Training Programme
for Public Health Nurses and Doctors
in Child Health Screening, Surveillance and Health Promotion

Unit 6
Growth Monitoring

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Acknowledgements

The Programme of Action for Children wishes to thank

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Introduction

The statutory national core child health programme includes recommendations for growth monitoring of all children aged 0-12 years in Ireland. Due to inequities in the resourcing and delivery of this programme, no systematic universally available growth monitoring currently exists for children in Ireland.

A national growth monitoring symposium was convened in November 2004 by the Programme of Action for Children to develop recommendations for a national growth monitoring programme. A number of general recommendations were made which we believe are critical to the success of such a programme (Appendix A).

The development of any screening programme can create false reassurance for parents and practitioners. This is a particular issue in growth monitoring, especially where growth is systematically measured at 2 or 3 time points, namely birth, at 6 to 8 weeks of age and at school entry with statistically determined cut-off points for referral for further assessment.

Communication with parents and professionals regarding the limitations of growth monitoring and screening needs to be ensured to avoid false reassurance of parents about the growth of children. Parental and professional concern always needs to be heeded and acted upon.

Growth monitoring forms part of a whole child service and must be viewed in the context of a holistic approach. Normal growth is a good indicator of well being. Children need to be considered within their family and community background.

Information sharing between child health service providers needs to be improved, especially in relation to children considered to be at risk of growth disorders. Introduction of the Parent Held Record (PHR) to facilitate information sharing with parents and between service providers is strongly recommended. Information for and communication with parents is essential, including the provision of support and education for healthy nutrition, growth and development, especially in light of increasing evidence of the effectiveness of health promotion.
Growth Monitoring

Growth is a sensitive indicator of health in childhood, as normal growth can only occur if a child is healthy, adequately nourished and emotionally secure.

We are concerned with child growth on a number of levels, namely:

- Growth monitoring on a national level to ensure the appropriate identification of children and adolescents with growth problems, at the earliest possible opportunity. The ultimate aim being early identification, prompt investigation and early treatment as appropriate. Prognosis for those with growth disorders is improved by early treatment.
- Investigation and management of those children and adolescents with growth disorders, either tall or short stature.
- Under or overnutrition

Growth assessment is, therefore, an essential part of the examination or investigation of any child [Hoey HMCV, Irish Doctor 1987, 424-31]. It should be performed as part of good routine clinical care.

Assessment of growth and wellbeing in childhood and adolescence requires:

- A thorough history
- Complete physical examination to include pubertal assessment where appropriate.
- Growth assessment should include:
  standing height in those aged over 2 years and supine length in the under 2’s, an assessment of body proportions and sitting height, weight, skinfold thickness and measured parental heights.

It is considered good practice to include assessments of growth at routine child health visits like immunisation visits and developmental assessments. Measurements taken as part of a universal growth monitoring programme aimed at all children are intended to be additional to those of routine care.

Any interpretation of growth data must be taken in the overall clinical context of the individual child. This is particularly so when considering growth data on the child aged less than two years, where both length and weight are influenced by a wide range of transitory external factors, such as the timing of the last feed and micturition.

In the community accurate growth measurement is vital and accurate plotting on the appropriate centile chart.
Short stature

A commonly used definition of short stature is where height is below the 3rd centile for the population. However, in certain circumstances different definitions may be used (see referral criteria). Height below the genetic potential for the family and height falling to lower centiles also warrants investigation. (Monitoring Childrens Growth BMJ 1996;312:122. Hind marsh PC) ***

Early diagnosis of short stature is important as the outcome is related to management. Height needs to be interpreted in the clinical context of individual children and in relation to weight, in order to facilitate early identification of children at risk of failure to thrive on one hand and overweight or obesity on the other. Clear communication must be made to families and general practitioners where there is concern regarding weight or obesity and referral made as appropriate. Healthy eating and lifestyle should be promoted at every opportunity in order to avoid obesity.

Growth velocity

In growth monitoring, height velocity remains a useful tool. However, in the assessment of height velocity the need for accurate measurement is even more important. In the assessment of height velocity 2 measurements are required separated by time, ideally 1 year. The average pre-pubertal child will grow between 4-6 cm per year between 3 and 8-9 years. A child who appears to have grown 4 cm in 1 year may in fact have grown between 3.3 cm and 4.7 cm. (The reliability of height measurement (The Wessex Growth Study) Voss et al, Arch Dis Child 1990;65:1340-1344). The former being a very low height velocity and the latter normal. Thus, while height velocity is an invaluable tool in growth clinics due to measurement variability described below it is not recommended for community based screening.

Issues in Measurement

In assessing growth, accuracy is a key consideration. An accurate measurement is one, which is precise and unbiased (Interpretation and use of Medical Statistics, Daly et al, 1991 Blackwell Oxford). “Bias is a result of a systematic error which tends to make the actual recording of a measurement consistently above (or below) the true value.[call it error if the true value of the measurement is known otherwise its called variation]”. 
Accuracy of Results

An accurate measurement is one, which can vary very little (precise) around the true value (unbiased) of what is being measured.

Observer variation has a major impact on measurement accuracy. Intra-observer (within the observer) variation reflects the differences by a single measurer on different occasions. It does not cause bias but does affect precision e.g. misreading. The variation within observers is assumed to be random.

Inter-observer variation, that is, variation between observers can bias results. It can be due to:
- Different criteria for making a measurement
- Different techniques – lying/standing
- Different observational methods
- Different methods of recording e.g. digit preference, rounding up/down and also errors in plotting or interpreting measurements
- These errors can be reduced by standardisation of methods and training.

Instrument variation – bias often due to faulty equipment or calibration. This is avoided by proper installation and careful maintenance of equipment. Equipment should be tested regularly, maintained and calibrated in accordance with manufacturer’s recommendations.

Subject variation – random or biological subject variation. Height varies within the same child during the course of the day with height decreasing as the day progresses. Measurements should be taken at approximately the same time of day under the same conditions. An experienced measurer can expect to have a small degree of variation of 0.25 cm, but if different measurers are measuring the same child the difference can be up to 1.5 cm.
Measuring Technique and Equipment

Accuracy in growth measurement is essential. The major sources of variation shown above affect the accuracy of growth measurements. Accuracy can be improved in the following ways:

- Instrument variation is minimised by the use of appropriate equipment that is regularly calibrated and maintained.
- Subject Variation is minimised by taking measurements at approximately the same time of day under the same conditions. These errors can be reduced by standardisation of methods and training.
- Observer variation can be reduced by standardisation of methods and training.

The appropriate measuring equipment should be used. The recommended equipment is:

- Electronic self zeroing scales
- Supine length measure (infantometer or babymat)
- Leicester height measure (self calibrating)
- Age calculator to correct for prematurity until age 2 years
- Nine centile charts for the Irish population
- Non-stretchable 0.5cm tape for head circumference

Measurements must be taken by a trained measurer. Training in accurate measurement is fundamental and should be provided by those with expertise in auxology. Training must include training in the use of the recommended equipment. Auxology is a skill which requires demonstration and observed practice. This requires an interactive workshop training and practice session of all aspects from equipment assembly, to positioning the child, taking a measurement, calculating age, plotting the data on a centile chart and interpreting the end result. In addition those who will undertake measurement require background training on normal growth and its influencers, calculation of mid parental height, growth disorders, growth interpretation, the importance of accurate measurements, the basis and limitations of centile charts, the use of centile charts and when to request further referral.

They should understand and be skilled in the appropriate equipment and techniques for different age groups. The child should be measured standing if over 2, standing height should be taken without shoes, the child standing with their heels and back in contact with an upright wall. The head is held in the Frankfurt plane, so that he/she looks straight forward with the lower borders of the eye sockets in the same horizontal plane as the external auditory meati (i.e. head not with nose tipped upwards), hair decorations should be removed where possible. The Leicester stadiometer is then slid down to the top of the head. During the measurement the child should be told to stretch their neck to be as tall as possible, though care must be taken to prevent their heels coming off the ground. Gentle but firm pressure upwards should be applied by the measurer under the
mastoid process to help the child stretch. In this way the variation in height from morning to evening minimised. Standing height should be recorded to the last completed 0.1cm (ref Irish Clinical Growth Standards, Hoey, Tanner, Cox, Castlemead Publications). Those aged under 2 should be measured supine, with the knees carefully extended with careful attention to head positioning, using the babymat or infantometer.

Weight should be taken in light clothing using a self-calibrating electronic scales appropriate to age.

Head circumference should be measured at the maximal occipito-frontal circumference, taking the largest of 3 consecutive measurements using a narrow non-stretchable tape.

These measurements must then be accurately plotted on a centile chart for interpretation. Plotting of measurements is a further source of error to be guarded against (Cooney et al, Arch Dis Child 1994; 71: 159-60). The appropriate centile chart for the community should be selected which enables comparison with the specific population growth patterns. At all times interpretation should be made in clinical context.

Growth assessment requires accurate measurements using appropriate equipment that is regularly calibrated and maintained. Measurements must be undertaken by a trained measurer. The key to success lies in accurate measurements which can be achieved using standardised methods and training.
Interpreting Growth Data

The desired outcome of analysis of an individual child’s growth is to identify those at increased risk of having an underlying disorder impairing their growth and resulting in short stature or indeed tall stature, and identifying these children at the earliest opportunity. To do this most effectively accurate measures must be taken and these measurements compared with the normal or average growth patterns for the population. Centile charts are a useful way of allowing comparison of an individual measurement for a child against the population pattern. Centile charts allow the use of probability in assessing the likelihood of an individual child having a growth disorder.

A number of types of growth charts exist, these include: cross-sectional; longitudinal; and longitudinal tempo-conditional.

Cross-sectional charts involve the measurement of large numbers of children once. These charts enable global comparisons between and within countries by placing a child's measurements in relation to the normal population. After the age of 9 years they are heavily influenced by the wide variation in the timing of puberty. These charts are unsuitable for tracking the growth of an individual child over time.

Longitudinal growth charts allow assessment of growth of individual children. These are constructed using repeated measurements on the same group of children.

Longitudinal tempo-conditional growth charts are constructed from repeated measurements and pubertal assessment on the same group of children. These charts enable the accurate monitoring of growth of individual children in association with the tempo of their pubertal development, which has such a key influence on growth assessment.

The clinical growth standards for Irish children aged 2-18 years provide tempo-conditional longitudinal height data (Hoey H, Tanner J, Cox L, Clinical Growth Standards for Irish Children. Acta Paediat Scand Supplement 1987;388;1-31), population standards for weight, head circumference and skin fold thickness. These growth standards were derived from accurate measurements of 7,509 children from a single ethnic background, provided by a single trained measurer on high quality standardised calibrated equipment. The methodology on which these standards are based is extremely robust and exceeds that of many national standards, which include, self-reported data, multiple measurers, untrained measurers, varied equipment etc. No comprehensive Irish national standards exist for the under 2’s and the Gardner-Pearson charts were being used. The use of the Gardner Pearson chart has been abandoned in the UK largely as a result of concerns relating to head circumference measurement.

As a result new 9 centile growth charts for the Irish population are being developed and are recommended for National Growth Monitoring. These charts are based on the existing robust Irish population data contained in the clinical growth standards for Irish children aged 2-18 years to which is added the current UK references for those aged 0-2 years (based on composite UK data). These data will be portrayed in the 9 centile line format portraying the 0.4th and 99.6th centile.
Growth tracking of individual children in clinical settings should be carried out using the current 2-18 year Irish longitudinal tempo-conditional growth charts for the reasons outlined above.

**Referral Criteria**

Setting the “reaction points” or “cut-off points” in the growth monitoring programme dictates the sensitivity and specificity of screening. That is, to apply the 0.4\textsuperscript{th} centile as the cut-off point for short stature will increase the likelihood of a child who is below the 0.4\textsuperscript{th} centile having a growth abnormality, but will increase the risk of missing a child with disordered growth (number of false negative or missed cases). It would be expected that 1 child in 260 will be below the 0.4\textsuperscript{th} centile (2.67 SD) line. Setting the 3\textsuperscript{rd} centile as the cut-off reduces the likelihood of missing or delaying the presentation of those with short stature, but will increase the number of false positives, that is, children referred as having a possible growth disorder whose growth is normal (Hindmarsh PC, Monitoring Children’s Growth BMJ 1996:312:122).

Centile based “cut-offs” for referral criteria are arbitrarily chosen statistical reference points, which aim to balance optimal detection of true positive cases (growth disorders) while minimising false positives thereby avoiding unnecessary investigation of normal children within the limited capacity of the healthcare system. Additional information such as, height velocity or measured parental heights would improve the sensitivity and specificity of the programme. (Hindmarsh PC, Cole TJ. Height monitoring as a diagnostic test. Arch Dis Child. 2004; 89: 296- 297). The inclusion of such data was discussed but was not thought feasible at this time.

The choice of referral criteria is controversial in all screening programmes. The endocrinologists participating in the growth symposium developing the referral criteria had strong views suggesting the 3\textsuperscript{rd} percentile be selected as the cut-off point to improve early detection and referral for those with growth disorders. There is concern that choosing the 0.4\textsuperscript{th} centile will result in missing some children with pathological causes of short stature including Turner syndrome, celiac or thyroid disease etc. Concern has also been raised in the UK that this cut-off is too strict also. (Community growth monitoring in practice Agwu JC et al, Arch Dis Child 2004; 89:394-395.) However, the consensus view was that the 0.4\textsuperscript{th} percentile be chosen in the first instance.

The effect of monitoring using this cut point is to be systematically audited with a commitment to revision of the cut-off if children are being missed and presenting late. This programme is to be welcomed as providing the national evidence base on which we can evaluate the appropriate referral criteria. In addition, it must be recognised that other factors influence growth such as, familial growth potential using parental heights and tempo of puberty which are not systematically part of the monitoring programme. As a result it has been agreed that children must be referred at any time if there is clinical concern or parental concern about their growth irrespective of their centile line.
Communication of growth concerns to family and GP is a vital component of the programme.

Continuing evaluation and audit of the growth monitoring programme is vital to ensure that this programme continues to be appropriate for Irish children.
National Standards in Growth Monitoring

Working Group Membership

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Rationale

• The potential benefits of growth monitoring are:
  o Health Promotion
  o Early intervention in growth disorders
  o Identification of and early intervention in chronic disorders associated with abnormal growth
  o Reassurance to parents
  o Epidemiological data collection
• There is insufficient evidence to recommend screening for overweight and obesity, but growth monitoring data can be used to establish prevalence rates.

Recommendations

• Reduced number of mandatory growth monitoring assessments (birth, 6 to 8 week check and school entry), but children should be weighed at opportunistic times including birth, at immunisations and during child health surveillance checks.
• Focus on accuracy of measurement, documentation and interpretation of findings.
• Development of nine centile growth charts based on Irish data.

Equipment

• Electronic self zeroing scales
• Supine length measure (infantometer or babymat)
• Thin non stretchable tape measure
• Age calculator to correct for prematurity until age 2 years
• Leicester height measure (self calibrating)
• Nine centile charts

Referral Criteria

• Below 0.4th centile for weight, length and height
• Seek advice if head circumference below 0.4th or above 99.6th centile
• Parental or professional concern
# Growth Monitoring

<table>
<thead>
<tr>
<th>Timing</th>
<th>History</th>
<th>Examination</th>
<th>Equipment</th>
<th>Health Education</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birth</strong></td>
<td>Gestational age Low birth weight (LBW) Dysmorphic features Major medical problems Parental concerns Professional concerns</td>
<td>Weight (naked) in kg Head circumference in cm</td>
<td>Electronic self-zeroing scales Supine length measure (infantometer or baby mat) Thin non stretchable measure tape Nine centile charts for children with special needs</td>
<td>Nutritional advice Infant care</td>
</tr>
<tr>
<td><strong>Postnatal visit within 48 hours of hospital discharge</strong></td>
<td>Gestational age LBW Dysmorphic features Major medical problems Parental concerns Professional concerns</td>
<td>Weight (naked) in kg Head circumference in cm</td>
<td>Electronic self-zeroing scales Supine length measure Thin non stretchable measure tape Age calculator to correct for prematurity (infants born before 36 weeks gestation) Nine centile charts Nine centile charts for children with special needs</td>
<td>Nutritional advice Infant care</td>
</tr>
<tr>
<td><strong>6 to 8 weeks</strong></td>
<td>As for postnatal visit</td>
<td>Weight (naked) in kg Head circumference in cm</td>
<td>As for postnatal visit</td>
<td>Nutritional advice Infant care</td>
</tr>
<tr>
<td><strong>3 months</strong></td>
<td>As for postnatal visit</td>
<td>Weight (naked) in kg Head circumference in cm</td>
<td>As for postnatal visit</td>
<td>Nutritional advice Infant care Weaning</td>
</tr>
<tr>
<td><strong>7 to 9 months</strong></td>
<td>As for postnatal visit</td>
<td>Weight (naked) in kg Head circumference in cm</td>
<td>As for postnatal visit</td>
<td>Nutritional advice Infant care Weaning</td>
</tr>
<tr>
<td><strong>18 to 24 months</strong></td>
<td>As for postnatal visit</td>
<td>Weight (light clothing) in kg Height in cm</td>
<td>Leicester Height Measure (self-calibrating) Electronic self-zeroing scales Nine centile charts Nine centile charts for children with special needs</td>
<td>Nutritional advice Active play</td>
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<tr>
<td><strong>3.25 to 3.5 years</strong></td>
<td>Medical history Parental concern Professional concern</td>
<td>Weight (light clothing) in kg Height in cm</td>
<td>Leicester Height Measure (self-calibrating) Electronic self-zeroing scales Nine centile charts Nine centile charts for children with special needs</td>
<td>Nutritional advice Active play</td>
</tr>
<tr>
<td><strong>School entry (Junior Infants)</strong></td>
<td>Parental concern Professional concern Health questionnaire to elicit underlying chronic illness</td>
<td>Weight in kg (light clothing) Height in cm BMI for epidemiological purposes</td>
<td>Leicester Height Measure (self-calibrating) Electronic self-zeroing scales Nine centile charts Nine centile charts for children with special needs</td>
<td>Nutritional advice Active play</td>
</tr>
</tbody>
</table>

Please note: *Italics* indicate items not fulfilling screening criteria, but constituting accepted good clinical practice or requirements under a growth monitoring programme for children at risk of or with established growth disorders.
Appendix A

Growth Monitoring
Recommendations for Children in Ireland

Summary Report
From
the National Growth Monitoring Symposium

Introduction

Growth monitoring is an integral part of child health surveillance and screening. There currently is diversity in practice and opinion regarding the use of standardised growth monitoring tools and the application of referral criteria and pathways and no nationally accepted tools are available. Ongoing international debate is taking place on these issues. Similar discussions had been addressed successfully by a consensus approach in other countries. In an attempt to access a high level of expertise, it was decided to convene a growth monitoring symposium with national and international experts to make evidence based recommendations for growth monitoring of children in Ireland.

Methodology

Aim

• To achieve consensus on recommendations for a growth monitoring programme as part of the national statutory core child health programme in line with evidence for quality assured and equitable service delivery to children, leading to improved health outcomes through early identification and intervention.

Objectives

• To identify evidence based research and examples of best practice
• To discuss and agree national recommendations for growth monitoring of children in Ireland
• To develop guidance for practitioners on use of growth monitoring tools and application of appropriate criteria and pathways
• To provide a basis for standardised training of community based practitioners in growth monitoring
Process

The above objectives were addressed by participants in two parallel workshops:

1. **Evidence based practice for population based growth monitoring of children in Ireland:**
   - Whether and when to screen
   - Growth velocity measurement accuracy in routine settings
   - Growth monitoring as a public health function
   - Measurement precision, recording and quality assurance over time

2. **Growth charts and referral criteria for population based growth monitoring of children in Ireland.**

A draft report was circulated for comments and approval to all participants. Following two revisions, it was endorsed by all except one participant.

Recommendations

A. **GENERAL RECOMMENDATIONS**

   Children need to be considered within their family and community background.

   Growth monitoring forms part of a whole child service and must be viewed in the context of a holistic approach.

   Normal growth is a good indicator of well being.

   As in any other screening programme, communication with parents and professionals regarding limitations of growth monitoring and screening needs to be ensured to avoid false reassurance of parents about the growth of children.

   Information sharing between child health service providers needs to be improved, especially in relation to children considered to be at risk of growth disorders.

   Introduction of the Parent Held Record (PHR) to facilitate information sharing with parents and between service providers is strongly recommended.

   Information for and communication with parents is essential, including the provision of support and education for healthy nutrition, growth and development, especially in light of increasing evidence of the effectiveness of health promotion.

   Parental and professional concern always needs to be heeded and acted upon.
Crossing centile channels is not uncommon in healthy normal children under the age of 2 years, but becomes progressively uncommon thereafter. It can be absent on growth disordered children and is therefore not a reliable indicator to identify children with growth disorders in community settings. It is of value to monitor the growth of individual children in paediatric settings.

Screening for childhood overweight and obesity is currently not supported by available evidence, but community practitioners involved in growth monitoring programmes need to be informed about appropriate preventative and therapeutic interventions for children at risk of or with manifest overweight or obesity.

Further discussion is required on definition of overweight and obesity for children in Ireland, based on nine centile charts under development, primary prevention programmes, secondary prevention and interventions for children at risk of or with manifest overweight and obesity and the usefulness of defined growth measurement thresholds to identify children in need of such interventions.

Ongoing monitoring and audit is required to ensure that objectives of screening programmes are met and that referral criteria remain appropriate.

B. WORKSHOP 1

EVIDENCE BASED PRACTICE FOR POPULATION BASED GROWTH MONITORING OF CHILDREN IN IRELAND

Children to be screened at birth, 6-8 weeks and at school entry

In addition, it is good clinical practice to measure growth in children as part of scheduled assessments and immunisation visits, as well as opportunistically.

- It is useful to have a growth measurement at 2-3 years of age.
- All measurements should be plotted on growth charts contained in PHR.

Children in need of further assessment and investigation must be clearly identifiable, using standardised referral criteria.

There must be adequate resources for investigation and treatment:
Adequate staffing is essential.
Role of community medical officers and interface with community paediatricians needs to be clarified.
Facilities are currently inadequate, especially in health centres and schools. Department of Education has a role in the provision of adequate facilities for school health services according to Health Act, 1970.

Data are collected and analysed to generate population health information on epidemiological trends.

It is critical that the issue of a unique personal identifier is addressed. Information must be contained and recorded in Personal Health Record.
PHR IT support system needs to be introduced nationally to support data analysis and map epidemiological trends. Consent and data protection issues need to be addressed.

Explicit standards for staff training, equipment and facilities are developed.

It is essential that all staff have an understanding of normal growth and disorders potentially identified by growth monitoring. Ongoing training and assessment of practice is required to ensure appropriate growth monitoring technique and interpretation of findings.

Protocols for evidence based practice are reviewed regularly.

Quality assurance mechanisms are essential to maintain a high standard of performance. This includes:

- Audit of referral outcomes
- Observation of examination technique
- Accuracy of documentation
- Checking instrument calibration
- Corrective action if problem identified

Growth velocity assessment in population settings is not recommended. Estimates of growth velocity, even under optimal conditions, are imprecise and can lead to delays in referral or false reassurance.

C. WORKSHOP 2

GROWTH CHARTS AND REFERRAL CRITERIA FOR POPULATION BASED GROWTH MONITORING OF CHILDREN IN IRELAND

Irish growth charts

It is recommended to incorporate current UK growth charts for 0 – 2 year olds into nine centile charts based on Irish growth standard data for 2 – 18 year olds (Hoey et al).

Charts for weight, length and height as well as body mass index will be developed.

Charts for ethnic minorities are not recommended. The differential of normal growth between different ethnic groups tends to be small, except for children of African origin. In the absence of growth charts for a child from a particular ethnic group, parental height adjustment can be used in the assessment of that child.

Referral criteria for weight, height and length
The 0.4 centile represents the cut off below which all children are referred promptly. This adds clarity to the broader range of children at risk below the second centile on UK growth charts or third centile on existing Irish growth charts.

In relation to children at risk of growth disorders, parental and professional concern needs to guide the decision making process whether to refer children for investigation or not.

It is important to improve communication regarding children to be perceived at risk of disordered growth through improved information exchange between health service providers. This process will be supported through the introduction of the PHR.

**Children aged 0 – 2 years**

**Weight**

Weight above the 99.6 centile is not considered a useful threshold for referral, as there is no evidence for effective interventions for that particular group of children compared to others who are considered overweight.

**Weight faltering**

Especially during infancy, there are variations in weight gain depending on age. It is not possible to make an overall statement to describe normal weight velocity.

Existing research on patterns of weight gain has failed to establish a consensus on referral criteria based on centile crossing. Clinical assessment and decision making needs to be supported through community staff training.

**Length**

Length above 99.6 centile is not useful as a referral threshold in the context of a screening programme, as length measurements in infancy are difficult to perform with accuracy. There is rapid growth during infancy, and length measurements confer little, if any, additional benefit compared with weight measurements.

**Head circumference**

Head circumference is inaccurate at birth due to moulding. A measurement taken at the first postnatal visit carried out within 48 hours from hospital discharge by the public health nurse is preferable.

Head circumference measurements are of questionable value, unless there are concerns. If a measurement below the 0.4th or above the 99.6th centiles is found, advice should be sought. Most parents want to know if their child has a serious illness, but it can take time to arrive at the decision whether the child has a
health problem or not, and care must be taken not to create parental anxiety through repeated measurements and time delays in reaching a diagnosis.

No definite recommendation for referral of infants with a head circumference below the 0.4 centile can be made. There is no evidence that additional cases of microcephaly are detected in this way. While effective treatments and other benefits of early detection and intervention for microcephaly are lacking, it is occasionally useful for clinical purposes to elicit the cause of microcephaly.

No definite recommendation for referral above a certain centile, including 99.6th, can be made, as many healthy children are above the 99.6th centile. Familial large head is common, and measurement of parental head circumference is recommended to identify such cases where a child is found to have a large head.

On very rare occasions, an increase of head circumference can be the only clinical sign of an underlying pathological process. Centile crossing can be an indication for this, and where parents or professionals have concerns, referral is indicated.

**Recommendation:** The national longitudinal study of child health and well being offers an opportunity to carry out head circumference measurements in babies. These could be used to generate head circumference measurement charts appropriate to Irish infants and young children. An audit into referrals for increased head circumference, as well as suspected microcephaly, would be required to test the validity of a referral threshold for existing and newly developed charts.

**Children aged 2 – 12 years**

**Height**

Height above the 99.6 centile is not useful as a referral threshold because children rarely present with excessive longitudinal growth as the sole indicator of a pathological process. But if there is concern of parents or primary care practitioners about rapid or excessive growth, referral for investigation needs to be made.

**Weight**

Weight needs to be considered in relation to height, but comparisons of weight and height centile charts are fraught with difficulty.

The value of BMI as a clinical tool in community settings is of uncertain value. Its interpretation requires expertise, and its value lies mainly in public health.

It is unhelpful to define a BMI centile, above which a referral for investigation or treatment should be made, as childhood overweight and obesity develops on a continuum. BMI based adult cut-off points are based on known health risk, while corresponding relationships in children have not been established.
While there is a strong argument for primary population based prevention, the evidence for the effectiveness of secondary childhood overweight and obesity prevention is currently not strong, but this might change with time. In view of the complex nature of the factors contributing to childhood overweight and obesity, multifaceted health education and promotion programmes aimed at developing healthy lifestyles need to reach all children in the settings of their families, communities and schools.

**Recommendation:** Further discussion is required on the following issues:

- Definition of overweight and obesity for children in Ireland, based on nine centile charts under development

- Primary prevention programmes

- Secondary prevention and interventions for children at risk of or with manifest overweight and obesity.

- Usefulness of defined growth measurement thresholds to identify children in need of such interventions

- Role of parents and health professionals in addressing childhood obesity epidemic
References


Cooney et al, Arch Dis Child 1994; 71: 159-60.


