Promotion of Healthy Weights at Preschool Public Health Vaccination Clinics in Calgary

An Obesity Surveillance Program

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ABSTRACT

Objective: To evaluate the acceptability and feasibility of a surveillance program of overweight and obesity in preschool children in Calgary, and to provide advice for families to promote healthy weights.

Participants and Setting: Children (mean age 4.9±0.6 years) attending pilot-site clinics in September 2002 and all clinics in Calgary between February 2003-December 2003 (n=7048).

Intervention: The growth assessment protocol and resources supported a three-pronged approach to promote healthy weights (healthy eating, active living and positive body image). Public health nurses were trained in standardized measurement techniques and information resources. Links with physicians were made to facilitate continuity of care. Children's weight and height measurements were plotted on the Weight-for-Stature growth chart⁷ and used to identify children as obese (≥95th percentile), healthy weight (≥5th, <95th) or underweight (<5th). Subsequent analysis calculated the Body Mass Index (BMI)-for-Age¹⁶ to identify overweight children (≥85th, <95th percentile). The protocol was pilot tested and subsequently implemented in all Calgary public health clinics.

Outcomes: The majority (98%) of parents were either very happy or happy with information received during the visit. Public health nurse counselling confidence significantly improved after the pilot (p<0.001). Data indicated that 9% of children were obese, 15% were overweight and 3% were underweight.

Interpretation: This approach to identifying children's weight status appeared satisfactory to stakeholders, maximized use of existing resources to establish a surveillance program for Calgary, and provided an opportunity to give parents health-promoting advice on healthy weights.

MeSH terms: Obesity; primary prevention; public health; growth; child

La traduction du résumé se trouve à la fin de l'article.

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Childhood obesity has increased over the past three decades, and is described as an "epidemic".¹⁻⁴ Depending on how obesity is defined, the change in prevalence among 7-13 year old Canadian children between 1981 to 1996 is reported as a 2.4 to 4.7-fold increase for girls and a 2.7 to 5-fold increase for boys.^{5,6}

Children whose excess body weight could pose medical complications are described by the Centers for Disease Control and Prevention as "overweight" and "at risk of overweight",⁷ while others^{5,6} use the terms "obese" and "overweight" to describe this situation. New Canadian standards⁸ indicate "overweight" and "obese" are the preferred terms, and are used in this paper.

There are long-term health risks associated with childhood obesity, including Type 2 diabetes and the prospect of diabetic complications.⁹ This has long-term implications for Canada's universal system of healthcare. Preventive action must consider the prejudice that already exists against obese people,^{10,11} affecting children as young as four years.¹² Furthermore, unhealthy slimming practices may lead to the development of clinical eating disorders,¹³ or smoking to control weight.^{14,15} Restrictive dieting may contribute to weight gain.¹³ Therefore, promotion of healthy weights in children also needs to prevent unhealthy slimming practices.¹⁶

Recent reports on Canadian children's weight status have been based on parental reports of children's heights and weights.^{6,17} Accurate assessment of weight status, particularly the height component, is difficult to achieve in growing children.¹⁸ Adolescents and adults tend to under-report their body weight by 8-10%.^{19,20} Little is known about bias in parental reports of children's weight.

Public health nurses (PHNs) in Calgary, supported by specialists in nutrition, active living and mental health, routinely measure children's growth and advise families on healthy growth at public health vaccination visits. In Calgary, all preschool (4.5 years) children attend public health clinics for vaccination, providing an opportunity to develop a surveillance system of children's weight status. This system is invaluable for public health planning and monitoring the effectiveness of obesity prevention initiatives.

Figure 1. Public Health Nurse Protocol for conducting the growth assessment at the preschool vaccination visit at the Public Health Clinic

* Data form - Growth assessment data for analysis (birthdate, date of clinic visit, age, gender, weight, height, weight status assigned at clinic, parent refusal, and whether a physician information letter was sent).

† Resources - Information for families on positive body image, healthy eating and physical activity supplemented by specific information for underweight and obese children as necessary.

‡ Physician Information Letter - Information letter for family doctors of children identified as underweight or obese, recorded measurements and weight status assigned at clinic.

Considering the limited resources for obese children in the region, it was decided to only identify those children who were obese ($\geq 95^{\text{th}}$ percentile), and to categorize overweight children ($\geq 85^{\text{th}}$, $< 95^{\text{th}}$) within the healthy weight group ($\geq 5^{\text{th}}$, $< 95^{\text{th}}$) in this program. The numbers of overweight children ($\geq 85^{\text{th}}$, $< 95^{\text{th}}$) was assessed by calculating the BMI-for-Age.

The aim of this study was to evaluate the acceptability and feasibility of a public health surveillance model that includes provision of advice on how to achieve healthy weight in children. Specifically, we aimed to determine i) if a surveillance system attached to the preschool vaccination visit is an effective way to capture children's weight status, and ii) whether it provides an acceptable opportunity to provide parents with information about promoting healthy weights.

METHODS

Design

In January 2002, 332 PHNs were serviced on the revised CDC growth charts.⁷ They identified key elements required for the implementation of a growth assessment and surveillance system for healthy weight promotion (see Appendix). A multidisciplinary team developed the protocol for the pre-school vaccination visit. This protocol was pilot tested during September 2002 in four

public health clinics in the Calgary Health Region. This pilot phase included parent and PHN evaluation questionnaires to ascertain feasibility and acceptability of the protocol. Following a successful pilot phase, protocol implementation occurred throughout all 13 public health clinics in February 2003.

Subjects

The study enrolled 7,048 children (3,439 girls and 3,609 boys, mean age 4.9 ± 0.6 years) who presented for their preschool

TABLE I

Proportions [% (n)] of Parents (n=125), According to Their Child's Weight Status, Reporting Level of Satisfaction with Information Provided by Public Health Nurses on Growth Assessment for Obesity Prevention at the Preschool Vaccination Visit (pilot phase)

Weight Status*	Very Happy	Happy	Neither Happy nor Unhappy	Unhappy	Very Unhappy
	% (n)	% (n)	% (n)	% (n)	% (n)
Underweight	60 (6)	30 (3)	10 (1)	0	0
Healthy weight	65 (62)	30 (28)	5 (5)	0	0
Overweight	60 (12)	25 (5)	15 (3)	0	0
Total n=127	64 (80)	29 (36)	7 (9)	0	0

* Weight status using Weight-for-Stature Charts for 2-5 year olds⁷

Underweight <5th percentile

Healthy weight ≥5th, <95th

Overweight ≥95th

vaccination between February 2003 and December 2003. During the pilot phase, parents of children attending and PHNs in the four pilot sites were invited to complete evaluation questionnaires.

Protocol

All children were weighed and measured according to the developed protocol (Figure 1). If parents agreed to having advice on their child's growth, their child's data was plotted and the child was classified into one of three groups using the Weight for Stature chart: underweight (<5th percentile), healthy weight (≥5th, <95th) or obese (≥95th).⁷ Children identified as obese or underweight had an information letter sent to their physician about the child's weight status, unless an immediate physician referral was made at the discretion of the PHN. Growth assessment data on all children (including those of children whose parents declined advice on growth assessment) was recorded on data forms. Data were later analyzed to calculate the BMI-for-Age for each child based on age (to the nearest quarter year) and sex, allowing the classification of children as underweight (<5th), healthy weight (≥5th, <85th), overweight (≥85th, <95th), or obese (≥95th).²¹

The BMI-for-Age and Weight-for-Stature charts perform equally well in assessing underweight and overweight (≥85th percentile) in children 2-5 years of age.²² This finding allowed the usual practice of identifying children who meet or exceed the 95th percentile cut-off to continue during this initial project phase.

Growth assessment

Weight and height were measured using standardized procedures,²¹ calibrated weigh scales (Detecto or Health-O-Meter 103-

503 KL pro-series, adult clinic scales) and wall-mounted stadiometers (Seca Height Rod Model 226). Measurements were plotted with a triangular ruler (Staedtler® Mars Clear Acrylic) to minimize plotting error.

Resources

Information packages were provided to parents (see Appendix) that included advice to promote healthy weights (healthy eating, active living and positive body image), and was posted on the Region's website (www.calgaryhealthregion.ca/nutrition). A summary sheet was translated into Arabic, Chinese, Farci, Hindi, Korean, Punjabi, Spanish and Vietnamese.

Training

Two public health nutritionists trained all PHNs on the protocol, standardized measuring technique,²¹ interpretation of growth charts and the information resources. Training reduced inter-measurer variability of height from 4 cm to <1 cm and intra-measurer variability to <0.5 cm. One PHN per clinic undertook additional training and coordinated the process, which included posting standardized assessment techniques beside measurement equipment.

Family Physicians

Training packages were mailed to family physicians within the Region (see Appendix). These packages provided growth assessment guidelines, posters on standardized measurement techniques,²¹ equipment specifications, metric/imperial conversion tables and information resources.

Questionnaires

In the pilot phase, parents were invited to complete a questionnaire (colour-coded

according to their child's weight status). Questions focussed on parental satisfaction with information provided during the visit, and if they had enough information to help their child grow healthily. After the pilot study, PHNs were invited to complete a questionnaire that asked about how well the growth assessment went, adequacy of resources, and their perceived comfort-level in counselling families on children's growth before and after the pilot study.

Data management and statistical analysis

Data forms were scanned into a computer database using Teleform software (Cardiff Software, version 8.2) at the Region's Health Information Center. The chi-square statistic was used to test the independence between gender and weight status. Alpha was set at 0.05.

Ethical review

This study was reviewed and approved by the Conjoint Health Research Ethics Board of the Faculties of Medicine, Nursing and Kinesiology, University of Calgary and the Affiliated Teaching Institutions.

RESULTS

The protocol (Figure 1) was pilot tested and evaluated in September 2002 in four clinics where 383 children attended for preschool vaccinations. Questionnaires were completed by 127 parents, 33% of those whose children were measured during the pilot phase. There were no differences in parental satisfaction with information provided according to the child's weight status (Table I). Overall, 98% of parents felt they had the information needed to help their child grow healthily. The remaining 2% of parents had children assessed to have a healthy weight.

PHN questionnaires were completed by 45 of 70 nurses (64%) (Table II). Significantly more nurses felt comfortable providing growth assessment counselling to parents after the pilot project ($p < 0.001$). Overall 80% of PHNs reported the growth assessment went "very well" or "well", while 20% said it went "neither well nor badly". Available resources were rated as "very good" or "good" by 87% of PHNs, while 9% gave a rating of "neither good

nor bad", and 4% rated the resources as "bad".

Table III shows the proportions of children in each weight status category. The distribution of weight status in boys is different than that in girls ($p=0.0003$). Further analysis showed that the proportion of boys and girls are different in the obese category only ($p=0.0001$).

A minority of parents (2.5%) did not consent to have their child's weight and height plotted on the Weight-for-Stature charts. Of these children, 4% were underweight, 75% were healthy weight, 11.7% were overweight and 10% were obese. This weight status distribution was not different from parents who consented ($p=0.136$).

A comparison of the weight status assigned using the Weight-for-Stature chart, and the weight status determined by BMI-for-Age during data analysis revealed a misclassification such that 6.2% of children identified as healthy weight ($\geq 5^{\text{th}}$, $<95^{\text{th}}$) by PHNs using the Weight-for-Stature chart were reclassified as obese ($\geq 95^{\text{th}}$) according to BMI-for-Age. These children were just under the 95th percentile on the Weight-for-Stature charts, indicating the misclassification was due to differences in the growth charts. This misclassification represented 5.6% of the total sample.

DISCUSSION

This project maximized use of existing resources to establish a preschool weight-status surveillance system that was acceptable to both staff and families. The model developed identified variation in weight status by location, and therefore provides information for public health planning. Of all children attending the preschool vaccination, consenting families (97.5%) received healthy-weight promotion information that focussed on healthy eating, active living and positive body image.

Approximately one quarter of preschool children were found to be either overweight or obese. Table IV shows the comparison in weight status with other published reports, and suggests that obesity in preschool children in Calgary may be lower than in other parts of Canada.

The new growth charts⁷ introduced a focus on obesity prevention, including a lower cut-off to identify overweight chil-

TABLE II

Proportions [% (n)] of Public Health Nurses (n=44, 64% of those involved) Reporting Comfort Level in Counselling Families Before and After the Pilot Phase of Growth Assessment for Obesity Prevention at the Preschool Vaccination and Assessment Visit

	Pre-pilot % (n)	Post-pilot % (n)
Very comfortable	18 (8)	25 (11)*
Comfortable	36 (16)	57 (25)
Neither comfortable nor uncomfortable	27 (12)	16 (7)
Uncomfortable	18 (8)	2 (1)
Very uncomfortable	0	0

* Fisher's Exact Test = 35.5, $p=0.0001$

TABLE III

Weight Status of Children (n=7048, mean age 4.9 ± 0.6 years) Attending the Preschool Vaccination Clinic at the Calgary Health Region Public Health Clinics (February 2003-December 2003)

Weight Status (BMI*-for-Age Percentile) ⁷	Girls % (n)	Boys % (n)	Total % (n)
Underweight ($<5^{\text{th}}$)	2 (82)	3 (94)	3 (176)
Healthy weight ($\geq 5^{\text{th}}$, $<85^{\text{th}}$)	75 (2588)	72 (2583)	73 (5171)
Overweight ($\geq 85^{\text{th}}$, $<95^{\text{th}}$)	15 (509)	16 (562)	15 (1071)
Obese ($\geq 95^{\text{th}}$)	8 (260)	10 (370)	9 (630)
Total	49 (3439)	51 (3609)	100 (7048)

* Body Mass Index (kg/m^2)

Chi-square statistic = 18.6, $p=0.0003$

TABLE IV

Proportions and Age Ranges of Children (n=7048) Found to be 'Overweight'* and 'Obese'† in the Growth Assessment for Obesity Prevention Project in Calgary (based on measured height and weight) and in National Studies (based on parental reported height and weight)

Study	Girls		Boys	
	Overweight % (n)	Obese % (n)	Overweight % (n)	Obese % (n)
Calgary (mean age 4.9 ± 0.6 ; range 4-7 years)	15 (509)	8 (260)	16 (562)	10 (370)
National Study 1 ¹⁷ (2-11 years)	18 ‡	17	19	19
National Study 2 ⁶ (7-13 years)	17 (531)	9 (281)	23 (725)	10 (315)

* BMI-for-Age (kg/m^2) $\geq 85^{\text{th}}$, $<95^{\text{th}}$ percentile. BMI-for-Age was calculated for each child based on age (nearest quarter year) and sex.

† BMI-for-Age (kg/m^2) $\geq 95^{\text{th}}$ percentile, BMI-for-Age was calculated for each child based on age (nearest quarter year) and sex.

‡ Raw numbers not available because sample weights were applied to be representative of all children.

dren. The decision to only identify obese children ($\geq 95^{\text{th}}$ percentile) reflected concerns about overwhelming the primary care system with overweight children ($\geq 85^{\text{th}}$, $<95^{\text{th}}$ percentile). Furthermore at the time of this study, the BMI-for-Age cut-offs were still under review by Canadian health professional bodies.⁸ The Weight-for-Stature chart is most equivalent to the BMI-for-Age in 2-5 year olds,²² allowing the usual practice of only identifying children who exceed the 95th percentile cut-off to continue during this initial phase of the project. Misclassification effects in weight status between the Weight-for-Stature and BMI-for-Age assessment methods were confined to under-identification of a small

proportion of obese children (5.6%). No false positive results were generated, an important factor in screening children.²³

Having an estimate of the numbers of overweight children has facilitated resource planning. This project's next phase involves transition to the BMI-for-Age chart, and identification of all weight status categories. Any positive outcome of identifying the greater numbers of overweight children will yield significant population effects.

A barrier faced by this project was parent^{24,25} and frontline staff concerns that weight assessment could lead to unhealthy body image and eating disorders. The involvement of the eating disorder preven-

Appendix

Key Elements of a Model for Growth Assessment and Obesity Prevention in Public Health: A Health Promotion and Surveillance Program for Pre-school Vaccination Clinics

Key elements required as identified by public health nurses

Protocol for growth assessment visit and extra clinic time for assessment.
Accurate, well-maintained equipment for growth assessment.
Training in standardized growth assessment procedures and in counselling on obesity prevention.
Information for parents (translated to accommodate ethnic minorities) on all growth issues.
Links with family physicians for continuity of care for children identified with growth anomalies.
Raised public awareness of growing problem of childhood obesity.
Pilot test of protocol.

Protocol for growth assessment

Multidisciplinary involvement in development of protocol ensured "comprehensive approach to growth assessment and obesity prevention. Team included family physician, public health nurses and nutritionists, specialists in active living and eating disorder prevention.

Public health clinic resources

Equipment - New stadiometers were procured for each public health clinic, weigh scales were recalibrated and accuracy continuously monitored.
Time - An extra 5 minutes was added onto each public health vaccination visit to complete growth assessment and education.

Counselling information for parents

Parent information packages were developed containing information on healthy eating, active living, and positive body image.
Three new handouts were developed, including 2 addressing the issue of childhood obesity*.
Main summary sheet translated into 8 languages: Punjabi, Hindu, Farci, Spanish, Korean, Arabic, Chinese, Vietnamese.

Link with family physicians

Physician Information Letter developed for children whose growth is <5th or ≥95th percentiles.
Guidelines package on Prevention of Childhood Obesity developed and distributed to all family physicians in the Region. Presentations at continuing education rounds via videoconference to physicians throughout the province, and presentation material posted on the Department of Family Medicine, website. Region website featuring growth assessment for obesity prevention materials was profiled as website of the month by the Department of Family Medicine.

Raised awareness about the growing problem of childhood obesity

Radio, television and print media used to convey key messages on promoting healthy weights.

Pilot test and evaluation of preschool growth assessment for obesity prevention in 4 of 13 public health clinics prior to Region-wide implementation.

* Growth handouts available at www.calgaryhealthregion.ca/nutrition

tion team in resource and protocol development helped ensure promotion of healthy body image. The public health clinic setting provided a private and safe environment. High parental satisfaction, regardless of their children's weight status, and the lack of bias towards overweight in children whose parents refused to participate, suggest that these concerns were adequately addressed.

Frontline staff training in assessment techniques and resources, accurate equipment and clinic time to provide growth assessment, are concerns that have been documented previously by public health professionals working in the obesity field.²⁶ In the present study, procurement of quality stadiometers, training, and additional time for the visit were sufficient to address these concerns.

This study's limitations include a lack of information on what impact the growth assessment and information had on families, and the effectiveness of the *Physician Information Letter* in facilitating continuity

of care. This is an important area for future research. Another limitation is that not all families choose to vaccinate their children. The weight status of these children is not included in the surveillance system, introducing bias. The Region's statistics indicate that 80% of preschool children are vaccinated by age 6, suggesting that the model captures the weight status of most children.

This project has enabled public health and primary care professionals to take a leadership role in assessing childhood obesity and coordinating prevention efforts. Strategies targeting environmental change require stakeholder involvement outside the health sector.^{26,27} This project provides baseline information for evaluating the effectiveness of these other initiatives.

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RÉSUMÉ

Objectif : Évaluer l'acceptabilité et la faisabilité d'un programme de surveillance de l'embonpoint et de l'obésité chez les enfants d'âge préscolaire à Calgary et offrir des conseils aux familles pour favoriser le maintien d'un poids-santé.

Participants et lieu : Les enfants (âge moyen : $4,9 \pm 0,6$ ans) ayant fréquenté nos cliniques d'essai en septembre 2002 et toutes les cliniques de Calgary entre février 2003 et décembre 2003 ($n=7\ 048$).

Intervention : Notre protocole et nos outils d'évaluation de la croissance des enfants étaient axés sur une triple approche de promotion du poids-santé (saine alimentation, vie active et image corporelle positive). Des infirmières hygiénistes ont été formées à l'utilisation de techniques de mesure et de ressources documentaires normalisées. Des liens ont été établis avec des médecins pour assurer la continuité des soins. Les mesures du poids et de la taille des enfants ont été tracées sur la fiche de croissance (poids-taille)⁷ et ont servi à classer les enfants dans les catégories « obésité » ($\geq 95^{\circ}$ centile), « poids-santé » ($\geq 5^{\circ}$, $< 95^{\circ}$ centiles) ou « poids insuffisant » ($< 5^{\circ}$ centile). Nous avons ensuite calculé l'indice de masse corporelle (IMC)¹⁶ pour cibler les enfants faisant de l'embonpoint ($\geq 85^{\circ}$, $< 95^{\circ}$ centiles). Le protocole a d'abord été mis à l'essai, puis nous l'avons appliqué dans toutes les cliniques de santé publique de Calgary.

Résultats : La majorité (98 %) des parents sont heureux ou très heureux des renseignements qui leur ont été fournis lors de leurs visites. La confiance envers les conseils des infirmières hygiénistes s'est beaucoup améliorée après le projet-pilote ($p < 0,001$). Selon les données recueillies, 9 % des enfants étaient obèses, 15 % faisaient de l'embonpoint et 3 % avaient un poids insuffisant.

Interprétation : Cette façon de déterminer le statut pondéral des enfants semble avoir satisfait les intervenants, maximisé l'utilisation des ressources existantes pour la création d'un programme de surveillance à Calgary et permis d'offrir aux parents des conseils sur les poids-santé.

The Health of Young Canadians

Growing up in Canada, young people may face many pressures that can play a role in their health and development. The Canadian Institute for Health Information's new report from its Canadian Population Health Initiative explores the association between the health of young Canadians and ties with parents, peers and schools. Findings show that youth who report feeling nurtured by their parents and engaged in their schools tend to report better health and higher self-worth.

■ Learn more in

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