The Canadian Pediatric Endocrinology Group (CPEG) has produced complementary growth curves based on the 2010 ‘WHO Growth Charts for Canada’ (1). Our members believe that our modifications enhance these 2010 curves, particularly for pediatric clinicians. CPEG recognizes and appreciates the methodology for data collection and analysis used by the WHO to produce growth curves that better reflect contemporary trends and recommendations in breastfeeding, and an ethnically diverse population of children (2-4). We also recognize the efforts of the Dietitians of Canada, the breast feeding, and an ethnically diverse population of children (2-4).

Inclusion of additional percentile lines within the normal ranges

The WHO Growth Curves Adapted for Canada depict one, two and three SDs above and below the mean, corresponding to percentiles 0.1, 3, 15, 50, 85, 97 and 99.9. This has resulted in fewer centiles, through strict application of WHO exclusion criteria and the WHO reference curves for school-aged children and adolescents. These extended curves are complementary measures that should be followed in parallel with height-for-age. This is particularly important for dietitians, gastroenterologists and other clinicians caring for children with conditions in which short-term changes in weight may impact linear growth and reflect disease activity. The ability to view both height and weight on one page is key to this pattern recognition. While we wholeheartedly embrace the enhanced use of BMI curves to track and diagnose obesity, we still need to track weight, height and BMI concurrently in older children. Extension of the weight curves does not diminish the utility of the BMI norms. These extended curves are based on the same North American ‘core data’ used to generate the WHO reference curves for school-aged children and adolescents, through strict application of WHO exclusion criteria and curve-fitting methods. For details, consult the CPEG Statistical Methods and Models manual (http://cpeg-gcep.net).

Continuation of the weight-for-age curve beyond 10 years of age

The continuation of the weight-for-age curves beyond 10 years of age enable a simultaneous assessment of changes in both weight and height on the same page. While we recognize the clinical importance of promoting the use of body mass index (BMI) rather than weight in this age group, we believe that BMI and weight-for-age are complementary measures that should be followed in parallel with height-for-age. This is particularly important for dietitians, gastroenterologists and other clinicians caring for children with conditions in which short-term changes in weight may impact linear growth and reflect disease activity. The ability to view both height and weight on one page is key to this pattern recognition. While we wholeheartedly embrace the enhanced use of BMI curves to track and diagnose obesity, we still need to track weight, height and BMI concurrently in older children. Extension of the weight curves does not diminish the utility of the BMI norms. These extended curves are based on the same North American ‘core data’ used to generate the WHO reference curves for school-aged children and adolescents, through strict application of WHO exclusion criteria and curve-fitting methods. For details, consult the CPEG Statistical Methods and Models manual (http://cpeg-gcep.net).

Key Words: Body mass index, Body weight changes; CDC; Growth curves; WHO

Les ajouts du Groupe canadien d’endocrinologie pédiatrique aux courbes de croissance de l’OMS : à quoi bon?

Le Groupe canadien d’endocrinologie pédiatrique (GCEP) a produit des courbes de croissance complémentaires qu’il a adaptées des courbes de croissance de l’OMS pour le Canada produites en 2010. En réponse aux préoccupations des membres du GCEP et de la communauté des pédiatres généraux au sujet de la présentation des données de l’OMS, des courbes complémentaires ont été produites qui, de l’avis des auteurs, favorisent la clarté, réduisent les erreurs de classification potentielles et permettront aux utilisateurs de mieux suivre les changements à court terme, notamment en matière de poids chez les enfants plus âgés. Plus précisément, ces courbes intègrent le poids par rapport à l’âge après dix ans, ajoutent des centiles dans la plage normale, suppriment les centiles extrêmes et harmonisent le choix de centiles d’indice de masse corporelle avec les définitions d’embonpoint et d’obésité chez les adultes. Toutes les modifications respectent la méthode rigoureuse de l’OMS et se fondent sur les données fondamentales du National Center for Health Statistics des États-Unis. Les courbes, tout aussi soignées que les courbes canadiennes de 2010, sont accessibles, en anglais, dans le site Web du GCEP (http://cpeg-gcep.net).
Figure 1) CPEG growth charts for boys aged 2 to 19 years. A) Height-for-age and weight-for-age; B) BMI-for-age

Figure 2) CPEG growth charts for girls aged 2 to 19 years. A) Height-for-age and weight-for-age; B) BMI-for-age
percentile lines (3, 10, 25, 50, 75, 90 and 97), enabling a more precise description within the normal range (6). The addition of the 25th and 75th percentile lines enables health care providers to more easily detect aberrations in growth at an earlier stage. This is particularly critical for weight-for-age, where failure-to-thrive is often defined by crossing two percentile lines (7). In returning to these traditional percentile lines, we hope to avoid inadvertent delays in the detection of abnormal growth (8).

**Removal of extreme percentile lines (0.1 and 99.9)**

Similarly, we have opted to remove the 0.1 and 99.9 percentile lines to avoid compression of the curves and to promote clarity in plotting and interpretation. There is the risk that growth between percentiles 0.1 and 3 or between percentiles 97 and 99.9 may be interpreted as normal simply because it is ‘on the curve’. Such misinterpretations persist in the community even though the Dietitians of Canada clearly define (for individuals two to 19 years of age) weight-for-age <3rd percentile as ‘underweight’ and height-for-age <3rd percentile as ‘stunted’, in both cases warranting further assessment (1). More extreme percentiles may actually be misleading: Although data from large numbers of children were used in the creation of the charts, percentiles 0.1 and 99.9 each refer to one in 1000 children. Such extreme percentiles are simply not well estimated with only a mean (± SD) of 673±204 boys per yearly interval and 646±185 girls per yearly interval between five and 19 years of age. As a result, these more extreme percentiles are based on very limited data.

**Modification of the BMI percentile lines**

As noted above, we continue to strongly endorse the use of the WHO BMI curves as an important tool. These differ from the CDC curves in their definition of obesity (6). Importantly, the WHO curves align more closely at 19 years of age with standard adult definitions for overweight (25 kg/m²) and obesity (30 kg/m²) (9). As highlighted above, the elimination of the extreme percentile lines (0.1 and 99.9) emphasizes more healthy BMIs while retaining the WHO definitions.

**CONCLUSION**

After discussion with other Canadian stakeholders (eg, Canadian Paediatric Society, Association of Quebec Pediatricians, Dietitians of Canada), CPEG has released these complementary curves. With the exception of extending the weight-for-age curves beyond 10 years of age, we have simply reformatted existing WHO curves to achieve the goals outlined above. The extension of the weight-for-age reference beyond 10 years of age follows from strict application of the WHO methodology to the core North American data used to create the original WHO reference curves (2). These revised curves retain the clean, well-designed appearance of the curves published by the Dietitians of Canada and are available from the CPEG website in both French and English (http://cpeg-gcep.net). A useful anthropometric calculator for calculating percentiles and z-scores is also available from this website.

**ACKNOWLEDGEMENTS:** The working group thanks the membership of CPEG for their creative and financial support of this project.

**REFERENCES**