 2010; see Appendix B). Although these 2007 Growth References are also based on cross-sectional data collected only from the US like the CDC growth charts, they are still said to be superior based on the fact that they have been updated to address the obesity epidemic and allow for smooth transitioning from the younger growth charts (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010).

Studies conducted both nationally and internationally have examined paediatric growth and prevalence estimates of growth status (i.e. underweight, stunting, wasting, overweight, and obesity) using the 2006 WHO Growth Standards compared to the 2000 CDC and 1977 NCHS growth curves for weight-for-age, length/height-for-age, weight-for-length, weight-for-height, and BMI-for-age (e.g. de Onis, Garza, Onyango, & Borghi, 2007; Nash, Secker, Corey, Dunn, & O'Connor, 2008; van Dijk & Innis, 2009). Some studies have also evaluated the growth performance of healthy breast-fed infants according to the WHO standards and the CDC charts. De Onis et al. (2007) compared the WHO and CDC Z-score curves for boys' weight-for-age, length/height-for-age, weight-for-length, weight-for-height, and BMI. They also used monthly (zero to 12 month) longitudinal data from a pooled sample of 226 healthy breast-fed infants from seven studies in North America and Northern Europe to evaluate the adequacy of the WHO Growth Standards versus the CDC charts for assessing growth patterns in these infants. The findings revealed that the CDC charts reflected a heavier, and somewhat shorter sample than the WHO sample, which subsequently resulted in lower rates of undernutrition (with the exception of during the first six months of life), as well as higher rates of overweight and obesity when based on the WHO standards. Furthermore, healthy breast-fed infants from two months and onward were shown to track along the WHO Growth Standard's weight-for-age mean Z-score while they appeared to falter on the CDC chart. Based on this finding, it was determined that the shorter measurement intervals in the WHO Growth Standards resulted in a better tool for monitoring the rapid and changing rate of growth in early infancy. Thus, it was suggested that the WHO charts were more appropriate than the CDC ones for monitoring the growth of breast-fed infants. It was also noted that the establishment of the breast-fed child as the norm for growth

brings consistency between the tools used to assess growth and the infant feeding guidelines that recommend breast-feeding as the optimal source of nutrition during infancy.

Within Canada, the Collaborative Statement Advisory Group (2008, as cited in Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010) determined the differences that the WHO standards and CDC references would produce by retrospectively applying both growth charts to a large sample of Canadian children from birth to five years old, and from three different geographical areas in the country. Four regional databases containing height, length, or weight measurements of these children were merged and percentiles and z-scores were electronically generated. Although none of these data sets provided information regarding whether each child had been bottle or breastfed, notable differences were observed when applying the two different charts. In particular, it was found that when applying the WHO Growth Standards versus the CDC references, the differences in the classification of overweight using weight-for-length/height were small and varied by age; however, more children between the ages of two and five years were classified as overweight until four years old when using BMI-for-age. It was also found that more children between birth and five years old were classified as obese using weight-for-length/height, and that more children between the ages of two and five years were also classified as obese when using BMI-for-age. These findings were similar to the previous study that also found that the two charts produced different estimates of overweight and obesity, and recommended that the WHO Growth Charts be used to assess and monitor Canadian children and adolescents.

Another cross-sectional study conducted by Nash et al. (2008) applied the WHO Growth Standards and CDC references to a sample of 547 children under the age of two years old that were hospitalized in a paediatric tertiary care centre in Toronto, Canada. The results showed that

the WHO Growth Standards identified fewer infants and toddlers as wasted (weight-for-length <5th percentile) compared to the CDC references (18.6% and 31%, respectively), and classified more as overweight and obese (weight-for-length >85th percentile; 21% and 16.6%, respectively). Furthermore, it was found that although the WHO BMI-for-age and weight-for-length percentiles were strongly correlated, they were not interchangeable, especially for children under six months old. A longitudinal study conducted by van Dijk and Innis (2009) specifically compared the pattern of infant growth of 73 healthy babies in Vancouver, BC, Canada from birth to 18 months old. The results revealed that breastfed infants charted along the WHO Growth Standards more so than formula-fed infants who deviated with higher weight-for-age. Moreover, the breastfed infants demonstrated a decline in weight-for-age commencing at six months when compared to the CDC charts. The importance of the type of growth curve used for interpreting infant growth and identifying the onset of excess weight gain was thus highlighted, and it was concluded that the WHO Growth Standards provided the best tool for identifying the prevalence and age of onset of early excess weight increases in Canadian infants.

In addition to such studies providing evidence for the differences between the WHO Growth Standards and CDC references, and the noted benefits of using the former charts within Canada, an external five-person expert review panel examined the methodological soundness of the WHO's process for creating both the 2006 and 2007 Growth Charts (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). This panel, selected by the Public Health Agency of Canada, came to a general consensus that the methodologies used to develop both charts were sound and acceptable. As such, it was acknowledged that these standards and references should be recommended for use as they represent the best available tools for growth assessment for younger and older children and adolescents in Canada. However,

the adoption and LoU of the WHO Growth Charts within the country, and specifically BC, has yet to be examined.

2.4 Guiding Models

2.4.1 Introduction. A number of different theories and frameworks, collectively referred to in this document as models, exist for studying the diffusion, dissemination, adoption, and implementation of health research findings and guidelines into practice. One of the main differences between these concepts is the passive versus active nature of each process. Diffusion can be seen as the passive process "by which an innovation is communicated through certain channels over time by members of a social system" (Rogers, 2003, p. 5), whereas dissemination is a more active process representing "the actions taken to facilitate the diffusion of innovation health promotion programs from one locale to another" (Steckler, et al., 1992, p. 215). Adoption can be seen as the decision to try a new innovation (Rogers, 2003), and implementation, as described by Fixsen, Naoom, Blasé, Friedman, and Wallace (2005), is an active process that includes "a specified set of activities designed to put into practice an activity or program of a known dimension" (p. 5). Despite these variations, it is essential to understand the diffusion, dissemination, adoption, and implementation of research findings and CPG based on the evidenced difficulty of translating these findings into meaningful patient care outcomes across multiple contexts (Damschroder et al., 2009). The 2006 and 2007 WHO Growth Charts were disseminated within BC through the active process of sending out information and copies of the charts to PH units and physician offices as well as providing online training, with the intention and hopes that they would diffuse and be adopted and implemented by all FP within the province. Thus, two main models focusing on these processes have been chosen to guide the

current study, and the rationale for choosing each will be described below in addition to presenting the supporting evidence for each model's usefulness in directing this work.

2.4.2 The Diffusion of Innovations theory. According to Rogers's (2003) DOI theory, the diffusion innovation-decision process can be broken down into five stages that represent two distinct phases (Figure 1). The *dissemination phase* is comprised of the first two stages of knowledge and persuasion. In the *knowledge stage*, the intended user(s) (e.g. the FP) become acquainted with and develop an adequate understanding of the innovation (e.g. the WHO Growth Charts). Certain prior conditions and adopter characteristics are believed to influence this knowledge, such as norms of the social system, the adopter's innovativeness, previous practice, needs and concerns, socioeconomic characteristics, personality variables, and communication behaviours. In the *persuasion stage*, the user(s) develop either a positive or negative attitude towards the innovation. Five perceived characteristics of the innovation can positively or negatively persuade the adopters' attitudes or motives and these include: relative advantage (the degree to which the innovation is perceived as better than previous innovations); compatibility (the degree to which the innovation is perceived as consistent with existing values, past experiences, and needs); complexity (the degree to which the innovation is perceived as relatively difficult to understand and use); trialability (the ability to test the innovation); and observability (the degree to which the results of the innovation are visible to others; Rogers, 2003). Thus, in a broad sense, dissemination refers to how well information about an innovation's existence and value is provided to those intended to use the innovation (Durlak & DuPre, 2008). Tabak et al. (2012) further adds to this idea by stating, "dissemination is the active approach of spreading evidence-based interventions to the target audience via determined channels using planned strategies" (p. 339).

The *adoption phase* is then comprised of the subsequent stages of decision, implementation, and confirmation. In the *decision stage* the intended user(s) decides to adopt or reject the innovation based on having more information, trying it out, and observing it used by others. The *implementation stage* represents the actual use or integration of an innovation within a setting and is based on gaining more competencies, positive personal experiences, and social influences. Finally, the *confirmation stage* represents the maintenance and full integration of the innovation into daily routine practice based on reinforcement and feedback (Rogers, 2003). Communication channels are also believed to influence all five of these stages, and include mass media versus interpersonal channels as well as cosmopolite versus localite channels (Rogers, 2003). While implementation falls into the broader category of adoption based on this theory, Durlak and DuPre (2008) separate the two ideas by classifying adoption as whether the intended user(s) decides to try the new innovation, and implementation as how well the innovation or program is conducted during a trial period. Despite this slight incongruity, the term adoption will be used to encompass the last three stages outlined in the DOI theory for the purposes of this study, with the understanding that implementation falls within this concept and refers to the actual use of the innovation.

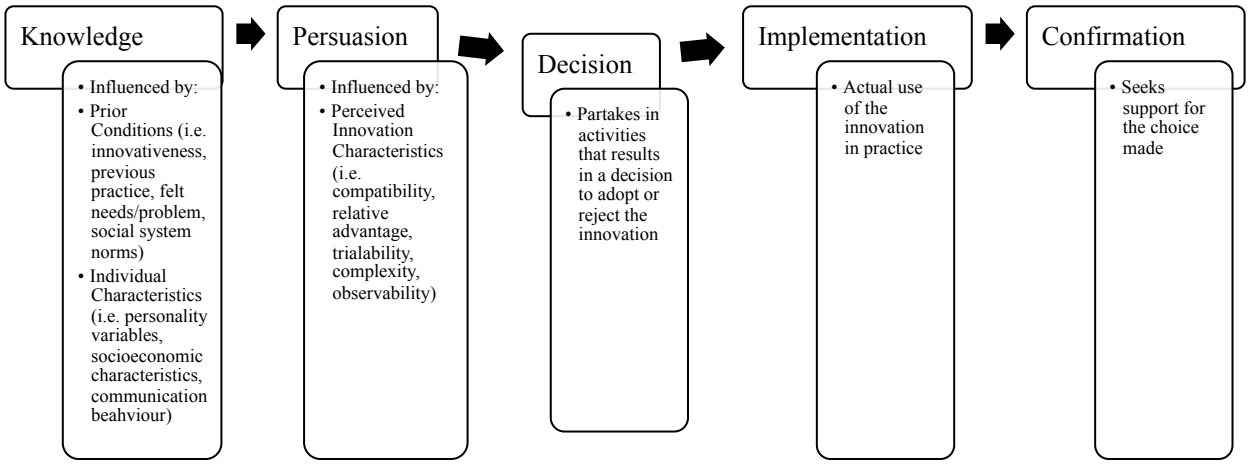


Figure 1. The Five Stages in the Innovation-Decision Process adapted from Rogers (2003).

The DOI theory was chosen as one of the main guiding models as it covers the entire diffusion process from the dissemination of an innovation to its complete adoption (Rogers, 2003). Furthermore, it provides the opportunity to incorporate different theoretical constructs in the various steps of the diffusion process and helps to identity the potential promoting and impeding determinants throughout this process. In this study, the WHO Growth Charts are assumed to be an innovation as they represent a CPG that could be perceived as relatively new by FP compared to existing growth charts. This model is also useful as it focuses on the *individual's* adoption of an innovation, which is particularly important when studying health care providers that work in individual practices as opposed to within a larger organization or HCT.

In addition to these stages, the theory also provides a model and corresponding S-shaped diffusion curve (Figure 2) that describes the way and rate at which innovations are taken up in a specific population (Rogers, 2003). This model posits that for any given behaviour, an audience can be broken down into five segments, referred to as adopter categories, based on an individual's inclination to accept the innovation and the relative time it takes each group to adopt. *Innovators* are the first members of a group to adopt a new innovation and represent about 2.5% of the population; they are generally more adventurous, cosmopolite, educated, and are able to cope with a high degree of uncertainty compared to their peers. *Early adopters/opinion leaders* represent the second group and are generally also well educated, though less cosmopolite and less able to deal with uncertainty than the innovators. They represent 13.5% of the population. The *early majority* group then comprises one-third of the members in a population, and they adopt an innovation just before the average person. The *late majority* group also comprises one-third of the population, but adopts the new idea just after the early majority. This adoption is generally based on peer-pressure, as these members are skeptical of the new idea or

practice. Finally, the *laggards/last adopters* represent the remaining 16% who have taken the most time to adopt a new innovation either because of suspicion or having to evaluate all of the pros and cons of the innovation (Rogers, 2003). To help understand the relationships between these adopter categories and all of the factors identified in the innovation-decision process (e.g. characteristics of the innovation, communication channels, etc.), which have been established through previous diffusion research, Rogers (2003) came up with a list of "generalizations" for each category of factors. These generalizations are included in Appendix C and were used to help inform the direction of the hypotheses for the determinants predicting the LoU of the WHO Growth Charts.

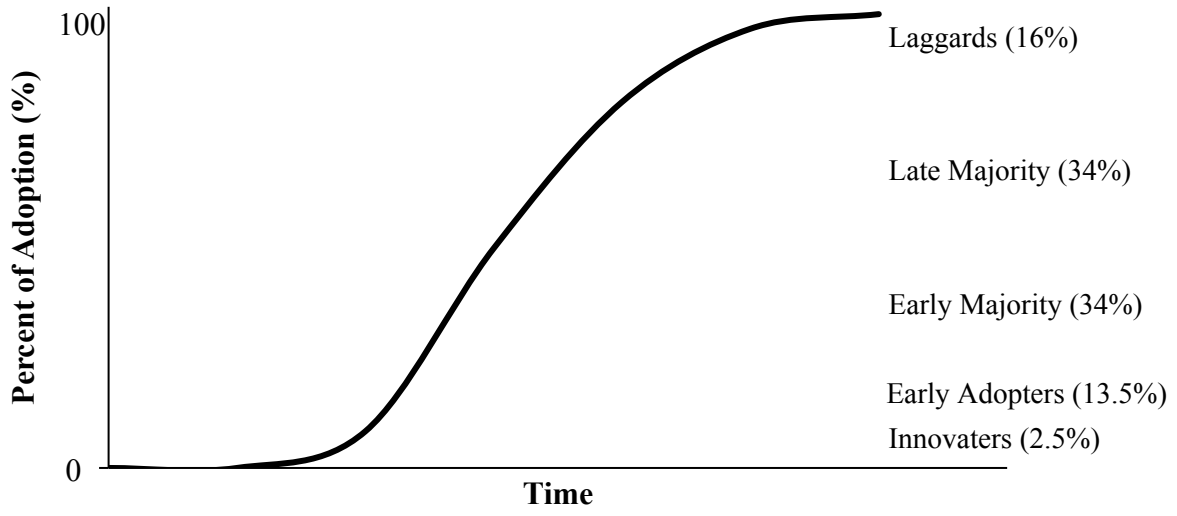


Figure 2. S-Shaped Diffusion Curve with associated adopter categories adapted from Rogers (2003).

2.4.3 Application to health care. While research on the diffusion of innovations dates back to the 1940s, the diffusion tradition was applied to PH and medical sociology starting in the 1950s (Rogers, 2003). In more recent years, studies have used this theory to specifically look at the adoption and determinants of new medical ideas, including various CPG, in a variety of

health care settings. These studies have generally used focus groups, one-on-one interviews, or surveys to gather information, and even though the questions have been guided by concepts derived from the DOI theory, one common measurement tool has yet to emerge.

While no study has specifically looked at the diffusion and uptake of the WHO Growth Charts using this theory, Harting et al. (2009) used Rogers's (2003) innovation-decision process and the five successive stages to help understand physical therapists' behaviours, experiences, and attitudes toward the adoption and diffusion of Dutch guidelines for low back pain in the Netherlands. Three focus group interviews were conducted with a total of 30 participants and both the interview route and data analysis were informed by the theory. Results yielded great insights into the different determinants of guideline adherence and overall it was found that there was a common tendency for the therapists to dismiss CPG, including the ones for low back pain. Although many of the professionals had received the guidelines, very few paid much attention to them and none had applied them regularly or completely. It was also found that the five characteristics of the guidelines (e.g. relative advantage, compatibility, etc.) influenced the use and attitudes towards them, as predicted by the theory. The authors therefore acknowledged that this theory provided a sound framework for properly structuring the interviews, producing a detailed analysis of the data, and attributing the determinants to the five stages of the diffusion process. However, recommendations for future research were also made based on their findings, which included having more focus groups to provide a better understanding of all five stages of the diffusion process, in addition to examining the influences of different communication channels and facilitators at the organizational level. They also suggested possibly including credibility as a perceived characteristic of the guideline that can influence its adoption and implementation as it was brought up within the discussions. Furthermore, it was recommended

that future studies should apply a purposeful sampling strategy to ensure that the focus groups represent professionals from each stage of the diffusion process, and that objective measures for studying CPG use should be employed.

Within Canada, Hader et al. (2007) designed a qualitative interview protocol to generate insights into how doctors think about CPG and how CPG fit into the prevailing culture of medical practice. Using Orlandi and colleagues' version of Rogers's DOI model as a framework, the authors mapped doctors' views on the implementation of CPG. They also noted that this modified model included the external environment as a fifth influence on the innovation, which was intended to capture factors unrelated to the doctor, linkage system, development characteristics, and innovation that collectively form a part of the practice environment such as social trends, payment systems, and patient demand. Semi-structured interviews were conducted with 45 representative doctors (16 FP, 14 general surgeons, and 15 internists) in Saskatchewan, and working within the guiding diffusion framework, the participants were asked about their attitudes, opinions, and behaviours regarding CPG. Results indicated that the study did not uncover any previously unidentified barriers to guideline implementation, and as such, the findings supported the use of the modified DOI model to guide CPG implementation research. Furthermore, the model permitted the researchers to define guideline use or uptake with more precision, as it represents CPG uptake as a series of stages in which barriers may interfere with further progress towards full, ongoing implementation at any of these stages. It was also noted that systematically exploring these barriers can allow developers to consider strategies for overcoming these issues, such as modification of guidelines to suit the characteristics of the intended users, assessment and modification of barriers presented by the external environmental factors, or altering dissemination practices. Because of possible discrepancies between doctors'

actual and self-perceived adherence to CPG, the authors also designed a survey examining doctors' attitudes surrounding the uptake of CPG, and the responses were then linked anonymously to their actual utilization behaviours. Although the results have yet to be released, this further highlights the importance of using both self-report and objective measures of guideline use in practice that was also noted by Harting et al. (2009).

Another Canadian study used the DOI theory to examine the factors influencing the adoption of the Canadian Heart Health Kit (HHK), which is a risk management and patient education resource for the prevention of cardiovascular disease (CVD) and promotion of cardiovascular health (Scott, Plotnikoff, Karunamuni, Bize, & Rodgers, 2008). Their study aimed to determine if certain attributes of the HHK, as well as contextual and situational factors, would be associated with physicians' intention and actual use of the kit. The authors also wanted to see if any contextual and situational factors would be associated with individual or environmental barriers that would prevent the uptake of the HHK among those physicians who did not intend to use the kit. All FP in Alberta were invited to participate and the resulting 153 participants were sent a HHK, followed-up two months later with a questionnaire assessing primary factors on the physicians' clinical practice, attributes of the HHK (i.e. relative advantage, compatibility, complexity, trialability, and observability), confidence and control using the HHK, barriers to use, and individual attributes. Similar to the previous two studies, it was noted that this theory provided a sound framework for understanding the various determinants of the diffusion and adoption of a new practice/object in a health care setting. The authors acknowledged that recognizing these factors is of particular importance as it can provide valuable information to guiding dissemination efforts, which can subsequently increase the efficiency of innovation implementation.

Studies such as these highlight the effectiveness and value of using the DOI theory to understand the key determinants influencing the adoption and implementation of innovations in a health care setting. As such, it will be used as a guiding framework for examining the uptake of the WHO Growth Charts by FP in BC. Furthermore, some of the feasible recommendations for future research that were made within these studies will be addressed in the current study, such as categorizing the different types of users based upon Rogers's (2003) adopter categories.

2.4.4 Ecological Framework for Effective Implementation. Although the DOI theory is very useful for describing in detail the provider and innovation characteristics affecting the dissemination and adoption of an innovation, it neglects to incorporate several important broader contextual factors that have been identified in subsequent implementation studies and literature reviews (e.g. Damschroder et al., 2009; Durlak & DuPre, 2008; Greenhalgh et al., 2005; Fixsen et al., 2005; Stith et al., 2006; Tabak et al., 2012). Thus, after reviewing several other models that have been applied to the health care sector, the EFEI developed by Durlak and DuPre (2008) was also chosen to guide this study as it encompasses a number of these additional influencing constructs. Prior to conducting their literature review of implementation in prevention studies related to children and youth, Durlak and DuPre (2008) developed their framework (see Figure 3) from previous work. The premise behind this model was that implementation is influenced by variables present in five categories including: innovation characteristics, provider characteristics, community factors, prevention delivery system (i.e. features related to organizational capacity), and the prevention support system (i.e. training and technical assistance). The specific factors within each category that will be used in this study and an explanation of each can be found in Appendix D. While the authors believed that the latter two systems lie at the center of effective implementation, they also noted that "Under favorable circumstances, variables in all five

categories interact and lead to effective implementation, that is, a process for conducting the intervention as planned. What is specifically required for effective implementation, however, depends on a constellation of factors because local contexts differ" (pp. 335-336). This model is therefore useful as it acknowledges the importance of the interaction between many different constructs influencing implementation, while at the same time recognizing how these relationships may change depending on the specific context or setting. The integrative nature of their model, which in general is intended to "capture and clarify the multidetermined, multilevel phenomenon of innovation implementation" (Klein & Sorra, 1996, p. 1056), is also valuable as it addresses the lack of these types of models previously found in innovation implementation research (Klein & Sorra, 1996).

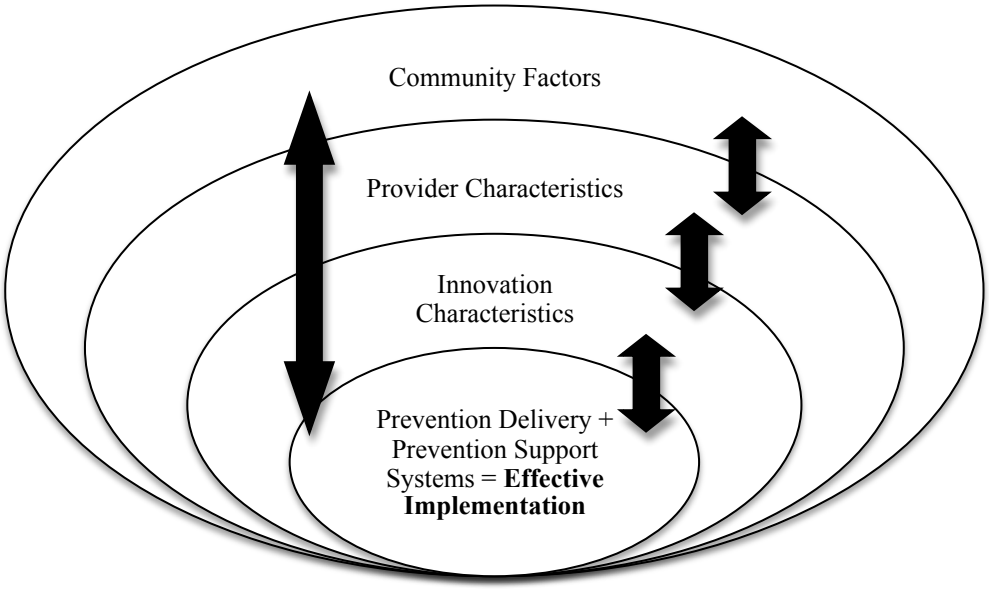


Figure 3. Ecological Framework for Effective Implementation adapted from Durlak and DuPre (2008).

In order to conduct their review of published and unpublished studies to validate and support their framework, Durlak and DuPre (2008) first completed computer searches in three different databases, followed by an examination of the references from several reviews and

manual searches of journals that had published relevant articles in the past five years. A total of 81 studies were located containing qualitative or quantitative data on factors affecting the implementation process, and from these studies, 23 factors were identified that were associated with one of the model's five categories (see Appendix D). Factors were only included if they were related to implementation in at least five articles and if findings were consistent in the more rigorously conducted investigations. Overall, the data provided strong support for the ecological framework and how the categories serve to classify the individual factors as well as the interactions between them.

While Durlak and DuPre's (2008) literature search was not exhaustive and did not include several health prevention and promotion models that have been reviewed in more recent reviews (e.g. Damschroder et al., 2009; Tabak et al., 2012), the authors did note that there was good convergent validity between the influencing implementation factors established in their review and those found in three other previously conducted systematic narrative reviews (Greenhalgh et al., 2005; Fixsen et al., 2005; Stith et al., 2006). Although Durlak and DuPre (2008) acknowledged the diversity in scope and purpose of these other reviews, they still found substantial overlap regarding specific factors that affect implementation and concluded, "convergent evidence obtained from several fields confirms that implementation is a complex developmental process that can be affected by a multiple array of interacting ecological factors present at the individual, organizational and community level" (pp. 340-341). Furthermore, many of these factors, although sometimes labeled and categorized differently, have also been identified in the subsequent reviews. For example, The Consolidated Framework for Implementation Research developed by Damschroder et al. (2009) was specifically created to offer an "overarching typology to promote implementation theory development and verification

about what works where and why across multiple contexts… [and it provides] a pragmatic structure for approaching complex, interacting, multi-level, and transient statues of constructs in the real world by embracing, consolidating, and unifying key construct from published implementation theories" (p. 50). While the five major domains (labeled intervention characteristics, characteristics of the individuals involved, outer setting, inner setting, and the process of implementation) differ from the ones in the EFEI in terms of labeling and the exact constructs they include, there is much overlap between the underlying concepts of each factor in both models.

Another benefit of using the EFEI as a guiding model is that it encompasses organizational factors. The concept of organizational/work climate falls within the "factors related to the prevention delivery system: organizational capacity" category, which is found at the center of the ecological framework, and several other studies and reviews have also acknowledged that a supportive climate is essential to the adoption of an innovation (Steckler et al., 1992). According to Snider (1990), as cited in Klein and Sorra (1996), climate refers to "employees' perceptions of the events, practices, and procedures and the kinds of behaviours that are rewarded, supported, and expected in a setting" (p. 1060). Klein and Sorra (1996) further comment, "A strong implementation climate fosters innovation use by (a) ensuring employee skill in innovation use (b) providing incentives for innovation use and disincentives for innovation avoidance, and (c) removing obstacles to innovation use" (p. 1060). Although FP are often viewed as independent care providers with their own individual practices, it is still important to consider the broader health care context that they work within, whether that is apart of a specific HCT or within the health care organization on a large-scale, and how it affects their implementation of medical innovations. As such, it will be essential to study these organizational

factors and their influences on the use of the 2006 and 2007 WHO Growth Charts.

In summary, the factors affecting diffusion and implementation that have been identified in the literature, specifically by Rogers (2003) and Durlak and DuPre (2008), will be assessed in this study to help explore the LoU of the WHO Growth Charts by FP in BC.

3.0 Methodology

3.1 Study Design

A cross-sectional survey design based on a stratified sampling strategy was used to evaluate LoU of the WHO Growth Charts in family practice, and explore the factors influencing use. It also assessed the awareness FP have of community, provincial, national, and international resources and initiatives available to support their paediatric patients who are overweight, obese, or at-risk. The dependent variable was LoU of the WHO Growth Charts. The independent variables were the identified factors affecting implementation (i.e. provider characteristics; perceived characteristics of the WHO Growth Charts; factors related to the prevention delivery system including general organizational factors, specific practices and processes, and specific staffing considerations, and; factors related to the prevention support system including growth chart training).

3.2 Participants

Family physicians in BC were eligible to participate in the survey if they were registered, practicing full or part-time, self-identified as having paediatric patients in their practice, and had their own family practice, worked as a locum, hospitalist, at a walk-in clinic, or had a combination of any of these types of practices. Specialists, such as emergency room physicians and paediatricians, were excluded from this study. For survey distribution purposes, FP were also

excluded if they did not have a registered telephone number, facsimile (fax) number, email address, or if they wanted the survey package mailed to their office instead of faxed or emailed.

3.3 Pilot Testing

Prior to participant recruitment and finalizing the measurement tool, the survey underwent pilot testing with six known physicians (five from BC and one from Ontario) for readability, clarity, content (i.e. correct medical terminology/language used and if more questions should be added that would provide better insight into practice behaviour), question design (i.e. providing a neutral option for multiple choice questions), and length (i.e. removing irrelevant/repetitive questions or number of multiple choice options). The physicians also provided recommendations on types of incentives or compensation that could be offered to FP study participants for completing the survey, as well as methods for survey distribution.

All suggested modifications were made to the survey and upon recommendation, it was decided that the incentive for participation would involve the chance to win a charitable donation of the winner's choice. In order to maintain the anonymity of the survey, participants had the option of providing their contact information (telephone number or email address) if they wanted to be entered into the draw to win a $100 donation towards a program or organization of their choice in their community that supports or promotes paediatric healthy living. For survey distribution, it was also recommended in pilot testing that participants were provided with email or fax options to receive the survey.

Once this phase of pilot testing was complete, the survey was converted to an online format in the software program FluidSurveys™ version 4.0 (Fluidware Incorporated, 2012) to allow for electronic distribution. Two of the pilot physicians-one from BC and one from Ontario-then tested the online version for ease of use, esthetics, layout, and length. Questions were again

scrutinized to see if any could be omitted or reworded, and all suggested alterations were made. Overall, pilot testing lasted from December 2012 until March 2013, at which point the final version of the survey included 44 questions.

3.4 Recruitment

3.4.1 Overview. Two strategies were employed to recruit participants. The first strategy consisted of a random selection of stratified rural and urban FP, and the second strategy was survey distribution through the BC Divisions of Family Practice (DoFP). A DoFP is a community-based group of FP, organized at the local or regional level, that works together to achieve common health care goals (DoFP, n.d.). An overview of the recruitment process is presented in Figure 4. Ethical approval for this study was obtained from the University of Victoria Human Research Ethics Board.

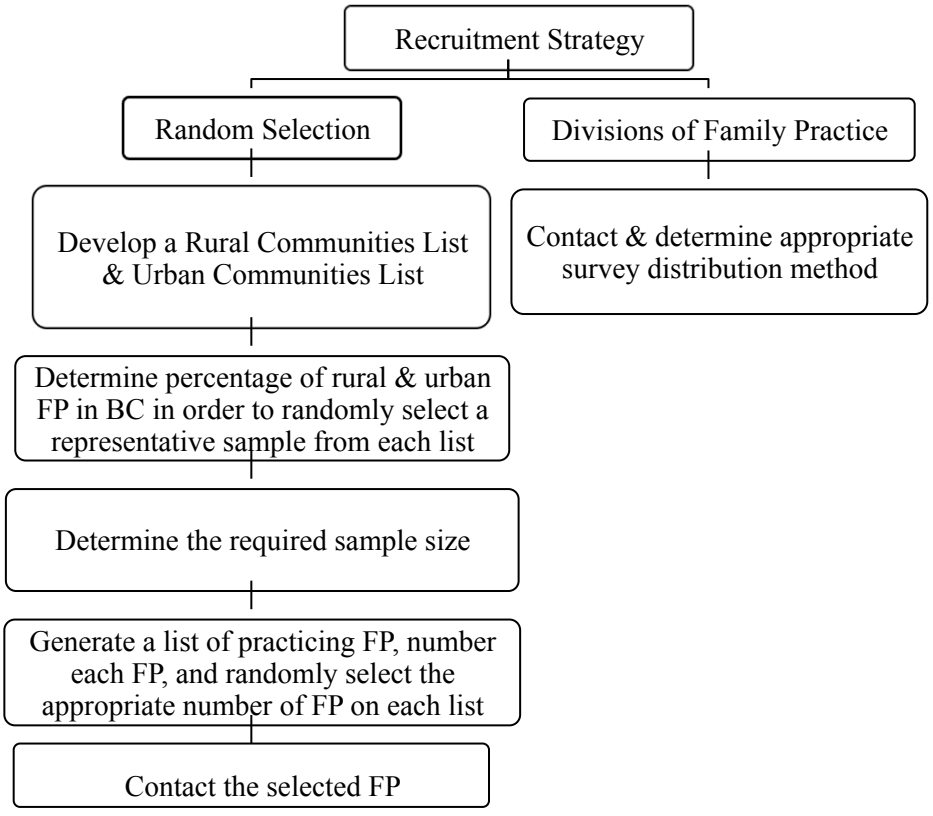


Figure 4. Recruitment strategies and process for contacting Family Physicians.

3.4.2 Random selection. In order to generate and contact the list of randomly selected FP, the following step-by-step process occurred:

3.4.2.1 Rural Communities List. First, regions in BC considered to be urban and rural were determined in order to stratify FP according to their region of primary practice, thereby allowing for a representative sample of rural and urban FP to be randomly selected. To create a "Rural Communities List" database, the 2012 Subsidiary Agreement for Physicians in Rural Practice (RSA) was utilized (British Columbia Ministry of Health, 2013; Rural Coordination Centre of BC, 2013). The RSA outlines a list of communities that are eligible for rural medical programs, and are designated as A, B, C, or D based on the number of isolation points they receive. The isolation points are allocated depending on a number of medical isolation and living factors, including the number of designated specialties within 70km, number of general practitioners within 35km, community size, distance from a major medical community (Kamloops, Kelowna, Nanaimo, Victoria, Vancouver, Abbotsford, Prince George [PG]), degree of latitude, specialist centre, and location arc. According to the RSA, "A Communities" have 20 or more isolation points, "B Communities" have 15 to 19.99, "C Communities" have 6 to 14.99, and "D Communities" have .5 to 5.99 points. The RSA Communities list, effective April 1st, 2009 to March 31st, 2012, included 120 A communities, 22 B communities, 40 C communities, and four D communities. Therefore, 185 out of the 186 communities were placed on the Rural Communities List (see Appendix E).

PG was the only city excluded from the Rural Communities List, as the Executive Director (ED) of the PG DoFP had agreed to email out the survey to its members through its electronic distribution list. As a result, FP were not randomly selected from this city.

3.4.2.2 Urban Communities List. The BC Population Centres list provided by Statistics Canada (2013b) was primarily used to determine the urban areas to be placed on the "Urban Communities List." Since the 1971 Census, Statistics Canada (2011) has defined urban areas as having a minimum population of 1,000 inhabitants and a minimum density of 400 people per square kilometer. However, Statistics Canada (2011) has deemed this term to be too broad, leading to misinterpretations and challenges when disseminating data. As such, the term "population centre" replaced "urban area" in 2011. Although the population and density requirements remained the same, three sub categories were created to reflect varying population sizes and the urban-rural continuum. The population centre categories include: small (population between 1,000 and 29,999), medium (30,000 to 99,999) and large urban (100,000 inhabitants and over). There were a total of 100 BC population centres on the Statistics Canada (2013b) list (see Appendix F). For the purpose of this study, the term "urban" is used synonymously with "population centre."

While the BC Population Centres list provided a sufficient foundation for defining the urban areas to be placed on the Urban Communities List, there were two issues with this list. First, a majority of the small, and a few of the medium, population centres were present on both the BC Population Centres list and the RSA Communities list. In this case, the overlapping community was kept on the Rural Communities List due to the RSA's methodical designation of a rural community based on isolation points. Second, despite their large populations and high densities, almost all 22 Metro Vancouver Municipalities were not on the BC Population Centres list (Metro Vancouver, 2011; see Appendix G). As such, municipalities absent from the RSA Communities list were included on the Urban Communities List, with the exception of Belcarra and Tsawwassen, as their small populations did not meet the population centre requirement of at

least 1000 inhabitants. A similar issue occurred in the Greater Victoria Region, as it encompasses 13 municipalities and many neighbourhoods that fall outside the City of Victoria (Greater Victoria Chamber of Commerce, 2012; see Appendix H). Of these 13 municipalities, Sidney and Saanichton, which are located in the municipality of Central Saanich, were added to the Urban Communities List, as these areas have a high number of FP.

Based on the BC Population Centres list, and the additional Metro Vancouver Municipalities and Greater Victoria Region areas that were added, there was a total of 41 urban areas included on the Urban Communities List (see Appendix I). Although PG was also on the BC Population Centres list, it was again omitted from the urban list because the survey was distributed to the PG DoFP members. While there are many smaller regions and neighbourhoods throughout BC, we tried to be as inclusive as possible of all the major rural and urban areas in the two lists generated, and acknowledge that some areas may have been unintentionally excluded if they did not appear on any of the aforementioned lists.

3.4.2.3 Percentage of rural and urban physicians. Once the Rural Communities List and Urban Communities List were created, the approximate percentage of rural and urban FP in BC was determined in order to randomly select a representative sample of FP from each list. To identify this rural-urban percentage, data provided in the Scott's Medical Database was used (CIHI, 2005a). This database is disseminated by the CIHI and contains information for all active physicians in Canada, provided they are registered with a provincial or territorial licensing authority. According to the CIHI (2005a) publication, *Geographic Distribution of Physicians in Canada: Beyond How Many and Where,* 12.4% of FP in BC practiced in rural areas, and 87.6% practiced in urban areas in 2004. Similarly, the CIHI (2012) publication, *Supply, Distribution and Migration of Canadian Physicians in 2011*, revealed that 11.3% of FP in BC had rural

practices and 88.7% had urban ones. Since the percentage of rural-urban FP has not changed drastically from the 2004 to 2011 time period, it was decided that 12% of the rural and 88% urban FP would be randomly selected in this study.

3.4.2.4 Sample size. The required sample size (*N*) for the study was 85 participants. This was determined using Cohen's (1992) suggested statistical power of .8, medium effect size of .15 for a multiple regression and correlation analysis (medium effect size of .3 for significance of product-moment *r* statistical test), and an alpha level of .05. To reach the target sample size of 85 FP, a total of 250 FP were initially randomly selected. This number was chosen as it reflected the estimated 35% survey response rate for FP in BC, which was suggested in data collected through the Canadian Medical Association (CMA) Masterfile and the 2004 National Physician Survey (NPS) Database (CIHI, 2005b). Thirty FP on the Rural Communities List and 220 FP on the Urban Communities List were randomly selected to ensure that a representative number of rural (12%) and urban (88%) FP would be recruited.

3.4.2.5 Search strategy and participant selection. With an Urban Communities List and Rural Communities List, and a percentage of FP to randomly select from each list, the College of Physicians and Surgeons of British Columbia (CPSBC, n.d.) "Find a Physician" search engine was utilized from February 13th, 2013 to February 19th, 2013 to generate a list of actively practicing FP in each of the rural and urban communities. The resulting 1258 FP in communities on the rural list and 4329 FP in communities on the urban list were printed and numbered 1-1258 and 1-4329, respectively. Thus, each FP on the rural and urban list was given a unique number to allow for random selection.

The online program Research Randomizer Form version 4.0 (Urbaniak & Plous, 2013) was used to generate five sets of 30 unique, randomly selected numbers per set, with a range

from one to 1258 for the rural list, and five sets of 220 unique, randomly selected numbers per set, with a range from one to 4329 for the urban list. Five sets of unique numbers was chosen in case there would have to be multiple rounds of random selection, and having these unique numbers would eliminate any duplications when re-selecting. Once the list of random numbers was generated for each list, the FP with the corresponding number on his or her respective list was selected and recorded in a master database using Microsoft® Office Excel® version 12.3.6 (Santa Rosa, California). Since only the name and city was provided on the printed list, the contact information for each randomly selected FP also had to be retrieved on the CPSBC website (n.d.) and recorded in the database. A mailing address and telephone number was provided for most FP on the CPSBC website. In the case where a telephone number was not available, the FP was excluded from the study, and the first number from the next set of 30 or 220 numbers was used to select another FP. For example, if rural FP #600 was randomly selected on the first set of 30 numbers and did not have any contact information, the first number on the next set of 30 numbers was chosen as a replacement. If rural FP #650 was randomly selected next on the first set and also did not have any contact information, the second number on the next set of 30 numbers was chosen, and so forth. This process continued until a complete set of 30 rural and 220 randomly selected FP with telephone numbers was complied.

3.4.2.6 Participant contact. Telephone numbers were used to contact the FP since fax numbers or email addresses were not included under the contact information on the CPSBC website (n.d.), and mailing surveys was outside of the study's budget. In most cases, the telephone number was for the clinic at which the FP practiced and the medical office assistant (MOA) was reached; in a few cases, personal telephone numbers were used to contact the FP. In all cases, a consistent telephone script (see Appendix J) was used to identify the best way to send

FP the information and survey so that they could participate if interested. Responses recorded included: the FP's personal or clinic email address, fax number, ineligibility (i.e. if the FP did not see any paediatric patients, was retired, was away from their practice for too long, or wanted the survey package mailed), or refusal to provide an email address or fax number and the reason for it (i.e. because the FP had no time to complete surveys or was not interested in participating). If there was no answer, attempts were made to contact the FP at least three times on different days, after which point, it was recorded as a "no contact" if there was still no answer. A no contact status was also recorded if the number was not in service or if the FP was no longer practicing at that clinic.

The random sampling process occurred between April 5th, 2013 and July 24th, 2013. By this time, the response rate was less than half of the target sample size, and as such, an additional sampling method was employed (after ethical approval of the modified recruitment strategy) to try to increase the number of participants.

3.4.3 Divisions of Family Practice in British Columbia. The second recruitment strategy was through the DoFP in each region. At the commencement of data collection there were 32 DoFP in BC that encompassed 129 communities (DoFP, n.d.). On August 13th, 2013 the Campbell River and District DoFP was also created (DoFP, n.d.), however, it was not included in the recruitment process. Contact information for each Division's Coordinator or ED was obtained through the DoFP website (n.d.), and they were subsequently contacted to request distribution of the survey to their Divisions' members. The study background, survey details, and additional information (see Appendix K) were provided to the Coordinators or EDs via email or telephone. Various methods of survey distribution were generated through discussion with these leads, such as including the information in an electronic bulletin, newsletter, direct email to the

members, or a link on the individual DoFP website. A follow-up email or telephone call was done if there was no response within a week of the initial contact with the Division. In the end, 21 of the 32 DoFP agreed to send out the survey to their members. Of the remaining 11 DoFP, six did not respond to the requests and five refused to participate, as their members already felt overburdened with other research requests.

In terms of survey distribution through the DoFP that agreed to participate, a brief study synopsis (see Appendix L) that the Divisions could use in their bulletin, newsletter, etc. was sent to those who requested it in order to minimize the amount of work the Divisions would have to do in recruiting participants. A PDF of the Letter of Information (LoI) for Implied Consent Form (see Appendix M) was also attached in the email to the Coordinator or ED and they were asked to include it as a hyperlink in the study synopsis. Follow-up emails were sent within a week after the DoFP originally indicated that they would be distributing the survey to confirm what day it was sent out on and to how many members. Correspondence with the Divisions began on July 31st and lasted until September 30th, 2013 at which point all data collection was terminated.

3.5 Procedures

In PG, the survey package was emailed to DoFP members on April 15th, 2013, which included an Invitation to Participate (see Appendix N) with study details, as well as the LoI. No reminder emails were sent to the FP after the initial survey distribution. Only a few FP in PG responded within the two-week deadline for completing the survey. As such, paper copies of the survey package, including the Invitation to Participate, LoI for Implied Consent Form, and a copy of the survey, were placed in personally addressed envelopes and distributed to FPs' mailboxes at the University Hospital of Northern BC by a PG DoFP member on July 15th, 2013.

The Invitation to Participate also noted that the survey could be returned to the member's personal hospital mailbox, or faxed back to the primary researcher.

In terms of the randomly selected FP, when a physician's individual email address or one for the clinic was provided by the MOA, the email package was sent out immediately with the subject line *Att'n Dr. [Last Name]: Paediatric Growth Charts and Obesity Prevention Survey*. The body of the email contained the Invitation to Participate, which provided a synopsis of the study background and purpose, an overview of the demands of participation, the survey link, alternative ways to receive the survey (i.e. via fax), and the primary researcher's contact information (see Appendix O). The LoI for Implied Consent Form was attached as a PDF in the email.

When a fax number was provided, the fax was sent within a few days of the telephone call. For efficiency purposes, faxes were often sent in batches and not necessarily on the same day of contact. The faxed package was 15 pages and included the same Invitation to Participate as the email, LoI for Implied Consent Form, and a paper copy of the survey.

A reminder email or fax (see Appendix P) was sent approximately two weeks after the initial package had been sent to each FP, provided the FP had not returned the survey with their identification on it. For emails, the subject line was *Att'n Dr. [Last Name]: Paediatric Growth Charts and Obesity Prevention Survey Reminder*, and an Invitation to Participate similar to the initial one was included in the body. The only difference between the initial and reminder email was that the reminder email omitted the background and purpose of the study, and thanked the FP for participating if they had already completed the survey. The same LoI for Implied Consent Form sent in the original email was again attached as a PDF. For the faxed reminders, content similar to the reminder email was provided in the body; however, the important points were

highlighted and boxed to allow for an easy-read format, and some words were excluded to ensure that the information would fit on one page. Refusal to participate or ineligibility was also recorded if the FP indicated after the initial contact or reminder message that they were not interested in the study or did not see paediatric patients in their practice.

3.6 Measurement Tool

3.6.1 Overview. Survey development was guided by the DOI theory and the EFEI to collect data on FPs' LoU of the WHO Growth Charts, as well as key determinants influencing their use of the charts. The survey primarily included forced-choice (check box) questions with some open-ended questions, allowing participants to explain their responses or provide additional comments. A majority of the questions were adapted from previously developed scales and questionnaires. Unfortunately, due to feedback about the length of the survey during pilot testing, many questions from the original instruments were omitted to reduce participant burden. Scale reliabilities were computed to check for internal consistency when constructs were measured by more than one variable.

The final version therefore had 44 questions, arranged into seven sections that categorized similar information, including: (1) demographic and practice information (10 questions); (2) concerns and LoU (two questions); (3) perceived characteristics of the WHO Growth Charts (seven questions); (4) innovativeness and cosmopoliteness (11 questions); (5) training, efficacy, and outcome expectations (five questions); (6) factors related to prevention delivery system (five questions); and (7) barriers, facilitators, and awareness of programs (four questions). Appendix Q presents the 2006 & 2007 WHO Growth Charts survey. At the beginning of the survey, participants were asked to keep the following in mind when completing the survey:

1. **The WHO Growth Charts**: This term will refer to both the 2006 WHO Child Growth Standards and the 2007 WHO Growth References.

2. **Paediatric population**: Refers to those from birth to 19 years old as this reflects the age categories encompassed in the WHO Growth Charts.

3. Please answer each question as it applies to your own practice.

3.6.2 Demographic and practice information. Section A contained questions regarding the participants' characteristics, including demographic information and clinical practice behaviours. Questions were asked about: gender (female or male), age group (20-29, 30-39, 40-49, 50-59, 60-69, or 70 or above), years practicing medicine (1-5 years, 6-10 years, 11-15 years, 16-20 years, or 21+ years), HA region of primary practice (Northern, Interior, Vancouver Island, Vancouver Coastal, or Fraser), community or communities of primary practice (open-ended question), type of practice (outpatient/walk-in clinic, solo practice, solo practice but associated with a larger group [e.g. Family Health Network], group practice, clinic associated with a tertiary/acute care setting, locum, hospitalist, or other and please specify), and approximate percentage of paediatric patients seen per week (0-19%, 20-39%, 40-59%, 60-79%, or 80-100%). To understand the measurement(s) that the FP used to assess/monitor paediatric growth, a chart with three age category columns (birth-2 years old, 3-5 years old, and 6-19 years old) and six rows with measurement methods (weight-for-age, height/length-for-age, weight-for-length, head circumference, BMI-for-age, and other) was provided. Participants were able to choose as many measurement types as they needed to for each age category. Information regarding use of an EMR system in practice was then gathered in three questions. The first question was "Do you use an EMR system in your practice?" with a response option of *yes* or *no*. The second question was "If YES, which EMR system do you use?" and a blank box was provided for the answer.

The third question was "If YES, do you use it to enter and plot paediatric growth data?" with a response option of *yes* or *no*.

A list of growth charts developed by different organizations was provided to determine the type of charts that the FP used in their practice. At the beginning of the list, participants were informed that each growth chart had its respective, related organization identified on it, and the FP were encouraged to look at the chart in their EMR system to identify it. For each type of growth chart there was a response option of *yes* or *no*. Thus, from (a) to (e), the options were: (a) 2000 CDC Growth Charts (with subcategories of birth-2 years old, 3-5 years old, and 6-19 years old and *yes* or *no* options for each subcategory), (b) WHO 2006 Growth Standards for ages 0-60 months, (c) WHO 2007 Growth References for ages 5-19 years old, (d) I mostly use my own professional judgment to assess paediatric growth patterns, and (e) Other (please specify...).

3.6.3 Concerns and Level of Use. Section B contained questions about FPs' concerns regarding the health consequences of paediatric overweight and obesity, as well as their LoU of the WHO Growth Charts. Concern about the health consequences is seen as a provider characteristic, and was assessed using one item adapted from Steckler et al.'s (1992) Awareness-Concern questionnaire (based on the work of Hall & Rutherford, 1979, and Hall & Hord, 1984, as cited in Steckler et al., 1992). This item was taken from the interest factor scale within the questionnaire ($\alpha = .72$), and modified so that the statement used in this survey was "I am concerned about the health consequences of paediatric overweight/obesity." It was answered on a four-point Likert scale with response options scored as follows: 1 = *not at all*, 2 = *slightly true*, 3 = *somewhat true*, and 4 = *very true*.

An adapted version of Steckler et al.'s (1992) Level of Use questionnaire (based on the work of Hall & Loucks, 1975, as cited in Steckler et al., 1992) was used to measure participants'

LoU of the WHO Growth Charts. Within the original 22-item questionnaire, eight questions were used to measure LoU, and each had a dichotomous response scale of *true* or *false*. These questions represented five levels of use including: Level 0 (non-use, little, or no knowledge of the innovation), Level 1 (very low use, orientation, and preparation to use), Level 2 (low use, mechanical, and learning use), Level 3 (moderate use, routine use, and refinement), and Level 4 (high use, integration, and renewal). A reliability coefficient was not computed as the authors argued, "there is no reason that higher level of use items would correlate with lower level of use items" (Steckler et al., 1992, p. 219). To minimize the number of questions within the current survey while still retaining these stratification levels, the FP were asked to "Please pick the statement that best describes your current level of use of the 2006 & 2007 WHO Growth Charts." The following response options were provided: (1) "I am not using, nor have I used, the WHO Growth Charts in my practice"; (2) "I am not using the WHO Growth Charts now, but have previously used them in my practice"; (3) "I am currently learning or have learned about what the WHO Growth Charts are"; (4) "I am currently preparing or have prepared myself in order to begin using the WHO Growth Charts"; (5) "I have already begun to use the WHO Growth Charts in my practice"; (6) "At this time, I am routinely using the WHO Growth Charts in my practice"; and (7) "I have spent time and energy discussing major revisions to using the WHO Growth Charts with others in order to improve them."

3.6.4 Perceived characteristics of the WHO Growth Charts. Section C contained questions related to the FPs' perceived attributes of the WHO Growth Charts. Characteristics of the charts included relative advantage, complexity, accessibility, observability, trialability, and compatibility, and questions were adapted from Steckler et al.'s (1992) Rogers's Adoption Questionnaire and Moore and Benbasat's (1991) Perceptions of Adopting an Information

Technology Innovation scale. The former questionnaire by Steckler et al. (1992) had four questions to measure relative advantage (α = .88), three questions to measure complexity (α = .83), and two questions to measure observability (α = .77). Response options were *strongly agree, somewhat agree, somewhat disagree,* and *strongly disagree*. The latter instrument developed by Moore and Benbasat (1991) had both a long (38-item) and short (25-item) form, and the number of items and Cronbach's alpha for each construct can be seen in Table 1. A seven-point Likert scale was used for response options, ranging from *extremely disagree* to *extremely agree*. The voluntariness, image, and visibility constructs were not evaluated in the current study. Furthermore, their ease of use construct was labeled as complexity in this study, and result demonstrability was labeled as observability. Questions in this survey and the constructs they measured were as follows: (1) "The WHO Growth Charts improve the overall quality of paediatric weight assessments by Family Physicians in BC" (relative advantage), (2) "Using the WHO Growth Charts makes it easier to identify paediatric overweight/obesity compared to other available growth charts" (relative advantage), (3) "The WHO Growth Charts are or appear to be difficult to use" (complexity), (4) "The WHO Growth Charts are/were easy to access for use in my practice" (accessibility), (5) "I can easily see how using the WHO Growth Charts has impacted the paediatric patients in my practice" (observability), (6) "Before deciding whether to use the WHO Growth Charts, I was able to try them out" (trialability), and (7) "Using the WHO Growth Charts is compatible with my work needs and values" (compatibility). Response options were scored as follows: 1 = *strongly disagree*, 2 = *somewhat disagree*, 3 = *unsure*, 4 = *somewhat agree*, and 5 = *strongly agree*. An *N/A* response option was also provided and was coded as missing data. Reverse scoring was used for responses to the complexity question so that scoring would be consistent with the directionality of the wording of the item.

Individual scores for the two questions regarding relative advantage were summed to produce an overall relative advantage score, with a theoretical range of scores from two to 10.

Table 1

Long and Short Versions of Moore and Benbasat's (1991) Perceptions of Adopting an Information Technology Innovation Scale Instrument

	38-item scale		25-item scale	
Construct	Items	α	Items	α
Relative advantage	8	.92	5	.90
Ease of use	6	.80	4	.84
Result demonstrability	3	.77	4	.79
Trialability	5	.71	2	.71
Compatibility	4	.83	3	.86
Image[a]	4	.80	3	.79
Visibility[a]	4	.73	2	.83
Voluntariness[a]	4	.87	2	.82

Note. [a]Constructs not evaluated in the current study.

3.6.5 Innovativeness and cosmopoliteness. Section D contained questions about FPs' general tendencies to adopt new medical practices or guidelines, measured as their level of innovativeness, as well as their frequency of use of various information sources and communication channels typically used in practice, measured as their level of cosmopoliteness.

The participants' levels of innovativeness were assessed using questions adapted from Hurt, Joseph, and Cook's (1977) Innovativeness Scale. Nunally's r for the 20-item scale was .94, therefore demonstrating excellent internal reliability. The scale was also reported to have construct validity as the percentages of respondents categorized into the five adopter types based on their innovativeness scores were not significantly different from those percentages defined in the DOI theory. A shorter 10-item scale was also offered, which included the highest item-total correlations, and had a correlation with the 20-item scale of .92 (Nunally's r = .89). No data had been gathered to test the short form's validity. The responses were ranked on a seven-point Likert scale, which ranged from *strongly agree* to *strongly disagree*. Many of the questions in

the original 20-item scale had to be excluded to minimize length of the current survey, however, we tried to retain at least one question that would represent each of Rogers's (2003) adopter types. Thus, the questions included in this survey were: (1) "My colleagues often ask me for medical-related advice or information," (2) "I seek out new ways to do things in my practice," (3) "I am generally cautious about accepting new medical ideas," (4) "I consider myself to be creative and original in my medical thinking and practice," (5) "I am aware that I am usually one of the last people in my medical colleague group to accept new medical ideas," (6) "I enjoy taking part in the leadership responsibilities of the medical group(s) I belong to," (7) "I must see other colleagues using new medical innovations before I will consider using them," and (8) "I am receptive to new medical ideas." While the original scale had *undecided* as a response option, it was omitted in this survey to ensure that an answer was chosen. Response options to each question were scored as follows: 1 = *strongly disagree*, 2 = *disagree*, 3 = *moderately disagree*, 4 = *moderately agree*, 5 = *agree*, and 6 = *strongly agree*. Reversed scoring was used for responses to questions three, four, and five so that scoring would be consistent with the directionality of the wording of the item. Individual responses to all eight questions were then summed to produce an overall innovativeness score for each participant, with a theoretical range of scores from eight to 48. Higher scores represented higher degrees of innovativeness.

The FPs' levels of cosmopoliteness were determined by their frequency of use of various information sources and communication channels. This was assessed using an adapted version of the sources of knowledge questions presented by Birdsell, Thornley, Landry, Estabrooks, and Mayan (2005), which was chosen because their study also examined physicians' use of information sources. While no validity or reliability measures were reported for the original scale, a total of 18 types of sources/communication channels were included in the current study,

such as studies published in peer reviewed scientific journals, systematic reviews/meta analyses, presentations and seminars, CPG, information from colleagues, etc. Each source was ranked on a five-point Likert scale and scored as follows: 1 = *never use*, 2 = *rarely use*, 3 = *sometimes use*, 4 = *often u*se, and 5 = *very often use*. Individual responses to each question were then summed to produce an overall cosmopoliteness score for each respondent, with a theoretical range of scores from 18 to 90. Higher scores represented higher degrees of cosmopoliteness.

3.6.6 Training, efficacy, and outcome expectations. Section E contained questions about FPs' pre-use training for the WHO Growth Charts, as well as their efficacy and outcome expectations in terms of paediatric growth and weight management. The factor related to the prevention support system (i.e. training) was adapted from one item in Steckler et al.'s (1992) scale, although a validity or reliability measure was not provided. The adapted statement used in the present survey was "I have participated in pre-use training or planning in preparation for using the WHO Growth Charts with my paediatric patients" with a response option of *yes* or *no.* A follow-up question was then asked to gather qualitative information from those who had responded *yes*. This question was "If you answered YES, which training have you participated in? (Please check all that apply)" and response options included "medical school training," "Dietitians of Canada online training program modules," "through a continuing education course (please specify…)," "training provided by my Health Care Team/Network (please specify…)," and "other (please specify…)."

FPs' efficacy and outcome expectations regarding paediatric growth and weight management were assessed using an adapted version of Brenowitz and Tuttle's (2003) Nutrition-Teaching Self-Efficacy Scale. These authors offered a one 20-item scale ($\alpha = .90$) or two subscales of efficacy expectations (14 items; $\alpha = .90$) and outcome expectations (six items; $\alpha =$

.85). The two questions adapted from the efficacy expectations subscale that were included in the current survey were: (1) “How confident are you that you can do a good job educating your paediatric patients and their families on weight and growth-related issues (i.e. proper nutrition, physical activity and sedentary behaviours)?” and (2) “How confident are you that you are aware of appropriate resources and programs for healthy weight management that are available for your patients and their families?” The two questions adapted from the outcome expectations subscale were: (1) “How confident are you that, in general, if you identify a paediatric patient that is leaving the healthy weight trajectory, that the patient and family will be interested in weight management advice?” and (2) “How confident are you if you spend more time educating your patients and their families on healthy weight management, that it will have a positive impact on their knowledge and attitudes about healthy weight practices (i.e. nutrition, physical activity, sedentary behaviours)?” Answers were ranked on a four-point Likert scale and scored as follows: 1 = *not at all confident*, 2 = *somewhat confident*, 3 = *fairly confident*, and 4 = *very confident*. Response scores to the first two questions were summed to produce an overall score designated as efficacy expectations, and scores for the second two questions were summed to produce an overall score designated as outcome expectations. Both of these constructs had a theoretical range of scores from two to eight, with higher scores representing higher degrees of expectations.

3.6.7 Factors related to the prevention delivery system. Section F contained questions about FPs’ organizational capacity in terms of specific staffing considerations, specific practices and processes, and general organizational factors in their HCT or Network. Sociometric self-designating methods were used to identify the presence of an innovation champion in the FP’s practice, HCT, or region that was promoting the WHO Growth Charts (Rogers, 2003). First, participants were provided with the definition of an innovation champion as “an individual who

throws his or her weight behind an innovation (i.e. a new idea, practice, or object such as the 2006 & 2007 WHO Growth Charts) by actively and enthusiastically promoting its progress through the critical organizational stages, thus overcoming indifference or resistance that the innovation may provoke." They were then asked "Using the above definition, is there an innovation champion in your practice, Health Care Team, or region that is promoting the WHO Growth Charts?" with a response option of *yes* or *no*, and a follow-up question of "If you answered YES, is it you?" with the same dichotomous response option.

Specific practices and processes, and general organizational factors were measured using a variety of questionnaires adapted from Taylor and Bowers (1972), including the Technological Readiness, Group Processes, Decision-Making Practices, and Communication Flow questionnaires. These questions specifically asked about the integration of new programming (a general organizational factor), shared decision-making and communication (specific practices and processes), and were ranked on a five-point Likert scale ranging from *to a very little extent* to *to a very great extent*. The first question asked "Are you apart of a Health Care Team/Network, or Group Practice?" with a response option of *yes* or *no*. If they answered *no*, they were instructed to go to the next section, and if they answered *yes*, three additional questions were asked, including: (1) "To what extent does your Health Care Team/Network/Group collaborate in determining what clinical practice guidelines will be implemented and how?" (2) "To what extent is your Health Care Team/Network/Group generally quick to incorporate new clinical practice guidelines?" and (3) "How adequate is the amount of information you get about what is going on in other Health Care Teams/Networks/Groups in terms of screening for healthy weights or managing paediatric overweight/obesity?" Answers were ranked on the same five-point Likert scale and scored as

follows: 1 = *to a very little extent*, 2 = *to a little extent*, 3 = *to some extent*, 4 = *to a great extent*, and 5 = *to a very great extent*. Response scores to the first two questions were summed to produce an overall score designated as team collaboration, and this score had a theoretical range from two to ten. Higher scores represented higher levels of team collaboration.

3.6.8 Barriers, facilitators, and awareness of programs. Section G was the final section that allowed for identification of any additional barriers or facilitators that either hindered or enhanced FPs' use of the WHO Growth Charts, as well as their awareness of any community, provincial, national, and international resources available to support paediatric patients who are at an unhealthy weight. The first question asked, "If you do not currently, or do not intend to use the WHO Growth Charts on a regular basis in your practice, what are your reasons for not doing so? (Please check all that apply)" and response options included: "policies in my organization that prevent changes," "insufficient time to implement," "not a priority area for me," "lack of funding," "lack of incentives," "not feasible in my normal daily work," "not relevant for my patients," "lack of consensus to use them amongst my colleagues," "lack of knowledge in this particular area," and "other (please specify…)." The number of checkmarks from each participant was summed so that everyone received an individual barrier score. The second question was "Are there any additional reasons why you are using the WHO Growth Charts? (Please specify...)" and a blank spot was provided for the answer. Again, the number of checkmarks from each participant was summed so that everyone received an individual awareness score. The third question was "Are you aware of any of the following community, provincial, national, or international resources/initiatives available to support paediatric patients who are currently at, or at-risk of being, an unhealthy weight? (Please check all that apply)" and options included: "HealthLink BC," "Subspecialty Care," "Centre for Healthy Weights-

Shapedown BC," "BC Children's Hospital," "multidisciplinary team in community," "Exercise is Medicine," "Sustainable Childhood Obesity Prevention through Community Engagement (SCOPE)," "Mind, Exercise, Nutrition, Do It! (MEND)," and "other (please specify…)." The last question asked, "Do you have any additional comments, questions or concerns pertinent to this topic/survey? (Please specify...)" and a blank spot was provided for the answer.

The final portion of the survey thanked the FP for their participation, and had a blank spot to provide their name and contact information (telephone number or email address) if they wished to be entered into the draw to win a $100 charitable donation.

3.6.9 Scale reliabilities. The majority of theoretical constructs were assessed using a single-item variable in the survey. However, some constructs were measured by more than one variable. When this was the case, scale reliabilities were computed to check for internal consistency and to ensure that the variables were measuring the same construct. When two items were used to measure one construct (i.e. two questions assessed the relative advantage of the WHO Growth Charts, FPs' efficacy expectations, outcome expectations, and team collaboration), the Spearman-Brown split half coefficient was calculated in IBM® Statistical Package for the Social Science® (SPSS) Statistics version 22.0 software (IBM Corporate, 2013). The Spearman-Brown coefficient was chosen over other reliability statistics for two-item scales (i.e. Pearson's coefficient, Cronbach's alpha, or Guttman's lambda-2) based on the work of Eisinga, te Grotenhuis, and Pelzer (2013). While these authors commented that using only one or two items to detect a construct has been acknowledged as problematic for some time, it was necessary to reduce the original number of scale questions in order to minimize the survey length and participant burden in the current study. When three or more items were combined to create a composite measure (i.e. to create innovativeness and cosmopoliteness scores), Cronbach's alpha,

the most frequently reported reliability statistic, was calculated (Eisinga et al., 2013). Participants with missing data (i.e. that did not answer one or more questions in the subscales) were excluded in the scale reliability analysis. The commonly accepted value of .7 was used as a cut-off point for the scale reliability coefficients (Field, 2013), and any scales with values significantly lower were omitted in the analyses.

Table 2 presents the scale reliabilities, including the constructs and associated survey questions. The two questions measuring the relative advantage of the WHO Growth Charts (i.e. Q13 and Q14) had a Spearman-Brown split half reliability coefficient approaching the accepted value of .7, and as such, they were combined to create one scale.

The two questions that were initially thought to measure the complexity of the WHO Growth Charts (i.e. Q15 and Q16) had a low Spearman-Brown split half reliability coefficient (< .5). This could be attributed to the fact that Q16 was not drawn from a previously developed scale, although it was believed to represent an aspect of the complexity construct. It was also added as an interest point to inform key stakeholders (e.g. the MOH) about the accessibility of the charts. The scale reliability analysis indicates that it appeared to have measured a separate construct from complexity. As such, the two items were analyzed separately in the subsequent analyses and Q16 was labeled as the "accessibility" construct.

The scale reliability for the eight questions measuring FPs' innovativeness (Q20-27) was acceptable ($\alpha > .7$). Scale reliabilities for questions regarding the FPs' use of various information sources in practice were tested for four different types of groupings, including: academic sources (e.g. journal studies, systematic reviews, databases, etc.), professional sources (e.g. presentations and seminars, CPG, teaching rounds, etc.), and personal sources (e.g. information from colleagues, specialists, other health professionals, etc.), and then by combining all 18 sources

together for a cosmopoliteness score. While personal sources had the highest reliability coefficient (α = .86), the reliability for the cosmopoliteness score (α = .79) was higher than that of the two other groupings (i.e. academic and professional sources), and as such, it was decided to use the cosmopoliteness construct in subsequent analyses.

Four questions were used to measure FPs' self-efficacy expectations (Q32-35). Results from the development of the original measurement tool suggested that this construct could be kept together, or divided into efficacy expectations and outcome expectations (Brenowitz & Tuttle, 2003). Thus, two questions measured FPs' efficacy expectations (Q32 & Q33) and two questions measured FPs' outcome expectations (Q34 & Q35). A computation of the scale reliabilities for these three different groupings (i.e. overall self-efficacy expectations, efficacy expectations, and outcome expectations) revealed fairly similar reliability coefficients (all >.7). It was therefore decided to analyze efficacy expectations and outcome expectations as two separate constructs.

Two different scale reliabilities were computed for the three questions that intended to measure the organizational climate of the FP involved in a HCT/Network or Group Practice (Q38-40). The first scale reliability was performed on the two questions (Q38 and Q39), collectively referred to as "team collaboration." The second scale reliability was performed on these two questions plus the third (Q40). This construct was designated as organizational climate. As the reliability coefficient was greater than .7 for the team collaboration construct, and less than .7 for the organizational climate construct, the former scale was included in subsequent analyses.

Table 2

Scale Reliabilities for Multi-Item Measures

Construct	*n*	Survey questions	S-B split half	α
Relative advantage	53	13 & 14	.69	-
Complexity	51	15 & 16	.47	-
Innovativeness	54	20 - 27	-	.74
Academic sources	51	28	-	.75
Professional sources	51	29	-	.75
Personal sources	53	30	-	.86
Cosmopoliteness	48	28 - 30	-	.79
Efficacy expectations	55	32 & 33	.77	-
Outcome expectations	54	34 & 35	.75	-
Self-efficacy expectations	54	32 - 35	-	.76
Team collaboration	38	38 & 39	.72	-
Organizational climate	38	38 - 40	-	.66

Note. Boldface denotes the constructs that were included in the analysis. S-B = Spearman-Brown.

3.7 Data Treatment and Management

Responses from returned surveys were input to FluidSurveys™ and upon completion of data collection, all data in FluidSurveys™ were exported to Microsoft® Office Excel® version 12.3.6 (Santa Rosa, California). Responses were then coded and cleaned, and exported to SPSS®. Missing data and *N/A* responses were coded as -88 and -99, respectively. A cross-check of coded data against raw answers was completed to find and correct any possible data entry errors. Completed surveys were kept in a locked cabinet in the University of Victoria, School of Exercise Science, Physical and Health Education building. All information in Excel® and SPSS® were accessed through the secure University of Victoria Netdrive server.

3.8 Statistical Analysis

All statistical analyses were performed in SPSS® and significance was set at $p < .05$. Two-tailed tests were performed for all analyses. Although directionality was suggested in the hypotheses for relationships between certain variables and LoU, and directionality would indicate the use of a one-tailed test, a two-tailed test is more liberal and is suitable when the

results may not support the hypothesis (Howell, 2008).

3.8.1 Descriptive statistics and exploratory data analysis. Descriptives were calculated for all individual variables to determine frequencies and/or means, standard deviations, medians, ranges, and modes. Scatterplots, quantile-quantile (Q-Q) plots, probability-probability (P-P) plots, boxplots, histograms, skewness and kurtosis values, Komogorov-Smirnov, and Shapiro-Wilk tests were also computed to see if the data met the four main assumptions underlying parametric tests (Field, 2013).

The first assumption of parametric tests is of additivity and linearity, which matters for model validity and means that the predictors are linearly related to the outcome variable (Field, 2013). The second assumption is of normal distribution, which means that the data should come from a normally distributed population, although the data itself does not have to be normally distributed. This assumption is relevant to several things when fitting models and assessing them, such as parameter estimates, confidence intervals (CI), null hypothesis significance testing, and errors. However, the central limit theorem (CLT) proposes that as sample size increases (typically greater than 30 participants; Field, 2013), the sampling distribution is normally distributed with a mean equal to the population. Furthermore, the CLT suggests that normality does not matter as much if only model parameters are being estimated, and even when constructing CIs around the parameters or computing significance tests, normality would matter in small samples but not in larger samples. As 30 is the widely accepted minimum sample size for this theorem to hold true, it can be seen that our sample of 62 FP is likely large enough to not worry about violating the assumption of normality.

The third assumption is of homogeneity of variance, which assumes that the spread of outcome scores is roughly equal at different points on the predictor variable. The fourth

assumption is of independence, meaning that errors in the model are unrelated to each other as a result of participants answering the survey independently. This is important when calculating the standard error, which is then used to compute CIs and significance tests. In this study it was assumed that no participants conferred with each other while completing the survey, and thus, that this assumption was not violated (Field, 2013).

3.8.2 Correlations. Pearson's product-moment correlation coefficients (*r*) were computed to determine the strength of relationships between variables, and to see which independent variables were statistically significantly correlated with the dependent variable. The values of this standardized measure can range from -1 to + 1, with larger values in either direction indicating a stronger relationship (Field, 2013). As suggested by Cohen (1992), an *r* of .10 would signify a small effect (i.e. that the effect of the one variable accounts for 1% of the total variance in the outcome variable), *r* = .30 would show a medium effect (i.e. the effect explains 9% of the total variance), and *r* = .50 would show a large effect (i.e. the effect explains 25% of the total variance). In terms of directionality, a negative value would mean that as one variable changes, the other variable changes in the opposite direction by the same amount. A zero would indicate that as one variable changes the other does not change, and a positive value would mean that as one variable changes, the other variable changes in the same direction by the same amount (Field, 2013). While *r* measures the degree to which two variables are related, the squared *r* (r^2), representing the coefficient of determination, was also assessed as it signifies the percent of the variation in the value of the outcome variable (i.e. LoU) that can be attributed to the variations in the values of the predictor variables (Taylor, 1990). The coefficients of determination (i.e. percentages) associated with small, medium, and large effects, as well as their interpretations, have been included after the suggested effect values noted above.

3.8.3 Multiple linear regression. Multiple linear regression was run to test the hypothesis for the second research question, which aimed to establish the factors predicting LoU of the WHO Growth Charts based on constructs included in the guiding models. Cases were excluded pairwise in the regression to maximize the amount of data included in the analyses. The initial model and subsequent regression analyses were assessed for a number of items, which are described below.

The correlation matrix was first checked for multicollinearity, which revealed if any independent variables were too highly correlated at $r > .9$. The Durbin-Watson test statistic was used to test the assumption of independent errors. Fit of the model, which refers to "the model's ability to predict the outcome variable" (Field, 2013, p. 329), was measured using the following: Fisher's *F*-ratio (i.e. the variance explained relative to error in the model), the value of *R* (i.e. the multiple correlation coefficient between the independent variables and the outcome), the corresponding R^2 (i.e. how much of the variability in the outcome is accounted for by the independent variables), and the adjusted R^2 (i.e. how much variance in the outcome variable would be accounted for if the model had been taken from the population from which the sample was derived; Field, 2013).

T-statistics were analyzed to see whether the estimated coefficients of the regression model (i.e. the unstandardized regression coefficients for each variable, *B*s) were significantly different than zero (a $p < .05$ would indicate that the variable was a significant predictor). However, the standardized beta coefficients (β) were interpreted instead of the unstandardized *b*-values, as they do not depend on the variables' units of measurement (Field, 2013). They signify the effect that a one standard deviation change in the predictor will have on the number of standard deviation changes in the outcome variable. Since these values are measured in standard

deviations, each predictor's value can be directly compared, therefore revealing the importance of each predictor. To determine the actual value change in LoU for each predictor, the predictor's β-value was multiplied by the LoU standard deviation (1.95). Multiple model analyses were run, sequentially removing variables that did not have a significant *t*-statistic value, until the most-fitting regression model was produced (Field, 2013).

4.0 Results

4.1 Overview

This section is presented in four overarching sections, including descriptives for demographic and practice information of the sample, LoU of the WHO Growth Charts, factors predicting use determined through multiple linear regression, and FPs' awareness of resources and programs available to support paediatric weight management. The data appeared to meet the four main assumptions underlying parametric tests based on the exploratory analysis.

The random selection and exclusion procedures for rural and urban FP in BC, including eligibility and response rates, can be found in Figure 5. Overall, 30 of the 41 urban communities and 111 out of the 185 of the rural communities had actively practicing FP. There was a total of 4329 urban FP and 1258 rural FP to randomly select from. The response rate for the combined random selection of urban and rural practicing FP was 6.4% (n = 21/328).

Table 3 presents survey distribution through the DoFP in BC, including responses, distribution modes, and number of FP in each DoFP. Of the 32 DoFP representing the six HA regions contacted during data collection, 21 (66%) agreed to distribute the survey. Distribution occurred from the beginning of August to September. The most frequently used distribution mode was newsletters (n = 9), followed by direct emails to DoFP members (n = 8), including it on the DoFP website (n = 4), bulletins (n = 3), message boards (n = 1), and FPs' hospital

mailboxes (n = 1). Five of the DoFP also used a combination of these methods in an attempt to enhance FP contact. Between the 21 participating DoFP, the survey was sent to a total of 2525 FP. However, many of the DoFP Coordinators or EDs indicated that their mode of distribution would likely not reach each FP in their division as many of the FP would not check their emails, newsletters, their DoFP website, etc. Furthermore, they mentioned that it was not a convenient time to contact FP as many were on summer holidays. As such, it is difficult to determine how many FP would have actually received the survey information. If all 2525 FP did receive it, then the response rate was very low at 1.6% (n = 41). Between the random selection of FP and survey distribution by the DoFP, 62 usable surveys were returned for a response rate of 2.2% (N = 2853). The average time for survey completion was 12 minutes.

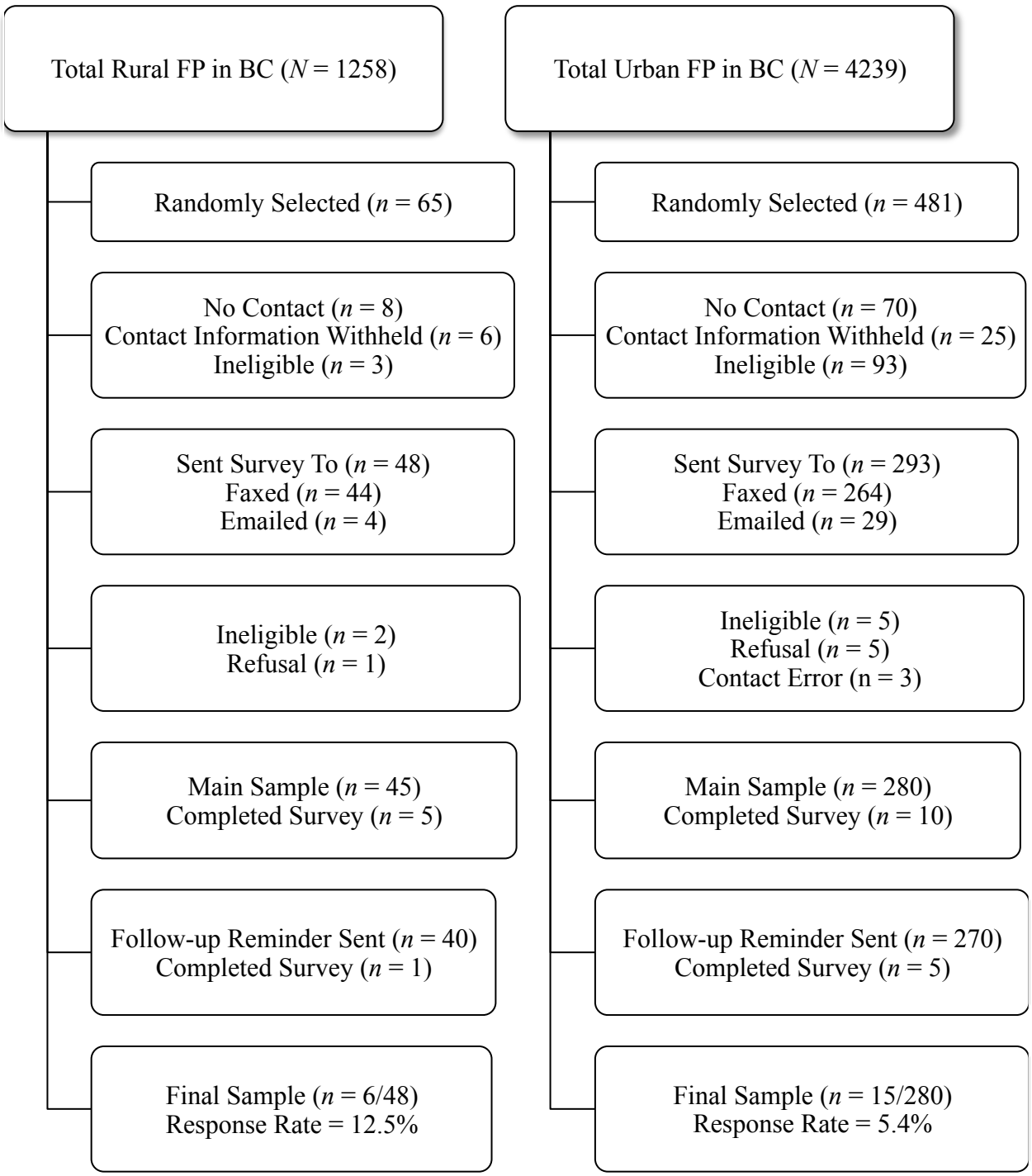


Figure 5. Random selection, exclusions, and response rates of rural and urban Family Physicians.

Table 3

Survey Distribution Through the Divisions of Family Practice in British Columbia

HA	DoFP	Response (Y/N)	Distribution Mode	No. of FP
Northern	North Peace	N	-	-
	Northern Interior Rural	N	-	-
	Prince George	Y	E & M	78
FP responses				**11**
Vancouver Coastal	North Shore	Y	N & W	162
	Powell River	Y	N & MB	27
	Richmond	Y	N	119
	Sunshine Coast	Y	E	35
	Vancouver	Y	B	650
FP responses				**4**
Vancouver Island	Comox Valley	Y	N	102
	Cowichan Valley	Y	E	90
	Nanaimo	Y	W	127
	Oceanside	Y	E	38
	South Island	Y	N & W	144
	Victoria	N	-	-
FP responses				**12**
Interior	Central Interior Rural	Y	E	44
	Central Okanagan	Y	N	149
	East Kootenay	Y	N	80
	Kootenay Boundary	N	-	-
	Shuswap North Okanagan	Y	N	128
	South Okanagan Similkameen	N	-	-
	Thompson Region	N	-	-
FP responses				**4**
Fraser	Abbotsford	Y	E	118
	Burnaby	N	-	-
	Chilliwack	N	-	-
	Delta	Y	B	59
	Fraser Northwest	N	-	-
	Langley	N	-	-
	Mission	Y	E	28
	Ridge Meadows	N	-	-
	Surrey-North Delta	Y	W & N	223
	White Rock-South Surrey	Y	B	94
FP responses				**9**
Across Health Authorities	Rural and Remote	Y	E	30
FP responses				**1**

Note. HA = Health Authority; DoFP = Divisions of Family Practice; FP = Family Physicians; Y = yes; N = no; distribution modes include: E = direct email; M = mailboxes at hospital; MB =

message board; B = bulletin or information flyer/fast facts; N = newsletter; W = website.

4.2 Demographics and Practice Information

Frequencies and percentages were calculated for participant demographic and practice information for the total sample ($N = 62$), although some participants did not answer every question in this section. Table 4 contains the frequencies and percentages of response categories for FPs' ages, years practicing medicine, and the percentage of paediatric patients seen per week. In terms of gender, 55.7% ($n = 34/61$) of participants were female. The ages ranged from 20 to 69 years old, with the average age between 40 and 49 years old ($M = 3.28$, $SD = 1.13$). The average number of years practicing medicine was 11 to 15 years ($M = 3.56$, $SD = 1.52$), and the average percentage of paediatric patients seen per week out of the total practice populations was between zero and 19% ($M = 1.42$, $SD = .56$).

Table 4

Age, Years Practicing Medicine, and Percentage of Paediatric Patients Seen by Reporting Family Physicians as Frequencies and Percentages of the Sample

	n	%
Age (*N* = 61)		
20 – 29	2	3.3
30 – 39	17	27.9
40 – 49	13	21.3
50 – 59	20	32.8
60 – 69	9	14.8
70 or older	0	0.0
Years practicing medicine (*N* = 61)		
1 – 5	9	14.8
6 – 10	9	14.8
11 – 15	8	13.1
16 – 20	9	14.8
21 or more	26	42.6
Paediatric patient load per week (*N* = 62)		
0 – 19%	38	61.3
20 – 39%	22	35.5
40 – 59%	2	3.2
60 – 79%	0	0.0

80 – 100%	0	0.0

Note. Family Physicians were instructed to answer these questions according to their primary practice information if they had multiple practices.

The percentage of FP practicing in the various HA regions can be seen in Figure 6. The highest representation was from Fraser Health (n = 16, M = .26, SD = .44*)*, and the lowest was from Interior Health (n = 8, M = .13, SD = .34). One participant did not respond to this question. Figure 7 shows the percentage of FP (N = 61) practicing in various community sizes. The highest representation was from large urban population centres (n = 24, 39.3%), and the lowest was from small communities (n = 2, 3.3%). Representation from the specific rural community types (i.e. A, B, C, or D) were also determined and compared to urban representation. While the majority of FP (n = 32/61, 52.5%) practiced in urban areas, the second largest representation was from Rural B Communities (n = 12, 19.7%), followed by Rural C Communities (n = 9, 14.8%) and Rural A Communities (n = 8, 13.1%). No FP practiced in Rural D communities. Again, one participant did not respond to this question.

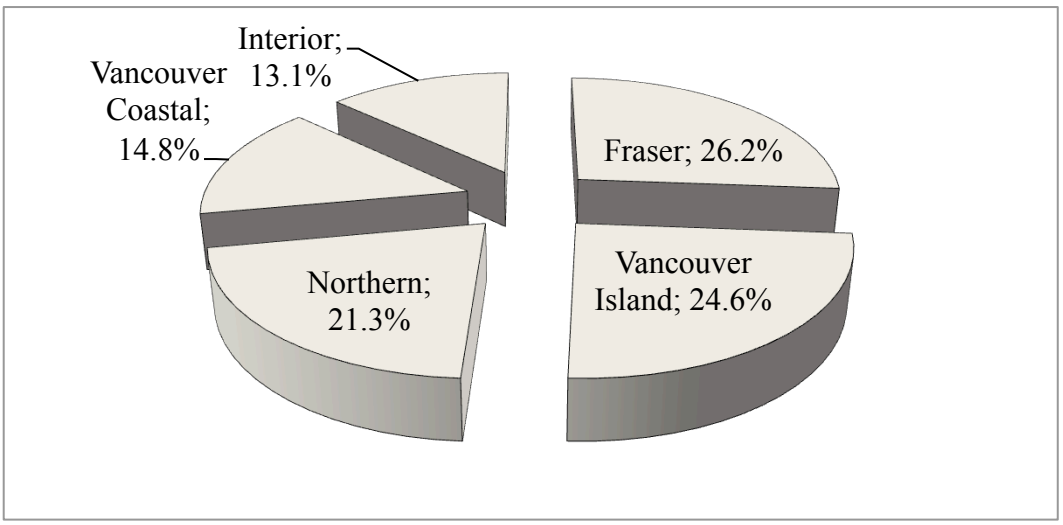


Figure 6. Representation of Health Authority regions by reporting Family Physicians (N = 61).

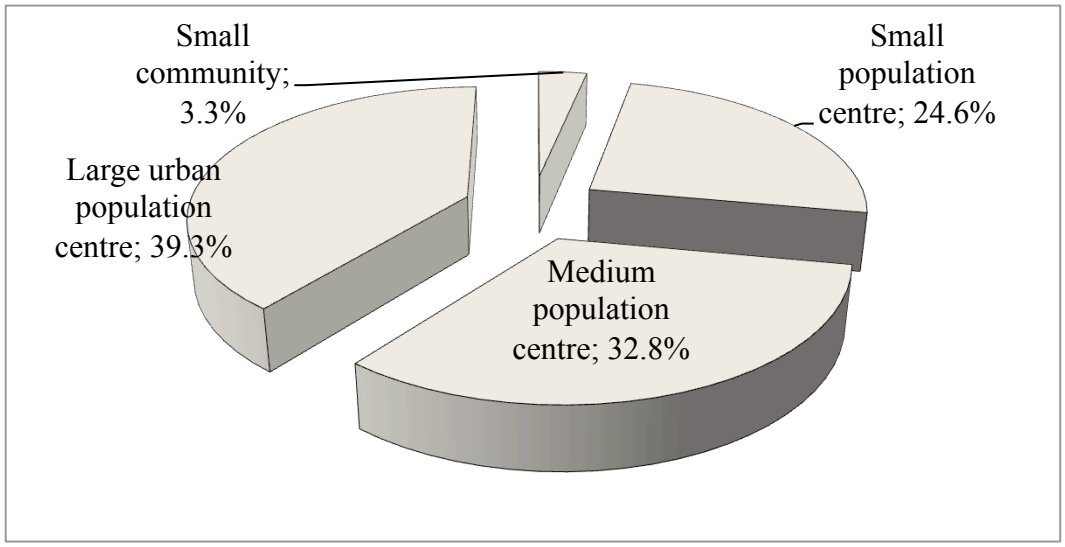


Figure 7. Representation of community sizes by reporting Family Physicians ($N = 61$).

In terms of practice type, the majority of the 62 respondents were members of group practices ($n = 43$, 69.4%), followed by outpatient/walk-in clinics and solo practices (both with $n = 4$, 6.5%), locums ($n = 3$, 4.8%), and solo practices associated with a group and clinics associated with a tertiary or acute care setting (both with $n = 2$, 3.2%). The smallest representation was from FP who worked in a community health centre, hospital inpatient setting, as a locum and walk-in physician, or had a solo practice and also worked at a maternity clinic (each with $n = 1$, 1.6%). No FP worked strictly as hospitalists.

All 62 participants responded to the question regarding the methods used to assess and monitor growth, and the frequencies and percentages of responses are presented in Table 5. The most commonly utilized methods for all three age categories were weight-for-age and length-for-age. Head circumference was also frequently used for birth to two year olds, and BMI-for-age was frequently used for six to 19 year olds.

Table 5

Methods Family Physicians Reported Using to Assess and Monitor Paediatric Growth as Frequencies and Percentages of the Sample

	Birth to 2 yrs old		3 to 5 yrs old		6 to 19 yrs old	
	n	%	*n*	%	*n*	%
Weight-for-age	57	91.9	50	80.6	39	62.9
Height/length-for-age	57	91.9	55	88.7	40	64.5
Weight-for-length	22	35.5	15	24.2	12	19.4
Head circumference	56	90.3	8	12.9	3	4.8
BMI-for-age	6	9.7	11	17.7	32	51.6
Other	0	0.0	0	0.0	2	3.2

Of the 62 respondents, 80.6% (*n* = 50) reported using an EMR system in their practice; of these FP, 88% stated that they used it to plot paediatric growth data. As seen in Figure 8, the most commonly used EMR system was Profile by Intrahealth (22%) and the least commonly used systems were Plexia, CLINICARE, Practice Solutions by Telus, and Med SQL (each at 2%).

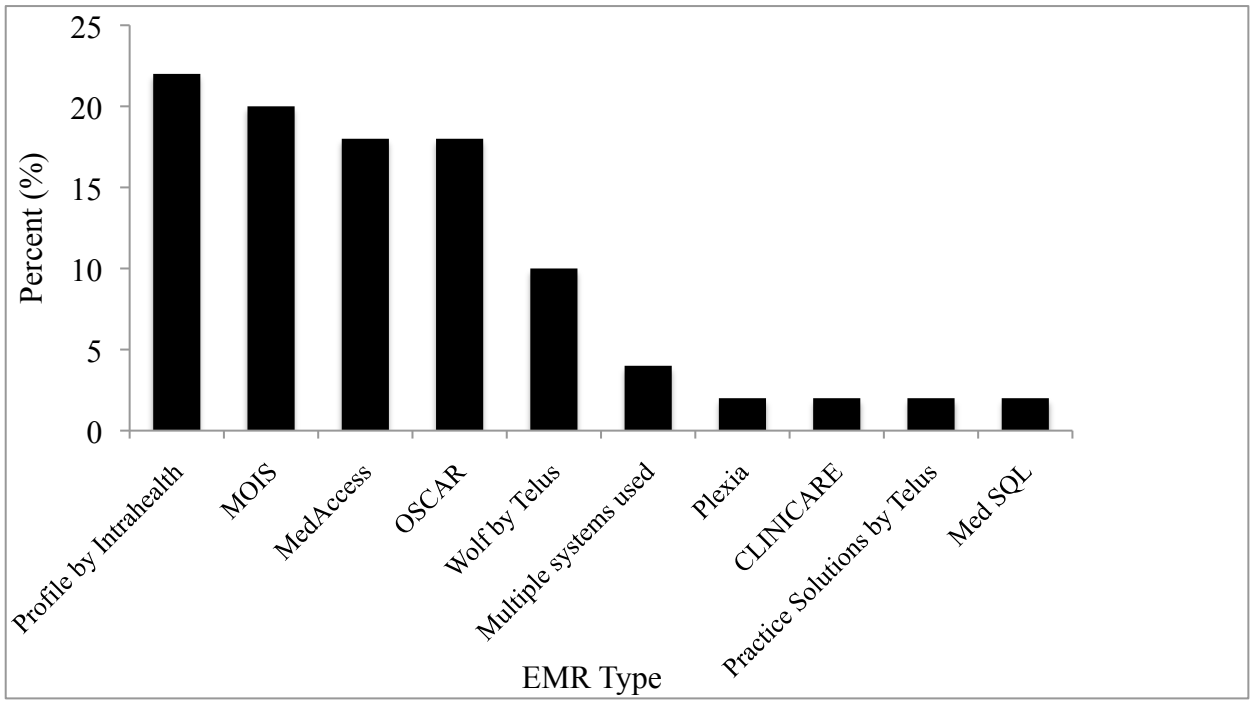


Figure 8. Percentage of responding Family Physicians reporting use of specific Electronic Medical Record systems (*N* = 50).

4.3 Level of Use of the WHO Growth Charts

Survey question 10 was used to understand which growth charts FP were using in their practices. The number and percentages of responses for each option are presented in Table 6. However, not every FP responded with *yes* or *no* to each question, and as such, the *N* column in Table 6 represents the total number of participants that had responded (with either answer) to the particular question. The most frequently used charts were the WHO Growth Standards (*n* = 38/54, 70.4%) and the WHO Growth References (*n* = 31/54, 57.4%), and 9.8% of respondents (*n* = 4/41) indicated that they mostly used their professional judgment to monitor paediatric growth patterns.

Table 6

Type of Growth Charts Family Physicians Reported Primarily Using in Practice as Frequencies and Percentages of the Sample

Growth Chart Type	*N*	*n*	%
2000 CDC (birth to two yrs old)	53	17	32.1
2000 CDC (three to five yrs old)	53	17	32.1
2000 CDC (six to 19 yrs old)	52	14	26.9
WHO 2006 Growth Standards (0 to 60 months)	54	38	70.4
WHO 2007 Growth References (five to 19 yrs old)	54	31	57.4
Professional judgment	41	4	9.8
Other	57	13	22.8
Unknown type	57	6	10.5
Combination of WHO and CDC charts	57	3	5.3
US NCHS 1977 growth charts	57	2	3.5
Older provincial growth charts	57	1	1.8
Ross Pediatrics growth charts	57	1	1.8

Note. CDC = Centers for Disease Control and Prevention; WHO = World Health Organization; US NCHS = United States National Centre for Health Statistics.

Survey question 12 aimed to evaluate FPs' overall LoU of the 2006 and 2007 WHO Growth Charts. While there were seven response options, only three of these options were chosen by participants. Of the 56 FP that responded, 11 (19.6%) picked the statement "I am not using, nor have I used, the WHO Growth Charts in my practice." Ten FP (17.9%) picked the

statement “I have already begun to use the WHO Growth Charts in my practice” and 35 (62.5%) responded as “At this time, I am routinely using the WHO Growth Charts in my practice” (*M* = 4.84, *SD* = 1.95, *Mdn* = 6, *Mo* = 6; see Figure 9).

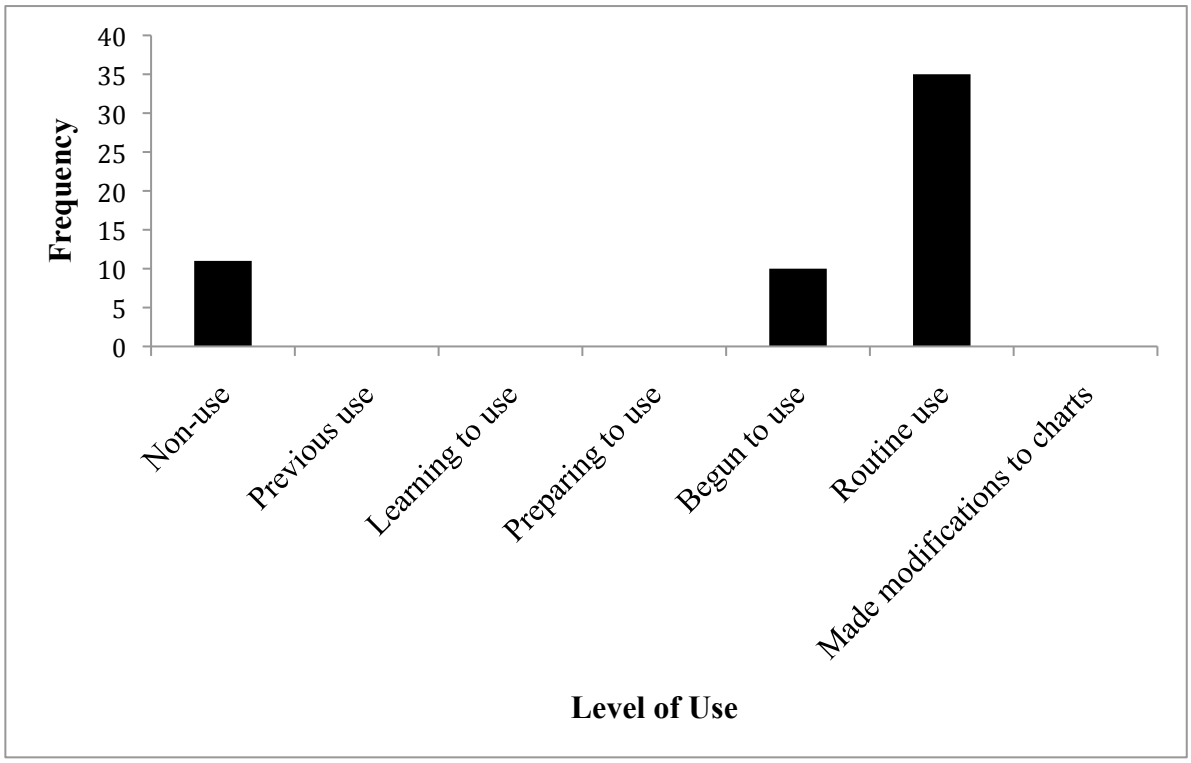


Figure 9. Frequencies of Level of Use of the WHO Growth Charts for reporting Family Physicians (*N* = 56).

Reponses to questions 10 and 12 were correlated to test if the two questions could be cross-validated. The results indicated a validation between these measurements as there was a significant, moderate and positive correlation between responses to use of the 2006 WHO Growth Standards and the LoU question ($r = .62$, $p < .01$, $N = 53$), as well as between use of the 2007 WHO Growth References and LoU ($r = .53$, $p < .01$, $N = 53$). There was also significant, negative correlations between LoU and responses to use of the 2000 CDC Growth Charts for birth to two year olds ($r = -.59$, $p < .01$, $N = 52$), CDC charts for three to five year olds ($r = -.50$, $p < .01$, $N = 52$), and the CDC charts for six to 19 year olds ($r = -.32$, $p < .05$, $N = 51$). There was no

significant correlation between LoU and responses to professional judgment, or with the use of other charts.

4.4 Factors Predicting Level of Use

Based on the DOI theory and the EFEI, there were four categories that contained factors hypothesized to influence LoU of the WHO Growth Charts. These categories included provider characteristics, perceived characteristics of the WHO Growth Charts, factors related to the prevention delivery system (i.e. general organizational factors, specific practices and processes, and specific staffing considerations), and factors related to the prevention support system (i.e. training). The descriptives for responses to the questions for each factor are first presented below, followed by the results of the correlation and multiple linear regression analyses.

4.4.1 Provider characteristics. FPs' reported levels of concern regarding the health consequences of paediatric overweight and obesity were overall quite high. Of the 57 respondents, the majority, at 42 FP (73.7%), answered *very true* ($M = 3.68$, $SD = .57$, $Mdn = 4$, $Mo = 4$) to question 12, "I am concerned about the health consequences of childhood overweight/obesity." Twelve FP (21.1%) answered *somewhat true*, three (5.3%) responded with *slightly true*, and none answered *not at all true.*

Levels of innovativeness were determined by FP responses to eight questions (Q20-27) regarding their general tendencies to adopt new medical practices. The means, standard deviations, medians, ranges, and modes of each questions' scores can be seen in Table 7. The varying *N* values represent the number of FP that responded to each question. These individual scores were then combined to produce an overall innovativeness score for each participant, and the frequencies of these scores are presented in Figure 10. The innovativeness scores ranged from 25 to 44 with a mean score of 34.52 ($N = 54$, $SD = 4.56$, $Mdn = 35$, $Mo = 31$), while the

theoretical range of this score was from eight to 48. Similar to Rogers's (2003) classification of adopter types, in which the majority of the population fall into the early or late majority categories, these results suggest that the majority of FP respondents also followed this pattern as the highest frequency of scores ranged between 31 and 37.

Table 7

Responses to Innovativeness Questions by Reporting Family Physicians

Survey Question	*N*	*M (SD)*	*Mdn* (range)	*Mo*
20. Colleagues ask advice	55	4.25 (1.04)	4 (2-6)	4
21. Seek new ways to do things	55	4.84 (.81)	5 (3-6)	5
22. Cautious accepting new ideas[a]	55	3.33 (1.14)	3 (1-6)	4
23. Creative and original	56	4.16 (.87)	4 (2-6)	4
24. Usually one of last adopters[a]	56	4.77 (.89)	5 (3-6)	5
25. Enjoy leadership	55	4.24 (1.07)	4 (2-6)	5
26. Must see others using new innovations first[a]	56	4.04 (1.13)	4 (1-6)	5
27. Receptive to new medical ideas	56	5.02 (5.6)	5 (4-6)	5
Innovativeness score (range 8-48)	54	34.52 (4.56)	35 (25-44)	31

Note. Response codes were: 1 = *strongly disagree*; 2 = *disagree*; 3 = *moderately disagree*; 4 = *moderately agree*; 5 = agree; 6 = *strongly agree*.
[a]Items with reverse scoring.

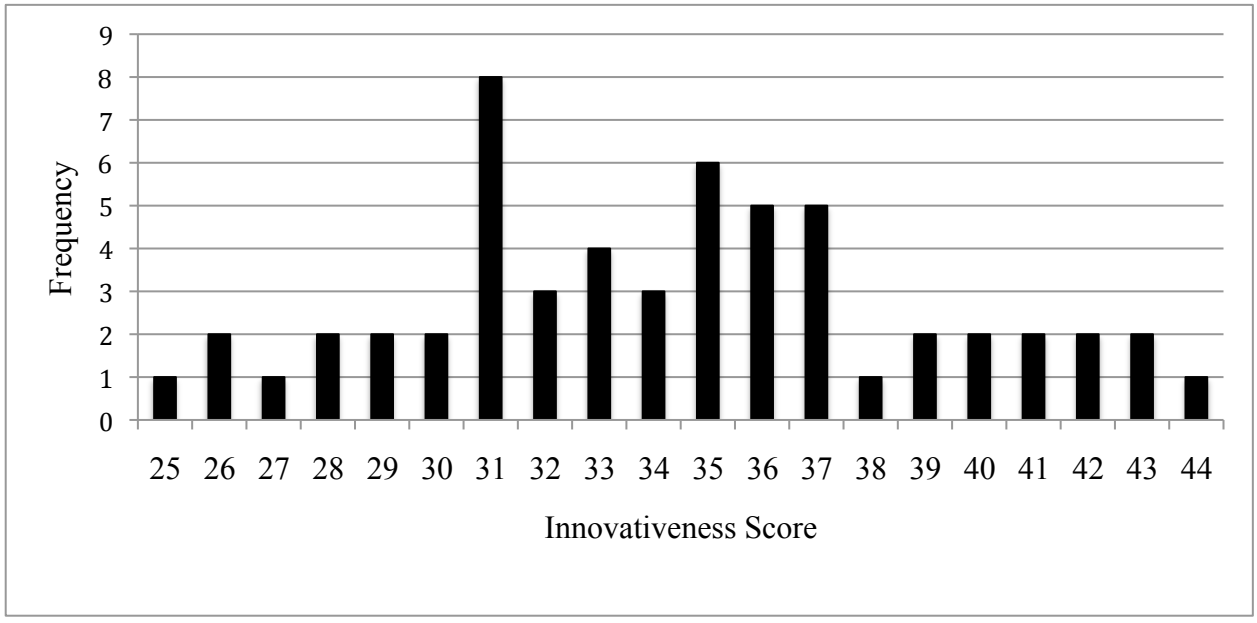


Figure 10. Frequencies of innovativeness scores for reporting Family Physicians (*N* = 54).

Levels of cosmopoliteness were determined by the reported frequencies of use of 18 various information sources by FP in practice (Q28-30). The means, standard deviations, medians, ranges, and modes of each information source score are presented in Table 8. Based on these results, it can be seen that the top three sources with the highest mean scores were continuing education courses (M = 4.02), publications that focus on evidence-based medicine (M = 3.98), and information from medical specialists and personal experience/what has worked for the FP in the past (M = 3.96). It is also noted that the average response for use of CPG, which is relevant to use of growth charts, was *sometimes use*, but very close to the response of *often use* (M = 3.91). The three information sources with the lowest mean scores were databases (M = 2.46), policy and procedure manuals (M = 2.83), and medical bulletins and newsletters (M = 3.11). Scores for each information source were then summed to produce an overall cosmopoliteness score for each participant, and the score range was from 49 to 82 (N = 54, M = 63.17, SD = 7.79, Mdn = 62.5, Mo = 59). The theoretical range for this was from 18 to 90. Figure 11 shows the frequencies of cosmopoliteness scores.

Table 8

Frequencies of Use of Information Sources by Reporting Family Physicians

Information Source	*N*	*M (SD)*	*Mdn (*range)	*Mo*
Continuing education courses	53	4.02 (.77)	4 (2-5)	4
Evidence-based publications	55	3.98 (.78)	4 (2-5)	4
Medical specialists	54	3.96 (.73)	4 (2-5)	4
Personal experience	54	3.96 (.67)	4 (3-5)	4
Clinical practice guidelines	54	3.91 (.78)	4 (2-5)	4
Online physician resources	53	3.89 (.82)	4 (2-5)	4
Presentations & seminars	54	3.74 (.81)	4 (2-5)	4
Colleagues	54	3.74 (.78)	4 (2-5)	3
Medical literature searches	55	3.71 (1.33)	4 (1-5)	5
Other health care professionals	53	3.64 (.76)	4 (2-5)	4
Conference proceedings	53	3.45 (.99)	4 (1-5)	4
Peer reviewed journal studies	55	3.45 (1.00)	3 (1-5)	3
Involvement in other health agencies	54	3.37 (.83)	3 (1-5)	3 & 4
Systematic reviews/meta analyses	54	3.30 (1.06)	3 (1-5)	3

Teaching rounds	54	3.17 (.97)	3 (1-5)	3
Bulletins & newsletters	53	3.11 (.82)	4 (1-5)	4
Policy & procedure manuals	54	2.83 (.86)	3 (1-5)	3
Databases	54	2.46 (1.04)	2 (1-5)	2
Cosmopoliteness score (range 18-90)	54	63.17 (7.79)	62.5 (49-82)	59

Note. Response codes were: 1 = *never use*; 2 = *rarely use*; 3 = *sometimes use*; 4 = *often use*; 5 = *very often use*.

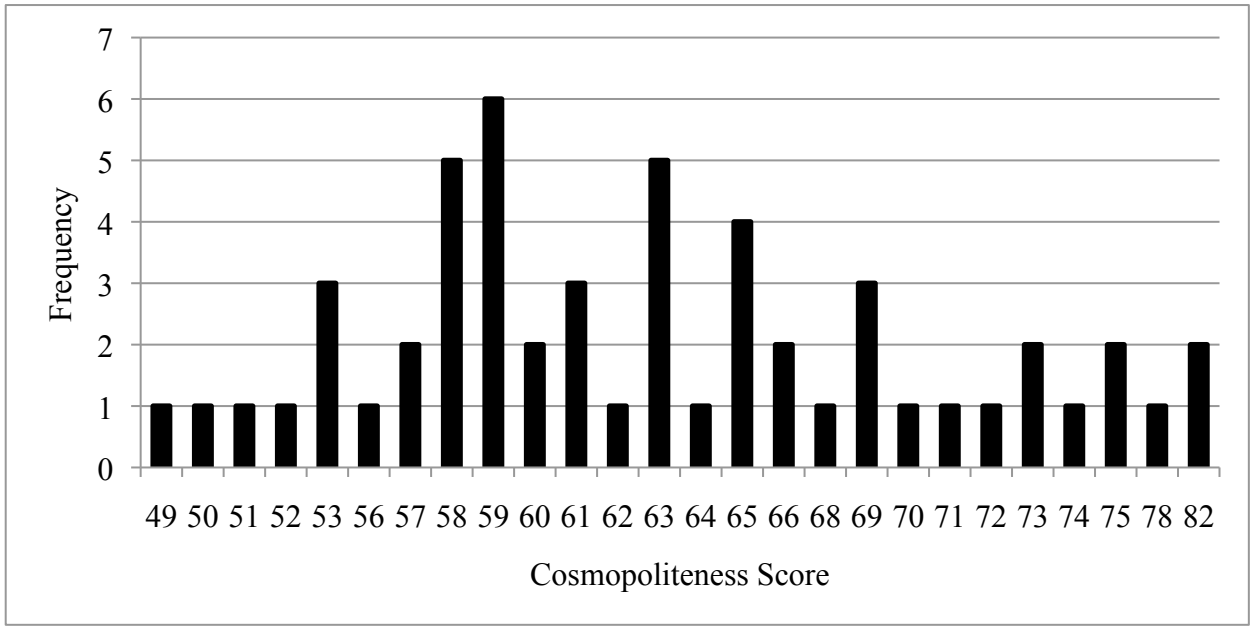


Figure 11. Frequencies of cosmopoliteness scores for reporting Family Physicians (N = 54).

The means, standard deviations, medians, ranges, and modes of each efficacy and outcome expectation question, as well the composite scores for these constructs, are presented in Table 9. Both composite scores had a theoretical range from two to eight. While efficacy expectations (M = 4.84, SD = 1.48) were on average higher than outcome expectations (M = 4.52, SD = 1.42), these scores were both in the middle of the theoretical scale range.

Table 9

Responses to Efficacy and Outcome Expectations Questions by Reporting Family Physicians

Survey Question/Construct	*N*	*M (SD)*	*Mdn* (range)	*Mo*
32. Confidence in educating about growth-related issues	55	2.69 (.79)	3 (1-4)	2 & 3
33. Confidence in awareness of resources for	55	2.15 (.85)	2 (1-4)	2

paediatric weight management				
Efficacy expectations score (range 2-8)	55	4.84 (1.48)	5 (2-8)	5
34. Confidence in patients' interest in weight management advice	54	2.17 (.72)	2 (1-4)	2
35. Confidence in having a positive impact on patients' knowledge & attitudes about healthy weight practices	55	2.35 (.87)	2 (1-4)	2
Outcome expectations score (range 2-8)	54	4.52 (1.42)	4 (2-8)	4

Note. Response codes for individual questions were: 1 = *not at all confident*; 2 = *somewhat confident*; 3 = *fairly confident*; 4 = *very confident*.

A list of ten barriers was provided to explore the reasons why participants were not, or did not intend to, use the WHO Growth Charts on a regular basis in their practice. These barriers included both community factors (i.e. policies, funding, and incentives) and provider characteristics. Participants were able to check as many barriers that applied to their own practice. The results indicated that the most common barrier was answered in the "other" option, as six FP stated that the barrier was related to their EMR system (i.e. that the WHO Growth Charts were not interfaced, embedded, or installed in their EMR, or there was the convenience of having the CDC growth charts already installed; $n = 6$). The second most common barrier was "not a priority area for me" ($n = 4$), followed by "lack of knowledge in this particular area" ($n = 3$), "lack of consensus to use them amongst my colleagues" ($n = 2$), "insufficient time to implement" ($n = 2$), "doing well and keeping with my current charts" ($n = 2$), "lack of funding" ($n = 1$), "lack of incentives" ($n = 1$), and "not feasible in my normal daily work" ($n = 1$). One respondent also commented in the "other" option, "it would be helpful if the WHO charts were circulated to FP," and another one stated that they "were not sufficiently aware of the WHO charts." This respondent also requested to have additional details and sample charts sent. No FP checked "policies in my organization that prevent changes" or "not relevant for my patients" as barriers to use. A dummy variable was also created for each barrier type, and individual scores were tallied to determine each participant's frequency of cited barriers. Theoretical barrier scores

ranged from zero (no barriers checked) to 13 (all barriers checked). The observed range was from zero to three (M = .44, SD = .82, Mdn = 0, Mo = 0), indicating an overall low presence of barriers to use of the WHO Growth Charts.

Participants were also asked if there were any additional reasons for why they were using the WHO Growth Charts. This was an open-ended question to explore any facilitators that might enhance use of the WHO Growth Charts. Similar to the barrier question, the most frequently cited reason for using these charts was due the fact that they were "integrated/embedded into the EMR system" (n = 6). Other facilitators included "ease of use" (n = 4), "standardization" (n = 1), "less likely to miss a developmental issue" (n = 1), "I have heard/read it is more accurate" (n = 1), "expected to use as part of routine care" (n = 1), and "lack of awareness between the WHO charts and previously used charts" (n = 1). While the last facilitator may intuitively be thought of as a barrier to use, it could be interpreted that a lack of awareness between the WHO Growth Charts and other existing ones has meant that the FP is just using the new ones because they are available or embedded in his or her EMR system. Thus the FP may not have made the voluntary decision to use these charts, but the availability of the charts provided a facilitator to use.

Participants were able to add any additional comments, questions, or concerns pertinent to the topic or survey in the final question. One respondent stated, "I live in a rural community with restricted access to tertiary care." Another respondent mentioned that the WHO Growth Charts should be made easier to see, and had added a comment beside the complexity question that "When printed, the charts are hard to read, and dark areas when photocopied make the lines very close together and difficult to see, so it is stressful to read." This issue has since been addressed in the development of the new Canadian Pediatric Endocrine Group (CPEG) growth charts, which will be reviewed in the discussion. Another respondent commented that "I work in

a clinic which is run by a group, and the communication with the administrative people is not great." One FP stated that "My focus has been on the birth to two year WHO charts in healthy breastfed infants who tend to dip down on the old CDC charts but maintain normal growth curves on the breastfed based WHO charts," therefore suggesting that some FP may choose to tailor which growth charts they use depending on their patients. Finally, a comment made by another FP was that there was a "lack of community support so a kid is obese, where do I send him…and his family (with no money)? There are no locally/easily accessible resources or programs in my community." This would support either a low awareness or presence of referral programs available to support paediatric weight management.

4.4.2 Perceived characteristics of the WHO Growth Charts. Central tendency measures of responses to questions regarding the perceived characteristics of the WHO Growth Charts are presented in Table 10. The two questions regarding relative advantage (Q13 & Q14) were combined to produce a composite score that had a theoretical range from two to 10 and an observed range from four to 10. Overall, the compatibility and complexity questions had the highest average scores (M = 4.34 and M = 4.30, respectively) and trialability had the lowest average score (M = 3.12).

Table 10

Responses to Perceived Characteristics of the WHO Growth Charts by Reporting Family Physicians

Survey Question	*N*	*M (SD)*	*Mdn* (range)	*Mo*
13. Relative advantage	54	4.15 (.74)	4 (2-5)	4
14. Relative advantage	54	3.78 (.77)	4 (2-5)	4
Relative advantage score (range 2-10)	53	7.92 (1.32)	8 (4-10)	8
15. Complexity[a]	53	4.30 (.85)	5 (2-5)	5
16. Accessibility	51	4.12 (1.09)	4 (1-5)	5
17. Observability	51	3.57 (.90)	4 (1-5)	4
18. Trialability	33	3.12 (1.60)	4 (1-5)	4
19. Compatibility	50	4.34 (.82)	4.5 (1-5)	5

Note. Response codes were: 1 = *strongly disagree*; 2 = *somewhat disagree*; 3 = *unsure*; 4 = *somewhat agree*; 5 = *strongly agree.*
[a]Items with reverse scoring.

4.4.3 Factors related to the prevention delivery system. There was a minimal presence of innovation champions promoting the WHO Growth Charts as only 16.7% of the FP (*n* = 9/54) stated that there was one in their practice, HCT, or region. Of these nine respondents, four reported being that innovation champion.

In order to understand the organizational climate, participants were first asked if they were a part of a HCT/Network or Group Practice. The majority of FP answered *yes* (*n* = 38/54, 70.4%) and were then instructed to answer the three questions regarding their organizational climate. The means, standard deviations, medians, ranges, and modes for each question, as well as for the team collaboration composite score comprised of the first two questions, are presented in Table 11. No FP responded to any of the three questions with *to a very great extent*. The most frequently occurring response to both the first and second question (Q38 & Q39) was *to some extent,* while it was only *to a very little extent* to the third question (Q40). The second question (Q39) regarding how quick the team generally was at incorporating new CPG had the highest average score (*M* = 3.11), while the question regarding the amount of information received about what was going in other teams had the lowest score (*M* = 2.00). This suggests that aspects of the organizational climate within the HCTs may be stronger than between HCTs.

Table 11

Responses to Organizational Climate Questions by Reporting Family Physicians

Survey Question	*N*	*M (SD)*	*Mdn* (range)	*Mo*
38. Team collaborates in determining what CPG to implement and how	38	2.50 (.92)	3 (1-4)	3
39. Team quick to incorporate new CPG	38	3.11 (.89)	3 (1-4)	3
Team collaboration score (range 2-10)	38	5.61 (1.60)	6 (2-8)	6
40. Amount of information about what is going	38	2.00 (.90)	2 (1-4)	1

on in other teams

Note. CPG = clinical practice guidelines; response codes were: 1 = *to a very little extent*; 2 = *to a little extent*; 3 = *to some extent*; 4 = *to a great extent*; 5 = *to a very great extent*.

4.4.4 Factors related to the prevention support system. The results indicate there was very low participation in pre-use training for the WHO Growth Charts, as only six FP (*N* = 55, 11%) responded *yes* to this question. Of these six, three received their WHO Growth Charts training through medical school, two through the Dietitians of Canada online training program modules, and one through their HCT/Network (specifically the PH Unit RN teaching module). No respondents had participated in training provided through a continuing education course.

4.4.5 Multiple linear regression. In order to determine the factors predicting LoU of the WHO Growth Charts, correlations between LoU and all variables were first computed. The variables that were significantly correlated with LoU are presented in Table 12. These 20 variables were entered into the multiple linear regression analysis. Correlations between LoU and FPs' responses to use of the different growth charts were excluded as they were essentially measuring the same construct. The initial regression model can be seen in Table 13. The three variables of: (1) use of an EMR system, (2) Med SQL EMR system, and (3) barrier of keeping current charts, were excluded from the analysis by SPSS® because they were constants or had missing correlations with LoU. The program also excluded the OSCAR EMR system and complexity of the WHO Growth Charts variables based on their collinearity diagnostics. Thus, the remaining 15 variables were included in the first regression model.

Table 12

Significant Correlations Among Level of Use of the WHO Growth Charts and Study Variables

	LoU	
	r	*p*
Complexity	.60	.00
Relative advantage	.47	.00

Compatibility	.44	.00
Med SQL EMR system	-.41	.01
Barrier score	-.41	.00
Assess head circumference (birth to two yrs old)	.39	.00
Use of EMR system	.38	.00
Barrier of keeping current charts	-.38	.01
Accessibility	.35	.01
Assess length-for-age (three to five yrs old)	.33	.01
Outcome expectations	.33	.02
Observability	.31	.03
Use of CPG	.31	.03
Aware of SCOPE	-.31	.03
Assess weight-for-age (birth to two yrs old)	.30	.03
Fraser Health	-.30	.02
Oscar EMR system	-.30	.01
Innovativeness	-.29	.04
Part of HCT/group practice	.28	.05
Age	-.28	.04

Note. Sig. 2-tailed. LoU = Level of Use; EMR = Electronic Medical Records; CPG = clinical practice guidelines; SCOPE = Sustainable Childhood Obesity Prevention through Community Engagement; HCT = Health Care Team.

Table 13

Multiple Linear Regression (Initial Model) for Variables Predicting Level of Use of the WHO Growth Charts

	B	SE_B	β	*t*	*p*
Age	-.40	.18	-.23	-2.23	.04
Fraser Health	-1.02	.49	-.23	-2.10	.05
Assess weight-for-age (birth to two yrs old)	.14	.80	.02	.18	.86
Assess length-for-age (three to five yrs old)	1.06	.68	.17	1.57	.13
Assess head circumference (birth to two yrs old)	1.78	.85	.27	2.09	.05
Relative advantage	-.04	.27	-.03	-.14	.89
Accessibility	.65	.24	.36	2.70	.01
Observability	.48	.31	.22	1.55	.13
Compatibility	.80	.39	.34	2.04	.05
Innovativeness	-.14	.05	-.34	-3.03	.01
Use of CPG	.25	.27	.10	.92	.37
Outcome expectations	-.21	.19	-.15	-1.12	.28
Part of HCT/group practice	-.02	.46	-.01	-.05	.96
Barrier score	-.16	.31	-.07	-.52	.61
Aware of SCOPE	-.98	1.03	-.12	-.95	.35

Note. Sig. 2-tailed. CPG = clinical practice guidelines; HCT = Health Care Team; SCOPE = SCOPE = Sustainable Childhood Obesity Prevention through Community Engagement.

A second analysis was then run, removing variables that were not significant in the first model. The final model therefore included six predictors (see Table 14). The multicollinearity check revealed that no independent variables were too highly correlated with each other (all $r <$ .9). The Durbin-Watson statistic, at 2.06, indicated that the assumption of independent errors was justifiable, as it was between the suggested values of one and three (Field, 2013). The *F*-ratio for the model was 14.88 ($p = .00$), and since this was greater than one, it shows that the improvement due to fitting the regression model was much greater than the inaccuracy within the model (Field, 2013). The R^2 of the model was .69, which indicates that these variables accounted for 69% of the variance in LoU. The adjusted R^2 was .64, and the small .05% difference between this value and the R^2 value reveals that the cross-validity of this model was very good (Field, 2013).

Table 14

Multiple Linear Regression (Final Model) for Variables Predicting Level of Use of the WHO Growth Charts

	B	SE_B	β	*t*	*p*
Compatibility	1.11	.21	.47	5.27	.00
Accessibility	.71	.17	.39	4.22	.00
Assess head circumference (birth to two yrs old)	1.48	.61	.23	2.45	.02
Innovativeness	-.16	.04	-.37	-4.11	.00
Age	-.49	.16	-.28	-3.15	.00
Fraser HA	-1.04	.39	-.24	-2.67	.01

Note. Sig. 2-tailed. HA = Health Authority.

While all of the predictors' β-values were relatively comparable, compatibility had the highest value, and thus, the greatest positive influence on LoU (β = .47). This was followed by accessibility (β = .39), and assessing head circumference for birth to two year olds (β = .23). Innovativeness had the greatest negative influence on LoU (β = -.37), followed by age (β = -.28), and Fraser Health (β = -.24). Each predictor's β-value was then multiplied by the LoU standard

deviation (1.95) to show the appropriate unit changes for each predictor-LoU relationship. For age, the β-value indicates that as age category increased by one standard deviation (1.13), LoU decreased by .28 standard deviations. As the standard deviation for LoU was 1.95, this results in a change of -.55 units of LoU (-.28 x 1.95). Therefore, for every 1.13 increase in age category, LoU decreased by .55 units. Using the same calculation procedure for each variable, the results for each of the predictors is as follows: (1) for every .82 increase in the rating of perceived compatibility of the WHO Growth Charts, LoU increased by .92 units; (2) for every 1.09 increase in the rating of perceived accessibility of the WHO Growth Charts, LoU increased by .76 units; (3) for every .30 increase in the use of head circumference assessments to measure the growth of birth to two year olds, LoU increased by .45 units; (4) for every 4.56 increase in a FP's innovativeness score, LoU decreased by .72 units; and (5) for every .44 increase in practice in the Fraser HA region, use of the charts decreased by .47 units. It must also be noted that each interpretation is true only if the effects of the others variables are held constant (Field, 2013).

4.5 Awareness of Programs and Initiatives

The final survey question asked participants about their awareness of community, provincial, national, and international resources and initiatives available to support paediatric patients who are currently at, or at-risk of being, an unhealthy weight. The number and percentage of respondents ($N = 54$) that answered *yes* to each option can be seen in Table 15. The results show that the most well known resources were HealthLink BC and BC Children's Hospital, as approximately half of the FP were aware of these two options. Awareness of the other programs, however, was quite low with less than a quarter of respondents aware of Centre for Healthy Weights- Shapedown BC, subspecialty care, a multidisciplinary team in their community, Exercise is Medicine, MEND, and SCOPE. Furthermore, only one FP indicated that

they were aware of another resource not listed, which they specified as "regional dietician resources." A composite awareness score was also calculated to determine the number of resources that each FP was aware of. The theoretical range of awareness scores was from zero (i.e. no resources were checked) to nine (i.e. all resources were checked). The results indicate that awareness was overall quite low, and the observed range of scores was from zero to six (N = 54, M = 1.74, SD = 1.46, Mdn = 2, Mo = 2).

Table 15

Awareness of Resources and Initiatives to Support Paediatric Weight Management by Reporting Family Physicians

Resource or Initiative	*n (N = 54)*	%
HealthLink BC	29	53.7
BC Children's Hospital	26	48.1
Centre for Healthy Weights- Shapedown BC	11	20.4
Subspecialty care	7	13.0
Multidisciplinary team in community	6	11.1
Exercise is Medicine	6	11.1
MEND	5	9.3
SCOPE	3	5.6
Other (regional dietitian resources)	1	1.9

Note. SCOPE = Sustainable Childhood Obesity Prevention through Community Engagement; MEND = Mind, Exercise, Nutrition, Do It!

To test the relationship between awareness scores and responses to the efficacy expectation question (Q33) of, "How confident are you that you are aware of appropriate resources and programs for healthy weight management that are available for your patients and their families?" a Pearson correlation was conducted and demonstrated a statistically significant relationship (n = 54, r = .37, p = .01), providing evidence of a cross-validation between the two awareness measures.

5.0 Discussion

5.1 Overview

Despite the low response rate, the sample population appeared to represent the diverse profile of FP practicing in BC. The characteristics of the participants are comparable to the BC FP that responded to the 2013 NPS (NPS, 2014), as well as respondents to Wiebe, Kaczorowski, and MacKay's (2012) study of British Columbian FP and gynecologists. In the current study, there was also representation from all five HA regions, the various community sizes, recent graduates to experienced clinicians, and all practice types except for hospitalists. Additionally, it was found that the percentage range of paediatric patients seen per week, out of the total percent of patients seen in each practice, was between zero and 59 percent. While most practices were on the lower end of this range, this is understandable given that paediatricians were excluded from the study and that the elderly population in Canada is growing (Statistics Canada, 2009b).

The primary purpose of this study was to evaluate the LoU of the 2006 and 2007 WHO Growth Charts by FP in BC, Canada. It was to also explore the factors that were related to, and predicted, FPs' LoU. Furthermore, it assessed their awareness of local, provincial, national, and international programs and initiatives available to support paediatric patients that are overweight, obese, or at-risk. The results indicate that there was an overall high use by respondents. Of the demographic and practice variables, and theoretically driven factors taken from the two guiding models, six variables predicted LoU. These included age, practicing in the Fraser HA region, assessing head circumference of birth to two year olds, the perceived accessibility and compatibility of the growth charts, and FPs' innovativeness. Despite the high LoU, awareness of programs and initiatives was low. The results are discussed in the context of the literature following. Limitations, strengths, suggestions for future research, and implications of the study

for primary care practice and PH in relation to the management of paediatric overweight and obesity are also discussed.

5.2 Level of Use of the WHO Growth Charts

The majority of survey respondents indicated that they were routinely using the 2006 and 2007 WHO Growth Charts in their practice or had begun to use them. Collectively, about 80% of respondents had adopted the charts, while the remaining had indicated that they were not using, nor have they used, these growth charts in their practice. Although the ultimate goal would be to have all FP in BC routinely utilizing the WHO Growth Charts in their practice, Durlak and DuPre's (2008) review on over 500 implementation studies in the field of health promotion and prevention interventions targeting children and adolescents found that positive study results have been typically obtained around implementation levels of approximately 60%, and that little research work has obtained levels of 80% or higher. Thus, the authors determined that it is unrealistic to expect perfect or near-perfect implementation by all providers.

The LoU is higher than previous literature, which found an insufficient number of health care providers using the proper CPG for monitoring the growth of their paediatric patients. For example, He et al. (2010) discovered that approximately 30% of the 464 Canadian FP surveyed used the CDC's BMI-for-age reference to guide their assessments, which was recommended at the time that their study was conducted. Rausch et al. (2011) surveyed 96 American general paediatric and family medicine attending and resident physicians and discovered that there was a very low percentage of providers accurately quoting BMI percentiles and using the correct BMI percentile cut-off points for overweight and obesity identification; less than half of the attendings and less than 10% of interns and residents used the recommended CDC criteria for identifying children who were overweight (24.7%) and obese (34.4%). The results of the current study may

have been influenced by the low response rate, which may have resulted in a biased sample; those most aware of, and/or using the WHO guidelines may have participated.

Additional information about growth chart use confirmed that the 2006 WHO Growth Standards and the 2007 WHO Growth References were the most commonly used charts in this study. This was followed by use of the 2000 CDC Growth Charts for birth to two year olds, three to five year olds, and six to 19 year olds (see Table 6). This variation in chart use is not surprising given the options and availability of different growth charts, as well as the diversity amongst medical practices in terms of what guidelines they choose to use. While the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada, and Community Health Nurses of Canada have recommended the adoption of these new charts by all Canadian PCP (Dietitians of Canada and Canadian Paediatric Society, 2010), each FP ultimately decides which CPG they adopt.

It was also promising to discover that less than 10% of the FP indicated that they mostly used their professional judgment to monitor paediatric growth patterns. As noted by Rausch et al. (2011), it is essential to have clinical standardization because providers are often not good at estimating overweight and obesity based on clinical judgment. The findings from the current survey conflict with existing Canadian research, which has found that approximately 90% of the time, FPs' and CPs' professional judgment influenced their assessment of overweight and obesity in their paediatric patients (He et al., 2010). However, this discrepancy may have been an artifact of respondent bias or a result of the wording of the questions. In the current survey, participants were asked to pick the growth charts that they used in their practice and were provided with a list of the different charts, as well as the option of "I mostly use my own professional judgment to assess paediatric growth patterns." In He et al.'s (2010) survey, the

question was worded around the circumstances in which practitioners assessed patients for paediatric overweight/obesity (i.e. “when professional judgment calls for further assessment”). Other circumstances provided in their survey included: (1) “screen all patients at each visit,” (2) “per referral by others,” (3) “when comorbidities exist,” (4) “at routine checkup,” (5) “when concern is shown by child/adolescent,” and (6) “per request by parent/guardian.” Thus, He et al. (2010) investigated when the assessment of overweight/obesity was made, while the current study examined the type of growth assessment used. It is also interesting to note that only a small proportion of practitioners assessed overweight/obesity during the first four other circumstances listed above, as identified by He et al. (2010). Asking about these circumstances could have been valuable information to gather from the present sample population, as it is possible that these situations could have been associated with, or predicted, LoU of the WHO Growth Charts.

5.3 Factors Predicting Level of Use

5.3.1 Overview. Predictor variables of LoU of the WHO Growth Charts were categorized, according to the DOI theory and EFEI, as: provider characteristics, perceived characteristics of the WHO Growth Charts, factors related to the prevention delivery system, and factors related to the prevention support system. The significantly correlated and predictor variables are discussed in the respective sections below.

5.3.2 Provider characteristics. Provider characteristics were further divided into the subcategories of demographics and practice information, concerns about paediatric overweight and obesity, innovativeness, cosmopoliteness, efficacy and outcome expectations, and barriers to use, and are presented accordingly.

5.3.2.1 Demographic and practice information. While variables included in the demographic and practice information had not been suggested as influencing factors within the

guiding models, there were significant, negative correlations between LoU and age, having a primary practice in the Fraser HA region, and using Oscar and Med SQL EMR systems. Thus, as the age of FP increased LoU decreased, and belonging to Fraser Health and using the Oscar or Med SQL EMR systems was associated with lower use of the WHO Growth Charts. The findings also indicated significant, positive correlations between LoU and the use of an EMR system in practice, and use of the three assessment measurements of: weight-for-age for birth to two year olds, length-for-age for three to five year olds, and head circumference for birth to two year olds. The use of an EMR system and these three methods were associated with greater use of the growth charts. Based on the weak to moderate correlations, these variables had a medium effect size accounting for approximately 9% of the total variance in the outcome measure. Of these significantly correlated variables, age, Fraser Health, and the assessment of head circumference for birth to two year olds remained predictive of use of the charts in the regression model.

The negative association between adoption of this CPG and age is supported by the results from other studies (Davis & Taylor-Vaisey, 1997). Ferrier, Woodward, Cohen, and Williams (1996) examined the views of recently graduated FP who began family practice in Ontario, and found that they were more supportive of adopting CPG than their older US colleagues. A systematic review on the relationship between clinical experience and quality of health care also suggested that older physicians who had been in practice longer might provide lower-quality care (Choudhry, Fletcher, and Soumerai, 2005). Encompassed in this concept of 'quality of care' is the adoption and adherence to standards of practice for prevention, screening, and diagnosis. Fifteen out of 24 studies reviewed in this area had results indicating that physicians practicing for more years were less likely to adhere to CPG. Despite the notion that

experienced FP have more skills and knowledge, and would therefore deliver higher quality of care, rapid changes in medical advances-especially in technology-may make it more difficult for older physicians to stay up to date with technically appropriate care, including use of appropriate CPG in their practice (Choudhry et al., 2005).

It is more difficult to understand why there were negative correlations between LoU and having a primary practice in the Fraser HA region, or using the Oscar and Med SQL EMR systems. For the Fraser Health variable, this may be a system delivery issue such as HA size or complexity of communicating in a larger region, or a consequence of sampling error. With the small sample size (16/61 FP) the correlation analysis must be interpreted with caution, as results may not be generalizable to all FP practicing in this region. The limited sample size should also be considered when interpreting the significant correlations for the two EMR systems. Only nine out of the 50 respondents who used an EMR system were using Oscar, and only one was using Med SQL. Thus, it is impractical to believe that these results are representative of the rest of the population.

The significant, positive correlation between LoU and use of an EMR system in practice could be explained by the idea that "physician adoption and use of technology is a system enabler that will support enhanced delivery of care, reduce adverse events, and reduce unnecessary duplication of tests and investigations" (CanadianEMR, 2007). If a FP uses an EMR system, and the recommended growth charts are embedded in it, then it is very likely that that is the chart type that will be routinely used in practice. Conversely, if the system has not been updated and does not have the new growth charts, then it is just as likely that the FP will only use the charts installed. This is supported by feedback provided in the survey, in which the most commonly cited barrier and facilitator to use of the WHO Growth Charts was related to

participants' EMR systems (i.e. that the charts were or were not interfaced, embedded, or installed). One respondent also commented that communication with the information technology (IT) worker was not great, therefore the FP could not control what was input into the system.

Eighty percent of the respondents reported use of an EMR system, and of these FP, 88% stated that they used it to plot paediatric growth data. This is slightly higher than 64.3% of Canadian, and comparable to the 74.3% of British Columbian FP reportedly using electronic records to enter and retrieve clinical patient notes (NPS, 2014). A high proportion of NPS (2014) respondents both nationally and provincially also reported that productivity in their medical practice had either increased or not changed since implementing EMR systems, and almost half said that the quality of patient care they provided had improved since implementation. In order to increase LoU of the WHO Growth Charts, relevant health care leaders such as the MOH, HCT leaders, MOAs, health care planners, and EMR providers could address these findings (i.e. the positive correlations, barriers and facilitators, and high usage of EMRs) and evaluate the growth charts embedded in EMR systems. Communication, especially between health care professionals and EMR IT teams, would be essential to ensuring that the recommended charts are installed. Once these relationships are established, this strategy has the possibility of enhancing the dissemination and adoption of any medical innovation that can be input into EMRs.

The growth assessment methods of weight-for-age for birth to two year olds, length-for-age for three to five year olds, and head circumference for birth to two year olds were significantly, positively correlated with LoU. They were also the most commonly used methods to assess growth, apart from measuring length-for-age for birth to two year olds. BMI-for-age was the least frequently used method for birth to two year olds and three to five year olds, and was assessed less than weight-for-age and length-for-age for six to 19 year olds. These findings

share similarities and differences with previous research. For example, Huang et al. (2011) found that while almost all of their 371 American respondents from family practice measured paediatric patients' weight and height regularly, only half regularly assessed obesity status by BMI percentile, and less than half assessed BMI when it was clinically indicated. All 96 respondents in Rausch et al.'s (2011) study reported checking paediatric height and weight at least yearly. However, unlike the findings in the current study, the majority also indicated checking BMI and BMI percentile, at 90% and 78%, respectively. He et al. (2010) found that only a small percentage of Canadian practitioners routinely assessed weight or screened their paediatric patients' growth at each visit. Approximately 10% of FP in their study measured weight alone in each of the age categories of two to five years old, six to 12 years old, and 13 to 18 years old, and the same approximate percentage of FP measured BMI in each age category. These inconsistencies could be attributed to the different age categories used in the surveys. The present study and He et al.'s (2010) study divided growth assessments into three distinct categories, whereas the other studies only had two categories (less than two years old and between two and 17 years old). Including more categories may have allowed for a deeper examination of the types of growth charts used for different ages.

The significant correlations between the three growth assessment methods and LoU may result from fact that weight-for-age, length-for-age, and head circumference have been long-established methods for assessing growth, especially in paediatric patients (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). It is therefore plausible that FP try to ensure that they are using, or are more aware of, the proper growth charts to monitor these frequently used growth assessment methods. BMI-for-age, on the other hand, is helpful to measure when a child enters an age period when overweight becomes a risk factor, but it is

unclear the exact age at which to begin using this method (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010). The controversy surrounding the age at which to use BMI may contribute to the findings that fewer FP assess BMI, and could suggest that it is not a priority for FP to adopt, seek out, or pay attention to what growth charts they are using to plot this measurement.

5.3.2.2 Concerns about paediatric overweight and obesity. The hypothesis for the variable "concerns about the health consequences of paediatric overweight and obesity" was not supported, as it was not significantly correlated with LoU. However, almost 95% of the respondents expressed that they were either somewhat or very concerned about the health consequences of this issue, and no FP responded being unconcerned. This confirms previous research, which have reported high concerns about paediatric overweight and obesity among FP (He et al., 2010; Story et al., 2002). According to the DOI theory, an individual must believe that there is a problem (i.e. a concern about paediatric overweight/obesity) and have a perceived need for an innovation (i.e. proper growth monitoring guidelines) as part of the preceding conditions that result in the initial knowledge of an innovation. However, there are a number of other influencing factors at this stage and at other stages along the innovation-decision process (see Figure 1). Given the interaction of these influential variables, and despite the role that concerns play at the beginning of the dissemination phase, it may be that limited variability in the data made it difficult to identify a linear relationship across ratings of concern.

5.3.2.3 Innovativeness. A significant, negative relationship between FPs' innovativeness and LoU was found. This result was in opposition to what was hypothesized. Innovativeness was also a negative predictor of LoU in the regression model. According to Rogers (2003), innovativeness is a personality trait. Relevant to the current study, it represents the degree to

which a FP is relatively earlier in adopting new ideas than the other FP. It is therefore an antecedent to entering into the innovation-decision process. Similar to the way in which individuals with a problem or a need for an innovation that addresses an issue are more likely to search for the innovation, those who are generally more innovative are also more likely to seek out novel ideas, objects, or practices. Thus, it was hypothesized that innovativeness would positively predict LoU. As outlined in the previous section, however, there are a number of other prior conditions and factors apart from innovativeness that influences the innovation-decision process (see Figure 1).

This puzzling finding could be attributable to the fact that the Innovativeness Scale (Hurt et al., 1977), from which questions were taken for this survey, was modified and significantly reduced to minimize survey length. It is plausible that the questions incorporated into this survey did not accurately capture personality traits that influence FPs' innovativeness (e.g. attitudes toward change, ability to cope with uncertainty and risk, creativity, adventurous, leadership, etc.). Furthermore, Hurt et al.'s (1977) scale was developed to measure willingness to innovate or change, as opposed to actual adoptive behaviour. This could provide a different interpretation of the results in that FP who were less willing to innovate were more likely to use the WHO Growth Charts. If this was the case, then it may be necessary to also examine the definition of innovation to see if it could provide further suggestions for the findings.

Rogers (2003) proposed that the fundamental concept behind an innovation was that it was perceived as new by an individual or other unit of adoption, and explained,

> It matters little, so far as human behaviour is concerned, whether or not an idea is "objectively" new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If an idea seems new to the individual, it is an innovation. (p. 12)

It was believed that FP would perceive the WHO Growth Charts as new based on when they

were released and distributed by the MOH. While essential elements were changed in these charts to address several limitations in the existing ones, the modifications may not have been significant enough to convince practitioners that these charts should be perceived as new and novel. A way to confirm this belief would have been to provide the innovation definition and ask participants whether or not they viewed these growth charts as an innovation. If the majority responded with *no*, it could explain why innovativeness did not predict LoU in the direction hypothesized. Perhaps the more innovative FP did not view these charts as new and have therefore not adopted them. Furthermore, as discussed in the section about the use of EMR systems in practice, it may be more the case that having the charts installed in the EMR system (or being provided with paper copies) has a larger influence on whether or not FP adopt the charts. Less innovative practitioners may not have actively searched for the WHO Growth Charts, but were using them because they were embedded in their system.

Despite the controversial results of the correlation and regression analyses, there was a relatively normal distribution of innovativeness scores. These scores, representing respondents' personality traits, can be used to classify the FP into adopter categories. The results support the approximate percentage of category membership suggested in the DOI theory (Rogers, 2003), including innovators (2.5% of the population), early adopters/opinion leaders (13.5%), early majority (one-third); (4) late majority (one-third), and laggards/last adopters (16%). Figure 2 highlights these adopter categories, and Figure 10 illustrates the similar classifications found in this study, as the fewest innovativeness scores were on the ends of the range and the majority of scores fell within the middle range.

Evaluating LoU of the WHO Growth Charts since they were disseminated would have also provided further insight into the findings. In addition to these adopter categories, the theory

also presents a model and corresponding S-shaped diffusion curve that describes the way and rate at which innovations are taken up in a specific populations (Rogers, 2003; see Figure 2). Innovators and the early adopters begin utilizing the innovation first, and diffusion continues over time, through certain communication channels, until the adoption rate is near 100%. Based on the LoU results, it appears as though these growth charts have had a sufficient amount of time to diffuse since most of the participants had begun or were routinely using the charts. However, additional surveys could have been conducted at certain time intervals (e.g. every two months) to establish the rate of adoption in the diffusion process since the charts were released. This information would have supplemented the findings of FPs' innovativeness and their adopter categorization, and revealed a more detailed diffusion process. Once again these findings should be considered in light of the limited representativeness of the sample.

5.3.2.4 Cosmopoliteness. Since communication channels and networks aid in the diffusion process (Rogers, 2003), it was hypothesized that there would be a significant, positive relationship between LoU and cosmopoliteness. Despite its well-established influence on the diffusion process (Durlak & DuPre, 2008; Rogers, 2003), the results of the study did not support this hypothesis. However, it was interesting to discover that *use of CPG* (one of the options within the cosmopoliteness question) was significantly, positively correlated with LoU, although it was not a significant predictor when other variables were accounted for in the regression model.

There were 18 sources of information included in the survey, divided into the three general categories of academic/literature, professional, and personal networks. While one cosmopoliteness score was computed based on results from the reliability analysis, it may have been better to keep these sources separated into the three categories to determine if they had

different relationships with LoU. For example, network interconnectedness was partially assessed through a few source options, such as information from colleagues, medical specialists, and other health care professionals. One study on the diffusion and prescription of new drugs by doctors discovered that innovativeness in adopting the drugs was related to seven network interconnectedness measures of the respondents (e.g. friendship and sharing an office space with colleagues, frequently attending hospital meetings, etc.; Coleman et al., 1966, as cited in Rogers, 2003). Physicians who reported a higher number of these measures than their isolate colleagues were more likely to adopt the drug, and of the seven measures, the friendship variable was the best predictor of innovativeness. Thus, dividing the sources of information into categories or including more personal network questions in the current study could have provided further insight into the factors predicting LoU of the WHO Growth Charts.

Previous research also suggests that the type of practice influences the adoption of CPG; specifically, FP in group practices were more likely to adopt than those in solo practices or rural ones with limited access to other resources (Audet, Davis, & Schoenbaum, 2006; Czaja, McFall, Warnecke, Ford, & Kaluzny, 1994; Ferrier et al., 1996; Scott et al., 2008; Wolfe, Sharp, & Wang, 2004). This could be due to the interpersonal networks linking FP and providing communication avenues for the exchange of evaluations of the innovation (Rogers, 2003). Those in group practice likely have more professionals to discuss ideas with and learn about new innovations through compared to those in solo or isolate rural practices. Future research could therefore investigate the interactions between FPs' practice types, use of networks, and adoption of the recommended growth charts. Additionally, Rogers (2003) has suggested that identifying and using opinion leaders represents the most frequent way to utilize a network. These are individuals who lead in influencing others' opinions; they are more cosmopolite, have greater

social participation, and are more innovative than their followers, although they may not be innovators. Given their importance, change agents, such as PH workers at the MOH who are responsible for facilitating the flow of innovations from an agency to a group of individuals, could enhance their dissemination efforts by recognizing and using the opinion leaders in medical groups.

5.3.2.5 Efficacy and outcome expectations. The guiding models of this study suggest that efficacy and outcome expectations positively influence the adoption of innovations (Durlak & DuPre, 2008; Rogers, 2003). Specifically, providers who believe that an innovation will have advantageous results, are confident that they can do what is expected, and have the necessary skills (e.g. to properly monitor and manage growth with use of the recommended growth charts), are more likely to adopt the innovation. Thus, it was hypothesized that there would be significant, positive relationships between LoU and FPs' expectations in regards to paediatric growth and weight management. The results supported this hypothesis for outcome expectations. However, this variable was not a significant predictor in the regression model. Furthermore, the results did not support the hypothesis for efficacy expectations.

Innovativeness, cosmopoliteness, and efficacy and outcome expectations are considered to be precursor provider characteristics to the diffusion process (Durlak & DuPre, 2008; Rogers, 2003). While these variables alone may not have predicted LoU, it is interesting that there was no significant association between LoU and efficacy expectations. Previous research has demonstrated that self-efficacy and outcome expectations influence adherence to, or implementation of, CPG. For example, Cabana et al.'s (1999) review found 19 articles in which physicians cited self-efficacy as a barrier to adhering to CPG, and eight in which the barrier was related to outcome expectancies. This does support the current results about outcome

expectations, as it shows that lower levels of this variable resulted in lower use of the guidelines. Kim et al. (2010) found that 90.3% of their physician respondents had low self-efficacy for practicing CPG. The authors also used a regression analysis to determine the factors related to implementation and found that the strongest predictors of CPG implementation were participants' degree of awareness and familiarity with CPG, followed by agreement with the guidelines, a positive attitude towards them, and self-efficacy using them. A notable difference between the findings in their study and the current one is that efficacy and outcome expectations were not assessed in relation to using the charts. Instead, the questions in the current survey were pertinent to paediatric weight management. Examining FPs' expectations in regards to chart use could have produced different results, and may have been significant predictors of LoU.

It was not surprising to discover that the average responses for both the efficacy and outcome expectations were *somewhat confident.* These results broaden previous research, which has consistently showed that FP typically have low levels of confidence counseling patients on healthy weight management (He et al., 2010; Huang et al., 2011; Lau et al., 2007; Story et al., 2002). These studies have also demonstrated that physicians have an overall low perceived success rate for treating overweight and obesity. Commonly cited barriers to addressing weight issues and managing this health issue included: a lack of parent involvement, patient motivation, support and referral services, and personal knowledge about healthy behaviours such as PA and nutrition; not knowing how to address family conflicts; low awareness of behavioural management strategies; discomfort addressing weight issues and stigma; time constraints; and reimbursement concerns. Huang et al. (2011) also found that PCP indicated a need for increased provision of CPG and physician training, as these were other barriers to efficacy and outcome

expectations. The importance of these expectations will be further discussed when analyzing the results from the training question.

5.3.2.6 Barriers to use. There was a very low presence of barriers to use of the WHO Growth Charts. The hypothesis for this variable was supported, as a lower barrier score was significantly associated with a higher LoU. Each of the 13 barriers were also individually correlated with use and the results showed that only the *barrier of keeping the current charts I am using* was significantly, negatively associated with LoU. Neither this variable nor the barrier score was a predictor in the regression model.

Though it has been shown that health care professionals generally view CPG as helpful tools for standardizing clinical practice and aid in shared decision-making (Solà et al., 2014), barriers exist that hinder providers from adopting guidelines. Cabana et al.'s (1999) review of 76 articles, which included 120 surveys and examined 293 potential barriers to physician adoption or adherence to CPG, parallel the findings of this study. The barriers in their review were categorized in terms of knowledge, attitudes, and behaviours. International research has also found similar barriers to physicians' implementation of CPG, and it has been noted that despite differences in health care systems between countries, the universal nature of professionals' attitudes towards CPG necessitates the development of global implementation strategies (Kim et al., 2010). These research findings further support the results of the current study, as they show that the micro level factors of knowledge and attitudes are more frequently cited barriers than the macro level factors of environmental or community variables. Only one FP in the current study cited a lack of funding and a lack of incentives as barriers to use of the WHO Growth Charts, and no respondents stated that there were policies in their organization that prevented changes. While these variables were included in Durlak and DuPre's (2008) framework based on the research

indicating that community factors influence implementation, the authors also acknowledged that these factors are usually necessary but inadequate conditions for successful implementation. It is possible that these issues were not as relevant to the FP in their decision-making about the adoption of CPG, whereas the funding and policy support to adopt CPG is critical at the level of the health care decision-maker.

Within Canada, Hader et al. (2007) utilized Orlandi and colleagues' version of the DOI model as a framework to map out doctors' views on the implementation of CPG. Their findings suggested that influences, which could be barriers or facilitators, on guideline adoption could be broken down into the five categories similar to the Orlandi/Rogers model including: (1) innovation, (2) communication, (3) adoption, (4) implementation, and (5) maintenance. Their findings, supported by those of the current study, demonstrated the wide variety of factors influencing every stage of the diffusion process that must be considered when disseminating CPG to health professionals. Based on the challenge of implementing evidence-based guidelines, it is crucial to recognize these barriers and employ strategies to overcome them in order to enhance the uptake of research findings (Fernandez, Davidson, Griffiths, and Salamonson, 2010). The positive correlation between barriers and LoU in the current study suggests that it will be important for PH workers to address these barriers if they want to ensure that health professionals are using the correct standards of practice in the future.

5.3.3 Perceived characteristics of the WHO Growth Charts. The results of the analysis revealed that relative advantage, observability, compatibility, and accessibility were all significantly and positively correlated with LoU, as was hypothesized. Of these variables, however, only compatibility and accessibility were predictors in the regression model. Furthermore, trialability was not significantly associated with LoU. This could represent the fact

that some innovations, such as growth charts, may be more difficult to trial than others. As noted by Rogers (2003), "If an innovation can be designed so as to be tried more easily, it will have a more rapid rate of adoption. Trying a new idea may involve re-inventing it so as to customize it more closely to the individual's conditions" (p. 258). Unlike other CPG that may be more customizable, the curves and associated cut-off points for the identification of overweight and obesity may not be viewed as guidelines that can, or need to be, tested out. This would support findings from Harting et al. (2009), who discovered that Dutch physical therapists viewed their guidelines on low back pain as having limited trialability due to the way in which the CPG was presented. The results of the current study also indicated that the average response to trialability question was *unsure*, thereby suggesting that most FP did not recognize the trialability of the charts. As such, this characteristic was not associated with, or a predictor of, LoU of the charts.

Existing literature has confirmed the findings on the positive associations of guideline adoption by health professionals with the other innovation characteristics of relative advantage, observability, and compatibility (Davis & Taylor-Vaisey, 1997; Hader et al., 2007; Harting et al., 2009; Scott et al., 2008). In terms of relative advantage, Rogers (2003) has suggested that the type of advantage (e.g. economic, status, and social) most valuable to the adopter is determined by the nature of the innovation. The two questions in the present survey that assessed this construct tapped into how the WHO Growth Charts improved the overall quality of paediatric weight assessments, and how they made it easier to identify paediatric overweight/obesity compared to other growth charts. With an average response to these questions of *somewhat agree*, and a significant correlation, it can be seen that this characteristic was linked to LoU of the charts. However, this variable was not a predictor variable, suggesting that it did not have a strong enough influence on LoU when holding other factors in the model constant. Rogers

(2003) has also noted that sometimes individuals find it difficult to detect the advantage of an innovation over an existing idea, practice, or object. This could be the case for the WHO Growth Charts, as there were not extreme differences compared to the existing growth charts. To confirm this rationale, additional questions exploring the other types of relative advantage could have been included in the survey to gain a deeper understanding about this construct's influence on the adoption of these CPG.

The same rationale could be used to explain the findings of the perceived observability of the WHO Growth Charts. After trialability, it had the second lowest average score, and an average response of *unsure* to the question "I can easily see how using the WHO Growth Charts has impacted the paediatric patients in my practice." As noted in the Dietitians of Canada and Canadian Paediatric Society Collaborative Statement (2010), "A child's measurements should be consistently and accurately recorded in an age and gender-appropriate growth record, carefully plotted and then analyzed to identify any disturbances in the pattern of growth" (p. 4). This highlights the importance of conducting regular growth assessments, plotting, and examining them over time, and reveals how it may be difficult for FP to observe the immediate impact that the WHO Growth Charts have on their paediatric patients. The term "impact" used in the question may have also been too vague, thereby leading to varying interpretations by participants.

The effect that the type of innovation has on its perceived observability and relative advantage can be seen in Scott et al.'s (2008) study on the factors influencing the uptake of the Canadian Health Heart Kit. The DOI theory also served as the guiding model for their study, and participating FP used this innovative kit to promote cardiovascular health. The results indicated that relative advantage was the only innovation characteristic associated with kit use, and that

relative advantage and the observability of the kit's benefits were significantly associated with physicians' intention to use the kit. However, the growth charts were different than this type of innovation; mainly the resource kits were more tangible than the charts, which could explain the differences in findings between Scott et al.'s (2008) study and the current one.

Compatibility was a predictor of LoU in the regression analysis. The majority of participants showed a relatively high level of concern about the health consequences of paediatric overweight/obesity. As these growth charts were developed to represent optimal growth, and respondents were provided with the synopsis on the chart's development, it can be hypothesized that the FP wanted to use charts that were compatible with their sociocultural values and beliefs, as well as their needs for proper growth monitoring. Based on this variable's widespread and consistently cited influence on the implementation of innovations (Durlak & DuPre, 2008; Rogers, 2003), it would be a recommended construct for health innovation organizations to focus on during the development phase, especially when designing CPG.

Accessibility was also a predictor variable. Although this was not an innovation characteristic included in either of the guiding models, it has been shown to influence the utilization of CPG (Fernandez et al., 2010; Solà et al., 2014). Furthermore, it represents an aspect of the complexity variable (Rogers, 2003). While it may not have a large impact on the adoption of many innovations, it is logical that it was an essential element contributing to, and predicting, the LoU of the WHO Growth Charts. The importance of accessibility was particularly evident through participant feedback provided in the survey, in which access to the charts, especially through EMR systems, was both a prominent barrier and facilitator to clinical uptake of the charts. Based on these findings, it is suggested that future research in this area could benefit from

considering how accessibility would impact the dissemination and adoption of innovations being studied.

Finally, complexity was significantly, positively correlated with LoU. The descriptive analysis on this variable showed that the average response was *somewhat disagree*, and the most frequently occurring response was *strongly disagree*, therefore demonstrating that most of the respondents did not find the WHO Growth Charts to be difficult to understand and use. This could be explained by the fact that growth charts have been available and recommended for use for many years (Dietitians of Canada and Canadian Paediatric Society Collaborative Statement, 2010), and so FP are familiar with how to use and interpret these guidelines. Because reverse scoring was used for this question, a higher score represented less perceived complexity of these charts. In terms of the correlation analysis, a greater perceived simplicity of the charts was associated with higher use. This supports both the DOI theory (Rogers, 2003) and findings within the Consolidated Framework for Implementation Research (Damschroder et al., 2009), in which the complexity of an innovation has been shown to have a well-established influence on implementation. Despite the result of a positive association, however, this variable was not a significant predictor of LoU. This can be explained by Rogers's (2003) findings that although complexity can be a very important barrier to the adoption of some innovations, it may not be as important as compatibility or relative advantage for many other innovations.

5.3.4 Factors related to the prevention delivery system. Of the variables representing general organizational factors, specific practices and processes, and specific staffing, the results indicated that being a part of a HCT or group practice was significantly, positively correlated with use of the WHO Growth Charts; a possible reason for this was provided in the cosmopoliteness section. However, none of the other variables, including the integration of new

programming and shared decision-making within the HCT, communication between HCTs, and the presence of an innovation champion were significantly associated with LoU. As such, they were not entered into the regression model.

Durlak and DuPre's (2008) framework was chosen as a guiding model for this research as it allowed for the assessment of medical practice structures, and the communication within and between those structures, that might influence use of these growth charts. As noted by these authors, some form of organizational structure is essential and responsible for guiding innovation implementation. Previous research has demonstrated that low team collaboration, shared decision-making, and a lack of communication can serve as barriers to guideline implementation by health professionals (Bigham et al., 2010). There appeared to be low organizational capacity in the current study's sample population. The majority of participants indicated that there was only a little or some team collaboration in determining what and how CPG were implemented in their team. The climate within the team/group was marginally stronger than the climate between teams/groups, as the majority of FP stated that they received a little amount of information about what was going on in other HCTs. The absence of significant correlations between LoU and these questions could be attributable to the structure of a medical team/group practice, in which FP can belong to a team but still maintain their own office practice, and therefore independently decide whether or not to adopt particular innovations. Thus, medical groups may not represent traditional organizational structures, and could explain why the findings differed from previous research on organizational structures (Durlak & DuPre, 2008). However, if the structures are similar enough, then there are other parties that can play an important role in organizational capacity, such as researchers, community members, and organizations. Future research in this area could consider investigating the impact that decision-making, coordination, and

collaboration with these parties has on the adoption of CPG by PCP.

Effective implementation is dependent on strong leadership, and the successful encouragement of innovation adoption has typically been delivered by at least one program champion (Durlak & DuPre, 2008). Unfortunately, there was a very low cited presence of champions promoting the WHO Growth Charts in this study. Less than 20% of respondents stated that there was a champion in their practice, HCT, or region, and of this percentage, less than half noted that they were the champions. Given the insignificant correlation between LoU and this variable, it is possible that the innovation champions cited were not well positioned in their region or did not possess the key qualities of a champion. Program champions have been characterized as individuals who are highly respected by their colleagues, interpersonal, charismatic, good negotiators, intuitive, analytical, and have a linking position in their organization (Durlak & DuPre, 2008; Hader et al., 2007; Rogers, 2003). The definition used in the survey did not contain these qualities, as it essentially only described an innovation champion as a person who actively promotes the WHO Growth Charts. While individuals may have been promoting the WHO Growth Charts, they may have lacked these attributes and consequently, were not enhancing the uptake of the charts by their colleagues. A way for organizations to increase their dissemination efforts and improve their results could be to identify or train regional champions, ensuring that they possess the aforementioned qualities.

5.3.5 Factors related to the prevention support system. The hypothesis for the factor related to the prevention support system was not supported, as there was not a significant, positive relationship between LoU and engagement in pre-use training about the WHO Growth Charts. Furthermore, there was very low participation in pre-use training. Previous research has also reported limited training and access to training materials as barriers to the implementation of

CPG by medical professionals (Bigham et al., 2010). The main purpose of training in any context is to effectively prepare professionals for their new task; this includes helping to develop or enhance providers' necessary skills, motivation, self-efficacy, and outcome expectations, as these can affect their decision to adopt an innovation (Durlak & DuPre, 2008). The interaction between these latter two components and training, specifically in terms of paediatric overweight and obesity management, has also been noted in previous research. He et al. (2010) found that Canadian FP who perceived a low success rate in treating paediatric obesity cited limited training as one of the key barriers to the success of obesity identification and management. Story et al. (2002) also discovered that health professionals who had self-perceived low expertise in obesity control articulated a high interest in additional skill training on behavioural management strategies, assessment of the degree of overweight, guidance in parenting techniques, addressing family conflicts, and modifications of eating practices, PA, and sedentary behaviours.

It is plausible that even in the few cases where FP were exposed to pre-use training of the WHO Growth Charts, the type of training was not effective enough to promote use of the charts. As noted by Davis and Taylor-Vaisey (1997), the most recurrent ways for physicians to enhance knowledge, develop skills, and maintain competence is through courses, workshops, conferences, small-group discussions, and symposia; however, these passive methods have typically failed at inducing a change in providers' performance. Conversely, many studies have showed that modeling, role-playing, and performance feedback are particularly valuable components of training since these active forms of learning foster skill attainment (Durlak & DuPre, 2008). In the current study, the most frequently cited pre-use training for the WHO Growth Charts was through medical school, in which it is likely that information was provided passively in a classroom setting. This passive delivery could have been the same for the online

modules that other respondents engaged in. Despite the insignificant relationship found between training and LoU, the weight of the literature suggests that participation in training should be addressed by key stakeholders based on the effects that it can have on efficacy and outcome expectations. In particular, the type of training provided, and understanding how it will affect efficacy and outcome expectations, should be considered when disseminating CPG.

5.4 Awareness of Programs and Initiatives to Support Paediatric Weight Management

It was disappointing to discover that the average awareness score of resources and initiatives available to support paediatric weight management was approximately two out a possible nine. The most well known were HealthLink BC and BC Children's Hospital, as approximately half of the respondents were aware of these two resources. While the awareness scores did not significantly correlate with LoU, awareness of SCOPE did in a negative manner. Although puzzling, it should be considered that only approximately 5% of participants reported that they were aware of this resource.

The low awareness scores were not that surprising given previous research, which has found that physicians, especially those with low efficacy and outcome expectations, want more paediatric weight management referral resources. In Canada, He et al. (2010) found that at least 50% of practitioners indicated that there were too few government-funded dietitians, and they identified the need for office tools, patient educational materials, and system-level changes in order to help deal with paediatric weight management. In BC, a map of existing resources for the management of childhood obesity, which included guidelines, services, and programs, was developed through an environmental scan and key stakeholder interviews (Child Health BC, 2013). This map was created to inform the clinical care pathway for the weight management of children and youth in BC, and was presented to a working group of health professionals to

generate a discussion on ideas and strategies to enhance it. The result of the discussion was a consensus about the need for increased collaboration with organizations, community centres, FP, families, hospitals, and other relevant members to address this health issue. The finding of a very low awareness of weight management services in the current study can further inform the working group, as well as the specific programs (e.g. Centre for Healthy Weights- Shapedown BC, SCOPE, Exercise is Medicine, and MEND) that there is a need for enhanced communication with physicians about the available referral resources. Consequently, increased contact with PCP may increase referrals to community programs.

5.5 Limitations

5.5.1 Overview. This study is subject to the limitations identified in other studies with the same sample population, cross-sectional survey design, and analyses. The issues that will be discussed include the caution that must be used when interpreting the results, the low response rate when surveying FP, limitations of the measurement tool, and the effects of response and social desirability biases.

5.5.2 Caution interpreting the results. The correlation coefficient (*r)* measures the degree, strength, or significance of the linear relationship between two defined variables, and indicates how closely the data fit a linear pattern (Taylor, 1990). While it is one of the most commonly utilized and reported statistical methods in research data, it is often times forgotten or misunderstood what it actually indicates about relationships among variables. Regardless of how strong the association, it cannot be interpreted as a cause-and-effect relationship. This is important to remember when analyzing the results of the correlation analysis conducted in this study. While many factors were significantly, positively or negatively correlated with LoU, it cannot be concluded that these particular variables were the cause of high or low LoU. Many of

the variables also had an *r* of around .3, which signifies a medium effect size and shows that the variable accounted for approximately 9% of the total variance in the outcome (Cohen, 1992). This is less than a large effect size ($r = .5$), which would explain 25% of the total variance. Furthermore, a variety of research issues could make it difficult to make reliable conclusions from the correlation analysis, such as sample bias, poor research design, error, or data contamination (Taylor, 1990). Although the regression analysis allowed for an additional description of the pattern of the existing relationships between the variables by determining the factors predicting LoU, the fact that correlation does not imply causation should be kept in mind when evaluating the research findings from these analyses.

The small and lower than anticipated sample size also limits the interpretation of the results. Based on Cohen (1992), the target sample size to achieve the statistical power and effect size sought was 85 participants. Larger samples are more likely to represent the entire population (Field, 2013), though it has also been noted that sample representativeness is more important than its size (Thomas et al., 2005). While it appeared that the demographic and practice information of the participants in this study were similar to existing research (NPS, 2014), the small sample size makes it difficult to say with certainty that the results obtained in the current study are representative of the total population of FP practicing in BC. Furthermore, sample size is an issue that must be considered because of the influences that it has on statistical calculations and the assumptions of statistical tests. Field (2013) states that a reliable regression model is obtained when enough data has been collected, and that the CLT suggests that bigger samples allow for the assumption that model parameters (*B*s and βs) are from a normally distributed sampling population. While it was believed that the assumption of normality was met based on the commonly accepted minimum sample size of 30 that is needed for this theorem to hold true

(Field, 2013), it is possible that this was not the case as the sample size was still relatively small. If this assumption was not met, there would have been inaccurate significance tests of models (Field, 2013). In summary, a larger sample size would have resulted in the statistical power and effect size desired, and instilled greater confidence that the assumption of a normal distribution was met, and that the results accurately reflected the views and practices of FP throughout BC.

5.5.3 Low response rates surveying physicians. Having a low response rate and thus a small sample size was a large limitation to this study in terms of being able to generalize the results to other FP both provincially and nationally. The number of randomly selected FP was determined based on data collected through the CMA Masterfile and the 2004 NPS Database (CIHI, 2005b), which suggested a 35% survey response rate for FP in BC. Recent results from the 2013 NPS (NPS, 2014), however, showed an overall national study response rate of 17.5% (*N* =10,487/60,021), and a response rate of 15.2% (*N* = 777/5107) for FP in BC. Wiebe et al. (2012) had a similar response rate in their cross-sectional, fax-back survey of a random sample of FP and all gynecologists in BC contacted through the CPSBC registry; only 76 (14%) out of the 542 physicians who received surveys responded.

These lower rates are not astonishing based on previous literature which has shown that PCP, and FP in particular, are a difficult group to survey compared to the general population (Klabunde, Willis, & Casalino, 2013). Sudman's (1985) review found that the top four reasons why professionals (e.g. physicians, lawyers, teachers, etc.) would not participate in surveys were: (1) being too busy and preferring to spend time on other more important tasks, (2) seeing an unclear or low value of the survey (based on a cost-benefit ratio), (3) having concerns about the confidentiality of results, and (4) perceiving the survey as biased or not providing a full range of responses. Apart from these barriers, Wiebe et al. (2012) discovered that 36.3% of the non-

respondent physicians had an office policy not to participate in surveys. These authors noted that this was a unique finding since little information existed regarding the profiles and rates of physicians who had this type of policy. Not surprisingly, the most common reasons for participation refusal or for the MOAs withholding the FP's contact information in the current study were: (1) lack of time due to other commitments, priorities, or being understaffed; (2) the MOA stating the FP does not participate in surveys, and; (3) the FP already feeling overburdened with surveys. In addition to these barriers, the other potential factors affecting response rates that will be discussed below were survey modes/distribution methods, the time between initial contact with participants and follow-up and number of reminders sent, the type of incentive/compensation provided, and the time/season of sampling as well as the order of random sampling and contact with the DoFP.

The survey mode can affect participation in surveys (Börkan, 2010; Flanigan, McFarlane, & Cook, 2008; Millar & Dillman, 2011). In the present study, FP were offered the options of receiving the survey electronically or by fax, and then completing it online or in the paper copy. However, a mailed option could have yielded greater results, especially for those physicians that did not have a fax machine or an email address. Flanigan et al.'s (2008) review of survey literature on physicians and other medical personnel found that the greatest response rates among mixed-mode surveys (i.e. mail, fax, email, and telephone) have been accomplished by mailed surveys and providing the choice to complete the survey by various modes. Millar and Dillman (2011) evaluated strategies for improving response to web and web/mail mixed-mode surveys and, contrary to popular belief that offering a choice of modes can increase participation, discovered that,

> When using only mail contacts, a simultaneous choice of web and mail response simply does not outperform a paper-only option, even in a highly Internet-literate population with

> complete web access. Alternatively, our study illustrates that offering modes in sequence (following requests for web response with a final request to respond by mail) can significantly increase the overall response rate, making it equivalent to the response rate when mail is the only response option. (p. 266)

This suggests that in order for web surveys to be as effective as mailed ones, these modes should be used sequentially rather than simultaneously. He et al.'s (2010) Canadian study had a relatively high response rate of 46% FP (N = 464/1200) when using a modified Dillman's mail survey method, which involved the following four steps: (1) mailing the survey and LoI in a self-addressed postage-paid return envelope to the randomly selected sample, (2) mailing a reminder card to all non-respondents five weeks after the initial mailing, (3) mailing another survey package to any other non-respondents ten weeks after the reminder cards were distributed, and (4) mailing a third package to the final non-respondents five weeks after the second mailing. Similar to the current study, He et al.'s (2010) participants were also provided the option of completing either an online version or a hard copy of the survey.

While mailing may be essential to high response rates, the use of an electronic form also has it benefits, such as: (1) a quick turnaround period, (2) survey completion at participants' convenience, (3) lower cost per case, and (4) the ease of data collection associated with this format which minimizes mistakes that could occur through manual data entry (Brenowitz & Tuttle, 2003; Flanigan et al., 2008). Furthermore, Thomas et al. (2005) noted that there has been an increased use of e-mail, fax, and the Internet to conduct surveys, and that there have typically been good return rates have using these methods. The major drawback with these formats, however, is that they restrict the participant pool to those that have these technologies available. In addition to access, a lack of comfort using these methods may also serve as a barrier to participation

(Brenowitz & Tuttle, 2003). Although these issues may not be as relevant for younger FP, it could affect engagement with older PCP given previous research, which has shown that response rates vary with age and survey mode (Börkan, 2010). Given these findings, survey mode should be considered in future research with this population.

He et al.'s (2010) sampling procedure also brings attention to how differences in the time elapsed between sending out the initial package and the reminders, as well as the number of reminders sent, may affect response rates. In their study, there was a much greater time period (i.e. five and ten weeks) between the initial contact and when the reminders were sent than the approximate two-week follow-up period used in the current study. Although an optimal time period between initial and follow-up contact has not been put forth, Thomas et al. (2005) recommended that one week was ample. On the one hand, a shorter follow-up period could provide a quicker prompt for the FP to complete the survey when they may have temporarily forgotten about it. On the contrary, a longer period could be beneficial for FP who are extremely busy during that month but may have time, if reminded, to complete it the following month. An example of this time-to-respond discrepancy was evident in the current study, as some of the participants completed the survey within two weeks of receiving the initial package, while others took about four weeks to respond and did so after receiving the reminder letter. One FP emailed the primary researcher six months after receiving a paper copy of the survey, stating that it was "lost under paperwork" and that they would complete it if data was still being collected. A way to circumvent the issue of delayed response could have been to send an additional follow-up package another two or three weeks after the first follow-up, or use telephone callbacks as reminders (Flanigan et al., 2008; He et al., 2010; Thomas et al., 2005). Unfortunately, these methods were not possible given the timeline and budget of this project.

Another issue that could have limited the response rate was the incentive offered in an effort to involve the FP and compensate them for the time taken to participate. Incentives show recognition that respondents' time is appreciated and can partially compensate them for their time (Flanigan et al., 2008). FP who pilot tested the current survey suggested that respondents were offered the option to be entered into a draw for a charitable donation of the their choice towards an organization or program that supported paediatric healthy living. However, only about 20% of the participants provided their contact information at the end of the survey, thereby suggesting that this incentive was not imperative to their participation. Instead, those that were interested in the survey topic were perhaps more likely to complete it regardless of the incentive offered, and those who were already not interested may not have found this to be an alluring form of compensation for participation burden.

Other more effective options could have been gift certificates or token cash incentives. He et al. (2010) included a $20 'Chapters' gift certificate in each envelope to the randomly selected sample of FP and CP and had almost a 50% response rate. Thorpe et al. (2009) had an approximate 75% response rate when surveying physicians that were provided gift certificates through recorded/delivery mail; this was much higher than the response rate of 48% obtained when they did not distribute incentives or use registered mail. Millar and Dillman (2011) found that "delivering token cash incentives in advance is critical for establishing the survey's legitimacy and increasing the benefits of survey response. These incentives dramatically improved web survey response" (p. 267). Similarly, Flanigan et al.'s (2008) review revealed that prepaid incentives at initial contact have improved response rates compared to those given on follow-up or other delayed incentives. These authors also found that physicians thought it was not worth the time to complete a survey that had a small or no incentive; they also did not

participate if the incentive was too large, as this was viewed as payment. While a reward seen as a token of appreciation had the greatest results, the major issue with these suggested incentives is that the first survey request has to be distributed by post mail. Unfortunately, mailing and providing each FP with compensation was outside of this study's budget, but would be recommended over a draw for a charitable donation in future studies with this population.

The seasonal timing of survey distribution could have also caused lower than anticipated response rates (Thomas et al., 2005). Random samplings of the stratified urban and rural FP commenced in April and data collection continued into the summer months, at which point the DoFP were contacted to try and increase the sample size. While every practice is different in terms of busiest times of patient visits and vacation schedules, many FP slow down during the summer months. This has its advantages as it provides time for FP to catch up on paper work and other items that may have been neglected, such as research requests. However, as indicated by some of the DoFP Coordinators or EDs, it can also be an inconvenient time as many FP go away on holidays and do not check their emails, newsletters, etc. while away. Upon further investigation, it was found that the most surveys were completed and returned in July. This was in line with advice given by the Coordinators or EDs, who noted that June was typically the busiest month for FP, July the slowest, and August was when many went on vacation. Although this may not hold true for all FP, it does shed light on the need to consider seasonal timing of survey distribution and to gather this information prior to data collection.

Finally, the sampling order could have limited FP participation. Specifically, it may have been beneficial to approach the DoFP Coordinators or EDs about survey distribution prior to employing a random sampling method. These leaders often had insightful advice to offer, such as the best methods for reaching the FP and when to distribute the survey, and it is possible that FP

would consider a survey to be more credible and important if it was sent through and approved by their DoFP (Harting et al., 2009). Earlier contact with the Divisions would have also meant that they could have sent out the survey package in the spring or early summer, which may have yielded greater response results than distributing in mid to late summer. If the response rate was still low after this distribution approach, then the random sampling could have been utilized.

Collectively, these survey limitations should be explored prior to data collection and discussed with the study population and relevant members, such as the FP involved in pilot testing and DoFP Coordinators and EDs. Addressing these issues would ideally produce higher response rates, which is important for legitimizing a survey's results (Wiebe et al., 2012).

5.5.4 Measurement tool. A majority of the survey questions were adapted from previously developed scales and questionnaires. However, most of these instruments were altered in length or wording based on piloting to meet the time constraints of physicians and to be applicable to the topic of study. While attempts were made to maintain the integrity of the original instruments from which the survey was developed, and scale reliabilities were computed for constructs that were measured by more than one variable, the validity and reliability of these instruments may have been compromised when incorporated into this survey. For example, Moore and Benbasat's (1991) Perceptions of Adopting an Information Technology Innovation scale was significantly reduced from both its long (38-item) and short (25-item) versions in this survey. Since their study measured the varying perceptions that a worker may have of adopting an IT innovation, the questions in the current survey also had to be reworded to reflect adoption of the WHO Growth Charts. Furthermore, the voluntariness, image, and visibility constructs examined by Moore and Benbasat (1991) were not evaluated in the current study since these variables were not as relevant to the growth charts. The authors cautioned against deleting items

from these scales if the instrument had not been tested in new samples. They also suggested additional examinations with other innovations in different contexts to determine the generalizability of the scales. Ultimately, reliability and validity checks of the shortened scale should have been conducted to ensure that the items were measuring what they were supposed to with the population and innovation in the current study.

This was also an issue for the eight-item Innovativeness Scale used in this study, which was taken from Hurt et al.'s (1977) 20-item scale. This was a difficult measurement tool to condense as each question tapped into a different personality characteristic that was to represent the various adopter types. The scores from these questions were then added to produce an overall innovativeness score. Having reduced this scale in the present study could have meant that the responses did not accurately or adequately capture the FPs' personalities and willingness to change, therefore categorizing them into incorrect adopter types. In retrospect, it may have been better to have one question with five answers reflecting the types (e.g. innovators, early majority, etc.), and asked the respondents to pick the statement that best approximated their general tendency to adopt a medical innovation. This would have been similar to the LoU question (Steckler et al., 1992), however it still would have been difficult to pick one personality statement to represent each adopter type. This issue should be addressed in future work surveying FP, especially since shorter surveys are required for higher response rates (Jepson, Asch, Hershey, & Ubel, 2005).

The survey may have also been too long, despite having significantly reduced the length of the original questionnaires and scales after pilot testing revisions. The average time to complete the survey was approximately 12 minutes, however, some FP stopped responding to questions in the electronic version halfway through the survey, therefore suggesting that they did

not have time to complete the rest. As confirmed from Flanigan et al.'s (2008) review, studies with longer surveys typically have less engagement from physicians. In one study, Jepson et al. (2005) compared surveys of different lengths and found that response rates began to decline after a threshold of 1000 words. While further reducing the survey would have compromised the integrity of theory questions, it may have been necessary to attain a higher response rate, thereby enhancing the representativeness of the results.

5.5.5 Response and social desirability biases. A major limitation to self-report measures such as surveys is that they can suffer from response and/or social desirability bias (Thomas et al., 2005). These biases can affect the validity and reliability of the results, and question the credibility of the responses. Response bias occurs when people who are interested in the survey topic are more likely to participate than those who are uninterested, and are therefore self-selected respondents; the responses are usually always biased in ways that are directly related to the research purpose (Fowler, 2002, as cited in Thomas et al., 2005). In this study, it is possible that FP who were particularly interested in paediatric health and/or growth monitoring were more inclined to complete the survey. This could explain the high level of concern about the health consequences of childhood overweight and obesity and the high LoU of the 2006 and 2007 WHO Growth Charts. A way to address this bias could have been to survey a small (e.g. 5% to 10%), randomly selected sample of the non-respondents via telephone or a special cover letter (Thomas et al., 2005). The respondents' and non-respondents' answers could then be compared; similar responses would imply that both groups were the same in their views, practices, and so forth, however, different answers would require surveying more non-respondents or at least addressing the differences in the report. Surveying non-respondents could

be quite difficult though, especially if they have already ignored the initial package and any follow-ups.

The FPs' responses could have also been subject to social desirability bias, which occurs when participants answer items in a way that displays a favorable image to others in order to achieve their approval and avoid embarrassment (Fisher, 1993). Provided each participant had read the study synopsis prior to completing the survey, which included background information on the WHO Growth Charts and their recommended use by all Canadian PCP, it is possible that questions were answered to positively support these topics. In addition to concerns about the health consequences of childhood overweight and obesity and LoU, the technique of asking the participants about the presence of an innovation champion for promoting the growth charts may have also been answered in a socially desirable way (Howell & Higgins, 1990). However, this was the alternative to providing a list of FPs' names or asking participants to personally identify the champion; given the low number of participants reporting that they were the champion, using this technique did not appear to be a major issue. As suggested by Fisher (1993), a way to reduce social desirability bias, especially on sensitive topics, would be to use indirect (i.e. structured and projective) questioning rather than direct (i.e. structured and personal) questions. Indirect questioning asks participants to answer questions from the viewpoint of another person or group. The authors found that this technique reduced this bias on variables prone to social influence but did not significantly affect socially neutral variables. Thus this questioning may have been useful for the more sensitive questions in the present study, and should be considered in future research with this population.

5.6 Strengths, Implications, and Future Research

5.6.1 Overview. Despite the limitations, the results from this exploratory and theory-guided study can help to inform different levels of PH decision-making. Locally and provincially, organizations and programs such as Child Health BC, the MOH, SCOPE, and BC Children's Hospital can use the results to adjust how their resources and/or innovations are disseminated to the appropriate audiences. These innovations could extend beyond CPG, as examined in the current study, to various initiatives that the organization may offer. Nationally, the findings could help guide researchers in other provinces conduct evaluations on chart use with their FP. The DOI theory and EFEI served as valuable guiding models for this study. They provided a foundation for the examination of numerous micro and macro level factors that can affect the diffusion process of an innovation, as well as the interactions between these variables. The implications and recommendations for future research concerning the variables studied have been suggested throughout the discussion. In addition to these ideas that can inform relevant stakeholders and programs on the dissemination and adoption of the 2006 and 2007 WHO Growth Charts, this study has other strengths, implications, and areas for future study that will be discussed below.

5.6.2 Participant feedback and a mixed-methods approach. Gathering participant feedback through several open-ended questions in this survey was imperative to gaining a deeper understanding about use of the 2006 and 2007 WHO Growth Charts. While open-ended questions can be less desirable for participants and researchers because they take more time to complete and responses are more difficult to categorize for analysis, they can produce critical information that would otherwise be missed from closed questions (Thomas et al., 2005). Open-ended questions were used to ask respondents about any additional barriers and facilitators to

why they were or were not using the WHO charts, and if they had any additional comments, questions, or concerns about the topic or survey. Responses to these questions illustrated the importance of open-ended questions. For example, the most commonly cited barrier was related to participants' EMR systems (e.g. that the charts were not interfaced, embedded, or installed). Similarly, the most frequently cited reason for using these charts was due the fact that they were integrated or embedded into the EMR system. This provided more information than was gathered in the closed questions about EMR use in practice. Other interesting responses included that it would be helpful if the WHO charts were circulated to FP, and that there was an insufficient awareness of the WHO charts. These are important issues for the MOH to recognize because they indicate that not all FP received copies of the new growth charts, or were aware of the available resources to increase their understanding and use of them. Finally, some respondents commented that they had restricted access to tertiary care in their rural practice, that there was a lack of community support for paediatric overweight and obesity, or there was no locally or easily accessible resources or programs in their community. A low accessibility and awareness of relevant programs and resources are fundamental issues that can be addressed by the program and resource coordinators or leaders via increased communication with the relevant health professionals.

The advantages of using open-ended questions highlighted a need for a mixed-method approach that would allow for the collection of additional qualitative data. Thus, future research could conduct focus groups or interviews after collecting survey data. Green, Caracelli, and Graham (1989) believe that researchers can take advantage of qualitative and quantitative methods' strengths when they are combined, which ultimately results in more robust analyses. Ivankova, Creswell, and Stick (2006) further suggest that a reason for gathering both types of

data in a study is that these methods are insufficient, by themselves, for understanding the specific details and tendencies of a situation.

Previous research has examined the dissemination and adoption of CPG by PCP in various health care settings through focus group interviews (Hader et al., 2007; Harting et al., 2009). Harting et al. (2009) used the DOI theory to inform both the interview questions and data analysis, and the authors determined that the results produced valuable insights into the various determinants of guideline adherence. The authors also recommended using a purposeful sampling strategy to ensure that focus groups represented professionals from each stage of the diffusion process. Future research on guideline implementation or adherence could therefore stratify focus groups into CPG users and non-users, and/or by the respondents' demographics or practice information. It could also be advantageous to interview non-respondents to gain a better understanding of their views, practices, and reasons for not participating in the survey. As noted by Klabunde et al. (2013), "a mixed-methods approach to studying facilitators and barriers to health care provider survey participation, such as follow-back coupled with key informant interviews, might provide a particularly rich context for understanding providers' motivations to participate-or not-in a given survey" (p. 292). Understanding the FPs' motivations would be particularly important given the low response rate, and the belief that physician cooperation rates will not increase in the future (Flanigan et al., 2008).

Finally, future studies surveying FP would benefit from building a rapport with MOAs and/or DoFP Coordinators and EDs prior or during data collection. On one hand, these "gatekeepers" can act as a barrier to survey participation (Klabunde et al., 2013) by limiting the amount of information provided to the researcher, such the FPs' fax or email addresses. On the other hand, they can be essential to higher PCP survey response rates by offering more

information than what could be obtained from FP in the survey. In the current study, some MOAs were interested in the study and provided insight into FPs' chart use, the factors influencing LoU, and survey habits. For example, one MOA said that a FP in their office did not have access to paper copies of the new WHO Growth Charts, and while this individual saw the most paediatric patients out of the three FP in the office, the physician did not use an EMR system like the other FP. Consequently, they were trying to find out how to access the growth charts without having to print their own copies. The request for additional chart copies occurred a few times throughout data collection, which demonstrated that a lack of access to these growth charts served as a barrier to adoption. In terms of the DoFP Coordinators and EDs, some refused to distribute the survey, although there were a greater number of helpful leaders that agreed to participate and suggested modes of survey distribution as well as optimal times to send them. Despite their importance, there is little existing research studying these gatekeepers' roles and influences on survey participation (Klabunde et al., 2013) and as such, it would be another recommended issue to investigate in the future.

5.6.3 CPEG Growth Charts. Future research may also need to evaluate the use of the new growth charts that were released during the period of data collection, in the summer of 2013, by the CPEG (Lawrence et al., 2013). These were developed by the CPEG, in combination with key stakeholders from family practice, PH, general and pediatric subspecialties, and dietetics, with the purpose of being complementary growth curves based on the 2006 and 2007 WHO Growth Charts. The development of these charts stemmed from concerns highlighted by CPEG members and the general paediatric community regarding the presentation of the WHO data. The two shortcomings of the current WHO charts that were addressed were the removal of the weight curves for children older than 10 years of age, and the replacement of the familiar 3-10-25-50-

75-97 centiles with plotting of extreme (i.e. 0.1 and 99.9) centiles. Thus, the specific changes made involved: (1) extending the sex-specific weight-for-age curves beyond 10 years of age so that fluctuations in height and weight can be simultaneously assessed on the same page; (2) bringing back the traditional percentiles within the normal range (3-10-25-50-75-97 compared to 0.1-3-15-50-85-97-99.9) to allow for a more exact description within the this range; (3) eliminating the extreme 0.1 and 99.9 centiles to avoid compression of the curves and to enhance clarity in plotting and interpretation; and (4) alterations of the BMI percentile lines (as mentioned in point 2 and 3), which still retains the WHO definitions of overweight and obesity but emphasizes healthier BMIs (Lawrence et al., 2013).

All alterations followed the WHO methodology and utilized core data from the same US NCHS. With the exception of the percentiles plotted, these charts are almost identical to the 2006 WHO Standards for children two years old and younger. However, the weight curves in the charts for children between two and 19 years old have a second, small discontinuity at age 10 due to outliers that were eliminated when making the curves. The CPEG charts are believed to "enhance clarity, reduce potential errors in classification, and enable users to better track short-term changes, particularly for weight in older children" (Lawrence et al., 2013, p. 295). Although paediatricians are more likely to be aware of the CPEG charts compared to FP, these charts may now be viewed and studied as an innovative CPG, which could affect how FP perceive the 2006 and 2007 WHO Growth Charts. Regardless of the specific population targeted, the present survey and study results may be beneficial for informing future evaluations on the use of the CPEG charts.

5.6.4 Knowledge translation. At the heart of the paediatric overweight and obesity prevention and management issue exists the challenge of knowledge translation (KT) between

researchers, physicians, PH educators, medical schools, health programs, government organizations, and the public. According to Straus, Graham, and Mazmanian (2006), KT is "the scientific study of the methods for closing the knowledge-to-practice gap, and the analysis of barriers and facilitators inherent in this process" (p. 3). Knowledge exchange is characterized by collaborative problem solving and interactive, mutual learning, so that the flow of information goes between all parties involved (Armstrong, Waters, Crockett, & Keleher, 2007; Gagliardi, Fraser, Wright, Lemieux-Charles, & Davis, 2008; Keown, Van Eerd, & Irvin, 2008). The disconnect between PH educators and physicians, as demonstrated by Mahoney, Fox, and Chheda (2011) at the Patients and Populations: Public Health in Medical Education, exposes the gaps in KT that exist in the health field. Far too often, research findings are not effectively translated to the audiences that could benefit the most from the information. For example, results of an evaluation study such as the current one may not be exchanged to those disseminating the CPG, and as such, dissemination efforts are not increased to ensure that the recommended guidelines are distributed and used by physicians. It has also been suggested that "Groups developing guidelines should ask relevant clinical questions and develop implementable and context specific recommendations. Developers should be explicit and consistent in the development and presentation of recommendations" (Solà et al., 2014, p. 86065). This highlights the role that the WHO also plays in ensuring that the charts can be easily utilized by PCP.

Additionally, Fernandez et al. (2010) assert, "Guideline adherence is an important strategy in ensuring quality health outcomes; therefore, strategies to promote the uptake of guidelines should be based on the experiences of the [health professionals] to overcome barriers to guideline implementation" (p. 15). As discussed, proper paediatric growth assessments and monitoring commencing at birth are fundamental steps in ensuring that the complications of

unhealthy, excessive weights are prevented or halted from occurring later on in life. This study has provided an evaluation on the current LoU of the 2006 and 2007 WHO Growth Charts by FP in BC, and has also offered insight into the factors that predicted use in this sample. However, the information obtained and presented will only be useful if it is adequately translated to, and used by, the appropriate audiences, such as the MOH for future dissemination efforts, EMR providers to ensure the appropriate CPG are installed, and the working group in BC that is developing a pathway for the identification, assessment, and management of children and youth who are overweight, obese, or at-risk (ChildHealth BC, 2013). Although there has been progress in addressing KT issues through various conferences, initiatives, and programs, the underlying concern of managing overweight and obesity will continue to exist until the barriers surrounding the exchange of information are addressed at all levels.

5.7 Conclusion

The high LoU of the 2006 and 2007 WHO Growth Charts is encouraging and revealed that the majority of BC FP in this sample had adopted these charts. It appeared that the application of Rogers's (2003) DOI theory and Durlak and DuPre's (2008) EFEI was advantageous for exploring the dissemination and adoption of these growth charts and for identifying several enhancing and hindering determinants of use. The descriptives and correlation analyses provided valuable information on FPs' practices, behaviours, and views on a number of topics related to paediatric growth monitoring and weight management. Six variables were found to predict LoU, including age, practicing in Fraser HA region, assessing head circumference of birth to two year olds, the perceived accessibility and compatibility of the growth charts, and innovativeness. Both the qualitative and quantitative results highlighted the importance of embedding these charts into the EMR systems to ensure that FP would use them.

Unfortunately, FPs' awareness of programs and initiatives to support paediatric overweight and obesity was quite low. A low response rate and small sample size makes it difficult to say for certain that the participants were representative of the total population of FP in BC, and that the findings are generalizable to FP in other Canadian provinces. However, the results can help to inform future dissemination efforts in the area of PH and provide a foundation for further investigations on the use and predictor variables of CPG adoption by PCP.

References

American Medical Association. (n.d.). *AMA Resident and Fellow Section Legislative Advocacy Committee defining the role of the resident physician*. Retrieved February 21, 2014, from http://www.ama-assn.org/resources/doc/rfs/ama-rfs-lac-gme-report.pdf

Armstrong, R., Waters, E., Crockett, B., & Keleher, H. (2007). The nature of evidence resources and knowledge translation for health promotion practitioners. *Health Promotion International, 22*(3), 254-260. doi:10.1093/heapro/dam017

Audet, A., Davis, K., & Schoenbaum, S. C. (2006). Adoption of patient-centered care practices by physicians: Results from a national survey. *Archives of Internal Medicine, 166*(7), 754-759. doi:10.1001/archinte.166.7.754

Bigham, B. L., Aufderheide, T. P., Davis, D. P., Powell, J., Donn, S., Suffoletto, B., … Morrison, L. J. (2010). Knowledge translation in emergency medical services: A qualitative survey of barriers to guideline implementation. *Journal of Resuscitation, 81*(7), 836-840. doi:10.1016/j.resuscitation.2010.03.012

Birdsell, J. M., Thornley, R., Landry, R., Estabrooks, C., & Mayan, M. (2005). *The utilization of health research results in Alberta*. Edmonton, AB: Alberta Heritage Foundation for Medical Research.

Börkan, B. (2010). The mode effect in mixed-mode surveys: Mail and web surveys. *Social Science Computer Review, 28*(3), 371-380. doi:10.1177/0894439309350698

Breat, C., Mervielde, I., & Vandereycken, W. (1997). Psychological aspects of childhood obesity: A controlled study in a clinical and nonclinical sample. *Journal of Pediatric Psychology, 22*(1), 59-71. doi:10.1093/jpepsy/22.1.59

Brenowitz, N., & Tuttle C. R. (2003). Development and testing of a nutrition-teaching self-efficacy scale for elementary school teachers. *Journal of Nutrition and Education Behavior, 35*(6), 308-311. doi:10.1016/S1499-4046(06)60345-X

British Columbia Ministry of Health. (2013). *2012 Rural Practice Subsidiary Agreement.* Retrieved August 28, 2013, from http://www.health.gov.bc.ca/msp/legislation/pdf/APPENDIX_C_Rural_Subsidiary_Agreement.pdf

Burke, L. E. & Fair, J. (2003). Promoting prevention: Skill sets and attributes of health care providers who deliver behavioral interventions. *Journal of Cardiovascular Nursing,*

18(4), 256-266. Available from http://www.ncbi.nlm.nih.gov/pubmed/14518601

Cabana, M. D., Rand, C. S., Powe, N. R., Wu, A. W., Wilson, M. H., Abboud, P-A. C., & Rubin, H. R. (1999). Why don't physicians follow clinical practice guidelines? A framework for improvement. *Journal of the American Medical Association, 282*(15), 1458-1465. doi:10.1001/jama.282.15.1458.

CanadianEMR. (2007). *About CanadianEMR.* Retrieved March 3, 2014, from http://www.canadianemr.ca/index.aspx?PID=10

Canadian Institute for Health Information. (2005a). *Geographic distribution of physicians in Canada: Beyond how many and where.* Retrieved March 11, 2013, from https://secure.cihi.ca/free_products/Geographic_Distribution_of_Physicians_FINAL_e.pdf

Canadian Institute for Health Information. (2005b). *2004 National Physician Survey response rates and comparability of physician demographic distributions with those of the physician population.* Retrieved September 3, 2013, from http://www.cihi.ca/CIHI-ext-portal/pdf/internet/PDAB1_2005_EN

Canadian Institute for Health Information. (2012). *Supply, Distribution and Migration of Canadian Physicians, 2011.* Ottawa, ON: CIHI.

Centers for Disease Control and Prevention. (2011). *About BMI for children and teens.* Retrieved March 18, 2013, from http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html#How%20can%20I%20tell%20if%20my%20child%20is%20overweight

Child Health BC. (2013). *Interprofessional consensus meeting report: Weight management for children and youth in BC.* Available from the Child Health BC website: http://www.childhealthbc.ca/guidelines/category/19-workshop-reports

Choudhry, N., Fletcher, R., & Soumerai, S. (2005). Systematic review: The relationship between clinical experience and quality of health care. *Annals Of Internal Medicine*, *142*(4), 260-273. Retrieved March 5, 2014, from http://scholar.harvard.edu/files/nkc/files/2005_length of_time_in_practice_and_quality_of_care_annals.pdf

Clarke, W. R., & Lauer, R. M. (1993). Does childhood obesity track into adulthood? *Critical Reviews in Food Science and Nutrition, 33*(4-5), 423-430. doi:10.1080/10408399309527641

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159. doi:10.1037/0033-2909.112.1.155

College of Physicians and Surgeons of British Columbia. (n.d.). *Find a physician.* Retrieved March 13, 2013, from https://www.cpsbc.ca/physician_search

Czaja, R., McFall, S. L., Warnecke, R. B., Ford, L., & Kaluzny, A. D. (1994). Preferences of community physicians for cancer screening guidelines. *Annals of Internal Medicine. 120*(7), 602-608. Available from http://www.ncbi.nlm.nih.gov/pubmed/8117000

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsch, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science, 4,* 50. doi:10.1186/1748-5908-4-50

Davis, D. A., & Taylor-Vaisey, A. (1997). A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. *Canadian Medical Association Journal, 157*(4), 408-416. Retrieved March 5, 2014, from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1227916/pdf/cmaj_157_4_408.pdf

De Onis, M. (2011). WHO child growth standards catch on. *Bulletin of the World Health Organization*, 89, 250-251. doi:10.2471/BLT.11.040411

De Onis, M., Garza, C., Onyango, A. W., & Borghi, E. (2007). Comparison of the WHO child growth standards and the CDC 2000 growth charts. *The Journal of Nutrition, 137*(1), 144-148. Available from http://www.ncbi.nlm.nih.gov/pubmed/17182816

De Onis, M., Onyango, A., Borghi, E., Siyam, A., Blossner, M., & Lutter, C. (2012). Worldwide implementation of the WHO Child Growth Standards. *Public Health Nutrition, 15*(9), 1603-1610. doi:10.1017/S136898001200105X

Dietitians of Canada and Canadian Paediatric Society. (2010). *A health professional's guide for using the new WHO growth charts*. Retrieved March 12, 2012, from http://www.dietitians.ca/Downloadable-Content/Public/DC_HealthProGrowthGuideE.aspx

Dietitians of Canada and Canadian Paediatric Society Collaborative Statement. (2010). *Promoting optimal monitoring of child growth in Canada: Using the new WHO growth charts (A collaborative statement from: Dietitians of Canada, Canadian Paediatric Society, The College of Family Physicians of Canada, and Community Health Nurses of Canada).* Retrieved March 30, 2012, from http://www.cps.ca/tools/growth-charts-

statement-FULL.pdf

Dietz, W. H. (1998). Health consequences of obesity in youth: Childhood predictors of adult disease. Pediatrics, 101(3 Pt 2), 518-525. Available from http://www.ncbi.nlm.nih.gov/pubmed/12224658

Divisions of Family Practice website. (n.d.). Retrieved September 3, 2013, from https://www.divisionsbc.ca/provincial/home

Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*(3-4), 327-350. doi:10.1007/s10464-008-9165-0

Elley, C. R., Dean, S., & Kerse, N. (2007). Physical activity promotion in general practice: Patient attitudes. *Australian Family Physician, 36*(12), 1061–1064. Available from http://www.ncbi.nlm.nih.gov/pubmed/18075637

Eisinga, R., te Grotenhuis, M., & Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach or Spearman-Brown? *International Journal of Public Health, 58*(4), 637-642. doi:10.1007/s00038-012-0416-3

Fernandez, R. S., Davidson, P., Griffiths, R., & Salamonson, Y. (2010). Overcoming barriers to guideline implementation: The case of cardiac rehabilitation. *Quality & Safety in Health Care, 19*(6), e15. doi:10.1136/qshc.2008.029587

Ferrier, B. M., Woodward, C. A, Cohen. M, & Williams, A. P. (1996). Clinical practice guidelines: New-to-practice family physicians' attitudes. *Canadian Family Physician, 42*, 463-468. Available from http://www.ncbi.nlm.nih.gov/pubmed/8616286

Field, A. (2013). *Discovering statistics using IBM SPSS Statistics (4th ed.)*. Los Angeles, CA: Sage.

Field, M. J., & Lohr, K. N. (1992). *Guidelines for clinical practice: From development to use*. Washington, DC: National Academy Press.

Fixsen, D. L., Naoom, S. F., Blasé, K. A., Friedman, R. M., & Wallace, F. (2005). *Implementation research: A synthesis of the literature*. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231). Available from http://ctndisseminationlibrary.org/PDF/nirnmonograph.pdf

Fisher, R. J. (1993). Social desirability bias and the validity of indirect questioning. *Journal of Consumer Research*, *20*(2), 303-315. doi:10.1086/209351

Flanigan, T. S., McFarlane, E., & Cook, S. (2008). Conducting survey research among physicians and other medical professionals: A review of current literature. Presented at the American Association for Public Opinion Research, New Orleans, May 2008. Retrieved February 24, 2014, from https://www.amstat.org/sections/srms/Proceedings/y2008/Files/flanigan.pdf

Fluidware Incorporated. (2012). *FluidSurveys* (Version 4.0) [Online Software]. Ottawa, ON: Fluidware Inc.

Freedman, D. S., Khan, L. K., Serdula, M. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2005). The relation of childhood BMI to adult adiposity: The Bogalusa Heart Study. *Pediatrics, 115*(1), 22-27. doi:10.1542/peds.2004-0220

Gagliardi, A. R., Fraser, N., Wright, F. C., Lemieux-Charles, L., & Davis, D. (2008). Fostering knowledge exchange between researchers and decision-makers: Exploring the effectiveness of a mixed-methods approach. *Health Policy, 86*(1), 53-63. doi:10.1016/j.healthpol.2007.09.002

Greater Victoria Chamber of Commerce. (2012). *About Victoria, BC.* Retrieved August 28, 2013, from http://www.victoriachamber.ca/about_victoria/

Green, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11*(3), 255-274. doi:10.3102/01623737011003255

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *Millbank Quarterly, 82*(4), 581-629. doi:10.1111/j.0887-378X.2004.00325.x

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2005). *Diffusion of innovations in health service organizations: A systematic literature review*. Oxford: Blackwell.

Guh, D. P., Zhang, W., Bansback, N., Amarsi, Z., Birmingham, C. L., & Anis, A. H. (2009). The incidence of co-morbidities related to obesity and overweight: A systematic review and meta-analysis. *BMC Public Health, 9*(1), 88. doi:10.1186/1471-2458-9-88

Hader, J. M., White, R., Lewis, S., Foreman, J. L. B., McDonald, P. W., & Thompson, L. G. (2007). Doctors' views of clinical practice guidelines: A qualitative exploration using innovation theory. *Journal of Evaluation in Clinical Practice, 13*(4), 601-606. doi:10.1111/j.1365-2753.2007.00856.x

Harting, J., Rutten, G. M., Rutten, S, T., & Kremers, S. P. (2009). A qualitative application of the Diffusion of Innovations theory to examine determinants of guideline adherence among physical therapists. *Physical Therapy, 89*(3), 221-232. doi:10.2522/ptj.20080185

He, M., Piche, L., Clarson, C. L., Callaghan, C., & Harris, S. B. (2010). Childhood overweight and obesity management: A national perspective of primary health care providers' views, practices, perceived barriers and needs. *Paediatrics Child Health, 15*(7), 419-426. Available from http://www.ncbi.nlm.nih.gov/pubmed/21886445

Howell, D. C. (2008). *Fundamental statistics for the behavioral sciences (6th ed.)*. Belmont, CA: Thompson Wadsworth.

Howell, J. M., & Higgins, C. A. (1990). Champions of technological innovations. *Administrative Science Quarterly*, *35*(2), 317-341. Available from http://www.jstor.org/stable/2393393

Huang, T. T., Borowski, L. A., Liu, B., Galuska, D. A., Ballard-Barbash, R., Yanovski, S. Z., …Smith, A. W. (2011). Pediatricians' and family physicians' weight-related care of children in the U.S. *American Journal of Preventative Medicine, 41*(1), 24-32. doi:10.1016/j.amepre.2011.03.016

Hurt, H. T., Joseph, K., & Cook, C. D. (1977). Scales for the measurement of innovativeness. *Human Communication Research, 4*(1), 58-65. doi:10.1111/j.1468-2958.1977.tb00597.x

IBM Corporate. Released 2013. *IBM SPSS Statistics for Windows* (Version 22.0) [Online Software]. Armonk, NY: IBM Corp.

Ivankova, N. V., Creswell, J. W., & Stick, S. L. (2006). Using mixed-methods sequential explanatory design: From theory to practice. *Field Methods, 18*(1), 3-20. doi:10.1177/1525822X05282260

Jepson, C., Asch, D. A., Hershey, J. C., & Ubel, P. A. (2005). In a mailed physician survey, questionnaire length had a threshold effect on response rate. *Journal of Clinical Epidemiology, 58*(1), 103–105. doi:10.1016/j.jclinepi.2004.06.004

Keown, K., Van Eerd, D., & Irvin, E. (2008). Stakeholder engagement opportunities in systematic reviews: Knowledge transfer for policy and practice. *Journal of Continuing*

Education in the Health Professions, 28(2), 67-72. doi:10.1002/chp.159

Kim, Y-K., Lee, S-H., Seo, J-H., Kim, J-H., Kim, D-K., & Kim, G-K. (2010). A comprehensive model of factors affecting adoption of clinical practice guidelines in Korea. *Journal of Korean Medical Science, 25*(11), 1568-1573. doi:10.3346/jkms.2010.25.11.1568

Klabunde, C. N., Willis, G. B., & Casalino, L. P. (2013). Facilitators and barriers to survey participation by physicians: A call to action for researchers. *Evaluation & Health Professions, 36*(3), 279-295. doi:10.1177/0163278713496426

Klein, K. J., & Sorra, J. S. (1996). The challenge of innovation implementation. *The Academy of Management Review, 21*(4), 1055-1080. Available from http://www.jstor.org/stable/259164

Lau, D. C. W., Douketis, J. D., Morrison, K. M., Hramiak, I. M., Sharma, A. M., & Ur, E. (2007). 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. *Canadian Medical Association Journal, 176*(8), 1-S13. doi:10.1503/cmaj.061409

Lawrence, S., Cummings, E., Chanoine, J-P., Metzger, D. L., Palmert, M., Sharma, A., & Rodd., C. (2013). Canadian Pediatric Endocrine Group extension to WHO growth charts: Why bother? *Paediatrics & Child Health (1205-7088), 18*(6), 295-297. Retrieved February 15, 2014, from http://pediatrics.med.ubc.ca/files/2013/06/15550_lawr.pdf

Lyznicki, J. M., Young, D. C., Riggs, J. A., & Davis, R. M. (2001). Obesity: Assessment and management in primary care. *American Family Physician, 63*(11), 2185. Available from http://www.ncbi.nlm.nih.gov/pubmed/11417771

Mahoney, J. F., Fox, M. D., & Chheda, S. G. (2011). Overcoming challenges to integrating public and population health into medical curricula. *American Journal of Preventive Medicine, 41*(4, Supplement 3), S170-S175. doi:10.1016/j.amepre.2011.06.025

Metro Vancouver. (2011). *Who is Metro Vancouver*. Retrieved August 28, 2013, from http://www.metrovancouver.org/about/Pages/default.aspx

Millar, M. M., & Dillman, D. A. (2011). Improving response to web and mixed-mode surveys. *Public Opinion Quarterly*, *75*(2), 249-269. doi:10.1093/poq/nfr003

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-220. doi:10.1287/isre.2.3.192

Nash, A., Secker, D., Corey, M., Dunn, M., & O'Connor, D. (2008). Field testing of the 2006 World Health Organization growth charts from birth to 2 years: Assessment of hospital undernutrition and overnutrition rates and the usefulness of BMI. *Journal of Parenteral and Enteral Nutrition, 32*(2), 145-153. doi:10.1177/0148607108314386

National Physician Survey website. (2014). Retrieved February 24, 2014, from http://nationalphysiciansurvey.ca/

Pi-Sunyer, F. X. (1993). Medical hazards of obesity. *Annals of Internal Medicine, 119*(7), 655-660. doi:10.1059/0003-4819-119-7_Part_2-199310011-00006

Public Health Agency of Canada and the Canadian Institute for Health Information. (2011). *Obesity in Canada: A joint report from the Public Health Agency of Canada and the Canadian Institute for Health Information*. Retrieved November 14, 2013, from http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/oic-oac/assets/pdf/oic-oac-eng.pdf

Rao, G. (2008). Childhood obesity: Highlights of AMA Expert Committee recommendations. *American Family Physician, 78*(1), 56-63. Retrieved March 18, 2013, from http://www.aafp.org/afp/2008/0701/p56.html

Rausch, J. C., Perito, E. R., & Hametz, P. (2011). Obesity prevention, screening, and treatment: Practices of pediatric providers since the 2007 expert committee recommendations. *Clinical Pediatrics, 50*(5), 434-441. doi:10.1177/0009922810394833

Reilly, J. J., Methven, E., McDowell, Z. C., Hacking, B., Alexander, D., Stewart, L., & Kelnar, C. J. H. (2003). Health consequences of obesity. *Archives of Disease in Childhood, 88*(9), 748-752. doi:10.1136/adc.88.9.748

Roberts, K. C., Shields, M., de Groh, M., Aziz, A., & Gilbert, J. (2012). *Overweight and obesity in children and adolescents: Results from the 2009 to 2011 Canadian Health Measures Survey.* Component of Statistics Canada Catalogue no. 82-003-X Health Reports. Available from http://www.statcan.gc.ca/pub/82-003-x/2012003/article/11706-eng.htm

Rogers, E. M. (2003). *Diffusion of Innovations (5th ed.).* Toronto, ON: Free Press.

Rural Coordination Centre of BC. (2013). *RSA communities.* Retrieved August 28, 2013, from http://www.rccbc.ca/rural-physicians/rsa-communities

Scott, S. D., Plotnikoff, R.C., Karunamuni, N., Bize, R., & Rodgers, W. (2008). Factors influencing the adoption of an innovation: An examination of the uptake of the Canadian heart health kit (HHK). *Implementation Science, 3*(1), 41. doi:10.1186/1748-5908-3-41

Shields, M., & Tremblay, M. S. (2010). Canadian childhood obesity estimates based on WHO, IOTF and CDC cut-points. *International Journal of Pediatric Obesity, 5*(3), 265-273. doi:10.3109/17477160903268282

Singh, A. S., Mulder, C., Twisk, J. W. R., Van Mechelen, W., & Chinapaw, J. M. (2008). Tracking of childhood overweight into adulthood: A systematic review of the literature. *Obesity Reviews, 9*(5), 474-488. doi:10.1111/j.1467-789X.2008.00475.

Solà, I., Carrasco, J. M., del Campo, P. D., Gracia, J. Orrego, C. Martinez, F., … Alonso-Coello, P. (2014). Attitudes and perceptions about clinical guidelines: A qualitative study with Spanish physicians. *PLoS ONE, 9*(2), e86065. doi:10.1371/journal.pone.0086065

Statistics Canada. (2005). *Canadian Community Health Survey*. Retrieved April 6, 2012, from http://www.chspr.ubc.ca/files/publications/mphc/mphc/update/pdfs/Familydoctorvisits.pdf

Statistics Canada. (2009a). *Canadian Community Health Survey*. Retrieved April 6, 2012, from http://www.statcan.gc.ca/daily-quotidien/100615/dq100615b-eng.htm

Statistics Canada. (2009b). *Seniors*. Retrieved February 24, 2014, from http://www41.statcan.gc.ca/2008/70000/ceb70000_000-eng.htm

Statistics Canada. (2011). *From urban areas to population centres.* Retrieved August 28, 2013, from http://www.statcan.gc.ca/subjects-sujets/standard-norme/sgc-cgt/notice-avis/sgc-cgt-06-eng.htm

Statistics Canada. (2013a). *Overweight and obese adults (self-reported), 2012*. Retrieved September 23, 2013, from http://www.statcan.gc.ca/pub/82-625x/2013001/article/11840-eng.htm#n1

Statistics Canada. (2013b). *Population and dwelling counts, for Canada, provinces and territories, and population centres, 2011 and 2006 censuses.* Retrieved August 28, 2013, from http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/hlt-fst/pd-pl/Table-Tableau.cfm?LANG=Eng&T=802&SR=1&S=3&O=D&RPP=9999&CMA=0&PR=59

Statistics Canada. (2013c). *Population and dwelling counts, for Canada, provinces and territories, and census subdivisions (municipalities), 2011 and 2006 censuses*. Retrieved August 28, 2013, from http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/hlt-fst/pd-pl/Table-Tableau.cfm?LANG=Eng&T=302&SR=601&S=51&O=A&RPP=25&PR=59&CMA=0

Steckler, A., Goodman, R. M., McLeroy, K. R., Davis, S., & Koch, G. (1992). Measuring the

diffusion of innovative health promotion programs. *American Journal of Health Promotion, 6*(3), 214-225. doi:10.4278/0890-1171-6.3.214

Stith, S., Pruitt, I., Dees, J., Fronce, M., Green, N., Som, A., & Linkh, D. (2006). Implementing community-based prevention programming: A review of the literature. *Journal of Primary Prevention, 27*(6), 599-617. doi:10.1007/s10935-006-0062-8

Story, M. T., Neumark-Stzainer, D. R., Sherwood, N. E., Holt, K. E., Sofka, D., Trowbridge, F. L., & Barlow, S. E. (2002). Management of child and adolescent obesity: Attitudes, barriers, skills, and training needs among health care professionals. *Pediatrics, 110*(1 Pt 2), 210-214. Available from http://www.ncbi.nlm.nih.gov/pubmed/12093997/

Straus, S. E., Graham, I. D., & Mazmanian, P. E. (2006). Knowledge translation: Resolving the confusion. *Journal of Continuing Education in the Health Professions, 26*(1), 3-4. doi:10.1002/chp.45

Sudman, S. (1985). Mail surveys of reluctant professionals. *Evaluation Review, 9*(3), 349-360. doi:10.1177/0193841X8500900306

Tabak, R. G., Khoong, E. C., Chambers, D. A., & Brownson, R. C. (2012). Bridging research and practice: Models for dissemination and implementation research. *American Journal of Preventative Medicine, 43*(3), 337-350. doi:10.1016/j.amepre.2012.05.024

Taylor, R. (1990). Interpretation of the correlation coefficient: A basic review. *Journal of Diagnostic Medical Sonography, 6*(1), 35-39. doi:10.1177/875647939000600106

Taylor, J. C., & Bowers, D. G. (1972). *Survey of organizations: A machine-scored standardized questionnaire instrument*. Ann Arbor, MI: Center for Research on Utilization of Scientific Knowledge, University of Michigan.

Thomas, J. R., Nelson, J. K., & Silverman, S. J. (2005). *Research methods in physical activity (5th ed.).* Champaign, IL: Human Kinetics.

Thorpe, C., Ryan, B., McLean, S. L., Burt, A., Stewart, M., Brown J. B., … Harris, S. (2009). How to obtain excellent response rates when surveying physicians. *Family Practice, 26*(1), 65-68. doi:10.1093/fampra/cmn097

Urbaniak, G. C., & Plous, S. (2013). *Research Randomizer* (Version 4.0) [Computer Software]. Retrieved February 20, 2013, from http://www.randomizer.org/

Van Dijk C. E., & Innis, S. M. (2009). Growth-curve standards and the assessment of early excess weight gain in infancy. *Pediatrics, 123*(1), 102-108. doi:10.1542/peds.2007-3382

Wellman, N. S., & Friedberg, B. (2002). Causes and consequences of adult obesity: Health, social and economic impacts in the United States. *Asia Pacific Journal of Clinical Nutrition, 11*(S8), S705-S708. Available from http://www.ncbi.nlm.nih.gov/pubmed/12534694

West, M. A. (1990). *The social psychology of innovation in groups*. In M. A. West. & J. L. Farr (Eds.), Innovation and creativity at work: Psychological and organizational strategies (pp. 309-334). Chichester, UK: Wiley.

Wiebe, E. R., Kaczorowski, J., & MacKay, J. (2012). Why are response rates in clinician surveys declining? *Canadian Family Physician, 58*(4), e225–e228. Retrieved February 24, 2014, from http://www.cfp.ca/content/58/4/e225.long

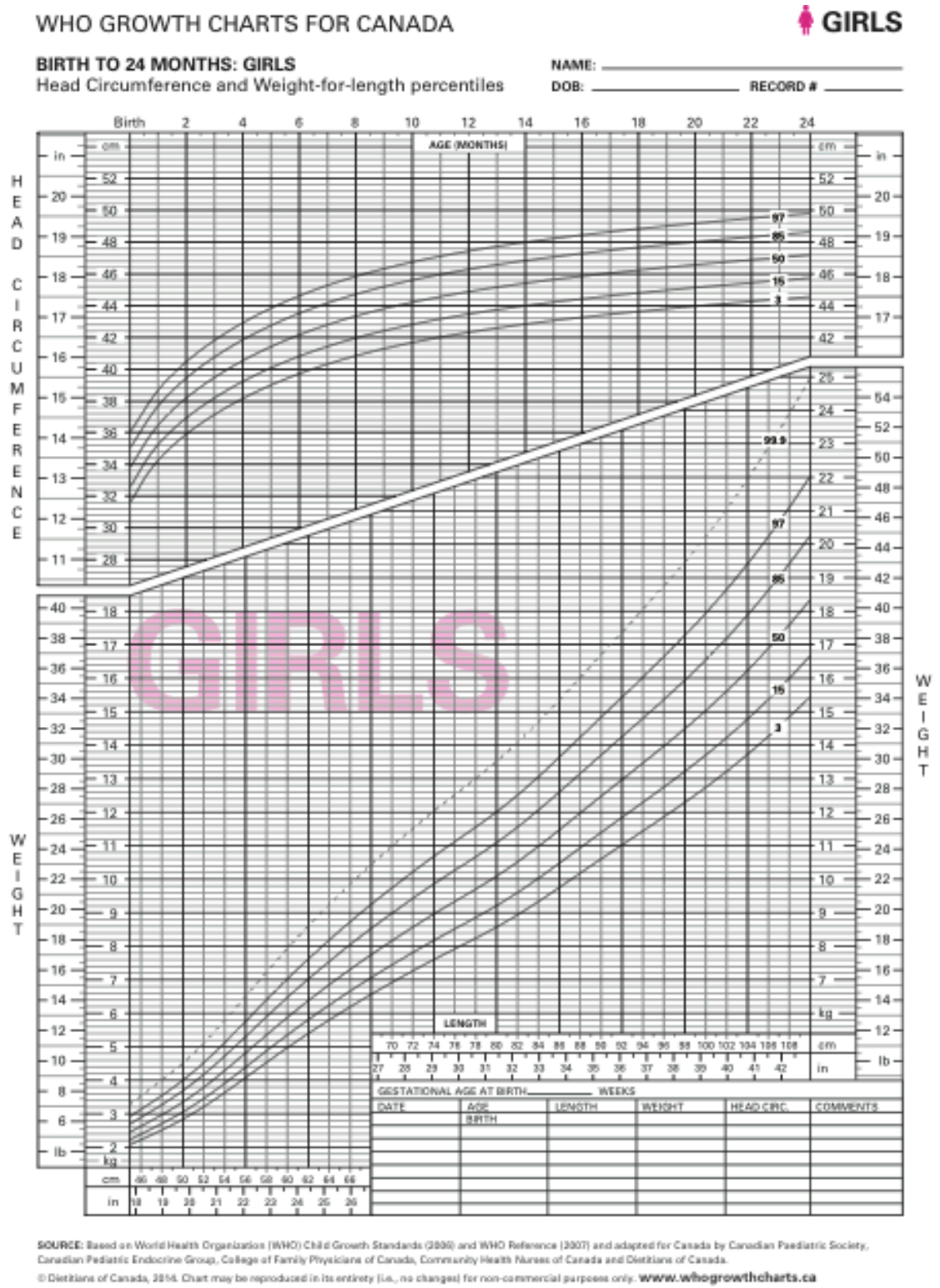
Wolfe, R. M., Sharp, L. K., & Wang, R. M. (2004). Family physicians' opinions and attitudes to three clinical practice guidelines. *Journal of the American Board of Family Medicine, 17*(2), 150-157. doi:10.3122/jabfm.17.2.150

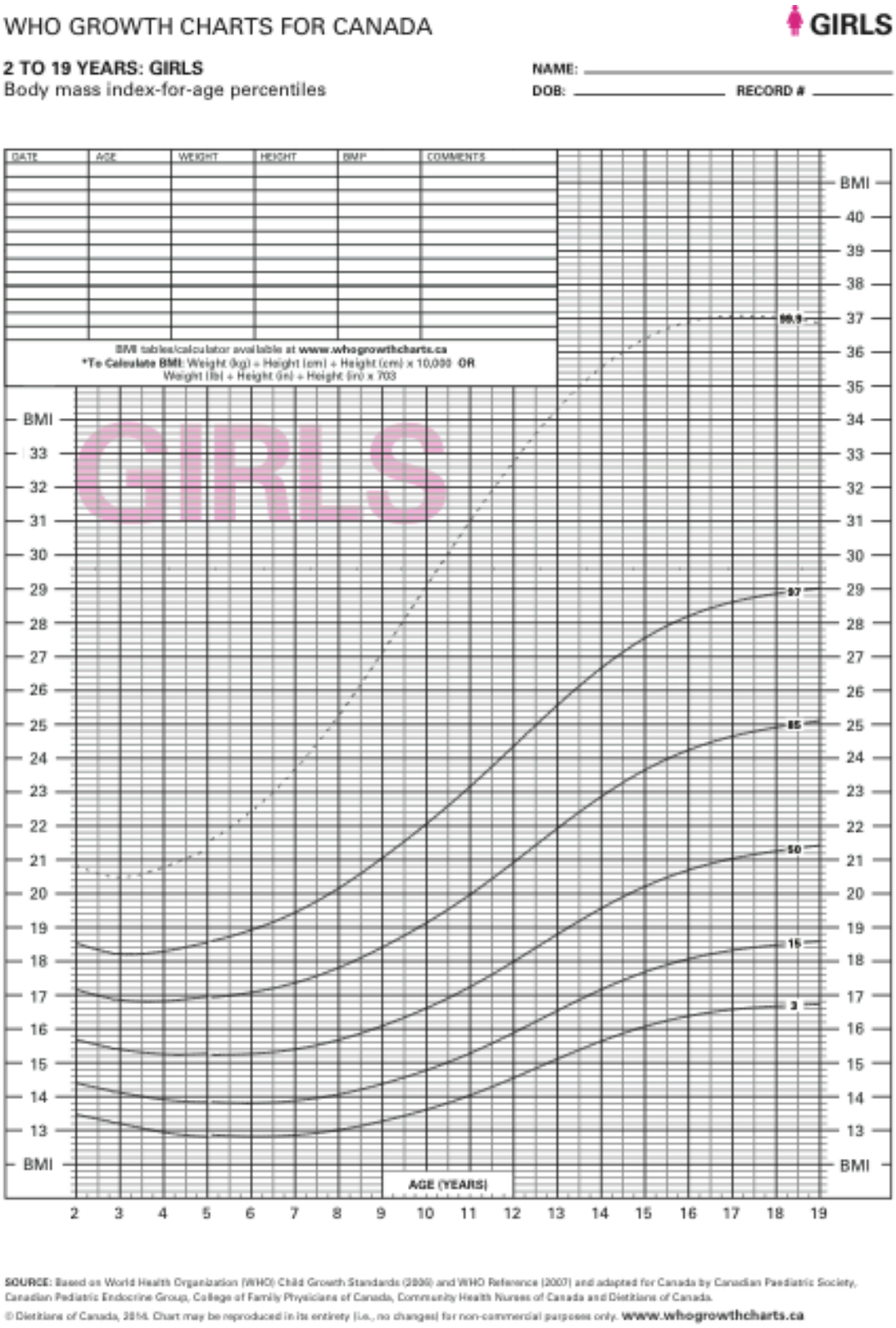
World Health Organization. (2000). *Obesity: Preventing and managing the global epidemic (WHO technical report series 894)*. Geneva, Switzerland: Author. Available from http://libdoc.who.int/trs/WHO_TRS_894.pdf

World Health Organization. (2006). *World Health Organization releases new Child Growth Standards*. Geneva, Switzerland: Author. Retrieved October 1, 2013, from http://www.who.int/mediacentre/news/releases/2006/pr21/en/index.html

World Health Organization. (2013). *Obesity and overweight fact sheet*. Retrieved September 23, 2013, from http://www.who.int/mediacentre/factsheets/fs311/en/

Appendix A: Two Examples of the 2006 & 2007 WHO Growth Charts





All WHO Growth Charts are accessible from www.whogrowthcharts.ca

Appendix B: WHO Cut-Off Points

Birth to 2 years

Growth Status	Indicator	Percentile
Underweight	Weight-for-age	< 3rd
Severe underweight		<0.1st
Stunting	Length-for-age	< 3rd
Severe stunting		<0.1st
Wasting	Weight-for-length	< 3rd
Severe wasting		<0.1st
Risk of overweight		>85th
Overweight		>97th
Obesity		> 99.9th

2 to 19 years

Growth Status	Indicator	Percentile	
		2-5 years	5-19 years
Underweight	Weight-for-age	< 3rd	< 3rd*
Severe underweight		<0.1st	<0.1st*
Stunting	Height-for-age	< 3rd	< 3rd
Severe stunting		<0.1st	<0.1st
Wasting	BMI-for-age	< 3rd	< 3rd
Severe wasting		<0.1st	<0.1st
Risk of overweight		>85th	not applicable
Overweight		>97th	>85th
Obesity		> 99.9th	>97th
Severe obesity		not applicable	> 99.9th

* weight-for-age not recommended after age 10 years; use BMI-for-age instead

Taken from Dietitians of Canada and Canadian Paediatric Society Collaborative Statement. (2010). *Promoting optimal monitoring of child growth in Canada: Using the new WHO growth charts (A collaborative statement from: Dietitians of Canada, Canadian Paediatric Society, The College of Family Physicians of Canada, and Community Health Nurses of Canada).* Retrieved March 30, 2012, from http://www.cps.ca/tools/growth-charts-statement-FULL.pdf

Appendix C: Generalizations from Rogers's (2003) Diffusion of Innovations Theory

1. The Innovation-Decision Process (pp. 217-218)
    a. Earlier knowers of an innovation, when compared to later knowers, are characterized by more formal education, higher social status, greater exposure to mass media channels of communication, greater exposure to interpersonal channels of communication, greater change agent contact, greater social participation, and greater cosmopoliteness.
    b. Re-invention occurs at the implementation stage for many innovations and for many adopters.
    c. A higher degree of re-invention leads to (1) a faster rate of adoption of an innovation and (2) a greater degree of sustainability of an innovation.
    d. Later adopters are more likely to discontinue innovations than are earlier adopters.
    e. Stages exist in the innovation-decision process
    f. Mass media channels are relatively more important at the knowledge stage, and interpersonal channels are relatively more important at the persuasion stage in the innovation-decision process
    g. Cosmopolite channels are relatively more important at the knowledge stage, and localite channels are relatively more important at the persuasion stage in the innovation-decision process.
    h. Mass media channels are relatively more important than interpersonal channels for earlier adopters than for later adopters.
    i. Cosmopolite channels are relatively more important than localite channels for earlier adopters than for later adopters
    j. The rate of awareness-knowledge for an innovation is more rapid than its rate of adoption.
    k. Earlier adopters have a shorter innovation-decision period than do later adopters.
2. Attributes of Innovations and Their Adoption Rate (pp. 265-266)
    a. The relative advantage of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.
    b. The compatibility of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.
    c. The complexity of an innovation, as perceived by members of a social system, is negatively related to its rate of adoption.
    d. The trialability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.
    e. The observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.
3. Innovativeness and Adopter Categories (p. 298)
    a. Adopter distributions tend to follow an S-shaped curve over time and to approach normality.
    b. The relatively earlier adopters in a social system are no different from later adopters in age, but they have more years of formal education, are more likely to be literate, and have higher social status, a greater degree of social mobility, and larger-sized units, such as farms, companies, and so on. These characteristics of

adopter categories indicate that earlier adopters have generally higher socioeconomic status than do later adopters.

c. Earlier adopters in a system differ from later adopters in personality variables. Earlier adopters have greater empathy, less dogmatism, a greater ability to deal with abstractions, greater rationality, greater intelligence, a more favorable attitude toward change, a greater ability to cope with uncertainty and risk, a more favorable attitude toward science, less fatalism and greater self-efficacy, and higher aspirations for formal education, higher-status occupations, and so on.

d. Adopter categories have different communication behaviour. Earlier adopters have more social participation, are more highly interconnected in the interpersonal networks of their system, are more cosmopolite, have more contact with change agents, greater exposure to mass media channels, and greater exposure to interpersonal communication channels, engage in more active information seeking, and have greater knowledge of innovations and a higher degree of opinion leadership.

4. Diffusion Networks (pp. 362-364)
    a. Homophily is the degree to which individuals who communicate are similar. Heterophily is the degree to which individuals who interact are different in certain attributes. Interpersonal diffusion networks are mostly homophilous.
    b. When interpersonal diffusion networks are heterophilous, followers generally seek opinion leaders of higher economic status, with more formal education, greater mass media exposure, more cosmopoliteness, greater contact with change agents, greater social participation, higher social status, and more innovativeness.
    c. Opinion leaders conform more closely to a system's norms than do their followers. When a social system's norms favor change, opinion leaders are especially innovative.
    d. The network interconnectedness of an individual in a social system are linked by interpersonal networks.
    e. The information exchange potential of communication network links is negatively related to their degree of (1) communication proximity and (2) homophily. Individuals tend to be linked to others who are close to them in physical distance and who are relatively homophilous in social characteristics.
    f. An individual is more likely to adopt an innovation if more of the other individuals in his or her personal network adopted previously.
5. The Change Agent (p. 400)
    a. A change agent is an individual who influences clients' innovation-decisions in a direction deemed desirable by a change agency. A change agent's relative success in securing the adoption of innovations by clients is positively related to (1) the extent of the change agent's effort in contacting clients, (2) a client orientation, rather than a change agent orientation, (3) the degree to which the diffusion program is compatible with the clients' needs, (4) the change agent's empathy with clients, (5) his or her homophily with clients, (6) credibility in the clients' eyes, (7) the extent to which he or she works through opinion leaders, and (8) increasing clients' ability to evaluate innovations.
6. Innovation in Organizations (pp. 433-434)

a. A consistent finding in this organizational innovativeness research was that larger organizations are more innovative. Rather low correlations of characteristics variables with organizational innovativeness were found, perhaps because the organizational structure variables that were studies were related to innovation in one direction during the initiation subprocess of the innovation process and in the opposite direction during the implementation subprocess.
b. The presence of an innovation champion contributes to the success of an innovation in an organization. A champion is defined as a charismatic individual who throws his or her support behind an innovation, thus overcoming the indifference or resistance that the new idea may provoke. Research has shown that they may be powerful individuals in an organization, or they may be lower-level individuals who possess the ability to coordinate the actions of others.
c. A performance gap, the discrepancy between an organization's expectations and its actual performance, can trigger the innovation process.
d. Both the innovation and the organization usually change during the innovation process.

Appendix D: Factors Affecting the Implementation Process Identified by Durlak & DuPre (2008)

Table 2 Factors affecting the implementation process

I. Community Level Factors
- A. Prevention Theory and Research[c]
- B. Politics[a,b]
- C. Funding[a,b,c]
- D. Policy[a,b]

II. Provider Characteristics
- A. Perceived Need for Innovation[b,c]
  - Extent to which the proposed innovation is relevant to local needs
- B. Perceived Benefits of Innovation[b]
  - Extent to which the innovation will achieve benefits desired at the local level
- C. Self-efficacy
  - Extent to which providers feel they are will be able to do what is expected
- D. Skill Proficiency[a,b,c]
  - Possession of the skills necessary for implementation

III. Characteristics of the Innovation
- A. Compatibility (contextual appropriateness, fit, congruence, match)[b,c]
  - Extent to which the intervention fits with an organization's mission, priorities, and values.
- B. Adaptability (program modification, reinvention)[b]
  - The extent to which the proposed program can be modified to fit provider preferences, organizational practices, and community needs, values, and cultural norms

IV. Factors Relevant to the Prevention Delivery System: Organizational Capacity
- A. General Organizational Factors
  1. Positive Work Climate[a,b,c]
     - Climate may be assessed by sampling employees' views about morale, trust, collegiality, and methods of resolving disagreements
  2. Organizational norms regarding change (a k a, openness to change, innovativeness, risk-taking)[b]
     - This refers to the collective reputation and norms held by an organization in relation to its willingness to try new approaches as opposed to maintaining the status quo
  3. Integration of new programming[b,c]
     - This refers to the extent to which an organization can incorporate an innovation into its existing practices and routines
  4. Shared vision (shared mission, consensus, commitment, staff buy-in)[b]
     - This refers to the extent to which organizational members are united regarding the value and purpose of the innovation
- B. Specific Practices and Processes
  1. Shared decision-making (local input, community participation or involvement, local ownership, collaboration)[a,b,c]
     - The extent to which relevant parties (e.g., providers, administrators, researchers, and community members) collaborate in determining what will be implemented and how
  2. Coordination with other agencies (partnerships, networking, intersector alliances, multidisciplinary linkages)[a,b,c]
     - The extent to which there is cooperation and collaboration among local agencies that can bring different perspectives, skills, and resources to bear on program implementation
  3. Communication[b]
     - Effective mechanisms encouraging frequent and open communication
  4. Formulation of tasks (workgroups, teams, formalization, internal functioning, effective human resource management)[a,b,c]
     - Procedures that enhance strategic planning and contain clear roles and responsibilities relative to task accomplishments
- C. Specific Staffing Considerations
  1. Leadership[a,b,c]
     - Leadership is important in many respects, for example, in terms of setting priorities, establishing consensus, offering incentives, and managing the overall process of implementation
  2. Program champion (internal advocate)[a,b,c]
     - An individual who is trusted and respected by staff and administrators, and who can rally and maintain support for the innovation, and negotiate solutions to problems that develop
  3. Managerial/supervisory/administrative support[a,b,c]
     - Extent to which top management and immediate supervisors clearly support and encourage providers during implementation

Table 2 continued

V. Factors Related to the Prevention Support System
A. Training[a,b,c]
Approaches to insure provider proficiencies in the skills necessary to conduct the intervention and to enhance providers' sense of self-efficacy
B. Technical Assistance[a, b, c]
This refers to the combination of resources offered to providers once implementation begins, and may include retraining in certain skills, training of new staff, emotional support, and mechanisms to promote local problem solving efforts

[a] Factors also identified by Fixsen et al. (2005)

[b] Factors also identified by Greenhalgh et al. (2005)

[c] Factors also identified by Stith et al. (2006)

Note. A detailed listing of the studies supporting the importance of each factor is available from the first author on request

Appendix E: RSA Rural Communities List and Sample Frame

Effective April 1, 2009 to March 31, 2012

Community	# of FP (Total Sample)[a]	Community	# of FP (Total Sample)[a]
A COMMUNITIES			
100 Mile House	15	Kootenay Bay	0
Ahousat	0	Riondel	0
Alert Bay	3	Kyuquot	0
Alexis Creek	0	Lower Post	0
Anahim Lake	0	Lytton	1
Ashcroft	0	Mackenzie	6
Cache Creek	0	Masset	4
Atlin	1	McBride	3
Bamfield	0	Miocene	0
Bella Coola	9	Mount Currie	0
Blueberry River	0	Nakusp	4
Blue River	0	New Aiyansh	4
Bridge Lake	0	New Denver	3
Burns Lake	6	Ocean Falls	0
Canal Flats	0	Port Alice	2
Chetwynd	5	Port Clements	0
Christina Lake	2	Port Hardy	5
Grand Forks	6	Port McNeill	6
Clearwater	2	Port Simpson	0
Clinton	0	Prince Rupert	18
Cortes Island	0	Princeton	4
Cranbrook	46	Quatsino	0
Creston	22	Queen Charlotte	6
Dawson Creek	21	Quesnel	30
Dease Lake	2	Revelstoke	13
Doig River	0	Rivers Inlet	0
Edgewood	0	Salmo	2
Elkford	4	Samahquam	0
Fernie	19	Savary Island	0
Fort Babine	0	Sayward	1
Fort Nelson	3	Seton Portage	0
Fort St. James	4	Sirdar	0
Fort St. John	33	Smithers	19
Taylor	0	Sointula	0
Fort Ware	0	Sparwood	6
Fraser Lake	3	Spences Bridge	0
Gold Bridge	0	Stewart	2
Bralorne	0	Tachet	0
Gold River	3	Tahsis	0

Golden	16	Takla Landing	0
Granisle	0	Tatla Lake	0
Greenwood	0	Tatlayoko Lake	1
Midway	1	Telegraph Creek	0
Rock Creek	1	Terrace	18
Halfway River	0	Tofino	4
Hartley Bay	0	Tsay Keh Dene	0
Hazelton	10	Tumbler Ridge	2
Holberg	0	Ucluelet	3
Hornby Island	0	Valemount	3
Hot Springs Cove	0	Vanderhoof	15
Houston	5	Waglisla	2
Hudson's Hope	0	Bella Bella	2
Invemere	0	Wardner	0
Kaslo	5	Williams Lake	35
Kimberley	11	Winlaw	1
Kincolith	0	Woss	0
Kingcome	0	Yekooche	0
Kitimat	9	Zeballos	0
Kitkatla	0		
Kitsault	0		
Kitwanga	0		
Klemtu	0		
B COMMUNITIES			
Barriere	2	Pender Island	2
Big White	0	Prince George[b]	123
Castlegar	13	Saturna Island	0
Chase	4	Skatin	0
Scotch Creek	2	Slocan Park	3
Crescent Valley	0	Teppella	0
Galiano Island	1	Texada Island	0
Lillooet	5	Trail/	24
Mayne Island	1	Rossland	18
Merritt	6	Fruitvale	6
Nelson	45	Wasa	0
C COMMUNITIES			
Agassiz	4	Nitinat	0
Harrison	0	Oliver	17
Blind Bay	2	Osoyoos	11
Bowen Island	3	Parksville	25
Campbell River	65	Qualicum	16
Chemainus	5	Pemberton	8
Cobble Hill	5	Port Alberni	27
Courtenay	53	Powell River	39
Comox	51	Quadra Island	0

Cumberland	5	Salmon Arm	51
Denman Island	3	Sicamous	2
Duncan	69	Saltspring Island	0
North Cowichan	0	Sechelt	21
Enderby	2	Gibsons	14
Gabriola Island	7	Shawnigan Lake	7
Hope	10	Sorrento	1
Keremeos	4	Squamish	29
Ladysmith	15	Whistler	30
Lake Cowichan	3		
Logan Lake	1		
Madeira Park	1		
Mill Bay	13		
D COMMUNITIES			
Armstrong	6		
Spallumcheen	0		
Lumby	3		
Sooke	6		
Total FP	1381 (including PG)	1258 (without PG)	

Note. FP = Family Physicians; PG = Prince George. Communities are designated as A, B, C, or D depending on the number of isolation points they receive according to the 2012 Subsidiary Agreement for Physicians in Rural Practice. A Communities have 20 points; B Communities have 15 to 19.99 points; C Communities have 6 to 14.99 points; D Communities have .5 to 5.99 points. Adapted from the "2012 Rural Practice Subsidiary Agreement" by British Columbia Ministry of Health, 2013.

[a]The total number of FP was based on the search conducted on the College of Physicians and Surgeons of British Columbia 'Find a Physician' website from February 15th to February 19th, 2013. [b]Prince George was not included in the sample frame for random selection of rural FP as the survey was distributed separately to FP in the Prince George Division of Family Practice.

Appendix F: British Columbia Population Centres and Sample Frame

Geographic Name	Population Centre Size[a]	Population, 2011 (Census)	# of FP (Total Sample)[b]
Canada		33,476,688	
British Columbia		4,400,057	
Vancouver	Large urban	2,135,201	1426
Victoria	Large urban	316,327	547
Abbotsford	Large urban	149,855	127
Kelowna	Large urban	141,767	214
Nanaimo	Medium	88,799	143
White Rock	Medium	82,368	61
Kamloops	Medium	73,472	113
Chilliwack	Medium	66,382	103
Prince George[c]	Medium	65,503	
Vernon	Medium	44,600	92
Courtenay	Medium	40,809	
Penticton	Medium	36,902	66
Campbell River	Medium	34,514	
Walnut Grove	Small	27,969	0
Duncan	Small	24,479	
Parksville	Small	24,326	
Port Alberni	Small	20,503	
Cranbrook	Small	19,364	
Fort St. John	Small	18,699	
Terrace	Small	15,569	
Squamish	Small	15,051	
Quesnel	Small	13,566	
Powell River	Small	13,175	
Aldergrove	Small	12,778	6
Williams Lake	Small	12,408	
Prince Rupert	Small	11,838	
Salmon Arm	Small	11,810	
Dawson Creek	Small	11,583	
Nelson	Small	10,520	
Trail	Small	9,276	
Castlegar	Small	8,992	
Ladysmith	Small	8,841	
Gibsons	Small	8,089	
Whistler	Small	7,699	
Sechelt	Small	7,251	
Merritt	Small	7,189	
Sooke	Small	7,136	
Kitimat	Small	7,046	
Revelstoke	Small	6,772	

Kimberley	Small	6,723	
Summerland	Small	6,704	17
Duck Lake	Small	6,281	0
Smithers	Small	5,473	
Creston	Small	5,379	
Oliver	Small	5,175	
Osoyoos	Small	4,855	
Armstrong	Small	4,830	
Fernie	Small	4,811	
Dallas	Small	4,445	0
Grand Forks	Small	4,274	
Hope	Small	4,234	
Fort Nelson	Small	3,902	
Golden	Small	3,701	
Fruitvale	Small	3,628	
Shawnigan	Small	3,543	
Port Hardy	Small	3,515	
Rossland	Small	3,491	
Sparwood	Small	3,460	
Cumberland	Small	3,381	
Mackenzie	Small	3,300	
Kent	Small	3,182	0
Lake Cowichan	Small	3,159	
Chemainus	Small	3,035	
Invermere	Small	2,955	
Enderby	Small	2,932	
Princeton	Small	2,724	
Tumbler Ridge	Small	2,700	
Elkford	Small	2,518	
Port McNeill	Small	2,505	
Chase	Small	2,495	
Sicamous	Small	2,441	
Burns Lake	Small	2,390	
Pemberton	Small	2,369	
Fort St. James	Small	2,278	
Chetwynd	Small	2,255	
Houston	Small	2,246	
Aldergrove East	Small	2,203	0
Lillooet	Small	2,068	
Logan Lake	Small	1,975	
Blind Bay	Small	1,738	
Lumby	Small	1,731	
One Hundred Mile House	Small	1,721	
Ashcroft	Small	1,628	
Ucluelet	Small	1,627	

Nakusp	Small	1,574	
Mill Bay	Small	1,549	
Roberts Creek	Small	1,472	0
Harrison Hot Springs	Small	1,468	
Cowichan Bay	Small	1,401	0
Vanderhoof	Small	1,382	
Lions Bay	Small	1,318	2
Gold River	Small	1,267	
Fraser Lake	Small	1,167	
Salmo	Small	1,139	
Miller's Landing	Small	1,113	0
Cultus Lake	Small	1,110	0
Welcome Beach	Small	1,106	0
Crofton	Small	1,092	1
Deep Cove	Small	1,088	0
Cache Creek	Small	1,040	
		Total FP	2918

Note. FP = Family Physicians. Boldface denotes population centres that were included on the Rural Communities List in this study as they were also on the 2012 Rural Subsidiary Agreement list. Adapted from "Population and Dwelling Counts, for Canada, Provinces and Territories, and Population Centres, 2011 and 2006 Censuses" by Statistics Canada, 2013b.

[a]Starting with the 2011 Census, the term 'population centre' replaced the term 'urban area.' Population centres are classified into one of three population size groups: small (with a population of between 1,000 and 29,999), medium (with a population of between 30,000 and 99,999) and large urban (with a population of 100,000 and over). [b]The total number of FP was based on the search conducted on the College of Physicians and Surgeons of British Columbia 'Find a Physician' website from February 15th to February 19th, 2013. [c]Prince George was not included in the sample frame for random selection of urban FP as the survey was distributed separately to FP in the Prince George Division of Family Practice.

Appendix G: Metro Vancouver Municipalities and Sample Frame

Authority	Municipality Type	Population, 2011 (Census)	# of FP (Total Sample)[a]
Anmore	Village	2,092	1
Belcarra[b]	Village	644	0
Bowen Island[c]	Island Municipality	3,402	3
Burnaby	City	223,218	212
Coquitlam	City	126,456	107
Delta	District Municipality	99,863	105
Langley[d]	City	25,081	116
Langley[d]	Township	104,177	
Lions Bay	Village	1,318	2
Maple Ridge	District Municipality	76,052	75
New Westminster	City	65,976	91
North Vancouver[e]	City	48,196	
North Vancouver[e]	District Municipality	84,412	
West Vancouver[e]	District Municipality	42,694	
Vancouver[e]	City	603,502	1424
Pitt Meadows	City	17,736	9
Port Coquitlam	City	56,342	47
Port Moody	City	32,975	35
Richmond	City	190,473	197
Surrey	City	468,251	360
Tsawwassen[b]	Treaty First Nation	720	0
White Rock	City	19,339	
		Total FP	2784

Note. FP = Family Physicians. Adapted from "Population and Dwelling Counts, for Canada, Provinces and Territories, and Census Subdivisions (Municipalities), 2011 and 2006 Censuses" by Statistics Canada, 2013c.

[a]The total number of FP was based on the search conducted on the College of Physicians and Surgeons of British Columbia 'Find a Physician' website from February 15th to February 19th, 2013. [b]Belcarra and Tsawwassen were excluded from the urban communities sample frame as their populations were below the population centres requirement of 1000 inhabitants. [c]Bowen Island was included on the Rural Communities List in this study as it was also on the 2012 Rural Subsidiary Agreement list. [d]Langley was not separated into city and township when conducting the FP search, thus 116 represents the number of FP in the two municipalities, collectively. [e]Vancouver was not separated into North Vancouver (city or township) and West Vancouver when conducting the FP search, thus 1424 represents the number of FP in the four municipalities, collectively.

Appendix H: Greater Victoria Region Municipalities and Sample Frame

District Municipality	Population, 2011 (Census)	# of FP (Total Sample)[a]
Esquimalt	16,209	0
Oak Bay	18,015	0
Saanich	109,752	0
Victoria	80,017	547
View Royal	9,381	0
Central Saanich	15,936	24[b]
North Saanich	11,089	0
Sidney	11,178	34
Colwood	16,093	0
Highlands	2,120	0
Langford	29,228	0
Metchosin	4,803	0
Sooke	11,435	6

Note. FP = Family Physicians. Adapted from "Population and Dwelling Counts, for Canada, Provinces and Territories, and Census Subdivisions (Municipalities), 2011 and 2006 Censuses" by Statistics Canada, 2013c.

[a]The total number of FP was based on the search conducted on the College of Physicians and Surgeons of British Columbia 'Find a Physician' website from February 15th to February 19th, 2013. [b]24 represents the number of FP in Saanichton, which is part of the Central Saanich, and was included in the sample frame.

Appendix I: Urban Communities List with Complete Urban Sample Frame

Urban Area	Population Centre Size Group[a]	# of FP (Total Sample)[b]
Vancouver (includes North & West Vancouver)	Large urban	1424
Victoria	Large urban	547
Abbotsford	Large urban	127
Kelowna	Large urban	214
Langley	Large urban	116
Burnaby	Large urban	212
Coquitlam	Large urban	107
Richmond	Large urban	197
Surrey	Large urban	360
Nanaimo	Medium	143
White Rock	Medium	61
Kamloops	Medium	113
Chilliwack	Medium	103
Vernon	Medium	92
Penticton	Medium	66
Delta	Medium	105
Maple Ridge	Medium	75
New Westminster	Medium	91
Port Coquitlam	Medium	47
Port Moody	Medium	35
Walnut Grove	Small	0
Aldergrove	Small	6
Summerland	Small	17
Duck Lake	Small	0
Dallas	Small	0
Kent	Small	0
Aldergrove East	Small	0
Roberts Creek	Small	0
Cowichan Bay	Small	0
Lions Bay	Small	2
Miller's Landing	Small	0
Cultus Lake	Small	0
Welcome Beach	Small	0
Crofton	Small	1
Deep Cove	Small	0
Anmore	Small	1
Pitt Meadows	Small	9
Sidney	Small	34

Saanichton[c]	Small	24

Note. FP = Family Physicians.
[a]Starting with the 2011 Census, the term 'population centre' replaced the term 'urban area.' Population centres are classified into one of three population size groups: small (with a population of between 1,000 and 29,999), medium (with a population of between 30,000 and 99,999) and large urban (with a population of 100,000 and over). [b]The total number of FP was based on the search conducted on the College of Physicians and Surgeons of British Columbia 'Find a Physician' website from February 15th to February 19th, 2013. [c]Saanichton is within the Central Saanich municipality and was included in the sample frame.

Appendix J: Telephone Recruitment Script

Hello,

My name is Emily Rand and I am calling from the University of Victoria. Does Dr. [Full Name] still practice at the clinic? [If NO, ask if the doctor has retired, works at a new clinic, etc., thank them and hang up. If YES…] We're surveying a sample of family physicians in BC on their use of the new World Health Organization Growth Charts in their practice, and I'm calling because Dr. [Name] has been randomly selected for the survey. Now I am trying to identify the best way to send him/her the information and survey link so he/she can complete it if he/she wishes to. We have an online version of the survey, so I can email the link and study information, or the information and survey can be faxed to the practice and then faxed back. All survey information will be anonymous and confidential and it will only take about 10 minutes to complete. Which do you think is the best way to get this information to Dr. [Name]- by email or fax?

[If they do not want to provide information, record refusal.]
[If they agree to provide an email address or fax number, gather more information…]
Before taking any more information, I just want to confirm that Dr. [Name] sees paediatric patients, anywhere from birth to 19 years old, in his/her practice?
[If YES, record the email address or fax number, ask if they have any other questions and thank them for their time.]

Appendix K: Invitation to Participate for Divisions of Family Practice

To whom it may concern,
I am contacting your Division of Family Practice to determine if your Division would be willing to send out an e-survey to your members related to the use of the newly released World Health Organization (WHO) Growth Charts. I have described the background, purpose and survey details below for your consideration. I can call you to discuss the initiative further if that is your preference or participate in a teleconference meeting with your group. Thank you very much for considering this request.

Background:
In BC, revised WHO Growth Charts (which are more representative of the Canadian population) were distributed by the Ministry of Health to health units for physician uptake in January 2012. However, the Ministry does not know how many FPs are now using these charts in their practice, or the reasons behind a physician's choice to use them.

This information is important as it can provide invaluable insight into future work that needs to be done to ensure that the recommended WHO Growth Charts and other physician initiatives are available and utilized by FPs across the province. Based on this, researchers at the University of Victoria (Dr. P.J. Naylor and Emily Rand) are conducting a provincial survey regarding the use of the WHO Growth Charts in family practice. We are contacting Divisions of Family Practice in BC to ask if they would email out the survey link and information to their members. For instance, the Division of Family Practice in Prince George has already distributed it out to their members.

Survey Details:
* It is for physicians who accept/see paediatric patients from birth to 19 years old.
* It is an on-line survey (you click on the link and fill it out electronically) but paper/fax copies are also available upon request.
* It will require approximately 10-15 minutes to complete.
* The survey is anonymous (no personal information data collected) and confidential.
* The physician can provide their name and contact information at the end of the survey to be entered into a draw to win a $100 donation towards any organization or program in their community that promotes or supports paediatric healthy living.

Further Information:
* We collaborated with Child Health BC on the development of the survey and they are interested in the results.
* The survey is being conducted by my student Emily Rand who will also use the information for her Master's thesis.

Survey Link: http://fluidsurveys.com/s/2006-2007-WHO-Growth-Charts/

Please let us know if you would be interested in this initiative, and if you have any questions or require further information. Thank you in advance and we look forward to hearing from you at your earliest convenience.

Sincerely,

Emily Rand, BSc, BPHE, MSc Candidate
University of Victoria
(250) 634-2932

On behalf of

Patti-Jean Naylor, PhD
Associate Professor
School of Exercise Science, Physical & Health Education
University of Victoria
pjnaylor@uvic.ca
T: 250-721-7844
F: 250-721-6601

Appendix L: Study Synopsis for Divisions of Family Practice

Researchers at the University of Victoria are requesting your participation in a provincial survey regarding Family Physicians' use of the newly released World Health Organization (WHO) Growth Charts in practice. The information gathered is important as it can provide invaluable insight into future work that needs to be done to ensure that the recommended WHO Growth Charts and other physician initiatives are available and utilized by FPs across the province. The survey takes approximately 10 minutes to complete, is anonymous and confidential, and can be accessed at http://fluidsurveys.com/s/2006-2007-WHO-Growth-Charts/. Participants are also eligible to win a $100 donation towards any organization or program in their community that promotes or supports paediatric healthy living upon completing the survey. For more details on this study, please see the attached link (PDF with additional study information and Letter of Information for Implied Consent Form).

Appendix M: Letter of Information for Implied Consent Form

University of Victoria | School of Exercise Science, Physical & Health Education

Letter of Information for Implied Consent Form

"Examining the Dissemination and Adoption of the World Health Organization Growth Charts by Family Physicians: An Integrated Innovation Implementation Approach

You have been randomly selected to participate in a research study entitled **"Examining the Dissemination and Adoption of the World Health Organization Growth Charts by Family Physicians: An Integrated Innovation Implementation Approach"** that is being conducted by Emily Rand. In summary, the study will look at FPs' level of use of the 2006 World Health Organization (WHO) Growth Standards for assessing growth in children from birth to the age of five, and the 2007 WHO Growth References for growth assessments of youth between the ages of 5 and 19 years old.

Emily Rand is a graduate student in the department of Exercise Science, Physical and Health Education (EPHE) at the University of Victoria. You may contact her if you have further questions by e-mail: erand@uvic.ca or phone: (250) 634-2932.

As a graduate student, she is required to conduct research as part of the requirements for a Master of Science in Kinesiology (M.Sc.) degree. The research is being conducted under the supervision of Dr. Patti-Jean Naylor, and she can be contacted by e-mail: pjnaylor@uvic.ca or phone: (250) 721-7844.

Purpose and Objectives
There are three purposes to this proposed project:
1) To determine the level of use of the 2006 and 2007 WHO Growth Charts by FPs in BC;
2) To determine the factors influencing the level of use of these growth charts; and
3) To determine what community and provincial resources and programs available to support paediatric weight management FPs in BC aware of.

Importance of this Research
Research of this type is important because understanding the level of use and the factors influencing the adoption of the 2006 and 2007 WHO Growth Charts by FPs can provide invaluable insight into future work that needs to be done to ensure that the recommended WHO Growth Charts are available and utilized by FPs across the province. If this is then accomplished, it will ideally increase the number of standardized paediatric growth assessments and monitoring conducted by FPs, which is the necessary first step for both the prevention of overweight or obesity and for identifying and addressing lifestyle behaviours that may need to be altered. Data collected will be particularly useful for organizations such as the Ministry of Health and Child Health BC as they are currently developing a clinical care pathway for children and youth that are overweight or obese that can be utilized by FPs in BC.

Participant Selection
You have been randomly selected and are being asked to participate in this study because you are a registered, practicing full or part-time FP (including locum, hospitalist, or walk-in clinic physician) in British Columbia that sees paediatric patients in your practice.

What is Involved
If you consent to voluntarily participate in this research, your participation will include completing an online or paper version of the survey, which addresses questions such as your level of use of the WHO Growth Charts, reasons for or against using them, and your awareness of community and/or provincial resources and programs available to support paediatric weight management. The survey will take approximately 15 minutes of your time. It can be accessed online from any electronic device with Internet access at **http://fluidsurveys.com/s/2006-2007-WHO-Growth-Charts/**, or the paper version can be **faxed back to 250-721-6601.** We ask that you complete the survey as soon as possible.

Inconvenience
Participation in this study may cause some inconvenience to you, including a time commitment of approximately 10-15 minutes.

Risks
There are no known or anticipated risks to you by participating in this research.

Benefits
Your participation in this research will help to provide in-depth information on the level of use of the WHO Growth Charts, as well as the factors influencing FPs level of use of these charts. This information has not yet been evaluated and is critical to know as it can provide invaluable insight into future work that needs to be done to ensure that the recommended WHO Growth Charts are available and utilized by FPs across the province. Data collected will be particularly useful for organizations such as the Ministry of Health and Child Health BC as they are currently developing a clinical care pathway for children and youth that are overweight or obese that can be utilized by FPs in BC.

Compensation
As a way to compensate you for any inconvenience related to your participation, you will be given the option at the end of the survey to provide your name and contact information (email or phone number) to be entered into a draw to win a $100 donation towards an organization or program in your community that promotes or supports paediatric healthy living. If you consent to participate in this study, this form of compensation to you must not be coercive. It is unethical to provide undue compensation or inducements to research participants. If you would not participate if the compensation were not offered, then you should decline.

Voluntary Participation
Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. As the survey is web-based and anonymous, it will be impossible to identify your survey after submitting it. If

you choose to have your survey faxed, your fax number will only be kept to send out a reminder to complete the survey if you have already done so. The number will not be kept or used for any other purpose such as identifying your data.

Anonymity and Confidentiality
If you have chosen to have the survey emailed to you and you complete it online, your survey responses will be kept completely anonymous and confidential, as the survey does not require any personal information. If you choose to have your survey faxed back, your fax number will only be used to send out a reminder to complete the survey if you have not already done so. All email addresses and fax numbers gathered through recruitment will only be used to send out the initial information and a follow-up reminder. If you choose to provide your contact information (i.e. phone number or email address) on the survey to be entered into the draw, it will only be used for contacting you if you win.

Dissemination of Results
It is anticipated that the results of this study will be shared with others in the following ways:

- Thesis/class presentation;
- Presentations at scholarly meetings;
- Directly to participants and co-investigators; and/or
- Published article.

Upon completion and write-up of this study, participants will be contacted and asked if they would like a copy of the results.

Disposal of Data
Any electronic raw data on which the results of this project depend will be retained in secure storage for five years, after which point they will be erased.

Contacts
Individuals that may be contacted regarding questions or concerns about this study include Emily Rand and Dr. Patti-Jean Naylor.

	E-mail	*Phone*
Emily Rand, Principal Investigator	erand@uvic.ca	(250) 634-2932
Dr. PJ Naylor, Supervisor	pjnaylor@uvic.ca	(250) 721-7844

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).
By completing and submitting the online survey, **YOUR FREE AND INFORMED CONSENT IS IMPLIED** and indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.
The survey can be accessed online at http://fluidsurveys.com/s/2006-2007-WHO-Growth-Charts/.
The fax-back number is 250-721-6601.

Please retain a copy of this letter for your reference.

Appendix N: Invitation to Participate for Prince George Family Physicians

Dear Family Physician of Prince George,

This is a request for your participation in a provincial survey regarding the use of the World Health Organization (WHO) Growth Charts in your practice. As a Master of Science in Kinesiology student at the University of Victoria, I am conducting this survey of Family Physicians to understand your utilization of the 2006 and 2007 WHO Growth Charts, including any barriers or facilitators influencing your level of use. In addition to this Masters project, I am also currently working with PacificSport Northern BC and Wellness in Northern BC (WINBC) on a program-planning project that aims to integrate more physical activity into youth summer camps in Prince George.

The survey will take approximately 15 minutes to complete. A Letter of Information for Implied Consent to participate is included below. By completing and submitting the online survey, your free and informed consent is implied. It indicates that you understand the conditions of participation in this study, and that you have had the opportunity to have your questions answered by the researcher. You may also email Dr. Anne Pousette with any questions at drannepousette@uvic.ca. A link to the survey is included at the bottom of this email. The analysis of the data will be utilized in group mean scores, and all data will be anonymous and confidential. As a thank you for completing the survey, you can provide your name and contact information at the end of the survey to be entered into a draw to win a $100 donation towards any organization or program in your community that promotes or supports paediatric healthy living.

Here is a brief synopsis of the study background and importance to further your understanding of this topic:

> In 2006, the WHO developed the Child Growth Standard Charts, which are based on children raised according to current international health and nutrition recommendations, for tracking the growth of children between 0 and 60 months. In 2007, the WHO also produced Growth Reference Charts for tracking the growth of youth between the ages of 5 and 19 years old, and these are considered to be closer to the growth standards as they have been updated to address the obesity epidemic. Since both sets of these WHO Growth Charts are more representative of the current Canadian population compared to other growth charts which have been previously developed and used, the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada, and Community Health Nurses of Canada have recommended the adoption of these new charts by all Canadian primary care providers since 2009. In BC, the WHO Growth Charts were distributed by the Ministry of Health to health units for physician uptake in January 2012, however the Ministry does not know how many FPs are using these charts in their practice for paediatric growth assessments. The purpose of this study is to therefore sample a representative group of FPs to gain an understanding of the level of use of the 2006 and 2007 WHO Growth Charts within the province, in addition to the factors influencing FPs' adoption of the charts.

> This information is important as it can provide invaluable insight into future work that needs to be done to ensure that the recommended WHO Growth Charts are available and utilized by FPs across the province. If this is then accomplished, it will ideally increase the number of standardized paediatric growth assessments and monitoring conducted by FPs, which is the necessary first step for both the prevention of overweight or obesity, and for identifying and addressing lifestyle behaviours that may need to be altered. Data collected will be particularly useful for organizations such as the Ministry of Health and Child Health BC, as they are currently developing a clinical care pathway for children and youth that are overweight or obese that can be utilized by FPs in BC, and standardized identification is the first step of this pathway.

Your participation is essential for this knowledge and the time spent completing the online survey is much appreciated. If you have any questions about this study, please feel free to contact me at any point. Thank you in advance and we look forward to your early response.

The survey can be accessed online at http://fluidsurveys.com/s/2006-2007-WHO-Growth-Charts/. Please respond before April 29th, 2013.

Sincerely,

Emily Rand, BSc & BPHE

M.Sc. Candidate
School of Exercise Science, Physical & Health Education
University of Victoria
erand@uvic.ca
250-634-2932

Appendix O: Invitation to Participate for Randomly Selected Family Physicians

Dear Dr. [Full Name],

This is a request for your participation in a provincial survey regarding the use of the World Health Organization (WHO) Growth Charts in your practice. As a Master of Science in Kinesiology student at the University of Victoria, I am conducting this survey of Family Physicians to understand your utilization of the 2006 and 2007 WHO Growth Charts, including any barriers or facilitators influencing your level of use. Child Health BC has worked collaboratively with me and is interested in the results.

The following is an overview of survey participation:
• You have been randomly selected and are eligible to participate if you are a Family Physician, Locum, Hospitalist, or work at a Walk-In Clinic, provided you accept/see paediatric patients from birth to 19 years old.
• It will require approximately 10-15 minutes to complete.
• A Letter of Information for Implied Consent is attached; by completing and submitting the survey, your free and informed consent is implied. It indicates that you understand the conditions of participation in this study, and that you have had the opportunity to have your questions answered by the researcher.
• The analysis of the data will include group mean scores, and all data will be anonymous and confidential.
• As a thank you for completing the survey, you can provide your name and contact information at the end of the survey to be entered into a draw to win a $100 donation towards any organization or program in your community that promotes or supports paediatric healthy living.
• If you would like to complete and submit the survey online, it can be accessed at http://fluidsurveys.com/s/2006-2007-WHO-Growth-Charts/
• Alternatively, if you would like to fill out a paper copy and fax it back to us the fax-back number is 250-721-6601.

Here is a brief synopsis of the study background and purpose to further your understanding of this topic:

In 2006, the WHO developed the Child Growth Standard Charts, which are based on children raised according to current international health and nutrition recommendations, for tracking the growth of children between 0 and 60 months. In 2007, the WHO also produced Growth Reference Charts for tracking growth of youth between the ages of 5 and 19 years old, and these are considered to be closer to the growth standards as they have been updated to address the obesity epidemic. Since both sets of these WHO Growth Charts are more representative of the current Canadian population compared to other existing growth charts, the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada, and Community Health Nurses of Canada have recommended the adoption of these new charts by all Canadian primary care providers since 2009. In BC, the WHO Growth Charts were distributed by the Ministry of Health to health units for physician uptake in January 2012, however, the Ministry does not know how many FPs are now using these charts in their practice, or the reasons for or against their utilization.

This information is important as it can provide invaluable insight into future work that needs to be done to ensure that the recommended WHO Growth Charts are available and utilized by FPs across the province. Having standardized paediatric growth assessments and monitoring is the necessary first step for the prevention of overweight or obesity, and for identifying and addressing lifestyle behaviours that may need to be altered. Data collected will be particularly useful for the Ministry of Health and Child Health BC, as they are currently developing a clinical care pathway for children and youth that are overweight or obese that can be utilized by FPs in BC, and having standardized identification is the first step of this pathway.

Your participation is essential for this knowledge and the time spent completing the survey is much appreciated. If you have any questions about this study, please feel free to contact me by email or phone at any point. Thank you in advance and we look forward to your early response.

Sincerely,

Emily Rand, B.Sc. & BPHE

M.Sc. Candidate
School of Exercise Science, Physical & Health Education University of Victoria
erand@uvic.ca
250-634-2932

Appendix P: Survey Reminder

Dear Dr. [Full Name],

This is a follow-up to an earlier request for your participation in a provincial survey regarding your use of the World Health Organization (WHO) Growth Charts in your practice. The survey is being conducted to understand your utilization of the 2006 and 2007 WHO Growth Charts, including any barriers or facilitators influencing your level of use. Child Health BC has worked collaboratively with this study and is interested in the results as it can help inform the development of a Clinical Care Pathway in BC for children and youth who are overweight, obese or at-risk.

If you have already completed the survey, we thank you very much for your time and participation and you may ignore the rest of this message.

The following is an overview of survey participation:

• You have been randomly selected and are eligible to participate if you are a Family Physician, Locum, Hospitalist, or work at a Walk-In Clinic, provided you accept/see paediatric patients from birth to 19 years old.

• It will require approximately 10-15 minutes to complete.

• A Letter of Information for Implied Consent is attached; by completing and submitting the survey, your free and informed consent is implied. It indicates that you understand the conditions of participation in this study, and that you have had the opportunity to have your questions answered by the researcher.

• The analysis of the data will include group mean scores, and all data will be anonymous and confidential.

• As a thank you for completing the survey, you can provide your name and contact information at the end of the survey to be entered into a draw to win a $100 donation towards any organization or program in your community that promotes or supports paediatric healthy living.

• If you would like to complete and submit the survey online, it can be accessed at http://fluidsurveys.com/s/2006-2007-WHO-Growth-Charts/

• Alternatively, if you would like to print and fill out a paper copy and fax it back to us the fax-back number is 250-721-6601.

Your participation is essential for providing insight into the provincial use of the WHO Growth Charts and the time spent completing the survey is much appreciated. If you have any questions about this study, please feel free to contact me by email or phone at any point. Thank you in advance and we look forward to your early response.

Sincerely,

Emily Rand, B.Sc. & BPHE
M.Sc. Candidate
School of Exercise Science, Physical & Health Education
University of Victoria
erand@uvic.ca
T: 250-634-2932
F: 250-721-6601

Appendix Q: The 2006 & 2007 WHO Growth Charts Survey

2006 & 2007 WHO Growth Charts Survey

Please keep in mind the following when completing the survey:
1. *The WHO Growth Charts:* This term will refer to both the 2006 WHO Child Growth Standards and the 2007 WHO Growth References.
2. *Paediatric population*: Refers to those from birth to 19 years old as this reflects the age categories encompassed in the WHO Growth Charts.
3. Please answer each question as it applies to your own practice.

SECTION A: DEMOGRAPHIC AND PRACTICE INFORMATION

This part of the survey is needed to help us understand the characteristics of the Family Physicians participating in the study.

1. Gender
- ○ Female
- ○ Male

2. Please indicate the age group to which you belong.
- ○ 20-29
- ○ 30-39
- ○ 40-49
- ○ 50-59
- ○ 60-69
- ○ 70 or above

3. How many years have you been practicing medicine?
- ○ 1-5 years
- ○ 6-10 years
- ○ 11-15 years
- ○ 16-20 years
- ○ 21+ years

4. In what Health Authority region do you primarily practice?
- ○ Northern Health
- ○ Interior Health
- ○ Vancouver Island Health
- ○ Vancouver Coastal Health
- ○ Fraser Health

5. In what community (or communities) do you practice? (Please include all)

6. Which of the following best describes your type of practice?

- ○ Outpatient/walk-in clinic
- ○ Solo practice
- ○ Solo practice but associated with a larger group (e.g. Family Health Network)
- ○ Group practice
- ○ Clinic associated with a tertiary/acute care setting
- ○ Locum
- ○ Hospitalist
- ○ Other (please specify...) _____

7. What is the approximate percentage of paediatric patients (birth-19 years old) that you see per week in your practice?

- ○ 0-19%
- ○ 20-39%
- ○ 40-59%
- ○ 60-79%
- ○ 80-100%

8. What method do you primarily use to assess/monitor your paediatric patients' growth? (Check all that apply for the appropriate age category)

	Birth-2 years old	*3-5 years old*	*6-19 years old*
Weight-for-age	☐	☐	☐
Height/length-for-age	☐	☐	☐
Weight-for-length	☐	☐	☐
Head circumference	☐	☐	☐
BMI-for-age	☐	☐	☐
Other	☐	☐	☐

9. Do you use an Electronic Medical Record (EMR) system in your practice?

- ○ Yes
- ○ No

a) If YES, which EMR system do you use?

_____

b) If YES, do you use it to enter and plot paediatric growth data?

- ○ Yes
- ○ No

10. The following is a list of paediatric growth charts that have been developed by different organizations. Each growth chart has the organization identified on it. Please identify which growth charts you use in your practice by checking YES or NO for each age category below. If you use an EMR system, you may need to look at the chart in your system to identify it.

a) 2000 Centers for Disease Control and Prevention (CDC) Growth Charts

	YES	*NO*
Birth-2 years old	☐	☐
3-5 years old	☐	☐
6-19 years old	☐	☐

b) World Health Organization (WHO) 2006 Growth Standards for ages 0-60 months

○ Yes
○ No

c) World Health Organization (WHO) 2007 Growth References for ages 5-19 years old

○ Yes
○ No

d) I mostly use my own professional judgment to assess paediatric growth patterns.

○ Yes
○ No

e) Other (please specify...) _____

SECTION B: LEVEL OF USE

The following questions are regarding your concerns about paediatric growth assessments and overweight/obesity, as well as your level of use of the 2006/2007 WHO Growth Charts.

11. I am concerned about the health consequences of paediatric overweight/obesity.

○ Not at all true
○ Slightly true
○ Somewhat true
○ Very true

12. Please pick the statement that best describes your current level of use of the 2006 & 2007 WHO Growth Charts.

○ I am not using, nor have I used, the WHO Growth Charts in my practice.
○ I am not using the WHO Growth Charts now, but have previously used them in my practice.
○ I am currently learning or have learned about what the WHO Growth Charts are.
○ I am currently preparing or have prepared myself in order to begin using the WHO Growth Charts.
○ I have already begun to use the WHO Growth Charts in my practice.
○ At this time, I am routinely using the WHO Growth Charts in my practice.
○ I have spent time and energy discussing major revisions to using the WHO Growth Charts with others in order to improve them.

SECTION C: YOUR THOUGHTS ABOUT THE WHO GROWTH CHARTS

The following questions relate to the factors influencing your level of use of the 2006/2007 WHO Growth Charts.

13. The WHO Growth Charts improve the overall quality of paediatric weight assessments by Family Physicians in BC.

- ○ Strongly agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Strongly disagree
- ○ N/A
- ○ Unsure

14. Using the WHO Growth Charts makes it easier to identify paediatric overweight/obesity compared to other available growth charts.

- ○ Strongly agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Strongly disagree
- ○ N/A
- ○ Unsure

15. The WHO Growth Charts are or appear to be difficult to use.

- ○ Strongly agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Strongly disagree
- ○ N/A
- ○ Unsure

16. The WHO Growth Charts are/were easy to access for use in my practice.

- ○ Strongly agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Strongly disagree
- ○ N/A
- ○ Unsure

17. I can easily see how using the WHO Growth Charts has impacted the paediatric patients in my practice.

- ○ Strongly agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Strongly disagree
- ○ N/A
- ○ Unsure

18. Before deciding whether to use the WHO Growth Charts, I was able to try them out.
- ○ Strongly agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Strongly disagree
- ○ N/A
- ○ Unsure

19. Using the WHO Growth Charts is compatible with my work needs and values.
- ○ Strongly agree
- ○ Somewhat agree
- ○ Somewhat disagree
- ○ Strongly disagree
- ○ N/A
- ○ Unsure

SECTION D: ABOUT YOU AND YOUR PRACTICE

This section asks about your general tendency to adopt new medical practices or guidelines. It also asks about the sources of information and communication channels you typically use in your practice.

20. My colleagues often ask me for medical-related advice or information.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

21. I seek out new ways to do things in my practice.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

22. I am generally cautious about accepting new medical ideas.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

23. I consider myself to be creative and original in my medical thinking and practice.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

24. I am aware that I am usually one of the last people in my medical colleague group to accept new medical ideas.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

25. I enjoy taking part in the leadership responsibilities of the medical group(s) I belong to.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

26. I must see other colleagues using new medical innovations before I will consider using them.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

27. I am receptive to new medical ideas.
- ○ Strongly agree
- ○ Agree
- ○ Moderately agree
- ○ Moderately disagree
- ○ Disagree
- ○ Strongly disagree

28. Please rate your frequency of use of various information sources in your practice by checking the appropriate number for each.
1=never use; 2=rarely use; 3=sometimes use; 4=often use; 5=very often use

	1	2	3	4	5
Studies published in peer reviewed scientific journals	☐	☐	☐	☐	☐
Computerized medical literature searches	☐	☐	☐	☐	☐
Publications that focus on evidence-based medicine	☐	☐	☐	☐	☐
Systematic reviews/meta analyses	☐	☐	☐	☐	☐
Databases (e.g. Child Health Survey, cancer registries, etc.)	☐	☐	☐	☐	☐
Other online physician resources	☐	☐	☐	☐	☐

29. Please rate your frequency of use of various information sources in your practice by checking the appropriate number for each.
1=never use; 2=rarely use; 3=sometimes use; 4=often use; 5=very often use

	1	2	3	4	5
Presentations and seminars	☐	☐	☐	☐	☐
Teaching rounds	☐	☐	☐	☐	☐
Conference proceedings	☐	☐	☐	☐	☐
Policy and procedure manuals	☐	☐	☐	☐	☐
Medical bulletins and newsletters	☐	☐	☐	☐	☐
Continuing medical education courses	☐	☐	☐	☐	☐
Clinical practice guidelines	☐	☐	☐	☐	☐

30. Please rate your frequency of use of various information sources in your practice by checking the appropriate number for each.
1=never use; 2=rarely use; 3=sometimes use; 4=often use; 5=very often use

	1	2	3	4	5
Information from colleagues	☐	☐	☐	☐	☐
Information from medical specialists	☐	☐	☐	☐	☐
Information from other health care professionals	☐	☐	☐	☐	☐
Personal experience/what has worked for you in the past	☐	☐	☐	☐	☐
Involvement in/coordination with other health agencies	☐	☐	☐	☐	☐

SECTION E: TRAINING, SKILLS AND EXPECTATIONS

The following questions are about your training, skills and outcome expectations in terms of the 2006/2007 WHO Growth Charts and weight management for those paediatric patients that have been identified as overweight, obese or at-risk.

31. I have participated in pre-use training or planning in preparation for using the WHO Growth Charts with my paediatric patients.

○ Yes
○ No

a) If you answered YES, which training have you participated in? (Please check all that apply)

☐ Medical school training
☐ Dietitians of Canada online training program modules
☐ Through a continuing education course (please specify...) _____
☐ Training provided by my Health Care Team/Network (please specify...) _____
☐ Other (please specify...) _____

For each of the following questions, use the starting phrase *"How confident are you that…"*

32. You can do a good job educating your paediatric patients and their families on weight and growth-related issues (i.e. proper nutrition, physical activity, sedentary behaviours)?

○ Not at all confident
○ Somewhat confident
○ Fairly confident
○ Very confident

33. You are aware of appropriate resources and programs for healthy weight management that are available for your patients and their families?

○ Not at all confident
○ Somewhat confident
○ Fairly confident
○ Very confident

34. In general, if you identify a paediatric patient that is leaving the healthy weight trajectory, that the patient and family will be interested in weight management advice?

○ Not at all confident
○ Somewhat confident
○ Fairly confident
○ Very confident

35. If you spend more time educating your patients and their families on healthy weight management, that it will have a positive impact on their knowledge and attitudes about healthy weight practices (i.e. nutrition, physical activity, sedentary behaviours)?

○ Not at all confident
○ Somewhat confident
○ Fairly confident
○ Very confident

SECTION F: ABOUT YOUR HEALTH CARE TEAM/NETWORK

The following questions ask about the presence of a program champion for the 2006/2007 WHO Growth Charts, in addition to specific processes in your Health Care Team or Network.

Definition: An ***innovation champion*** is an individual who throws his/her weight behind an innovation (i.e. a new idea, practice or object such as the 200/2007 WHO Growth Charts) by actively and enthusiastically promoting its progress through the critical organizational stages, thus overcoming indifference or resistance that the innovation may provoke.

36. Using the above definition, is there an innovation champion in your practice, Health Care Team, or region that is promoting the WHO Growth Charts?

○ Yes
○ No

a) If you answered YES, is it you?

○ Yes
○ No

37. Are you apart of a Health Care Team/Network or Group Practice?

○ Yes
○ No

If you answered YES, please answer the following questions. If you answered NO, please go to the SECTION G.

38. To what extent does your Health Care Team/Network/Group collaborate in determining what clinical practice guidelines will be implemented and how?

○ To a very little extent
○ To a little extent
○ To some extent
○ To a great extent
○ To a very great extent

39. To what extent is your Health Care Team/Network/Group generally quick to incorporate new clinical practice guidelines?

○ To a very little extent
○ To a little extent
○ To some extent
○ To a great extent
○ To a very great extent

40. How adequate is the amount of information you get about what is going on in other Health Care Teams/Networks/Groups in terms of screening for healthy weights or managing paediatric overweight/obesity?

○ To a very little extent
○ To a little extent
○ To some extent
○ To a great extent
○ To a very great extent

SECTION G: BARRIERS AND FACILITATORS

The final section is to help identify any additional barriers or facilitators that have either hindered or enhanced your use of the 2006/2007 WHO Growth Charts.

41. If you do not currently, or do not intend to use the WHO Growth Charts on a regular basis in your practice, what are your reasons for not doing so? (Please check all that apply)

- ☐ Policies in my organization that prevent changes
- ☐ Insufficient time to implement
- ☐ Not a priority area for me
- ☐ Lack of funding
- ☐ Lack of incentives
- ☐ Not feasible in my normal daily work
- ☐ Not relevant for my patients
- ☐ Lack of consensus to use them amongst my colleagues
- ☐ Lack of knowledge in this particular area
- ☐ Other (please specify...) _____

42. Are there any additional reasons why you are using the WHO Growth Charts? (Please specify...)

_____

43. Are you aware of any of the following community, provincial, national or international resources/initiatives available to support paediatric patients who are currently at, or at-risk of being at, an unhealthy weight? (Please check all that apply)

- ☐ HealthLink BC
- ☐ Subspecialty care
- ☐ Centre for Healthy Weights- Shapedown BC
- ☐ BC Children's Hospital
- ☐ Multidisciplinary team in community
- ☐ Exercise Is Medicine
- ☐ Sustainable Childhood Obesity Prevention through Community Engagement (SCOPE)
- ☐ Mind, Exercise, Nutrition...Do It! (MEND)
- ☐ Other (please specify...) _____

44. Do you have any additional comments, questions or concerns pertinent to this topic/survey? (Please specify...)

_____

THANK YOU FOR COMPLETING THE WHO GROWTH CHARTS SURVEY!

If you would like to be entered into the draw to win a $100 donation towards your choice of program or organization in your community that supports or promotes paediatric healthy living, please provide your name and contact information (phone number or email address) below.

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