Test-retest reliability and construct validity of Toddler NutriSTEP (registered trademark)

by

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ABSTRACT

TEST-RETEST RELIABILITY AND CONSTRUCT VALIDITY OF TODDLER NUTRISTEP®

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University of Guelph, 2012

This research represents phase C in the development of Toddler NutriSTEP® (Nutrition Screening Tool for Every Preschooler). NutriSTEP® is a valid and reliable screening tool designed to assess nutritional risk in preschoolers (3-5 years). A draft toddler (18-35 months) version of NutriSTEP® has recently been developed because of an expressed need. Convenience samples of caregivers were recruited across Ontario to assess the test-retest reliability and construct validity of the tool. Test-retest reliability was assessed based on total score and attribute scores using paired sample t-tests and intraclass correlation coefficients; individual questions were assessed using Wilcoxon signed rank tests and kappa statistics. Construct validity was assessed through comparison of high-risk groups to Toddler NutriSTEP® scores, as well as through exploratory and confirmatory factor analyses. Toddler NutriSTEP® was found to be test-retest reliable and construct valid, and therefore may be used to assess nutritional risk in Canadian toddlers.
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# Table of Contents

Acknowledgments .......................................................................................... iii
List of Tables .................................................................................................. viii
List of Figures ................................................................................................. ix
List of Abbreviations ....................................................................................... x

1.0 Introduction ............................................................................................... 1

2.0 Review of the Literature ............................................................................. 4

2.1 Nutrition Risk and Nutrition Screening .................................................. 4

2.2 Nutrition Screening Tools .......................................................................... 5
  2.2.1 Development of Nutrition Screening Tools ......................................... 5
  2.2.2 Assessing Reliability and Validity in Nutrition Screening Tools ........... 10
    2.2.2.1 Reliability ......................................................................................... 10
    2.2.2.2 Validity .......................................................................................... 13
  2.2.3 Existing Nutrition Screening Tools ....................................................... 18
    2.2.3.1 NutriSTEP® ..................................................................................... 18
    2.2.3.2 PEACH .......................................................................................... 20
    2.2.3.3 PNSC ............................................................................................ 21
    2.2.3.4 CEBQ ............................................................................................ 22
    2.2.3.5 Limitations of Existing Tools .......................................................... 23

2.3 Toddler Nutrition ....................................................................................... 24
  2.3.1 Nutrition Screening in Toddlers ............................................................. 24
  2.3.2 Toddler Nutritional Issues ..................................................................... 26
    2.3.2.1 Food and Fluid Intake ..................................................................... 26
    2.3.2.2 Introduction of Table Foods ............................................................ 29
    2.3.2.3 Changes in Milk Consumption ....................................................... 31
    2.3.2.4 Juices and Sweetened Beverages ................................................... 32
    2.3.2.5 Factors Affecting Food Intake ........................................................ 33
    2.3.2.6 The Feeding Relationship ............................................................... 34
    2.3.2.7 Physical Growth ............................................................................. 35
    2.3.2.8 Physical Activity and Sedentary Behaviour ................................... 36
  2.3.3 Toddler NutriSTEP® ............................................................................ 37
3.0 Rationale and Purpose of the Study ................................................................. 41
4.0 Methodology .................................................................................................... 42
4.1 Sample and Eligibility .................................................................................... 42
   4.1.1 Recruitment .............................................................................................. 43
   4.1.2 Incentives ................................................................................................ 44
4.2 Data Collection ................................................................................................ 44
   4.2.1 Ethical Considerations ............................................................................ 44
   4.2.2 Researcher Training .............................................................................. 45
   4.2.3 Process .................................................................................................... 45
      4.2.3.1 First Visit – Test-Retest Reliability and Validation ....................... 45
      4.2.3.2 Second Visit – Test-Retest Reliability .......................................... 46
      4.2.3.3 Second Visit – Validity ................................................................. 46
4.3 Data Entry ........................................................................................................ 49
4.4 Data Analysis ................................................................................................... 50
4.5 Summary and Next Steps .............................................................................. 53
5.0 Results ............................................................................................................. 54
5.1 Study Samples .................................................................................................. 54
5.2 Test-Retest Reliability .................................................................................... 59
5.3 Construct Validation ....................................................................................... 62
      5.3.1 Comparison of Parent Demographics to Toddler NutriSTEP® Scores ... 63
      5.3.2 Comparison of Child’s Actual Weight to Parent Perceptions .......... 66
      5.3.3 Factor Analysis ................................................................................. 67
5.4 Summary .......................................................................................................... 82
6.0 Discussion ........................................................................................................ 83
6.1 Study Participants ........................................................................................... 83
6.2 Test-Retest Reliability .................................................................................... 87
6.3 Construct Validity ........................................................................................... 90
      6.3.1 Comparison of Parent Demographics to Toddler NutriSTEP® Scores ... 90
      6.3.2 Comparison of Child’s Actual Weight to Parent Perceptions .......... 93
      6.3.3 Factor Analysis ................................................................................. 94
6.4 Strengths ......................................................................................................... 98
List of Tables

Table 5.1: Demographic characteristics of participants……………………………………56
Table 5.2: Comparison of participants completing the study to drop-outs…………………58
Table 5.3: Reliability statistics of total score and individual attribute scores for Toddler NutriSTEP®…………………………………………………………………………..60
Table 5.4: Reliability statistics on individual questions for Toddler NutriSTEP®…………61
Table 5.5: Reliability results of high vs low income participants…………………………62
Table 5.6: Construct validation statistics for Toddler NutriSTEP®…………………………65
Table 5.7: Comparison of child’s weight to parent’s perceptions of child’s weight (Q17 on Toddler NutriSTEP®)………………………………………………………………………76
Table 5.8: Hypothesized attribute structure of Toddler NutriSTEP®…………………………68
Table 5.9: Exploratory factor analysis of Toddler NutriSTEP®……………………………69
Table 5.10: Confirmatory factor analysis goodness of fit statistics…………………..76
List of Figures

Figure 1.1: Steps in the development of a nutrition risk screening tool…………………………9
Figure 2.1: Steps in the development of Toddler NutriSTEP®………………………………40
Figure 5.1: Flow of participants in the validation and reliability studies.............................54
Figure 5.2: Confirmatory factor analysis of the three factor model.................................78
Figure 5.3: Confirmatory factor analysis of the five factor model.................................79
Figure 5.4: Confirmatory factor analysis of the six factor model.................................80
Figure 5.5: Confirmatory factor analysis of the proposed attribute structure.................81
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGFI</td>
<td>Adjusted goodness-of-fit index</td>
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<td>ANOVA</td>
<td>Analysis of variance</td>
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<td>BMI</td>
<td>Body mass index</td>
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<td>CEBQ</td>
<td>Children’s Eating Behaviour Questionnaire</td>
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<td>CFI</td>
<td>Comparative fit index</td>
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<tr>
<td>CMIN/DF</td>
<td>Minimum discrepancy to degrees freedom ratio</td>
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<tr>
<td>FITS</td>
<td>Feeding Infants and Toddlers Study</td>
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<tr>
<td>GFI</td>
<td>Goodness-of-fit index</td>
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<tr>
<td>ICC</td>
<td>Intraclass correlation coefficient</td>
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<tr>
<td>NutriSTEP®</td>
<td>Nutrition Risk Screening Tool for Every Preschooler</td>
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<td>PCFI</td>
<td>Parsimony comparative fit index</td>
</tr>
<tr>
<td>PEACH</td>
<td>Parent Eating and Nutrition Assessment for Children with Special Health Needs</td>
</tr>
<tr>
<td>PNSC</td>
<td>Parent Nutrition Screening Checklist for Children with Special Needs</td>
</tr>
<tr>
<td>RMSEA</td>
<td>Root mean square error of approximation</td>
</tr>
<tr>
<td>ROC</td>
<td>Receiver operating characteristic</td>
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<tr>
<td>SCREEN©</td>
<td>Seniors in the Community: Risk Evaluation for Eating and Nutrition</td>
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<tr>
<td>SES</td>
<td>Socioeconomic status</td>
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<tr>
<td>STEP-CHILD</td>
<td>Screening Tool of Feeding Problems applied to children</td>
</tr>
<tr>
<td>TLI</td>
<td>Tucker Lewis index</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WIC</td>
<td>Special Supplemental Nutrition Program for Women, Infants and Children</td>
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1.0 Introduction

Nutritional habits are developed early in life and are vital to the health, growth, and development of a child (Ponza, Devaney, Ziegler, Reidy & Squatrito, 2004; Savage, Orlet Fisher & Birch, 2007; Siega-Riz et al., 2010; Weaver, 2007). Proper nutrition throughout childhood will lead to optimal growth and development, while maintaining these healthy habits in adulthood may help prevent chronic disease (American Dietetic Association, 2004; Weaver, 2007). Children in particular are vulnerable to inadequate nutrition, as many eating transitions occur throughout early childhood including the development of taste preferences and transitions from breast milk/formula to solid foods (Briefel, Reidy, Karwe, Jankowski, & Hendricks, 2004). It is therefore essential that nutritional issues occurring in childhood are addressed early on to ensure that health problems and chronic disease risk are reduced (Weaver, 2007).

One stage of childhood that is of particular importance to nutritional health is toddlerhood, as it is a stage of rapid growth and development, which needs to be fueled by sufficient nutrient intake (Ponza et al., 2004; Savage et al., 2007). Toddlerhood is the time that children learn what, when and how much to eat, which is heavily influenced by the environment in which they live (Savage et al., 2007). Toddlers are particularly vulnerable to nutritional risk, since inadequate intake of essential nutrients during this stage may result in impaired development and poor health (Ponza et al., 2004). Furthermore, although there is a wealth of information available to parents on feeding infants, resources regarding how to feed a toddler are much less common (Weaver, 2007). For these reasons, it is especially important that health care professionals focus on providing sufficient advice to parents concerned with their toddlers’ eating habits (Savage et al., 2007).
Having a quick and easy way of identifying toddlers with poor nutritional habits, and who therefore may be at risk of developing health problems, is of great importance (American Dietetic Association, 2004; Briefel et al., 2004; Dwyer, Butte, Deming, Siega-Riz et al., 2010; Weaver, 2007). This can be accomplished through nutrition risk screening (American Dietetic Association, 1994). Currently, instead of the promotion of healthy nutritional habits in toddlers, our health care system focuses more on treating any diseases or illnesses related to poor nutrition in toddlers after problems have already developed (Weaver, 2007). Moreover, because of limited resources, nutrition health care professionals, such as registered dietitians, have limited time available to meet with caregivers of healthy toddlers to ensure they are free of nutritional risk factors (American Dietetic Association, 1994; Baer & Harris, 1997; Schlenker, Cocking & Gilley, 2003). As the health care system evolves towards prevention of disease, nutrition screening in all age groups is becoming more important (American Dietetic Association, 1994; Charney, 2008; Keller, Brockest & Haresign, 2006); however there are no known community-based nutrition screening tools designed for toddlers.

A nutrition screening tool for toddlers could be used for many purposes. First of all, the screening tool would help to identify toddlers at nutritional risk, and therefore provide an opportunity for early intervention for those identified as at risk (American Dietetic Association, 1994; Keller, Brockest & Haresign, 2006). Secondly, a nation-wide screening tool could be used to prioritize and refer those at greatest risk to the help they need (Keller et al., 2006). Thirdly, the screening tool may be used in advocacy; highlighting the number of toddlers at nutritional risk may identify communities or populations that require greater
nutritional support (Keller et al., 2006). Finally, a tool that identifies toddlers at nutritional risk would be useful in providing support and nutrition resources to parents.

The Toddler NutriSTEP® (Nutrition Screening Tool for Every Preschooler) development study is a four-phase research project that aims to develop a community-based, parent-administered nutrition screening tool that will identify toddlers at nutritional risk. The first two phases, content validity and refinement, have already been conducted, and have culminated in the production of a draft Toddler NutriSTEP®. The current study will focus on the third phase of the Toddler NutriSTEP® development study, which consists of determining the construct validity, test-retest reliability, and an attribute affirmation of the Toddler NutriSTEP®. The final phase, criterion validation, is the focus of another article.
2.0 Review of the Literature

2.1 Nutrition Risk and Nutrition Screening

Nutrition risk is the presence of characteristics associated with malnutrition, which includes both over- and under-nutrition (American Dietetic Association, 1994; Keller et al., 2006). Nutrition screening involves identifying those individuals who are at nutrition risk and in need of further nutrition assessment, and potentially intervention (American Dietetic Association, 1994; Charney, 2008; Keller et al., 2006). To be most efficient, screening for nutrition risk involves large numbers of individuals, and therefore must be inexpensive, quick, and non-invasive. The process of screening precedes nutrition assessment, which differs from nutrition screening in that it is a much more in-depth look at an individual’s nutritional status that occurs after an individual is identified as at risk (American Dietetic Association, 1994; Keller, 2007). The results of the nutrition assessment lead to a planned intervention for the individual being screened (American Dietetic Association, 1994; Keller, 2007). Nutrition risk screening therefore streamlines those individuals in need of nutritional assessment, as well as prioritizes individuals at the greatest risk who need assessment and interventions immediately (Keller et al., 2006).

Nutrition screening can be considered a form of secondary prevention in health care, as it involves the early detection of individuals who may be at risk for nutritional problems, allowing these individuals to be directed towards treatment (Keller et al., 2006; Keller, 2007). As the focus of our health care system continues to shift from the treatment of disease towards the prevention and early detection of disease, the process of nutrition screening is of growing importance in both community and clinical settings (American Dietetic Association, 1994; Charney, 2008; Keller et al., 2006). In the community, malnutrition contributes greatly
to the mental and physical health of an individual; therefore, early identification of malnutrition or the risk of malnutrition may prevent a loss of function, illness, or chronic disease (Kondrup, Allison, Elia, Vellas, & Plauth, 2003). Malnutrition in clinical settings is associated with increased morbidity and mortality, as well as increased length of stay in a hospital and cost to the health care system (Jones, 2002; Kondrup et al., 2003; Weekes, Elia, & Emery, 2004). It is therefore necessary to identify any risk for malnutrition in a clinical setting early on to reduce these costs to the individual and society (Jones, 2002).

2.2 Nutrition Screening Tools

Nutrition screening tools are used to identify individuals at nutritional risk. These tools must be easy to complete, cost-effective, quick, and able to identify individuals at nutritional risk (American Dietetic Association, 1994; Keller et al., 2006). These characteristics are essential, as they define the difference between nutrition screening tools and nutrition assessments, which are far more complex and in-depth (American Dietetic Association, 1994).

A nutrition screening tool is usually a self-administered questionnaire or a check-list of characteristics associated with malnutrition (Jones, 2002). Screening tools should be designed to assess the current nutritional risk of the individual, giving the individual a score that is indicative of their degree of risk, thereby prioritizing further assessment or intervention (Kondrup et al., 2003).

2.2.1 Development of Nutrition Screening Tools

In order to fully evaluate the effectiveness of a nutrition risk screening tool, development must be comprehensive and fully documented (Jones, 2002; Jones, 2004a; Keller, Hedley & Wong, 2000). In the past, not enough emphasis has been placed on
publishing sufficient information regarding nutrition screening tool development and validity/reliability testing, preventing one from judging whether or not the screening tool is actually effective in screening for malnutrition (Jones, 2002). Guidelines should be followed to enhance the progress of research in this area, as well as to standardize the process of tool development. A few comprehensive guides to health measurement scale/nutrition screening tool development have been found that follow similar guidelines for tool development (Jones, 2004a; Keller et al., 2000; Streiner & Norman, 1995). The specific steps for developing a screening tool can be seen in Figure 1, and are discussed in more detail below.

When beginning the process of tool development, the target population and purpose for use must be clearly defined by the researchers (Jones, 2004a; Keller et al., 2000). Once the target population and purpose of the tool have been defined, a review of the literature should be conducted to ensure no similar tool exists (Jones, 2004a; Keller et al., 2000; Streiner & Norman, 1995). Any existing tools found in the literature should be critically appraised based on their described development procedures, as well as on validity and reliability testing (Keller et al., 2000). Upon determining that there is no existent or appropriate nutrition screening tool, a study protocol should be designed describing all aspects of the developmental process including a detailed description of the target population, how subjects will be recruited, the training the researchers and research assistants will receive, how actual nutrition status will be measured, a description of groups believed to be of particularly high risk, and a timeline for the study (Jones, 2004a).

After a study protocol has been outlined, tool development may begin. The first step in the development of the nutrition screening tool itself is the identification of variables associated with malnutrition in the target population. These factors can be identified through
an in-depth literature review, clinical judgment, and consultation with experts and/or the
target population themselves (Jones, 2004a; Keller et al., 2000; Streiner & Norman, 1995).
After the risk variables have been identified, content validity must be assessed by the
researchers, through consultation with experts in the area, to ensure that all areas of
malnutrition in the population have been identified in the risk variables, as well as to ensure
that all risk variables identified are relevant to the target population (Jones, 2004a; Keller et
al., 2000; Streiner & Norman, 1995). Once content validity has been established, the risk
variables should be laid out in the format in which the tool is to be presented (Jones, 2004a;
Keller et al., 2000). To ensure the tool can be completed with ease in the target population,
the researchers should then complete a pilot study testing all aspects of the tool’s use,
including the time it takes to complete the tool, the ease with which the tool can be
administered and completed, the understandability of instructions and questions, and the
layout of the tool itself (Jones, 2004a; Keller et al., 2000; Streiner & Norman, 1995).
Following the pilot study, the researchers should make any necessary modifications to the
tool content and layout based on user feedback, thereby creating a revised screening tool
(Jones, 2004a). This revised tool can then be tested for reliability and validity in the target
population (Jones, 2004a; Keller et al., 2000). The validation study results can be used to
establish a cutoff score, the score at which an individual is considered to be at nutritional risk
(Jones, 2004a; Keller et al., 2000; Streiner & Norman, 1995). This cutoff score should be
established keeping estimates of sensitivity and specificity in mind, choosing the cut point
that minimizes the number of errors (both false negatives and false positives), while
maximizing the number of true cases of malnutrition identified (Jones, 2004a; Keller et al.,
2000; Streiner & Norman, 1995).
Jones (2002) conducted a review of various nutrition screening and assessment tools, to critically appraise the methodology of their development. It was concluded that of the 44 tools identified, only four tools presented sufficient information to the reader on their development, including a justification of their content and an assessment of the tool within the target population (Jones, 2002). A literature search identified several additional nutrition screening tools that were not included in the review, developed for various target populations. Of the seven additional tools identified, only five tools were found to have detailed descriptions of tool development (Keller, Goy, & Kane, 2005; Laporte, Villalon, & Payette, 2001; Randall Simpson, Keller, Rysdale, & Beyers, 2008; Sermet-Gaudelus et al., 2000; Weekes et al., 2004) while two did not describe tool development (Burden et al., 2001; Lohse, Satter, Horacek, Gebreselassie, & Oakland, 2007). Therefore, there is a lack of nutrition screening tool development procedures in the current literature.
Figure 1.1: Steps in the development of a nutrition risk screening tool.

- **Review literature**
  Conduct a literature review to ensure that no similar tool exists for the target population.

- **Identify risk variables**
  Through examining the current literature and clinical judgment, identify any variables believed to be associated with malnutrition in the target population.

- **Validate content**
  Consult expert opinion on the risk variables identified to ensure the relevance and completeness of the variables identified to the concept of malnutrition.

- **Create a draft tool**
  Based on the risk variables identified and the content validation, create a draft tool in the format desired for the final tool.

- **Pilot**
  Conduct a pilot test on the draft tool assessing the tool for ease of use (understandability, layout, etc.)

- **Refine**
  Refine the tool by removing any variables identified in the analysis to be non-significantly related to the construct of malnutrition.

- **Assess validity and reliability**
  Test the refined tool for validity and reliability in the target population.

Source: Jones, 2004a; Keller, et al., 2000; Streiner & Norman, 1995
2.2.2 Assessing Reliability and Validity in Nutrition Screening Tools

It is necessary for a nutrition screening tool to have established effectiveness before being used in practice, both for ethical and practical reasons (Jones, 2002; Keller et al., 2006; Keller et al., 2005). That is to say, the reliability and validity of the nutrition screening tool must be established in advance of using the tool (Jones, 2004a; Streiner & Norman, 1995). The reliability of a tool describes its ability to yield consistent results across varying settings, with different administrators (if appropriate), and over time (Jones, 2004b; Keller et al., 2000; Kondrup et al., 2003). The validity of a screening tool describes the ability of the tool to differentiate between individuals who are and are not at risk, thereby ensuring the tool is actually measuring the construct that it was designed to measure (Jones, 2004a; Jones, 2004c; Keller et al., 2000; Kondrup et al., 2003). Using a tool that has not been proven to be reliable or valid in practice would be unethical, as many false positives or false negatives may unknowingly occur (Keller et al., 2005). Studies of validity and reliability should be carried out on the target population in the setting in which the tool is intended to be used, using different participants than those used in the tool development studies (Jones, 2004a; Keller et al., 2006).

2.2.2.1 Reliability

A tool is said to be reliable when similar results for the same individual are obtained across different times, settings, and with different administrators (Jones, 2004b; Streiner & Norman, 1995). That is to say, the tool remains consistent and results remain reproducible across various circumstances, indicating a tool that has little systematic or measurement error associated with its use (Streiner & Norman, 1995). There are several types of reliability that can be assessed on a tool. Intra-observer reliability refers to the consistency of a single rater
when administering the same tool to the same individual on two separate occasions (Jones, 2004b; Streiner & Norman, 1995). Inter-observer reliability refers to the consistency between two different raters administering the same tool to the same individual (Jones, 2004b; Streiner & Norman, 1995). These two forms of reliability are only applicable to those nutrition risk screening tools that are administered by a health care professional, and not those that are self-administered by the individual who is being screened themselves. Test-retest reliability relates to nutrition screening tools that are self-administered. This form of reliability describes the consistency of the tool when one individual completes the screening tool on two or more separate occasions (Jones, 2004b; Keller et al., 2000; Streiner & Norman, 1995).

The test-retest reliability of the tool is measured by completing the same tool twice, and then comparing the two occasions (Streiner & Norman, 1995). Statistically, there are several ways to assess reliability. Paired samples t-tests can be used to see whether or not the difference in scores between the two administrations is significant or not (Field, 2009). However, since this test assumes that data are at the interval level, it is appropriate for testing differences between total scores and attribute scores, but inappropriate for testing differences between individual questions or tools which are categorical data (Field, 2009). With categorical data, Wilcoxon signed-rank tests are appropriate, since this test does not depend on the assumption of interval data (Field, 2009). In both of these cases, when examining the reliability of the tool a non-significant result is desired to show that the score or response option was not significantly different between administrations.

The kappa statistic can also be examined to quantify the reliability of the tool if the outcome is a dichotomous variable (risk/no risk) (Jones, 2004b). The kappa statistic is a
number between 0 and 1, with higher values indicating better reliability (Jones, 2004b). Specifically, it is recommended that Shrout’s method of interpreting kappa values be used in reliability studies of nutrition risk screening tools; kappa statistics above 0.4 reflect fair reliability, while those above 0.6 reflect moderate reliability, and those above 0.8 indicate substantial reliability (Jones, 2004b). The intraclass correlation coefficient (ICC) is used for measures with several categories or for linear measures, and is appropriate for use in samples that include non-independent data (Field, 2009). Similar guidelines are used for interpretation of ICC, which also ranges from 0-1.0 (Streiner & Norman, 1995). Kappa statistics and ICC may be preferred to t-tests when assessing reliability because these two statistical tests enable us to quantify how similar the score is across administrations, whereas the t-test only assesses whether or not the scores obtained on two occasions are significantly different.

Another commonly used method to assess reliability of nutrition risk screening tools is to examine the Pearson’s correlation of the data between administrations (Streiner & Norman, 1995). However, this method often overestimates true reliability in comparison to intraclass correlations, and also assumes data are independent, and therefore ICC is often preferred to this method (Field, 2009; Streiner & Norman, 1995). Cohen (1988) suggests that a Pearson’s correlation of greater than 0.5 can be considered to be a large correlation, while correlations greater than 0.8 can be considered very large.

Jones (2002) found reliability to be assessed in only 20 of 44 (45%) nutrition screening and assessment tools that she identified in the literature. Of these 20 studies, only one referenced a sample size calculation, while five studies used inappropriate analysis methods to quantify reliability (Jones, 2002). Of the seven additional screening tools not examined by Jones, only four assessed the reliability of the tool (Burden et al., 2001; Keller
et al., 2005; Randall Simpson et al., 2008; Weekes et al., 2004), while three studies did not (Laporte et al., 2001; Lohse et al., 2007; Sermet-Gaudelus et al., 2000). This indicates some lack of attention to reliability for tools that have been developed to date. Hence, more emphasis must be placed on reliability testing when developing nutrition risk screening tools, as a tool must give the same result on repeat administration to ensure ethical and practical screening (Keller et al., 2006).

2.2.2.2 Validity

There are many different types of validity that can be assessed on a health measurement tool, all of which describe the tool’s ability to measure what it is designed to measure (Jones, 2004c). The three types of validity that will be discussed in this literature review are content validity, construct validity, and criterion validity. Content validity is usually tested during tool development, as it relates to the selection of risk variables for the tool, while criterion and construct validity are assessed once the tool has been fully developed (Jones, 2004c).

The content validity of a nutrition screening tool reflects the degree to which all relevant components of the construct of nutrition risk in the population are included in the tool (Jones, 2004c; Kondrup et al., 2003; Streiner & Norman, 1995). Assessing the tool’s content validity ensures the tool includes all variables related to nutrition risk in the population and that all variables not important to the construct of nutrition risk are not included in the tool (Jones, 2004a; Jones, 2004c; Streiner & Norman, 1995).

Content validity is generally assessed midway through the process of tool development, as it is closely related with the actual selection of risk variables in the tool development phase (Jones, 2004c). To assess the content validity, generally various
stakeholders, including experts in the field, clinicians, and individuals from the population on which the tool is to be used, are consulted and asked to give feedback on the relevance and completeness of all risk variables identified (Jones 2004a; Jones 2004c; Kondrup et al., 2003; Streiner & Norman, 1995); formal ranking of relevance of items distinguishes content validity from face validity.

The criterion validity of a nutrition screening tool reflects the extent to which the tool relates to other measures of nutrition risk or malnutrition with proven validity (Remler & Van Ryzin, 2011; Streiner & Norman, 1995). That is to say, a tool will demonstrate criterion validity if those who are identified as being at nutritional risk by the tool are also identified as being at nutritional risk by some “gold standard” method (Jones, 2004c). If a tool is valid it is able to differentiate between those who are at nutritional risk, and those who are not at risk (Jones, 2004c). This is usually assessed through having the same subjects complete the newly-developed nutrition screening tool, as well as a second “gold standard” method of measuring nutritional status in the population, and then examining the agreement between the two methods (Jones, 2004c; Streiner & Norman, 1995). In the case of measuring nutritional status, there is no clear method that is identified as the “gold standard” measure (Jones, 2004c). Therefore, a comprehensive nutrition assessment completed by a registered dietitian is often used as the “gold standard”, as it considers many aspects of nutritional health in great detail (American Dietetic Association, 1994; Keller, McKenzie, & Goy, 2001; Keller et al., 2005; Randall Simpson et al., 2008).

Receiver operating characteristic (ROC) curves are often used when assessing criterion validity (Jones, 2004a; Streiner & Norman, 1995). A ROC curve is created by determining the sensitivity and specificity of the tool at every possible risk score cut point.
(through comparison of the tool to the “gold standard” method), and then plotting the cut points on a graph of 1-specificity (x-axis) versus sensitivity (y-axis) (Streiner & Norman, 1995). The area under the curve is then examined to determine the tool’s ability to differentiate between those who are and are not at risk. This value ranges from 0 to 1, with 1 being the highest possible discriminating ability (Jones, 2004a; Streiner & Norman, 1995). A test that has no discriminating value would have a ROC curve area of 0.5; any tool developed with an area at or lower than this value will not be able to discriminate between those who are and who are not at risk better than chance alone (Streiner & Norman, 1995). Generally speaking, a value between 0.7 and 0.8 represents acceptable discrimination, a value between 0.8 and 0.9 represents excellent discrimination, and any value above 0.9 represents an outstanding ability to discriminate between those who are and are not at risk (Jones, 2004a). Usually, cut-points are established by selecting the points on the ROC curve that give the newly developed tool the highest estimates of sensitivity and specificity (Jones, 2004a; Streiner & Norman, 1995). However in some cases, cut-points may be adjusted to fit the purpose of the tool (Keller et al., 2005). In the case of nutrition risk screening, cut-points may be adjusted to increase the specificity of the tool, and therefore minimize the number of false positive cases identified. This is done so as to not overwhelm the available dietitian resources available for counseling those people identified as “at risk” by the tool (Jones, 2004a; Keller et al., 2005).

Construct validity is a type of validity that assesses how well the nutrition screening tool matches our theoretical expectations of how it should act prior to beginning its development (Jones, 2004c; Remler & Van Ryzin, 2011). That is to say, construct validity deals with looking at how well the nutrition screening tool corresponds with other variables.
that are theoretically related to nutritional risk (Remler & Van Ryzin, 2011). It would be expected that those individuals labeled as at risk for malnutrition by the screening tool would have similar characteristics related to malnutrition that are not included as risk variables on the tool (Jones, 2004c). For example, it has been found that maternal education level is significantly related to child malnutrition, with lower levels of maternal education being correlated with higher levels of child malnutrition (Hien & Kam, 2008). Therefore, it would be expected that a nutrition screening tool would identify children with mothers of low education to be at nutritional risk. The nutrition screening tool would display construct validity if this indeed was the case.

It can be hypothesized that certain variables not directly measured through use of the screening tool may be related to higher nutritional risk, such as high BMI. Therefore, in a study measuring construct validity, demographic information and nutrition factors not assessed in the tool should be measured in the participants, and then should be compared to the results of the screening tool completed by these participants. The tool will demonstrate construct validity if the theoretical expectations of who will be identified as being at risk correspond well with those actually identified as being at risk by the screening tool (Jones, 2004c). It is important to note that construct validity is an ongoing process, as it is limited by the theoretical expectations that the researchers themselves have about the construct being measured (Jones, 2004c). The tool will only establish construct validity with those variables that the researchers themselves identify as being related to the construct of nutritional risk (Jones, 2004c).

Construct validity of a nutrition screening tool can further be demonstrated through the use of confirmatory factor analysis (Brown, 2006). The concept of nutrition risk is
multifactorial; that is to say, nutrition risk is made up of numerous variables relating to various risk factors (Jones, 2002; Keller et al., 2006). Because of this, when developing a nutrition risk screening tool, it is important to keep in mind all of the dimensions of nutrition risk in the population, and develop questions relating to all of the possible risk factors that comprise nutrition risk (Jones, 2004a). Tool developers may identify various attributes of nutritional risk, and then develop tool questions based on the attributes making up nutritional risk. For example, in the development of the original NutirSTEP®, researchers identified four attributes that comprised nutritional risk in preschoolers: physical growth; food and fluid intake; physical activity and sedentary behaviour; and factors affecting food intake (Randall Simpson et al., 2008). Confirmatory factor analysis can be used to identify whether or not individual questions fall under the attribute that they were designed to fit in with, thus further validating the tool (Brown, 2006).

In confirmatory factor analysis, how well each individual item fits with the attribute or “factor” is measured by “factor loadings” (Brown, 2006; Remler & Van Ryzin, 2001; Streiner & Norman, 1995). A factor loading is represented by a correlation between the question and the factor between 0 and 1, with numbers closer to 1 representing a higher load onto a particular factor. Individual questions will have higher factor loads on the factors that they are a part of, while they will have much lower factor loads on questions on which they are not related (Remler & Van Ryzin, 2001; Streiner & Norman, 1995). Items should be highly correlated to the factor that they load on and should not be correlated with factors that they do not load on (Remler & Van Ryzin, 2001; Streiner & Norman, 1995).

Jones (2002) identified that 28 of 44 studies (64%) assessed validity when developing nutrition risk screening and assessment tools. Of the seven additional tools identified, six
assessed at least one type of validity (Burden et al., 2001; Keller et al., 2005; Laporte et al., 2001; Lohse et al., 2007; Randall Simpson et al., 2008; Weekes et al., 2004). One study examined construct validity (Lohse et al., 2007), two studies examined content validity (Keller et al., 2005; Randall Simpson et al., 2008), and five studies examined criterion validity (Burden et al., 2001; Keller et al., 2005; Laporte et al., 2001; Randall Simpson et al., 2008; Weekes et al., 2004). Therefore, there is some lack of validation studies of newly developed nutrition screening tools, which is an essential phase when evaluating the effectiveness of the tool. Validity testing must be done on newly developed tools to ensure ethical and practical screening in the population (Jones, 2002; Keller et al., 2006).

2.2.3 Existing Nutrition Screening Tools

There are few nutrition screening tools designed specifically for use in pediatric populations. Jones (2002) identified 44 different nutrition screening and assessment tools in the literature, many of which provided insufficient information regarding their intended use, development, validation, and reliability. In order to use a tool ethically and effectively, one must be well aware of this information to judge whether or not the tool is applicable in the intended situation (Jones, 2002; Keller et al., 2006). A few of the existent pediatric nutrition screening tools will be examined in more detail below to fully understand the intended use, development methods, and evaluation results of the tools.

2.2.3.1 NutriSTEP®

NutriSTEP® (Nutrition Screening Tool for Every Preschooler) is a valid and reliable 17-item community-based, parent-administered questionnaire that is used to identify preschool aged children (3-5 years) who may be at nutritional risk (Randall Simpson et al., 2008). The development of this tool took place over a seven-year period and was comprised
of a total of five development phases (Randall Simpson et al., 2008). These phases included assessing the feasibility of the tool, developing a draft tool based on parental input and professional consultation, refining the tool in Ontario and in Canada, and establishing the validity and reliability of the tool (Randall Simpson et al., 2008). NutriSTEP® was based on identifying four constructs of nutritional risk in preschoolers: physical growth, food and fluid intake, physical activity and sedentary behaviour, and factors affecting food intake (Randall Simpson et al., 2008). The 17 items in this questionnaire are based on the above-mentioned constructs, and have between two and five possible response options (Randall Simpson et al., 2008). All response options have been assigned an associated risk rating score ranging from 0 (no risk) to 4 (high risk) (Randall Simpson et al., 2008). The risk rating scores from all questions are added to give the child’s final risk score, with a high final score indicating an increased nutritional risk (Randall Simpson et al., 2008).

The content validity, criterion validity, and test-retest reliability of NutriSTEP® were assessed (Randall Simpson et al., 2008). The content of NutriSTEP® was validated by both parents of preschoolers and pediatric nutrition professionals. In terms of criterion validity (n = 269), it was found that the Spearman’s rho between the NutriSTEP® score and the “gold standard” (an in-depth nutrition assessment completed by a registered dietitian) was 0.49 (p = 0.01) (Randall Simpson et al., 2008). The ROC analysis revealed that a cut-point of > 25 identified a child as high risk (AUC = 81.5%, sensitivity = 92%, specificity = 36%), and a cut-point of > 20 and < 25 identified a child as moderate risk (AUC = 73.8%, sensitivity = 53%, specificity = 79%). The overall reliability (n = 140) was assessed using intraclass correlations (ICC), and found to be high, with ICC = 0.89 (F = 16.7, p < 0.001) (Randall
Simpson et al., 2008). Overall, it was concluded that the tool was valid and reliable for nutrition risk screening in preschoolers.

2.2.3.2 PEACH

The PEACH survey (Parent Eating and Nutrition Assessment for Children with Special Health Needs) is a 17-item, parent-administered screening tool designed to screen for nutritional issues in young children (under the age of 6) with developmental problems (Campbell & Kelsey, 1994). All questions have either a “yes” or “no” response option, with a point value between 1-4 assigned to positive responses (Campbell & Kelsey, 1994). Higher scores on the PEACH survey indicate a greater nutritional risk, with a total score of 4 or more indicating likelihood of a nutritional problem (Campbell & Kelsey, 1994).

The PEACH survey was developed through the use of existing pediatric nutrition screening tools to identify questions that relate to nutrition screening of children under the age of six (Campbell & Kelsey, 1994). These items were then arranged into a questionnaire and validated for content by six developmental pediatric experts, who also assisted in the development of a scoring system for the questionnaire (Campbell & Kelsey, 1994). Criterion validity (n = 79) was then assessed by comparing the “gold standard” method of a nutritional assessment conducted by a registered dietitian to the results of the PEACH survey (Campbell & Kelsey, 1994). Since the nutritional assessment and the PEACH survey identified the same number of cases of nutrition risk in the participants, the survey was said to be valid (Campbell & Kelsey, 1994). Furthermore, a high sensitivity (88.6%), specificity (90.9%), and predictive value (88.6%) were reported for the tool (Campbell & Kelsey, 1994).
2.2.3.3 PNSC

The PNSC (Parent Nutrition Screening Checklist for Children with Special Needs) is an 18-item, parent-administered pediatric nutrition screening tool designed to identify nutritional risk in children (aged 1-18) with special needs in a community setting (Schlenker, Cocking, & Gilley, 2003). The development of the PNSC was based on the PEACH survey and followed the methodology suggested by Keller et al. (2000). The questions on the PNSC have a “yes” or “no” response option, followed by a concern ranking option where the parent is able to rank their concern as 0 (no concern), 1 (some concern), or 2 (very concerned) (Schlenker et al., 2003). The concern scores are then totaled to the overall nutrition risk score, with a total score of 5 or more being indicative of a child that requires nutritional intervention (Schlenker et al., 2003).

The developmental procedures of the PNSC are described in great detail. The researchers first described the target population and desired use, and then conducted an in-depth literature review to identify any existing similar tools (Schlenker et al., 2003). The PEACH survey was identified as an existing tool that had a similar purpose; however, it lacked the age-range desired to be covered by the researchers (Schlenker et al., 2003). The researchers therefore decided to use the PEACH survey as the basis for the development of their new screening tool (Schlenker et al., 2003). Question development occurred through the use and modification of items found in the PEACH survey, as well as through consultation with parents and pediatric dietitians (Schlenker et al., 2003). All questions were determined to fall into one of three categories: health & special diets, oral feeding, and intake (Schlenker et al., 2003). The draft questionnaire was then developed to contain 30 items, which were reduced to 18 items upon pre-testing (Schlenker et al., 2003). After revising the PNSC,
criterion validation was conducted (n = 34) through comparison of the tool to the “gold standard” of a dietitian’s assessment of the child (Schlenker et al., 2003). The PNSC was found to have a sensitivity of 83.3%, a specificity of 62.5%, and a predictive value of 71.4% (Schlenker et al., 2003). Although the researchers had parents complete the PNSC twice, two weeks apart, test-retest reliability was not calculated, as it was believed the dietitian’s visit in between the two PNSC completions would have biased the results (Schlenker et al., 2003).

2.2.3.4 CEBQ

The CEBQ (Children’s Eating Behaviour Questionnaire) is a parent-administered, 35-item questionnaire designed to assess eating behaviours related to obesity risk in children (Wardle, Guthrie, Sanderson & Rapoport, 2001). The questionnaire includes eight constructs of eating behaviour in children, including responsiveness to food, enjoyment of food, satiety responsiveness, slowness in eating, fussiness, emotional overeating, emotional undereating, and desire for drinks (Wardle et al., 2001). Each item has five possible response options: never, rarely, sometimes, often, and always, which are scored using the values of 0–4 respectively (Wardle et al., 2001).

The development of the CEBQ involved identifying the constructs to be included in the questionnaire from a literature review and parental input (Wardle et al., 2001). Originally, ten constructs were identified for inclusion in the questionnaire, with 10–16 items representing each construct (Wardle et al., 2001). The constructs and items underwent a process of three pilot tests, each followed by revisions involving a total of 537 parents (Wardle et al., 2001). The final questionnaire consisted of 35 items representing 8 constructs (Wardle et al., 2001). This final version was tested for internal validity (using principle component analysis, a method similar to factor analysis) and test-retest reliability (n = 160),
and was found to be internally valid (Cronbach’s alpha = 0.74-0.91) and reliable ($r = 0.52-0.87$) (Wardle et al., 2001).

### 2.2.3.5 Limitations of Existing Tools

There are several limitations to the existing tools designed to screen children for nutritional risk. First, two of the existing tools screen for nutritional risk in specialized populations (children with special needs and children with developmental problems), and are therefore not useful for children in the general population (Campbell & Kelsey, 1994; Schlenker et al., 2003). Another existing tool screens only for overnutrition (obesity risk) and therefore does not identify children at risk of undernutrition (Wardle et al., 2001). Finally, the NutriSTEP® tool screens for nutrition risk in the community; however, it was developed to be used in a specific age range of only 3-5 years (Randall Simpson et al., 2008). Therefore, there are no tools available specifically designed to screen for nutrition risk in the community for toddlers.

Secondly, there are many differences between the tools in terms of how they were developed or evaluated. Although the PNSC and NutriSTEP® followed similar developmental procedures as recommended by Keller et al. (2000), the validation and reliability testing of these tools differed (Randall Simpson et al., 2008; Schlenker et al., 2003). Both tools assessed criterion validity, but only NutriSTEP® assessed test-retest reliability. Furthermore, the PNSC used a very small sample size ($n = 34$) when assessing criterion validity (Schlenker et al., 2003). The development of the CEBQ followed a structure somewhat similar to that used in the development of NutriSTEP® and the PNSC; however, criterion validity was not determined for this tool (Wardle et al., 2001). The PEACH survey used entirely different methods to develop the items for the tool, and
although test-retest reliability was not assessed, criterion validity was, albeit in a small sample (n = 79) (Campbell & Kelsey, 1994).

Because of the limited use of standardized methods for the development and testing of nutrition risk screening tools in children, as well as the lack of tools for use in a general population of toddlers, it was necessary to develop a new nutrition risk screening tool for this age group. This new tool followed standard methods of development, as well as was tested for content, criterion, and construct validity, in addition to measuring reliability.

2.3 Toddler Nutrition

Good nutritional habits developed early on in life are vital to the health, growth, and development of a child (Briefel et al., 2010; Randall Simpson et al., 2008; Weaver, 2007). Developing strong nutrition and physical activity habits early on may contribute to the continuation of good habits into adulthood, thereby reducing the risk of chronic disease (Briefel et al., 2010; American Dietetic Association, 2004; Weaver, 2007). Toddlers in particular are vulnerable to nutritional issues because of the many feeding transitions occurring at this stage (Briefel et al., 2004). It is therefore essential that early health and lifestyle problems be addressed in toddlerhood, including educating parents on toddler health and screening for potential problems, to ensure that health problems and chronic disease risk are reduced (Weaver, 2007).

2.3.1 Nutrition Screening in Toddlers

Although there are a few nutrition screening tools developed for use in children to date, there are currently no community-based, parent-administered nutrition screening tools for toddlers. A community-based tool is desired so that it may be used on all children in the general population, as opposed to a specific subset of children, so that any toddler at
nutritional risk may be identified. A tool that does not require a health care professional to administer is also desired, as access to dietitians is limited; therefore, parented-administered tools would enable dietitian visits to be limited to those children already identified as being of need (Baer & Harris, 1997; Keller, 2007; Schlenker et al., 2003).

The screening tools in use today are not appropriate for use on toddlers in the community. Both the PEACH survey and the PNSC (described in more detail above) are parent-administered nutrition screening tools that were developed for use in children with special needs and disabilities (Campbell & Kelsey, 1994; Schlenker et al., 2003). Since both of these tools were developed with a special subset of children in mind, they are not suitable for use in all children. Other nutrition screening tools for children have been developed for use in clinical settings that focus on a limited number of risk factors (Boutry & Needlman, 1996; Sermet-Gaudelus et al., 2000). Another tool often referenced, the ecSatter Inventory, only measures attitudes associated with eating competency, as opposed to actual eating behaviours, and has only been validated for use in adults (Lohse, Satter, Horacek, Gebreselassie, & Oakland, 2007). The CEBQ and STEP-CHILD (Screening Tool of Feeding Problems applied to children) are screening tools designed for use in children that look at various eating behaviours (Seiverling, Hendy & Williams, 2011; Wardel et al., 2001).

Although these tools may be useful in identifying children who may exhibit behaviours that could be precursors of weight or diet problems, they do not assess overall nutritional risk in children (Seiverling et al., 2011; Wardel et al., 2001).

Although NutriSTEP® has been determined to be valid and reliable in preschool aged children (children aged 3-5 years), it is not acceptable for use in toddlers (Randall Simpson et al., 2008). Toddlers (defined as children aged 18-35 months) have many nutritional issues
that are unique to their age group (Briefel et al., 2004; Devaney, Ziegler, Pac, Karwe, & Barr, 2004, Dwyer et al., 2010; Gumbley, 2011), which therefore requires that a toddler-specific nutrition screening tool be developed to fully capture these issues. Adapting NutriSTEP® for use in toddlers by addressing nutrition issues unique to the toddler age-group is therefore vital to the health of children.

2.3.2 Toddler Nutritional Issues

Toddler nutrition is of great importance, since toddlerhood is a stage of rapid growth and development, which needs to be supported by adequate nutrient intakes (Ponza et al., 2004; Savage et al., 2007). Toddlers are particularly vulnerable to nutritional risk, since inadequate intake of essential nutrients during this stage may result in impaired development and poor health (Ponza et al., 2004). Additionally, nutritional habits are established early on in life and the development of strong nutritional habits in toddlerhood may result in lifelong healthy eating practices, which may prevent chronic disease (American Dietetic Association, 2004; Savage et al., 2007).

There are many nutritional issues to consider when developing a tool to measure nutritional risk in toddlers. These issues may include food and fluid intake, the introduction of table foods, changes in milk consumption, juices and sweetened beverages, factors affecting food intake, the feeding relationship, physical growth, and physical activity, all of which will be discussed in more detail below.

2.3.2.1 Food and Fluid Intake

The food and fluid intake of toddlers was well studied with the Feeding Infants and Toddler Study (FITS, 2002 and 2008). This study collected large numbers on one-day dietary recalls for large samples of infants and toddlers in the United States. Although this is one of
the best sources of data on the dietary intakes of infants and toddlers in North America, these results must be interpreted with caution, as the data collected reflects actual and not usual intake. Through this study, it was found that, in general, on the day of the recall, toddlers consumed above the estimated energy requirement for their age group by 29-40% (Ponza et al., 2004). This is concerning since the prevalence of childhood obesity is currently quite high (Shields, 2008). Furthermore, the types of foods toddlers were consuming is worrisome: fewer than 10% of toddlers consumed dark green vegetables on the day of the recall; consumption of French fries, sweets, and sweetened beverages was quite high (Siega-Riz et al., 2010). If the recall day is reflective of usual intake, many toddlers in North America are not meeting the recommended intake for fruits and vegetables on a daily basis, which could result in inadequate intake of many essential nutrients; as well this is a risk factor for the development of overweight/obesity (Shields, 2008; Siega-Riz et al., 2010). Moreover, the lack of consumption of fruits and vegetables occurred during the period of time in which food preferences are established, which could impede the development of toddler preferences for these foods (Dwyer, Butte, Deming, Siega-Riz, & Reidy, 2010).

Intake of fat was also of concern, with 23% of toddlers in the FITS 2008 study found to have an intake of fat below the Acceptable Macronutrient Distribution Range on the recall day (Butte et al., 2010). Toddler intake of the majority of essential micronutrients were found to be adequate, with only vitamin E consumption being below the Estimated Average Requirement for 63% of the toddlers on the recall day (Butte et al., 2010). Fiber intake was also found to be low in this sample of toddlers, with the mean intake of 8.7 g/day being far below the Adequate Intake of 19 g/day (Butte et al., 2010). Furthermore, excessive sodium consumption above the Tolerable Upper Limit was seen in 45% of the toddlers studied (Butt
Iron consumption may also be of concern, as 15% of children under the age of five in the United States had iron deficiency anemia in 2008, and a high proportion of toddlers were found to have inadequate iron intakes in this study (Butte et al., 2010). Toddler intake of sweets, desserts, and sweetened beverages was also high, with 81% of toddlers consuming these foods in 2008 (Butte et al., 2010).

In terms of feeding patterns, the majority of toddlers were found to consume regular meals, although an increased prevalence of snacking has been observed, with 80% of toddlers consuming an afternoon snack (American Dietetic Association, 2004; Skinner, 2004). Small, frequent meals are important in this age group, as small stomachs restrict consuming large amounts of food at once; however, special care should be taken to ensure that snacks provide important nutrients and that high-energy foods, such as candy, chips, and cookies, are limited (Skinner, 2004). Alongside an increased prevalence of snacking, consumption of fast food and meals consumed outside of the home has also increased (American Dietetic Association, 2004). Children consuming more fast food were also found to have higher intakes of fat, saturated fat, cholesterol, and sodium (American Dietetic Association, 2004).

Supplement use in toddlers has been decreasing over the years, with 55% of toddlers consuming supplements in 1971-1974 (Briefel & Johnson, 2004), but 31% of toddlers being found to consume supplements in the FITS 2002 (Briefel, Hanson, Fox, Novak & Ziegler, 2006). It is important to note that these differences may be because of differences in methodology: the FITS 2002 study asked parents about supplement intake from a single day, whereas the review by Briefel & Johnson analyzed multiple sources of dietary data to make their conclusions. However, if this is reflective of a trend in supplement intake, this may be
considered a positive trend, as experts recommend that toddlers should be receiving most of their nutrients from food sources (Briefel et al., 2006).

2.3.2.2 Introduction of Table Foods

The toddler stage of childhood is often the stage in which the infant is weaned from breast milk and transitioned towards a diet consisting of solid table foods that is lower in fat and higher in protein than breast milk (Briefel et al., 2004; Butte et al., 2010; Fox et al., 2004; Siega-Riz et al., 2010). This is a stage of rapid changes where the child is highly vulnerable to nutrient deficiencies and nutritional problems (Briefel et al., 2004). During this time, many new foods are introduced to the toddler. It has been found that children require repeated exposures to a food before they will accept it, and therefore during this period, a variety of healthy foods must be continually offered to the toddler (Carruth, 2004; Briefel et al., 2004). A child who does not accept a food the first time he/she is exposed to it should not be considered a picky eater, but should be continually offered the food, between 10-20 different times, until acceptance occurs (Carruth, 2004; Satter, 2007). Furthermore, emphasis should be placed on the types of foods being introduced to toddlers, as current toddler consumption of fruits and vegetables is not meeting the recommended guidelines, and intake of sweets and sweetened beverages is excessive (American Dietetic Association, 2004; Briefel et al., 2004; Carruth, 2004; Fox et al., 2004; Siega-Riz et al., 2010; Skinner, 2004). Parental guidance on proper transitioning procedures during this time is vital, as developing proper eating habits in toddlerhood will influence the health of the child in the years to come (Briefel et al., 2004).

A few studies have been conducted that examine the transition period of toddlers from a mostly liquid diet to a diet consisting of a great deal of solid food. It has been found
that, as toddlers transition to table foods, the percentage of their daily energy intake that comes from liquids, including breast milk and formula, decreases, while the percentage of their energy intake from solids increases (Briefel et al., 2004). Conversely, the average calcium intake of transitioning toddlers is lower in those toddlers that are consuming greater amounts of solid foods (Briefel et al., 2004). It has been found that early introduction of table food to infants and toddlers may contribute to excessive weight gain and overweight in the preschool years (Griffiths, Smeeth, Sherburne Hawkins & Dezateux, 2009).

The transition from breast milk only to infant cereals and table foods should begin once an infant is 6 months old, and continue gradually throughout toddlerhood (Sherburne Hawkins & Law, 2006). During this time, it is necessary for the family to model appropriate eating behaviours, as the toddler may want to mimic the family and eat what the family is eating (Skinner, 2004). Furthermore, a wide variety of healthy foods should be offered to the toddler repeatedly, to develop preferences for nutritious foods, paying particular attention to offering foods high in iron and calcium (Briefel et al., 2004; Carruth, 2004; Skinner, 2004). Frequent small meals and snacks should be given, as toddlers have small stomachs and therefore may not be able to consume large volumes of food (Skinner, 2004). Excessive milk consumption should be avoided, as it may displace other necessary solid foods in the diet, while excessive amounts of sweetened beverages should be avoided because of their lack of health benefits (Fox et al., 2004; Skinner et al., 2004). The transition period should also consist of allowing the toddler to develop his/her self-feeding skills and transition from a bottle to a cup (Briefel et al., 2004; Fox et al., 2004; Skinner et al., 2004).
2.3.2.3 Changes in Milk Consumption

It is important that good beverage patterns are introduced and developed prior to the age of two, since it has been found that food preferences at age two are predictive of food preferences at age eight (Skinner, Carruth, Bounds, & Ziegler, 2002; Skinner, Ziegler & Ponza, 2004). Beverage consumption in toddlerhood is dynamic and constantly changing as the child grows (Skinner et al., 2004). In one study, beverages (including breast milk and formula) were found to provide 84% of total energy for infants 4-6 months, 43% of total energy for infants 12-14 months, and 36% of total energy for toddlers 19-24 months (Skinner et al., 2004). Therefore, as infants progress to toddlerhood, the amount of energy provided from beverages decreases, but still represents a large proportion of energy in the diet. However, it is important to note that introducing cow’s milk as a substitute for breast milk at too early an age (before 12 months) is a problem, as it may contribute to iron deficiency (Fox et al., 2004). Similarly, the transition from breast milk to cow’s milk is associated with bottle use (Sherburne Hawkins & Law, 2006). Prolonged bottle use can be a concern, as bottle use should be discontinued in toddlers aged 12-18 months, since in 3-year-old children, the use of a bottle was found to be associated with an increased risk of being overweight (Sherburne Hawkins & Law, 2006). Excessive consumption of milk should be avoided, as it may displace other essential foods in the diet, therefore contributing to nutritional problems (Skinner et al., 2004).

Data collected in the FITS found the majority of toddlers to be consuming milk, with only 4.9% of toddlers not consuming milk (Skinner et al., 2004). While the majority of the toddlers were found to consume whole fat milk, approximately one-third of the sample was found to consume reduced-fat milk (Fox et al., 2004; Siega-Riz et al., 2010; Skinner et al.,
These results show that milk consumption is still a problem with toddler-aged children, as some children did not consume any milk, while many others consumed reduced-fat milk. Milk consumption is vital for children of this age, as it contributes to a substantial proportion of essential nutrients, including calcium, protein, vitamin A and vitamin D (Skinner et al., 2004). Furthermore, reduced-fat milk consumption is not recommended to toddlers below the age of two years, as there is some evidence that restricting fat in young toddlers may lead to insufficient consumption of energy and essential nutrients (Fox et al., 2004; Siega-Riz et al., 2010).

### 2.3.2.4 Juices and Sweetened Beverages

The consumption of excessive juice (100% fruit juice) and sweetened beverages (fruit drinks, pop, etc.) in toddlers is high, with about 44% of toddlers in the United States in 2002 (Fox et al., 2004) and between 28-38% of toddlers in 2008 (Seigra-Riz et al., 2010) reported daily consumption of juice/sweetened beverages. Many toddlers consumed above the recommended 4-6 oz of juice per day, drinking upwards of 14oz of juice (Skinner et al., 2004). Furthermore, about 11% of toddlers were found to be consuming carbonated beverages (Skinner et al., 2004). These findings are concerning, as juice and sweetened beverages are high in energy and low in micronutrients; further, excessive consumption of these beverages may be related to childhood obesity (Fox et al., 2004; Sherburne Hawkins & Law, 2006). Moreover, intakes of juice/sweetened beverages were found to be negatively related to calcium density, indicating that increased intakes of juice/sweetened beverages may decrease the intake of calcium from the diet by displacing milk intake (Skinner et al., 2004).
2.3.2.5 Factors Affecting Food Intake

Many factors affect the food intake of toddlers. Financial insecurity often causes food insecurity, which negatively affects a child’s emotional, behavioural and cognitive development (American Dietetic Association, 2004). In the United States, there are some programs targeted at alleviating food insecurity in toddlers, such as the Special Supplemental Nutrition Program for Women, Infants and Children (WIC); these programs increase the probability that children will have adequate nutritional intakes (American Dietetic Association, 2004; Ponza et al., 2004). It is important to consider food insecurity when it comes to the nutritional intake of toddlers, as one quarter of all American children aged 1-4 years are WIC program participants, and therefore come from families with food insecurity (Ponza et al., 2004). One study compared the nutrient intake of toddlers in the WIC program to toddlers not in the WIC program and found several interesting results. Toddlers in the WIC program exceeded their estimated energy requirement by 40%, while those not in the program only exceeded the estimated energy requirement by 29% (Ponza et al., 2004). It was also found that WIC toddlers were more likely to consume sweetened beverages than toddlers not participating in the program, and less likely to consume fruit, with 40% of the WIC toddlers not consuming any fruit in the day (Ponza et al., 2004). These findings may indicate that toddlers participating in a program that targets food insecurity may be especially vulnerable to nutrition risk.

The environment in which a toddler grows up and is fed also influences his/her nutrient intake. Toddlers with mothers who had less than a college education and were unmarried were found to be less likely than toddlers with married mothers who attended college to exhibit a large number of positive feeding behaviours (Hendricks, Briefel, Novak
& Ziegler, 2006). Furthermore, the eating environment greatly influences toddler nutritional behaviours, with fewer toddlers consuming meals at home because of working parents and the high prevalence of convenient out-of-home foods (Savage et al., 2007). This results in an increase in energy-dense foods being consumed by toddlers (Savage et al., 2007). Having family meals is important, as they provide toddlers with the opportunity to frequently try new nutritious foods, be surrounded by positive eating behaviours, and learn to enjoy their foods in a family context (Satter, 2007).

2.3.2.6 The Feeding Relationship

The development of eating behaviours that occurs in the first five years of life is heavily influenced by the feeding relationship between the parent and child, including the diffusion of beliefs, attitudes, and practices involving food and eating (Savage et al., 2007). It has been found that parents and other role models, such as teachers, can largely influence the foods a child eats through both modeling healthy eating behaviours and having nutritious foods readily available for children to eat (Savage et al., 2007). Also, it has been found that toddlers have the innate ability to self-regulate their energy intake (Fox, Devaney, Reidy, Razafindrakoto & Ziegler, 2006); however, this innate ability can be lost based on learned feeding practices and parental influence (Johnson & Birch, 1994; Savage et al., 2007). Encouraging healthy foods, restricting “junk foods”, and offering food as rewards have all been found to have negative effects on children’s eating habits, including increasing a child’s preference for sweet, high-energy foods, decreasing a child’s preference for healthy foods, and negatively impacting their natural self-regulation ability (Satter, 2007; Savage et al., 2007). Self-regulation skills are extremely important in toddlerhood, as they have been found to be predictive of pediatric obesity, with toddlers with poor self-regulation skills being more
likely to develop pediatric obesity (Graziano, Calkins, & Keane, 2010). Maintenance of self-regulation skills can be encouraged in toddlers through a healthy eating environment in which parents provide healthy foods, model healthy eating behaviours, and allow the child to decide how much of the foods he/she consumes (Johnson & Birch, 1994; Satter, 2007; Savage et al., 2007).

2.3.2.7 Physical Growth

Physical growth is a great concern when it comes to toddlers, as both over- and under-nutrition can cause problems that are detrimental to the health of the child (Caulfield, de Onis, Blossner & Black, 2004; Ogden, Carroll, Curtin, Lamb & Flegal, 2010; Siega-Riz et al., 2010). It is well established that childhood overweight and obesity rates are currently increasing (American Dietetic Association, 2004; Shields, 2008; Ogden et al., 2010; Siega-Riz et al., 2010). In Canada, the 2004 Canadian Community Health Survey found that the overweight/obesity rate of children and adolescents (aged 2-17) doubled in the 25-year period between 1979 and 2004, reaching a prevalence of 26% in 2004 (Shields, 2008). A similar trend has been seen in the United States through the collection of data for the National Health and Nutrition Examination Survey 2007-2008; 32% of 2-19 year olds were above the 85th percentile for their weight and height (Ogden et al., 2010). High body weights can also be seen in American toddlers, with 10% of infants and toddlers being at or above the 95th percentile for weight-for-recumbent-length (Ogden et al., 2010).

Excessive body weight in toddlers and children is a problem because overweight children are more likely to become overweight adults (Serdula, Ivery, Coates, Freedman, Williamson & Byers, 1993). Adult overweight/obesity is associated with many chronic diseases, such as hypertension, diabetes, heart disease, some cancers, and even premature
death (Serdula *et al*., 1993). Furthermore, many overweight/obese adults have difficulty losing weight that they have carried for most of their lives (Serdula *et al*., 1993). In addition to being at greater risk for adult overweight/obesity, children with excessive body weight are susceptible to immediate negative health effects, such as high blood pressure and elevated triglyceride and cholesterol levels (Thompson *et al*., 2007).

On the contrary, under-nutrition leading to children being underweight is also very hazardous to one’s health (Caulfield *et al*., 2004). It was found that worldwide, under-nutrition was the leading cause of children’s deaths, attributing to 53% of childhood mortality (Caulfield *et al*., 2004). Although many associate under-nutrition with developing countries, it is important to note that insufficiently nourished children can also be found in developed countries (Ponza *et al*., 2004). In the United States, it was found that approximately one third of studied infants and one fifth of studied toddlers were utilizing the WIC program, designed to provide nutrition to women and young children who would not otherwise have access to a healthy diet (Ponza *et al*., 2004). Children whose mothers do not access this program when they need it may be at nutritional risk because of lack of sufficient nutrition.

### 2.3.2.8 Physical Activity and Sedentary Behaviour

Physical activity in toddlerhood is extremely important, as it is related to physical activity in adulthood and inversely related to excessive body weight (Baranowski *et al*., 1997; Sherburne Hawkins & Law, 2006). Developing lasting physical activity habits in toddlerhood is therefore an effective way to maintain a healthy weight throughout the lifespan, thereby avoiding any comorbidities associated with adult overweight/obesity (American Dietetic Association, 2004; Baranowski *et al*., 1997; Hawkins & Law, 2006;
Ogden et al., 2010). Furthermore, increased physical activity is related to enhanced overall health, as well as reduced risk of adult chronic diseases (Baranowski et al., 1997). Specifically, benefits of physical activity in children and adolescents include decreased overweight/obesity, anxiety, and risk factors for cardiovascular disease, as well as increased muscular fitness, self-esteem, and bone density (Baranowski et al., 1997).

It has been estimated that 48% of girls and 26% of boys do not participate in regular vigorous physical activity (Baranowski et al., 1997). Furthermore, more and more young children are engaging in sedentary behaviours more often (Miller, Taveras, Rifas-Shiman & Gillman, 2008; Sherburne Hawkins & Law, 2006; Shields, 2008). It was found that the televisions in the homes of two-thirds of American children aged 0-6 were left on for excessive periods of time, exceeding half of the day (Rideout, Vandewater & Wartella, 2003). Additionally, it was found that, on average, these children were watching approximately two hours of television per day, and 30% of children aged 0-3 years had a television set in their bedroom (Rideout et al., 2003). Exposure to two or more hours of television per day in preschoolers was found to be associated with an increased risk of being overweight (Lumeng, Rahnama, Appugliese, Kaciroti & Bradley, 2006). The evidence surrounding excessive television usage in young children is frightening, since increased television viewing has been found to be associated with poor diet quality in three year olds (Miller et al., 2008), as well as increased likelihood of being overweight or obese in 2-17 year olds (Shields, 2008).

2.3.3 Toddler NutriSTEP®

Since the public release of NutriSTEP® in 2008, a need has been expressed across Canada to adapt the tool for use with toddlers to reflect the unique nutritional issues present in this early stage. The format of the current NutriSTEP® is ideal for toddler nutrition
screening, as the community-based, parent-administered format can allow nation-wide nutrition screening without excessive use of dietitian/health care professional resources in the process (Baer & Harris, 1997; J. Randall Simpson, personal communication, 2011; Schlenker et al., 2003). Therefore, it was decided that NutriSTEP® would be modified to produce a version that could be used with toddlers.

The original NutriSTEP® includes questions on four attributes of preschooler nutrition: food and fluid intake; physical growth; physical activity and sedentary behaviour; and, factors affecting food intake (Randall Simpson et al., 2008). All of these attributes are consistent with the potential issues in toddlers and thus should be considered in the toddler version of NutriSTEP®; however, the additional nutrition concerns that are unique to toddlers must be included as well. Some of these concerns are discussed in more detail above and include: changes in milk consumption; introduction of table foods; juices and sweetened beverages; and the parent-toddler feeding relationship.

A research protocol for the modification of NutriSTEP® (see Appendix A) to Toddler NutriSTEP® was written, and it was decided that the project would proceed through the course of four phases: content validity (phase A), refinement (phase B), construct validity and reliability (phase C), and criterion validity (phase D). Phases A and B were completed between April 2010 and February 2011, with the current project consisting of phase C. The specific steps for the development of Toddler NutriSTEP® can be seen in Figure 2, and are discussed in more detail below.

Phase A, the content validity phase, began with a literature review on nutrition constructs important to the health of toddlers. This information, as well as the questions from the original version of NutriSTEP® were used as the starting point for the development of a
toddler version. Parent focus groups were then conducted in various locations across Ontario during which parent input was sought on the relevance of the preschooler NutriSTEP® questions to the nutritional health of toddlers. Parents were also asked to contribute any adaptation or additions they could foresee being necessary to include in a toddler nutrition screening tool. The focus groups were conducted using a pilot tested standardized script and were recorded for transcription and analysis. The purpose of this step was to ensure content validity of the screening tool to parents who may someday be utilizing the tool (Gumbley, 2011).

The next step in phase A was to consult pediatric nutrition experts for further opinions on the acceptability of the preschooler NutriSTEP® questions for toddlers, as well as any adaptations or additions that were considered necessary. Using this information, and the information collected from the parent focus groups, a draft Toddler NutriSTEP® was developed.

Phase B, the refinement phase, began with key intercept interviews with parents, in which parents of toddlers read each individual item in the draft Toddler NutriSTEP® and provided feedback on the draft screening tool. Parents were asked to comment on the readability and clarity of the questions, examples, and answer stems, as well as the ease with which the questionnaire could be completed. Experts in the area were also contacted at this phase to give their feedback on the draft Toddler NutriSTEP®. All of the feedback received was then used to refine the screening tool into the version that would be used in the current phase. This version included questions relating to five attributes: the same four attributes as the preschooler NutriSTEP®, with an additional attribute called “development” added. Questions related to toddler-specific concerns were added to each of the existing NutriSTEP®
attributes, while the attribute of development was added to reflect additional issues unique to toddlerhood, including bottle usage, chewing/swallowing problems, and the ability to feed oneself. The draft Toddler NutriSTEP® used in this phase of the research can be seen in Appendix B.

The current project represents the completion of phase C in the development of a Toddler NutriSTEP®. Test-retest reliability and construct validity will be determined for Toddler NutriSTEP® in this thesis.

**Figure 2.1: Steps in the development of Toddler NutriSTEP®**
3.0 Rationale and Purpose of the Study

Ever since the development of the original NutriSTEP® designed for parents of preschoolers, there has been an expressed need to adapt the tool for use with parents of toddlers. Toddlerhood is a stage of rapid growth and development that occurs alongside many changes in food consumption, making toddlers especially vulnerable to nutritional risk (Savage et al., 2007). Screening in toddlers would allow those at nutritional risk to be quickly identified and referred to the appropriate treatment, thereby preventing immediate nutritional problems, as well as future chronic disease (American Dietetic Association, 2004; Briefel et al., 2004; Dwyer et al., 2010; Weaver, 2007). Screening in toddlers also eliminates the need for toddlers who are not at nutritional risk to see a dietitian, thereby conserving limited dietitian resources (Baer & Harris, 1997; Schlenker et al., 2003). A valid and reliable tool that identifies toddlers who may be at nutritional risk is therefore needed in Canada.

The overall goal of this study was to contribute to the development of a Toddler NutriSTEP®, completing phase C of the project. The specific objectives included determining the test-retest reliability and construct validity of the tool. It was hypothesized that based on the rigorous development of the tool, the newly-developed Toddler NutriSTEP® would be found to have construct validity through comparison of theoretical constructs including parental income, education, and immigration status to total score on the NutriSTEP®, as well as through confirmatory factor analysis revealing the NutriSTEP® questions fit into the five attributes on which its development was based. Furthermore, it was hypothesized that Toddler NutriSTEP® would display test-retest reliability through non-significantly different total scores, attribute scores, and individual question scores.
4.0 Methodology

4.1 Sample and Eligibility

A sample size of 140 participants was desired and considered adequate for the reliability phase. This sample size was calculated using estimates of a desired kappa value (0.8) and prevalence of risk (30-40%), as suggested by Jones (2004b); furthermore, previous work with a similarly self-administered tool identified that this number was adequate to establish reliability with confidence (Randall Simpson et al., 2008). For the validation phase (C and D), the sample size was calculated using sample size estimation equations for construct and criterion validity suggested by Jones (2004c). For construct validity, a sample size of 113-129 participants was found to be acceptable for a population with a prevalence of risk between 30-40% using BMI as a comparison parameter (standard deviation = 1.6 kg/m$^2$, minimum clinical difference = 1.0kg/m$^2$) (Jones, 2004c). For criterion validity, a sample size of 428 participants was found to be acceptable based on estimates of sensitivity (88%) and specificity (40%), with a confidence interval of 95% (Jones, 2004c). Because of time and funding constraints, as well as the previous NutriSTEP® work, it was not believed that 428 participants was feasible or necessary for recruitment for the validation study (Randall Simpson et al., 2008); many of the questions on the Toddler NutriSTEP® were derived from the original NutriSTEP® further indicating that a smaller sample would be adequate (Randall Simpson et al., 2008). As well, sample size calculations are based on broad estimates of various constructs and are therefore approximations (Streiner & Norman, 1995). As a result, the final sample size target recruitment for the validation study was set at 200 participants.

The eligibility criteria for the study were as follows: participants had to be able to speak and read English fluently (at approximately a grade 6 level) and be a primary caregiver
of a toddler aged 18-35 months. Additionally, the reliability study required caregivers to have lived in Canada for at least five years. This criterion was not included in the validation study because recruitment occurred greatly through Peer Nutrition Programs in the Greater Toronto Area, which work mostly with newly immigrated caregivers. This was done because it was hoped that the final sample of participants in the validation phase would be a diverse representation of many different races, ages, genders, ethnic backgrounds and socioeconomic statuses. Diversity was necessary in the sample so that a range of risk could be identified, making validation assessment feasible with a smaller sample size.

4.1.1 Recruitment

Participants were recruited from various areas in Ontario, including Waterloo, Toronto, Burlington, York Region, North Bay, Sudbury, Thunder Bay, Peterborough, and Manitoulin Island. Recruitment was done mainly through attendance at parent-toddler programs at Ontario Early Years Centers, as well as through collaboration with partners such as Toronto Public Health, Perth District Health Unit, Thunder Bay District Health Unit, the Noojmowin Tej Health Centre, and the Stratford Family Health Team. At these recruitment locations, posters were displayed, flyers were handed out and caregivers of toddlers were approached directly by the researchers and given information about the study before being asked to participate (see Appendices C-F for recruitment materials). Purposive recruitment of First Nations participants occurred on Manitoulin Island, where a registered dietitian approached parents of toddlers present at the reserve health centers for scheduled appointments.
4.1.2 Incentives

Participants who completed the test-retest reliability study in Waterloo and Peterborough were compensated with $25 grocery vouchers, while those in all other areas were given a $20 grocery voucher. Parents participating in the validation study received a grocery voucher valued at $40. In the First Nations communities of Manitoulin Island, a $60 grocery voucher was given as an incentive, as these participants completed both the reliability and validity phases. Furthermore, all parents received toddler nutrition resources including an Eat Right, Be Active book (for parents or caregivers of toddlers aged 12-36 months), How to Build a Healthy Toddler, and an Eat Right Ontario refrigerator magnet. Finally, parents who participated in the validation study received feedback and suggestions related to their toddlers’ nutritional health from the registered dietitian completing the nutritional assessment.

4.2 Data Collection

4.2.1 Ethical Considerations

Ethical approval for this study was obtained through the University of Guelph Ethics Review Board, as well as through Toronto Public Health, and Manitoulin Anishinabek Research Review Committee (see Appendix G). Participants were given an information letter prior to the completion of the study, which explained all study procedures (see Appendices H and I). Informed written consent was obtained from all participants (see Appendices J and K).

One possible risk for participants was potential concerns about their child’s nutritional health. To alleviate this, participants of the study were given the contact information of a registered dietitian. Furthermore, participants in the validation study
received feedback on their child’s nutritional assessment from the registered dietitian completing the assessment.

4.2.2 Researcher Training

All researchers and research assistants were trained in the study procedures, including pilot testing with parents of toddlers prior to beginning the data collection process. Researchers were trained using written study protocol forms, which can be found in Appendices L and M. One experienced pediatric registered dietitian completed the comprehensive nutritional assessments for the entire validation study. This dietitian was also trained prior to the beginning of the study. This was to ensure standardized methods were followed throughout the study period.

4.2.3 Process

In both the validation and reliability samples, participants met with the researchers on two separate occasions. For the reliability study, participants filled out the Toddler NutriSTEP® on two occasions, two to four weeks apart. In the validation study, the participants first completed Toddler NutriSTEP® then had a second study session two to four weeks later to complete their assessment.

4.2.3.1 First Visit – Test-Retest Reliability and Validation

Researchers met with caregivers of toddlers at Ontario locations as previously described. If the participant met all eligibility criteria, the researcher went over the information letter with the participant in detail. The participant then signed an informed consent form and provided an address should they wish to receive the study results upon completion.
Participants then filled out a participant background form (see Appendix N), adapted from Statistics Canada, which has been used in all NutriSTEP® research (Randall Simpson et al., 2008; Statistics Canada, 2001). This form has categorical questions about the participant, including age, gender, ethnic background, marital status, number of people in the household, income, and education and also information on toddler’s age, gender, ethnic background and medical conditions. The participant was able to choose whether or not to answer these questions.

Each participant then completed the draft, 17-item Toddler NutriSTEP®. For parents who completed the test-retest reliability study, this concluded the first appointment with the participant. The researcher then booked a second appointment, two to four weeks later, for the completion of the second Toddler NutriSTEP® (retest). Parents who participated in the validation study were at this point given instructions from the researcher on how to complete a 3-day food record for their toddler. The researcher then booked a second appointment with the parent, two-four weeks later, during which the nutritional assessment of the toddler was completed.

4.2.3.2 Second Visit – Test-Retest Reliability

The researcher met with the participant two to four weeks following the first visit to complete the retest. The researcher called or emailed the participant two to three days prior to the scheduled meeting as a reminder of the next visit. After the participant completed the Toddler NutriSTEP®, the incentives were given and the participant was thanked for their time.

4.2.3.3 Second Visit – Validity

For the second visit, the registered dietitian met with the caregiver and his/her toddler at either the recruitment location or at the home of the caregiver. During this visit, the
registered dietitian conducted a full nutritional assessment of the toddler, which will be used in phase D to determine criterion validity. This nutritional assessment was completed through following a standardized nutritional assessment guide (see Appendix O), which assisted the dietitian in obtaining all necessary information from the caregiver about the toddler. This guide was an objective way of assessing the nutrition risk of the toddlers and attempted to eliminate the subjectivity of the dietitian. This guide was modified for use in toddlers from the guide used in the criterion validation of NutriSTEP® (Randall Simpson et al., 2008) by adding risk factors and behaviours specific to this age group. It allowed the dietitian to rate the child’s nutritional risk on a scale of 1-10, classifying the child as low (1-4), moderate (5-7), or high (8-10) risk through the use of objective criteria. The dietitian completing the nutritional assessment form was blinded to the Toddler NutriSTEP® completed by parents in the previous visit.

The first step in the nutritional assessment was to conduct a physical assessment of the child’s growth. The dietitian weighed the child using a calibrated portable pediatric scale (Tanita Digital Baby Scale, model 1584 with removable safety tray, Arlington Heights, Illinois), checked for accuracy using a standard weight. Weight was taken in triplicate following standard weighing procedures for infants and toddlers (Gibson, 2005).

The dietitian then measured the child’s length/height. In the case of toddlers under the age of two years, a recumbent length measurement was taken in triplicate using a portable measuring mat (Starters pediatric measure mat, Starters Division of Slater & Frith, Norwich, United Kingdom), following standard techniques (Gibson, 2005). For toddlers aged two years and older, height was measured in triplicate using a portable stadiometer (Road Rod, 214, SECA, USA) and standard techniques (Gibson, 2005).
The child’s growth measurements were interpreted using the 2010 WHO Growth Charts adapted for Canada (Dietitians of Canada, 2011). Length-for-age, weight-for-age, and weight-for-length were assessed for toddlers 24 months and younger, while those older than 24 months had their height-for-age, weight-for-age and BMI assessed. In all cases, gender-specific growth charts were used.

Following the assessment of the toddler’s growth, the dietitian further assessed indicators of the child’s health through a standardized nutrition interview, including health problems affecting appetite, history of iron deficiency, dental problems, and gastrointestinal issues, parental feeding behaviours and other pertinent material using the nutritional risk rating guide.

Next, the dietitian assessed the toddler’s food intake, by reviewing the 3-day food record that the caregiver completed. If the caregiver had forgotten to complete the three-day food record, or did not complete it in full, the dietitian completed a 24-hour food recall for a typical day with the parent. When assessing the child’s dietary intake, the dietitian used the risk rating guide to make note of the child’s variety of food intake, meal patterning, snacking habits, beverage consumption (milk, juice, flavoured beverages), fast food consumption, food allergies/dietary concerns, and appetite.

Following the dietary assessment, the dietitian assessed the child’s diet and feeding behaviours, as well as any other issues or concerns that may have affected the child’s dietary intake, including food storage and cooking facilities, income and food availability, activity patterns, sedentary behaviours, and familial stability. The nutrition risk-rating guide was used to rate the child’s nutritional risk in all categories as low, medium, or high risk. The dietitian then assigned the toddler a final risk score using a number between 1 and 10, based on the
child’s risk ratings. A child who was at low nutrition risk was assigned a value of 1-4; one who was at moderate risk was given a 5-7; and a child who was at high risk was assigned a value of 8-10.

After the dietitian finished the full nutritional assessment of the child, she gave suggestions to the parent on how to improve the child’s nutritional health. If the dietitian found the child to be of high risk, she completed a written referral to the child’s family doctor (with the permission of the parents), to ensure that the toddler would receive an intervention to improve his/her health. The dietitian also gave the caregiver time to ask any questions they may have had about his/her toddler’s nutritional health and provided the parent with the incentives.

4.3 Data Entry

Information collected from the participant background form and Toddler NutriSTEP® were entered in duplicate into an Excel spreadsheet. Separate spreadsheets were used for entering the data collected in the reliability study and in the validity study.

For the most part, the data collected on participant demographics from the participant background form was entered into the spreadsheet exactly as it appeared on the form itself. This includes information collected on age, first language, country of birth and ethnic background of the toddler and parents, as well as the number of people living in the household. Any reported toddler medical conditions also were entered into the spreadsheet exactly as they appeared on the form themselves. Several other personal characteristics were categorized when entered into the spreadsheet. These included gender, marital status, education, and income. For all questions coded in the spreadsheet a 99 was used to represent any answers left blank.
Responses selected on the Toddler NutriSTEP® were also entered into the Excel spreadsheet using categories. On the Toddler NutriSTEP®, the answer stems to all questions have a point value associated with the response. The point value assigned to the answer stem selected by the participant was entered into the spreadsheet as the code for that question.

The data collected from the dietitian’s nutritional assessment of the toddlers was also entered into the spreadsheet. This was done through dichotomous categorization (is the risk factor present or not) of all risk variables into a single spreadsheet.  

4.4 Data Analysis

Statistical analysis of demographic, reliability, theoretical construct data, and exploratory factor analysis were conducted using SPSS version 19 (PASW) for Mac. Confirmatory factor analysis was conducted using AMOS versions 19 and 20 for Windows. For this project, a $p$ value ≤ 0.05 was considered statistically significant. Data on the participant demographics were analyzed by calculating means (±SD) and frequencies.

In the reliability study, the test-retest reliability was analyzed through the comparison of the total NutriSTEP® score of the two separate occasions using a paired samples t-test. In this case, a non-significant result indicates adequate agreement between the two occasions, implying reliability. Wilcoxon signed ranks tests were used on individual questions to determine if the individual questions were significantly different across the two occasions. Non-significant Wilcoxon test results indicate the responses to the questions are not significantly different across occasions, thus indicating reliability. Kappa statistics, ranging from 0-1 with higher values indicating greater reliability, were also calculated for individual questions, to see if the children were classified into the same risk category (risk/no risk for item) across occasions (Jones, 2004b). Values above 0.4 are considered to reflect fair
reliability, values above 0.6 are considered to have moderate reliability, and values above 0.8 are considered to have excellent reliability (Jones, 2004b). Paired sample correlations and intra-class correlations of the total NutriSTEP® and attribute scores were also calculated to see how closely the two occasions were related, with higher correlations indicating better reliability. (Jones, 2004b; Streiner & Norman, 1995).

In the validity portion of phase C, construct validity was assessed through comparison of the researcher’s theoretical expectations of the tool with the performance of the tool itself (Jones, 2004c). To assess this, t-tests (for variables with two groups) and analysis of variance (for variables with more than two groups) were used to compare the average response on the questionnaire across varying risk groups to see if hypothesized trends existed (Jones, 2004c; Streiner & Norman, 1995). Variables that were compared with the total NutriSTEP® score included immigration status, income, and education. It was hypothesized that those parents with less income, lower education, and those who had immigrated into Canada would have toddlers scoring higher on the NutriSTEP® than parents with more income, education, and who were Canadian born, based on associations seen in the literature (American Dietetic Association, 2004; Bradley & Corwyn, 2002; Hendricks et al., 2006; Flasnerud & Kim, 1999; Ponza et al., 2004; Satia-Abouta, Patterson, Neuhouse, & Elder, 2002). BMI of toddlers was also hypothesized to be associated with nutritional risk based on previous literature (Ogden et al., 2010). It was hypothesized that those children with high and low BMIs (over- and underweight) would have higher scores on the Toddler NutriSTEP®. Statistical significance ($p \leq 0.05$) was be used as an indicator of construct validity in all of these cases.
Another hypothesized relationship between theoretical hypotheses and the Toddler NutriSTEP® that was expected to be observed was the inability of parents to correctly classify their toddler’s weight, since this finding has been shown in previous literature (Carnell, Edwards, Croker, Boniface, & Wardle, 2005; Etelson, Brand, Patrick, & Shirali, 2003). This relationship was tested by comparing the parent responses to question 17 on the Toddler NutriSTEP® (asks whether the parent believes their child should weigh more, weigh less, or is at an appropriate weight) to the actual classification of the child’s weight based on his/her BMI z-score. This was done through analyzing the frequencies at which parents correctly classified their child’s weight according to the NutriSTEP® question. For this analysis, BMI z-scores were calculated using the WHO Anthro: Software for assessing the growth and development of the world’s children, which calculated BMI z-scores and percentiles based on the age, gender, weight and height of the toddlers.

Factor analysis was also conducted on the data as a means of further demonstrating construct validity. Toddler NutriSTEP® was developed based on the original NutriSTEP® with the researchers developing the questions with a hypothesized factor structure in mind: the 17 questions were categorized into five attributes (Gumbley, 2011). To test whether or not this attribute structure resembled the statistical structure, exploratory and confirmatory factor analyses were run on a combined data pool of the Toddler NutriSTEP® questionnaires completed in the first visit of both the reliability and validity studies. For the exploratory factor analysis, the maximum likelihood extraction method was used, with factor loadings restricted to those greater than 0.3, and oblique rotation applied. It was hypothesized that the attribute structure of Toddler NutriSTEP® would be multi-dimensional and complex, and
therefore adequately reflect the attribute structure of the construct of nutritional risk in toddlers.

Exploratory factor analyses were conducted in SPSS version 19. Since the questions on the Toddler NutriSTEP® were developed based on five proposed attributes, six different exploratory factor analyses were run, with 1-6 factor solutions requested. Factor loadings were restricted to loadings greater than 0.3 and the maximum likelihood extraction method with oblique rotation was used (Field, 2009). Confirmatory factor analyses were conducted on factor solutions that appeared promising from the exploratory factor analyses using AMOS.

4.5 Summary and Next Steps

In summary, quantitative data were collected from over 300 families across Ontario to determine the test-retest reliability and construct validity of the newly developed Toddler NutriSTEP®. Parents participating in the reliability phase of the study completed a demographic form, as well as the Toddler NutriSTEP® on two separate occasions. The total score, construct scores, and individual question scores were analyzed using a variety of statistical methods to determine whether or not the NutriSTEP® was reliable. Families participating in the validity phase of the study completed a demographic form, the Toddler NutriSTEP®, a three-day food record for the toddler, and participated in a full nutritional assessment of the toddler. Construct validity was determined through statistically comparing NutriSTEP® scores to theoretical constructs using either a t-test or ANOVA, as well as through conducting a confirmatory factor analysis.
5.0 Results

5.1 Study Samples

A diagram depicting the flow of participants in both studies can be seen in Figure 5.1. A total of 376 packages were initially given out to recruited parents from both studies combined. Of these, 35 packages were incomplete due to attrition, and eight packages were incomplete due to missed questions on the Toddler NutriSTEP®. Twenty-seven families participated in both studies; hence the final sample of 306 unique families.

**Figure 5.1: Flow of participants in the validation and reliability studies**

![Diagram of participant flow]

A total of 158 parents of toddlers were recruited for participation in the reliability phase, with 141 completing the study. Since only data from participants whom had answered all questions on both occasions were used in the analysis, data from eight participants were further excluded because of missing responses. The final sample size on which reliability statistics were calculated was therefore 133.
A total of 218 families were recruited for participation in the validity study. Of these, 18 completed the first visit, but did not return for the follow-up nutritional assessment of their toddler. The final sample size of the validation study was therefore 200. Participant demographics for both the reliability and validity phases are shown in Table 5.1.

The final reliability and validity samples were compared to see if any significant differences existed. Participants in the reliability study did not significantly differ in terms of parent or child age and gender from those in the validation study, as seen in Table 5.1. Marital status, number of adults/children in the household, and child’s birth country were also not significantly different between the two studies. However, the two samples were significantly different in terms of mother’s and father’s first language, with a greater proportion of caregivers in the reliability study with English as his/her first language compared to the validity study (mother: 92% vs 52%, $\chi^2 = 69.56, p<0.001$; father: 87% vs 54%, $\chi^2 = 51.54, p<0.001$ respectively). The samples also differed significantly in terms of the birth country of the mother and father, with a greater proportion of mothers and fathers in the validity sample being born in a country other than Canada as compared to the reliability study (mother: 50% vs 9%, $\chi^2 = 59.68, p<0.001$; father: 48% vs 10%, $\chi^2 = 49.18, p<0.001$ respectively). Further, a significantly greater proportion of caregivers in the reliability sample graduated post-secondary school (74% vs 58%, $\chi^2 = 17.43, p=0.002$) and had household incomes greater than $60,000 per year (60% vs 32%, $\chi^2 = 39.56, p<0.001$) than those in the validity sample.
Table 5.1: Demographic characteristics of participants

<table>
<thead>
<tr>
<th>Participant characteristic</th>
<th>Reliability study (n=133)</th>
<th>Validation study (n=200)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean ± SD</td>
<td>mean ± SD</td>
</tr>
<tr>
<td>Parent’s age (years)</td>
<td>33 ± 6</td>
<td>32 ± 6</td>
</tr>
<tr>
<td>Child’s age (months)</td>
<td>25 ± 5</td>
<td>26 ± 5</td>
</tr>
<tr>
<td>Number of people in household</td>
<td>4 ± 1</td>
<td>4 ± 1</td>
</tr>
<tr>
<td>Number of children in household</td>
<td>2 ± 1</td>
<td>2 ± 1</td>
</tr>
<tr>
<td>Child’s weight (kg)</td>
<td>N/A</td>
<td>13.2 ± 2.1</td>
</tr>
<tr>
<td>Child’s height (cm)</td>
<td>N/A</td>
<td>88.1 ± 4.9</td>
</tr>
<tr>
<td>Child’s BMI</td>
<td>N/A</td>
<td>16.9 ± 1.8</td>
</tr>
<tr>
<td>Gender (parent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>Gender (child)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>89</td>
<td>85</td>
</tr>
<tr>
<td>Single</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Separated/divorced/widowed</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Education&lt;graduated high school</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Graduated high school</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Some post-secondary</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Graduated post-secondary</td>
<td>74</td>
<td>58</td>
</tr>
<tr>
<td>Income&lt;$30,000</td>
<td>16</td>
<td>42</td>
</tr>
<tr>
<td>$30,000-$59,999</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>&gt;$60,000</td>
<td>60</td>
<td>32</td>
</tr>
<tr>
<td>Mother’s first language&lt;graduated high school</td>
<td>92</td>
<td>52</td>
</tr>
<tr>
<td>French</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>48</td>
</tr>
<tr>
<td>Father’s first language&lt;graduated high school</td>
<td>87</td>
<td>54</td>
</tr>
<tr>
<td>English</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>French</td>
<td>10</td>
<td>45</td>
</tr>
<tr>
<td>Mother immigrated&lt;graduated high school</td>
<td>9</td>
<td>50</td>
</tr>
<tr>
<td>Father immigrated&lt;graduated high school</td>
<td>10</td>
<td>48</td>
</tr>
<tr>
<td>Child with medical condition</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>
Participations who completed the reliability and validity studies were compared using t-tests and Chi squared tests to those who dropped out of the respective studies to see if any differences existed between the groups (for results of these tests, see Table 5.2). For the reliability study, those who completed the study were not significantly different from those who did not complete the study in terms of parental age, gender, marital status, and education level. However, significant differences were seen between the groups in terms of income, immigration status, and total score on the first Toddler NutriSTEP®. Income was found to be significantly different between the groups, with a higher proportion of those who completed the reliability study having incomes over $60,000 than those who dropped out of the study (63% vs 21% respectively; $\chi^2=15.036, p=0.010$). Mean Toddler NutriSTEP® score on the first administration of the questionnaire was significantly higher in the group that dropped out of the study in comparison to the group that completed the reliability study (19±7 vs 15±7, $t=-2.38, p=0.019$ respectively). Immigration status also displayed significant differences, with those who dropped out of the study having a significantly higher proportion of mothers and fathers who had immigrated to Canada than those who completed the reliability study (mothers: 25% vs 9% respectively, $\chi^2=3.919, p=0.048$; fathers: 27% vs 9% respectively, $\chi^2=4.165, p=0.041$).

Participants who completed the validation study were not found to be significantly different from those who dropped out of the validation study in terms of parental age, gender,
education, income, and total Toddler NutriSTEP® score. However, those who dropped out of the study were found to have significantly different marital status than those who remained in the validation study, with a higher proportion of married parents completing the study versus those who dropped out (85% vs 59% respectively, $\chi^2=14.178, p=0.003$). Furthermore, those who dropped out had a significantly lower proportion of non-Canadian born mothers and fathers than those who completed the validation study (mothers: 12% vs 48% respectively, $\chi^2=8.579, p=0.003$; fathers: 12.5% vs 47% respectively, $\chi^2=7.159, p=0.007$).

Table 5.2: Comparison of participants completing the study to drop-outs

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Reliability Sample</th>
<th>Validity Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent age (x±SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>$33 \pm 6$ (n=138)</td>
<td>$32 \pm 6$ (n=192)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>$32 \pm 5$ (n=14)</td>
<td>$30 \pm 4$ (n=15)</td>
</tr>
<tr>
<td>$t=0.774$</td>
<td>$t=1.187$</td>
<td></td>
</tr>
<tr>
<td><strong>Parent gender (% female)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>91% (n=141)</td>
<td>92% (n=197)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>100% (n=16)</td>
<td>100% (n=17)</td>
</tr>
<tr>
<td>$\chi^2=1.474$</td>
<td>$\chi^2=1.392$</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status (% married)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>89% (n=140)</td>
<td>85% (n=198)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>75% (n=16)</td>
<td>59% (n=17)</td>
</tr>
<tr>
<td>$\chi^2=3.900$</td>
<td>$\chi^2=14.178^a$</td>
<td></td>
</tr>
<tr>
<td><strong>Mother immigrated (% immigrated)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>9% (n=135)</td>
<td>48% (n=191)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>25% (n=16)</td>
<td>12% (n=17)</td>
</tr>
<tr>
<td>$\chi^2=3.919^a$</td>
<td>$\chi^2=8.579^a$</td>
<td></td>
</tr>
<tr>
<td><strong>Father immigrated (% immigrated)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>9% (n=130)</td>
<td>47% (n=178)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>27% (n=15)</td>
<td>12.5% (n=16)</td>
</tr>
<tr>
<td>$\chi^2=4.165^a$</td>
<td>$\chi^2=7.159^a$</td>
<td></td>
</tr>
</tbody>
</table>
### Test-Retest Reliability

Between administrations, total scores on the Toddler NutriSTEP® were reliable (ICC=0.951, F=20.53, p < 0.001). Paired samples t-tests and paired sample correlations were also calculated on the total Toddler NutriSTEP® score, as well as on individual attribute scores, indicating that total and attribute scores were not significantly different across time (see Table 5.3).

### Table 5.3: Test-Retest Reliability

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Reliability Sample</th>
<th>Validity Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education level</strong>&lt;br&gt;(% graduated post secondary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>74% (n=138)</td>
<td>58% (n=195)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>75% (n=16)</td>
<td>47% (n=17)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>1.221</td>
<td>4.633</td>
</tr>
<tr>
<td><strong>Total household income</strong>&lt;br&gt;(% income &gt;$60,000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>63% (n=134)</td>
<td>32% (n=188)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>21% (n=14)</td>
<td>25% (n=16)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>15.036&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.297</td>
</tr>
<tr>
<td><strong>Total NutriSTEP® Score (x ± SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed study</td>
<td>15 ± 7 (n=138)</td>
<td>20 ± 9 (n=200)</td>
</tr>
<tr>
<td>Drop-out</td>
<td>19 ± 6 (n=17)</td>
<td>17 ± 5 (n=17)</td>
</tr>
<tr>
<td>$t$</td>
<td>-2.38&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.354</td>
</tr>
</tbody>
</table>

<sup>a</sup> Indicates a value that is significant at $p < 0.05$
Table 5.3: Reliability statistics of total score and individual attribute scores for Toddler NutriSTEP®

<table>
<thead>
<tr>
<th>Attribute</th>
<th>mean ± SD</th>
<th>Pearson’s correlation</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food and fluid intake</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>8 ± 3</td>
<td>0.81&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.237</td>
</tr>
<tr>
<td>Time 2</td>
<td>8 ± 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Physical growth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>1 ± 2</td>
<td>0.89&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.722</td>
</tr>
<tr>
<td>Time 2</td>
<td>1 ± 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>2 ± 2</td>
<td>0.89&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.954</td>
</tr>
<tr>
<td>Time 2</td>
<td>2 ± 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Physical activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>1 ± 1</td>
<td>0.84&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-1.173</td>
</tr>
<tr>
<td>Time 2</td>
<td>1 ± 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attribute</th>
<th>mean ± SD</th>
<th>Pearson’s correlation</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factors affecting food intake</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>4 ± 2</td>
<td>0.84&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.580</td>
</tr>
<tr>
<td>Time 2</td>
<td>4 ± 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>15 ± 7</td>
<td>0.91&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.882</td>
</tr>
<tr>
<td>Time 2</td>
<td>15 ± 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Indicates a value that is significant at <i>p</i> < 0.05

Individual questions were also tested for reliability by comparing whether or not the child was at risk or not based on the item. All questions had significant kappa statistics (<i>p</i> < 0.001), with most showing at least adequate reliability (kappa > 0.5). Most questions had non-significant Wilcoxon tests, indicating reliable questions, with only three questions having a significant result: frequency of grain product consumption, frequency of milk product consumption, and the child decides how much to eat. Results of the reliability tests on individual questions can be seen in Table 5.4.
Table 5.4: Reliability statistics on individual questions for Toddler NutriSTEP®

<table>
<thead>
<tr>
<th>Question stem</th>
<th>Wilcoxon signed rank test</th>
<th>Kappa statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>My child usually eats grain products:</td>
<td>-2.161(^a)</td>
<td>0.39</td>
</tr>
<tr>
<td>My child usually has milk products:</td>
<td>-2.185(^a)</td>
<td>0.70</td>
</tr>
<tr>
<td>My child usually eats vegetables and fruit:</td>
<td>-0.448</td>
<td>0.68</td>
</tr>
<tr>
<td>My child usually eats meat, fish, poultry or alternatives:</td>
<td>0.00</td>
<td>0.44</td>
</tr>
<tr>
<td>My child usually eats restaurant or take-out “fast foods”:</td>
<td>-0.622</td>
<td>0.63</td>
</tr>
<tr>
<td>My child usually drinks juice or flavoured beverages:</td>
<td>-0.011</td>
<td>0.67</td>
</tr>
<tr>
<td>I have difficulty buying food I want to feed my child because food is expensive:</td>
<td>-0.698</td>
<td>0.74</td>
</tr>
<tr>
<td>My child has problems chewing, swallowing, gagging or choking when eating:</td>
<td>-0.962</td>
<td>0.85</td>
</tr>
<tr>
<td>My child feeds his/her self at meals and snacks:</td>
<td>-0.333</td>
<td>n/a(^b)</td>
</tr>
<tr>
<td>My child drinks from a baby bottle with a nipple:</td>
<td>-0.447</td>
<td>0.89</td>
</tr>
<tr>
<td>My child is hungry at mealtimes:</td>
<td>-0.836</td>
<td>0.49</td>
</tr>
<tr>
<td>My child usually eats meals and snacks:</td>
<td>-1.043</td>
<td>0.46</td>
</tr>
<tr>
<td>I let my child decide how much to eat:</td>
<td>-2.532(^a)</td>
<td>0.53</td>
</tr>
<tr>
<td>My child eats meals or snacks while watching TV, or being read to, or playing with toys:</td>
<td>-0.870</td>
<td>0.70</td>
</tr>
<tr>
<td>My child usually watches TV, or uses the computer, or plays video games:</td>
<td>-1.253</td>
<td>0.79</td>
</tr>
<tr>
<td>I am comfortable with how my child is growing:</td>
<td>-1.134</td>
<td>0.82</td>
</tr>
<tr>
<td>I think my child: (in terms of weight)</td>
<td>-1.098</td>
<td>0.82</td>
</tr>
</tbody>
</table>

\(^a\)significant Wilcoxon test at \(p = 0.05\)

All kappa statistics were significant at \(p <0.001\)

\(^b\)unable to calculate a kappa statistic because risk/no risk was consistent across administrations
Because there were significant differences between the reliability and validity samples (validation sample more diverse), there was a possibility that the lack of diversity within the reliability sample may have lead to an overestimation of the reliability of the tool. To determine whether or not the limited diversity was overestimating the reliability, the reliability sample was split to check if different demographic groups were more or less reliable than the overall reliability sample. The reliability sample was split into participants who reported a high income (> $60,000 per year) and those who reported a low income (< $60,000 per year) and reliability was individually assessed amongst the groups (see Table 5.5). Statistical analysis showed that both high and low income groups remained reliable across administrations (high income: ICC=0.883, F=16.149, \( p < 0.001 \); low income: ICC=0.897, F=18.505, \( p < 0.001 \)).

**Table 5.5: Reliability results of high versus low income participants**

<table>
<thead>
<tr>
<th>Group</th>
<th>mean ± SD</th>
<th>ICC</th>
<th>Pearson’s correlation</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low income (n=57)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>18 ± 7</td>
<td>ICC=0.897</td>
<td>( r=0.897, \ p &lt; 0.001 )</td>
<td>( t=0.995, \ p=0.326 )</td>
</tr>
<tr>
<td>Time 2</td>
<td>17 ± 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High income (n=76)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>12 ± 5</td>
<td>ICC=0.883</td>
<td>( r=0.884, \ p &lt; 0.001 )</td>
<td>( t=-0.182, \ p=0.856 )</td>
</tr>
<tr>
<td>Time 2</td>
<td>12 ± 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.3 **Construct Validity**

Toddler NutriSTEP® was found to demonstrate construct validity through comparison of total score on NutriSTEP® across various parent demographic groups, comparison of child’s actual weight to parent perceptions of his/her weight, as well as through confirmatory factor analysis.
5.3.1 Comparison of Parent Demographics to Toddler NutriSTEP® Scores

Analysis of variance and t-tests were used on various constructs to see if the total Toddler NutriSTEP® score was significantly different between various groups, as hypothesized. The results of these construct validation tests can be seen in Table 5.6.

Parents with higher levels of income were hypothesized to have toddlers that scored lower on the Toddler NutriSTEP® than those from families with lower levels of income. An ANOVA comparing three levels of income found this to be true, with families of the highest income, greater than $60,000 per year, having significantly lower scores on the Toddler NutriSTEP® than parents with moderate incomes, $30,000-$59,999 ($p = 0.001), and parents with the lowest incomes, less than $15,000 ($p < 0.001). Parents with moderate incomes were also found to have significantly lower scores than parents with low incomes ($p = 0.045).

It was hypothesized that parents with more education would have toddlers who scored lower on the Toddler NutriSTEP® than toddlers of parents with less education. An ANOVA test was run on this construct comparing four levels of education to one another. Parents with the highest level of education (graduated post-secondary) were found to have toddlers with significantly lower scores on the Toddler NutriSTEP® in comparison to those with the lowest education (less than graduating high school) ($p = 0.009). Parents with moderate levels of education were not found to have significantly different scores than any other category of education.

Parents who had immigrated to Canada were hypothesized to have toddlers scoring higher on the Toddler NutriSTEP® than toddlers of parents who were born in Canada. Both the immigration status of mothers and fathers were compared to scores on Toddler NutriSTEP® using t-tests. The results of the t-tests indicated that mothers who were born in
Canada had toddlers with significantly lower scores on the Toddler NutriSTEP® than toddlers of mothers who immigrated into Canada ($p < 0.001$). Likewise, fathers who were born in Canada had children with significantly lower scores on the Toddler NutriSTEP® than children of fathers who immigrated into Canada ($p < 0.001$). The immigration status of both parents was also combined to form a construct with three variables: both parents born in Canada, one parent born in Canada, and neither parent born in Canada. When an ANOVA test was conducted, as hypothesized, those families where both parents were born outside of Canada had toddlers with significantly higher Toddler NutriSTEP® scores than families where one parent was born in Canada ($p < 0.001$) and families where both parents were born in Canada ($p < 0.001$). Families with both parents born in Canada and families with one parent born in Canada were not significantly different from one another.

A toddler who is in the extreme low or extreme high percentiles in terms of his/her BMI was hypothesized to be at higher nutritional risk than toddlers with BMIs within normal percentiles, since BMI may be an indication of problems with dietary intake in children (Ogden et al., 2010). Therefore, it was hypothesized that BMI z-score would be significantly associated with total Toddler NutriSTEP® score. Toddlers were categorized into four groups based on BMI z-scores: underweight (BMI z-score < -2), normal weight (BMI z-score -2 to +1), overweight (BMI z-score > +1 to +2), and extremely overweight (BMI z-score > +2). Toddler NutriSTEP® score did not differ significantly between the four groups. Furthermore, there was no correlation between Toddler NutriSTEP® score and the absolute value of the BMI z-score. Absolute values of BMI z-scores were used because it was hypothesized that both extreme low and extreme high z-scores would be indicative of higher nutritional risk, and therefore higher Toddler NutriSTEP® scores.
A correlation was also run between BMI z-score and a “negative behaviour” score made by combining the four questions on the Toddler NutriSTEP® that were hypothesized to be associated with overweight: juice consumption, fast food consumption, eating while playing/watching TV, and hours of TV watched per day. The correlation between these was small, yet significant ($r = 0.216, p = 0.002$), indicating that BMI z-scores are correlated with these four questions on the NutriSTEP®.

**Table 5.6: Construct validation statistics for Toddler NutriSTEP®**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Toddler NutriSTEP® score (mean ± SD)</th>
<th>Overall Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household Income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$30,000 (n=78)</td>
<td>23 ± 8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>F = 27.68,</td>
</tr>
<tr>
<td>$30,000-$59,999 (n=39)</td>
<td>19 ± 8&lt;sup&gt;b&lt;/sup&gt;</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>&gt;$60,000 (n=60)</td>
<td>14 ± 6&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Level of Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; Graduated high school (n=29)</td>
<td>24 ± 7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>F = 3.96,</td>
</tr>
<tr>
<td>Graduated high school (n=15)</td>
<td>21 ± 6</td>
<td>p = 0.009</td>
</tr>
<tr>
<td>Some post-secondary (n=37)</td>
<td>21 ± 8</td>
<td></td>
</tr>
<tr>
<td>Graduated post-secondary (n=114)</td>
<td>18 ± 9&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Immigration Status (Mother)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born in Canada (n=96)</td>
<td>15 ± 6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>t = -7.67,</td>
</tr>
<tr>
<td>Immigrated to Canada (n=95)</td>
<td>24 ± 8&lt;sup&gt;b&lt;/sup&gt;</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td><strong>Immigration Status (Father)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born in Canada (n=93)</td>
<td>15 ± 6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>t = -7.00,</td>
</tr>
<tr>
<td>Immigrated to Canada (n=85)</td>
<td>23 ± 9&lt;sup&gt;b&lt;/sup&gt;</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td><strong>Immigration Status (both parents)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parents born in Canada (n=85)</td>
<td>15 ± 6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>F = 35.42,</td>
</tr>
<tr>
<td>One parent born in Canada (n=16)</td>
<td>15 ± 6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Neither parent born in Canada (n=77)</td>
<td>24 ± 8&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Child’s BMI z-score</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight (n=114)</td>
<td>20 ± 9</td>
<td>F = 1.48,</td>
</tr>
<tr>
<td>Underweight (n=0)</td>
<td>NA</td>
<td>p = 0.231</td>
</tr>
<tr>
<td>Overweight (n=59)</td>
<td>18 ± 9</td>
<td></td>
</tr>
<tr>
<td>Extremely overweight (n=27)</td>
<td>22 ± 6</td>
<td></td>
</tr>
<tr>
<td><strong>Correlation between z-score and total Toddler NutriSTEP® score</strong></td>
<td>$r = 0.031$</td>
<td></td>
</tr>
<tr>
<td><strong>Correlation between z-score and “negative behaviour” score</strong></td>
<td>$r = 0.216$</td>
<td></td>
</tr>
</tbody>
</table>

<sup>abc</sup> variables with different superscripts are significantly different
5.3.2 Comparison of Child’s Actual Weight to Parent Perceptions

Question 17 on the Toddler NutriSTEP® asks parents whether they feel their child should weigh more, should weigh less, is at the right weight, or if they are unsure about the status of their child’s weight. It was hypothesized that the majority of parents with overweight children would not identify their children as overweight, as previously documented in the literature (Carnell, Edwards, Croker, Boniface, & Wardle, 2005; Etelson, Brand, Patrick, & Shirali, 2003). Although 86 toddlers (43%) in the study were identified as being overweight (BMI percentile above the 85th percentile for their age and gender group), only four parents correctly identified them as such. Furthermore, a frightening number of parents of overweight children incorrectly classified their child as being the “right weight” (n=64), or needing to weigh more (n=8). The detailed results of the frequency analysis of this question can be seen in Table 5.7.

**Table 5.7: Comparison of child’s weight to parent’s perceptions of child’s weight (Q17 on Toddler NutriSTEP®)**

<table>
<thead>
<tr>
<th>Q17: I think my child...</th>
<th>Total responses</th>
<th>Child is normal weight</th>
<th>Child is overweight</th>
<th>Correct classification of child</th>
<th>Incorrect classification of child</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is about the right weight</td>
<td>130</td>
<td>66</td>
<td>64</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
<td>Should weigh less</td>
<td>10</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Should weigh more</td>
<td>35</td>
<td>27</td>
<td>8</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td>Not sure</td>
<td>25</td>
<td>15</td>
<td>10</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>114</td>
<td>86</td>
<td>70</td>
<td>105</td>
</tr>
</tbody>
</table>
The parents who classified their child’s weight correctly were statistically compared to the parents who incorrectly classified their child’s weight on the demographic variables collected on the participant background form. There were no significant differences between the groups except that those who correctly classified their child’s weight had lower total Toddler NutriSTEP® scores than those who incorrectly classified their child’s weight (x=17±7 vs x=21±7, t=-3.414, p = 0.001).

Parents of children who were measured as overweight were compared to the parents of children who were measured as normal weight to see if any statistically significant differences existed between the two groups in terms of demographic variables. Parents of overweight and normal weight children were significantly different in terms of their immigration status and education. A higher proportion of parents of overweight children were born in Canada compared to the parents of normal weight children (mothers: 57% vs 43% respectively, $\chi^2 = 4.87, p=0.027$; fathers: 55% vs 45% respectively, $\chi^2 = 4.03, p=0.045$). In terms of education, a greater proportion of parents of overweight children did not attend any post-secondary education compared to the percentage of parents of normal weight children (31% vs 16% respectively, $\chi^2 = 9.90, p =0.042$).

5.3.3 Factor Analysis

Both exploratory and confirmatory factor analyses were conducted on the Toddler NutriSTEP® to determine the factor structure of the questionnaire and to see if that structure was reflective of the attribute structure used in the development. The attribute structure originally proposed by the researchers when developing the Toddler NutriSTEP® can be seen in Table 5.8. These analyses were conducted using a combined pool of data from the reliability (data from the first completion of the questionnaire) and construct validity studies.
After combining the data, removing incomplete questionnaires, and removing duplicate entries (from those who participated in both studies), the final sample size on which these analyses were conducted was 332. This sample size is considered “good” by Comrey and Lee (1992).

**Table 5.8: Hypothesized attribute structure of Toddler NutriSTEP®**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Question Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and fluid intake</td>
<td>My child usually eats grain products:</td>
</tr>
<tr>
<td></td>
<td>My child usually has milk products:</td>
</tr>
<tr>
<td></td>
<td>My child usually eats vegetables and fruit:</td>
</tr>
<tr>
<td></td>
<td>My child usually eats meat, fish, poultry or alternatives:</td>
</tr>
<tr>
<td></td>
<td>My child usually eats restaurant or take-out “fast-foods”:</td>
</tr>
<tr>
<td></td>
<td>My child usually drinks juice or flavoured beverages:</td>
</tr>
<tr>
<td></td>
<td>My child is hungry at mealtimes:</td>
</tr>
<tr>
<td></td>
<td>My child usually eats meals and snacks (frequency):</td>
</tr>
<tr>
<td>Physical growth</td>
<td>I am comfortable with how my child is growing:</td>
</tr>
<tr>
<td></td>
<td>I think my child (in terms of weight):</td>
</tr>
<tr>
<td>Development</td>
<td>My child has problems chewing, swallowing, gagging or choking when eating:</td>
</tr>
<tr>
<td></td>
<td>My child feeds his/herself at meals and snacks:</td>
</tr>
<tr>
<td></td>
<td>My child drinks from a baby bottle with a nipple:</td>
</tr>
<tr>
<td>Physical activity and sedentary behaviour</td>
<td>My child usually watches TV, or uses the computer, or plays video games:</td>
</tr>
<tr>
<td>Other factors affecting food intake</td>
<td>I have difficulty buying food I want to feed my child because food is expensive:</td>
</tr>
<tr>
<td></td>
<td>My child feeds his/herself at meals and snacks:</td>
</tr>
<tr>
<td></td>
<td>My child eats meals or snacks while watching TV, or being read to, or playing with toys:</td>
</tr>
<tr>
<td></td>
<td>I let my child decide how much to eat:</td>
</tr>
</tbody>
</table>

For the exploratory factor analyses, the Kaiser-Meyer-Olkin measure was 0.782, which indicates the sample size used in the exploratory factor analyses was “good” (Field, 2009). Barlett’s test of sphericity ($\chi^2 (136) = 1042.87, p < 0.001$) was significant, indicating that it was appropriate to do a factor analysis on the data (Field, 2009). The results of the exploratory factor analysis can be found in Table 5.9. The full question stem for each question in the table can be found in Appendix P.
<table>
<thead>
<tr>
<th>Factor solution, goodness of fit (variance)</th>
<th>Proposed factor name (eigenvalue after rotation)</th>
<th>Questions in factor</th>
<th>Factor loading</th>
<th>Questions not loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F1: Toddler eating habits (3.229)</td>
<td>Consumes fruits &amp; vegetables 0.666</td>
<td>Food is expensive, drinks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves 0.622</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eats while distracted 0.601</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes meat 0.498</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comfortable with growth 0.480</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes grains 0.475</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child weighs? 0.462</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eating frequency 0.461</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child decides how much 0.415</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problems chewing 0.386</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hungry at meals 0.376</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drinks from bottle 0.360</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes milk 0.352</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedentary activity 0.334</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>F1: Toddler eating habits (3.136)</td>
<td>Consumes fruits &amp; vegetables 0.651</td>
<td>Food is expensive, drinks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes grain 0.584</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eating frequency 0.571</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes meat 0.531</td>
<td></td>
<td>from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child weighs? 0.504</td>
<td></td>
<td>bottle,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves 0.491</td>
<td></td>
<td>consumes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes milk 0.445</td>
<td></td>
<td>fast food,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comfortable with growth 0.390</td>
<td></td>
<td>drinks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hungry at meals 0.372</td>
<td></td>
<td>juice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problems chewing 0.318</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child decides how much 0.317</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F2: Sedentary behaviours (2.234)</td>
<td>Eats while distracted 1.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedentary activity 0.484</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>F1: Food consumption (2.599)</td>
<td>Consumes fruits &amp; vegetables 0.567</td>
<td>Comfortable with growth, hungry at meals, child decides how much</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eating frequency 0.519</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes grains 0.479</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes meat 0.447</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes milk 0.436</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child weighs? 0.392</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Food is expensive 0.307</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F2: Behaviours while eating (2.650)</td>
<td>Eats while distracted 0.976</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves 0.499</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problems chewing 0.355</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor solution, goodness of fit (variance)</td>
<td>Proposed factor name (eigenvalue after rotation)</td>
<td>Questions in factor</td>
<td>Factor loading</td>
<td>Questions not loading</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>---------------------</td>
<td>----------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Drinks from bottle</td>
<td>0.329</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F3: “Unhealthy” behaviours (1.113)</td>
<td>Drinks juice</td>
<td>0.584</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sedentary activity</td>
<td>0.481</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consumes fast food</td>
<td>0.474</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>F1: Food consumption habits (2.737)</td>
<td>Consumers milk</td>
<td>0.743</td>
<td>Child decides how much</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes fruits &amp; vegetables</td>
<td>0.532</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes grains</td>
<td>0.487</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eating frequency</td>
<td>0.415</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves</td>
<td>0.402</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes meat</td>
<td>0.367</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hungry at meals</td>
<td>0.314</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comfortable with growth</td>
<td>0.313</td>
<td></td>
</tr>
<tr>
<td>F2: Behaviours while eating and inactivity (2.162)</td>
<td>Eats while distracted</td>
<td>0.934</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves</td>
<td>0.353</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedentary activity</td>
<td>0.323</td>
<td></td>
</tr>
<tr>
<td>F3: Developmental behaviours and access to food (2.003)</td>
<td>Drinks from bottle</td>
<td>0.456</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problems chewing</td>
<td>0.451</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Food is expensive</td>
<td>0.404</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child weighs?</td>
<td>0.320</td>
<td></td>
</tr>
<tr>
<td>F4: “Unhealthy” behaviours (0.937)</td>
<td>Drinks juice</td>
<td>0.521</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedentary activity</td>
<td>0.451</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes fast food</td>
<td>0.445</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>F1: Food consumption habits (2.756)</td>
<td>Consumes milk</td>
<td>0.651</td>
<td>Drinks from bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes grain</td>
<td>0.546</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes fruits &amp; vegetables</td>
<td>0.539</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eating frequency</td>
<td>0.441</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes meat</td>
<td>0.350</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child decides how much</td>
<td>0.329</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hungry at meals</td>
<td>0.303</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves</td>
<td>0.375</td>
<td></td>
</tr>
<tr>
<td>F2: Behaviours while eating and inactivity (2.344)</td>
<td>Eats while distracted</td>
<td>0.937</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves</td>
<td>0.391</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sedentary activities</td>
<td>0.337</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comfortable with growth</td>
<td>0.336</td>
<td></td>
</tr>
<tr>
<td>F4: Developmental</td>
<td>Problems chewing</td>
<td>0.671</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor solution, goodness of fit (variance)</td>
<td>Proposed factor name (eigenvalue after rotation)</td>
<td>Questions in factor</td>
<td>Factor loading</td>
<td>Questions not loading</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------</td>
<td>----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>behaviours and access to food (1.781)</td>
<td>Food is expensive</td>
<td>0.410</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F5: “Unhealthy” behaviours (0.941)</td>
<td>Drinks juice</td>
<td>0.506</td>
<td>Sedentary activity</td>
<td>0.453</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Consumes fast food</td>
<td>0.453</td>
</tr>
<tr>
<td>6</td>
<td>F1: Behaviours while eating (2.541)</td>
<td>Eats while distracted</td>
<td>0.857</td>
<td>Hungry at meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feeds themselves</td>
<td>0.581</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child decides how much</td>
<td>0.361</td>
<td></td>
</tr>
<tr>
<td>$\chi^2 (49) = 57.950$, $p &lt; 0.179$</td>
<td>F2: Milk and grain consumption (1.762)</td>
<td>Consumes milk</td>
<td>0.726</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes grain</td>
<td>0.332</td>
<td></td>
</tr>
<tr>
<td>(59.2%)</td>
<td>F3: Growth (1.858)</td>
<td>Comfortable with growth</td>
<td>1.021</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child weighs?</td>
<td>0.332</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F4: Meat, fruit and vegetable consumption (2.274)</td>
<td>Consumes meat</td>
<td>0.708</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes fruits &amp; vegetables</td>
<td>0.402</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problems chewing</td>
<td>0.372</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F5: “Unhealthy” behaviours (0.981)</td>
<td>Sedentary activity</td>
<td>0.516</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drinks juice</td>
<td>0.508</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumes fast food</td>
<td>0.470</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F6: Other factors affecting food intake (2.045)</td>
<td>Eating frequency</td>
<td>0.529</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drinks from bottle</td>
<td>0.515</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Food is expensive</td>
<td>0.417</td>
<td></td>
</tr>
</tbody>
</table>

Based on the results of the exploratory factor analysis, the three factor (40.4% of variance accounted for), five factor (53.3% of variance accounted for), and six factor (59.2% of variance accounted for) solutions were determined to fit the data the best. This evaluation was made based on the goodness-of-fit statistic (three factor: $\chi^2 (88) = 179.742, p < 0.001$; five factor: $\chi^2 (88) = 88.071, p < 0.013$; six factor: $\chi^2 (88) = 57.950, p < 0.179$), as well as by qualitative analysis of the factor structure itself. Although the goodness-of-fit statistic for the
six factor solution was non-significant, a qualitative analysis of the factors produced revealed that the factor structure made sense, and therefore should not be eliminated.

The three factor solution (food consumption, behaviours while eating, and “unhealthy” behaviours) accounted for 40.4% variance. When analyzing the questions in each factor qualitatively, it was seen that most questions placed into each factor could in some way logically fit with the other questions in that factor. The food consumption factor (factor 1) included two questionable questions, one asking about the ease at which the family can purchase food (because of money), and one asking about whether or not the child should lose weight. Although initially these questions may not seem to fit with the other questions concerning the frequency and amount of various foods a child consumes, a logical relationship can be established. The two questions, although not directly asking about the child’s food group eating frequency, directly involve eating: one reflects the child’s access to food, while the other may be related to the amount a child eats.

The five factor solution accounted for 53.3% of the variance. Qualitatively, two factors seemed to have questions that theoretically did not fit together. One factor (factor 2) has been named “behaviours while eating and inactivity” and includes questions asking about: the distractions for the child while eating (eats while distracted); whether or not the child feeds themselves (feeds themselves); and, how much the child watches television (sedentary activity). The relationship between these questions could be linked by “distractions”. For example, if a child is participating in other activities, such as watching television or playing while eating, he/she is most likely feeding his/herself. Likewise, if a child eats in front of the television, he/she likely watches more television a day than children who do not eat in front of the television. The second factor (factor 4) has been named
“developmental behaviours and access to food” and includes questions about food insecurity (food is expensive) and whether or not a child has difficulty chewing (problems chewing).

This factor may be problematic and reflect an issue with the data, as these questions do not appear to be related to the same nutrition related attribute.

The six factor solution accounted for 59.2% of the variance in the model. Most factors in this solution also seem logical when analyzing the results qualitatively. Two factors however appear to have questions that may at first not seem to go together. One factor (factor 4), named “meat, fruit, and vegetable consumption” contains questions asking about the child’s frequency of consumption of meat, fruits, and vegetables, as well as a question about chewing problems. These likely load onto the same factor because meats, fruits and vegetables can be difficult for toddlers to chew. The second factor (factor 6), named “other factors affecting food intake” contains questions on eating frequency, drinking from a bottle, and food insecurity. These questions also do not appear to fit well together qualitatively, and therefore have simply been labeled “other factors”.

The one, two and four factor solutions found through the exploratory factor analysis were eliminated, although the goodness-of-fit was significant, because the factor structure itself did not appear to make sense when looking qualitatively at the questions. For example, the four factor solution grouped the question regarding the expense of food with questions about bottle drinking and the child’s weight. Further, the one and two factor solutions did not account for a large amount of variance in the model in comparison to the other factor solutions (one factor: 23.3% variance; two factor: 32.8% variance).

Confirmatory factor analyses were therefore run on the three, five, and six factor solutions, as well as on the hypothesized attribute structure proposed by the researchers at the
beginning of the development of the Toddler NutriSTEP®. In all four models tested, the factors were highly correlated. This is somewhat expected, as all questions on the Toddler NutriSTEP® involve nutritional risk, and are therefore expected to be somewhat related. Results of the confirmatory factor analyses can be seen in Table 5.10. Although there are a few issues with all four confirmatory factor analyses, such as questions loading on multiple factors, as can be seen in the factor diagrams (Figures 5.2 to 5.5), based on a comparison of the goodness-of-fit statistics produced from the confirmatory factor analysis, the five factor solution appears to be the most fitting for the Toddler NutriSTEP®.

The five factor model appeared to best fit the Toddler NutriSTEP® questions, as it had the best goodness-of-fit statistics. The five factor model was the only model to have a minimum discrepancy to degrees freedom ratio (CMIN/DF) of under two, which indicates a good fit (Byrne, 2001). The goodness-of-fit (GFI) and adjusted-goodness-of-fit (AGFI) indices are also the closest of the four models to 1, being 0.934 and 0.904 respectively, again indicating good fit (Byrne, 2001). The Tucker-Lewis index (TLI) and comparative fit index (CFI, compares the model to a hypothesized worse fitting model) are also the highest in the five factor model, being 0.891 and 0.900 respectively further indicating the best fit of all of the models (good fit is indicated by values >0.95). The root mean square error of approximation (RMSEA, compares the fit of the model to the fit of a reasonable model) was also adequate, with a value of 0.053 (values of <0.05 are considered good). However, even with acceptable goodness-of-fit statistics, there are several problems associated with this model, and it therefore is not ideal. Firstly, several beta coefficients appear to be somewhat low. Conventionally, beta coefficients of about 0.8 are considered good, while those of about 0.5 are considered moderate, and those around 0.2 are considered poor (Jackson, Dezee,
Douglas, Shimeall, 2005). As seen from the qualitative analysis of this model, factors 2 and 4 seem to be somewhat problematic. Factor 2 has two questions with poor beta coefficients (0.21 and 0.32) and one factor with a beta coefficient greater than one (1.09). These issues may be the result of the questions not fitting well together on that factor. Likewise, one question on factor 4 has a low beta coefficient (0.29), indicating that factor four may also be problematic. Further, two questions in this model load on multiple factors, which could indicate a further problem with the structure of this model.

The attribute structure originally proposed by the researchers developing Toddler NutriSTEP® was also tested using confirmatory factor analysis. This model is the second best factor solution found in this analysis; the CMIN/DF is closest to 2 (2.356), and the TLI and CFI are all the second highest next to the five factor model (respectively 0.799, 0.838). Further, the GFI (0.915) and AGFI (0.883) are both acceptable. This indicates that although the proposed structure is not the best fit for the model, it is adequate. There are however several issues with the model. The factors in the proposed model were highly correlated as expected, with two factors, 3 and 4 (other factors affecting food intake and development), having a correlation of 0.99. This correlation is very high, and likely reflects an issue with the originally proposed attribute structure. Furthermore, two of the beta coefficients in factor 3 are poor (0.21 and -0.14), indicating a problem with the factor. However, this is somewhat expected, as factor 3 was created as an “other” category when developing the questions on Toddler NutriSTEP®, capturing questions fitting other attributes. These questions may not be related to each other in a way that is strong enough to load onto a single factor. Factor 1 (food and fluid intake) also has two questions with very low beta coefficients (0.11 and -0.01). These questions, about juice drinking behaviours and fast food consumption, often
loaded with other questions in the exploratory factor analyses, reflecting more “unhealthy”
behaviours, such as sedentary activity. This may indicate that these questions should belong
with questions relating to “unhealthy” behaviours, as opposed to those related to food and
fluid intake. The fifth factor (physical activity) also appears to be problematic, as it
represents one question. This factor may therefore need to be reevaluated in the proposed
Toddler NutriSTEP® attribute structure.

Table 5.10: Confirmatory factor analysis goodness-of-fit statistics

<table>
<thead>
<tr>
<th>Goodness-of-fit statistic</th>
<th>How statistic is evaluated (Browne &amp; Cudeck, 1992; Byrne, 2001)</th>
<th>3 factor solution</th>
<th>5 factor solution</th>
<th>6 factor solution</th>
<th>Hypothesized attribute structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMIN ($\chi^2$)</td>
<td></td>
<td>207.86</td>
<td>179.237</td>
<td>241.601</td>
<td>261.543</td>
</tr>
<tr>
<td>DF</td>
<td></td>
<td>74</td>
<td>93</td>
<td>89</td>
<td>111</td>
</tr>
<tr>
<td>CMIN/DF</td>
<td>$&lt; 2.0 = $ good fit</td>
<td>2.809</td>
<td>1.927</td>
<td>2.715</td>
<td>2.356</td>
</tr>
<tr>
<td>GFI</td>
<td>Closer to 1 = better fit</td>
<td>0.918</td>
<td>0.934</td>
<td>0.918</td>
<td>0.915</td>
</tr>
<tr>
<td>AGFI</td>
<td>$&gt; 0.90 = $ good fit</td>
<td>0.884</td>
<td>0.904</td>
<td>0.874</td>
<td>0.883</td>
</tr>
<tr>
<td>TLI</td>
<td>Closer to 1 = better fit</td>
<td>0.774</td>
<td>0.891</td>
<td>0.770</td>
<td>0.799</td>
</tr>
<tr>
<td>CFI</td>
<td>$&gt; 0.95 = $ good fit</td>
<td>0.817</td>
<td>0.900</td>
<td>0.830</td>
<td>0.838</td>
</tr>
<tr>
<td>PCFI</td>
<td>$&gt; 0.50 = $ adequate fit</td>
<td>0.664</td>
<td>0.697</td>
<td>0.615</td>
<td>0.684</td>
</tr>
<tr>
<td>RMSEA</td>
<td>$&lt; 0.05 = $ good 0.05-0.08 = reasonable 0.08-0.10 = mediocre $&gt; 0.1 = poor</td>
<td>0.074</td>
<td>0.053</td>
<td>0.072</td>
<td>0.012</td>
</tr>
<tr>
<td>P-Clos</td>
<td>$&gt; 0.50 = $ good fit</td>
<td>0.001</td>
<td>0.326</td>
<td>0.001</td>
<td>0.064</td>
</tr>
</tbody>
</table>

The five factor solution that was determined to be the best solution, although not an
ideal solution, is somewhat comparable to the proposed attribute structure on which the
Toddler NutriSTEP® was developed. Both solutions group questions on food group
consumption, frequency of eating, and hunger patterns into a common factor. This indicates
that, as hypothesized, these questions are tapping a similar attribute. Likewise, both models
also group questions regarding the toddler’s physical growth together, indicating that these questions are assessing a similar concept. However, there are a few differences between the models. One major difference was that the proposed attribute structure only had one question loading on two factors (feeds self), while the five factor solution had two questions loading on multiple factors (feeds self and sedentary activity). Further, the five factor solution did not find the question asking about whether or not the child drinks from a bottle to load onto any factor. Another major difference between the two models is that while the proposed attribute structure places the question on sedentary activity in an attribute on its own, the five factor model groups this question alongside juice drinking and fast food consumption. This may indicate that the question on sedentary activity is not really getting at the attribute of physical inactivity on its own, but is contributing to a more complex factor of unhealthy behaviours in toddlers.
Figure 5.2: Confirmatory factor analysis of the three factor model
Figure 5.3: Confirmatory factor analysis of the five factor model
Figure 5.4: Confirmatory factor analysis of the six factor model
Figure 5.5: Confirmatory factor analysis of the proposed attribute structure
5.4 Summary

The results presented in this section represent the results for test-retest reliability and construct validity phase of the Toddler NutriSTEP® development project. Statistical tests indicate that Toddler NutriSTEP® can be considered reliable and construct valid. Results from factor analyses indicate that the questions in Toddler NutriSTEP® likely represent a five factor model. The next step in analyzing the results of the data collected in this study include determining the criterion validity of the NutriSTEP®, as well as modifying the factor structure of the Toddler NutriSTEP® to determine if there is a structure with a better fit that exists.
6.0 Discussion

Toddler NutriSTEP® is the first known parent-administered, community-based nutrition risk screening tool to be developed for toddlers. The main finding of this study was that Toddler NutriSTEP® is reliable and construct valid. Determination and conclusions of construct validity and test-retest reliability were made based on having followed standardized and recommended procedures as suggested in the literature (Jones 2004a, b, c; Keller et al., 2000; Streiner & Norman, 1995).

6.1 Study Participants

The percentage of initially-recruited participants with complete and usable data at the end of the reliability and validity studies were approximately 84% and 91% respectively. This is comparable to the usable data seen in the reliability and validity studies of the original NutriSTEP®, where 87% of the reliability data and 91% of the validity data were available for analysis (Randall Simpson et al., 2008). These rates are much higher than those seen in the development of the CEBQ, where the percentage of recruited parents fully completing the questionnaire was only 58% (Wardle et al., 2001). Comparison of the retention rate of Toddler NutriSTEP® to the PEACH, PNSC and STEP-CHILD questionnaires could not be done, as retention/drop-out rates were not reported in these studies (Campbell & Kelsey, 1994; Schlenker et al., 2003; Seiverling et al., 2011). This indicates that the retention rates for the reliability and validity Toddler NutriSTEP® studies were comparably high, indicating internal validity.

The reliability and validity samples were compared to current Canadian statistics. Although in some cases both samples are somewhat reflective of the Canadian population, the validation sample is more representative, and therefore may be more generalizable.
Results of the 2006 Canadian census found that 19.6% of the Canadian population and 27.9% of the Ontarian population to have been born in a country outside of Canada (Statistics Canada, 2012). These proportions are much higher than the proportion of immigrant parents seen in the reliability sample, where only 9% of moms and 10% of dads were born outside of Canada, and are lower than those seen in the validity sample, where 50% of mothers and 48% of fathers were born outside of Canada. The proportion of caregivers in the validation sample with English as their first language was similar to that of the Canadian population: 52% of mothers and 54% of fathers in the validation sample reported English as their first language, while 57.2% of Canadians have English as their first language (Statistics Canada, 2012). Likewise, the proportion of caregivers graduating post-secondary education is similar to the proportion of Canadians over the age of 15 years with some form of college/university certificate, degree, or diploma: 58% of participants in the validation sample compared to 46% of Canadians (Statistics Canada, 2012). However, the reliability sample had a much higher proportion of participants with English as their first language (92% of mothers, 87% of fathers) and who had graduated post-secondary school (74%) than the Canadian population. Furthermore, both samples had a higher proportion of high income (>\$60,000/year) families than those in the Canadian population, with 60% of the reliability sample and 32% of the validity sample having high incomes, in comparison to 19% of the Canadian population aged 25-34 and 26% of the population aged 35-44 (Statistics Canada, 2012). However, the proportion of participants in both samples whom were married was also higher than that of the Canadian population (89% of the reliability sample, 85% of the validity sample, 48.4% of the Canadian population), and the proportion of married couples in
Canada with incomes over $60,000 per year is much higher than the general population (76%) (Statistics Canada, 2012).

The differences in these samples as compared to the demographics of the Canadian population and each other may be concerning. The validation sample, although still different demographically from the Canadian population, is much more representative of the diversity of Canadians than the reliability sample. This is likely due to purposive recruiting of an ethnically diverse population in the validation study, from programs such as the Peer Nutrition Program in Toronto and the Greater Toronto Area that target the participation of new Canadians. This was done to ensure that Canadians from as many backgrounds as possible were represented in the validation study, thereby validating the Toddler NutriSTEP® for the entire Canadian population. The researchers attempted to match the diversity of the validation sample as closely as possible to that of the Canadian population, in an attempt to capture all Canadian caregivers in the sample; however, in an attempt to do so, the researchers may have over-sampled high-risk groups. This over-representation of high-risk groups, however, is not thought to negatively affect the results of the validation study. This is because the chi-squared tests used to assess the construct validity of the Toddler NutriSTEP® require at least five participants per cell in order for the test to be valid (Field, 2005). If purposive recruitment had not been done to collect a diverse sample, some cells may not have had this number of participants, and therefore construct validity could not have been assessed using a chi-squared test. As a result, a greater proportion of at-risk toddlers in this sample is likely beneficial to this study.

The reliability sample was quite different from the Canadian population and validation sample in that it was less diverse. There is a possibility that the results of the
reliability study may therefore be overestimated as a result of a lack of diversity. To test this, reliability was run on a stratified sample of those of high incomes and those of low incomes to see if the reliability of the tool changed based on different groups. It was found that the reliability in both groups remained high, and therefore it is not suspected that the demographic make-up of the sample has affected the results of the study.

The demographic results of the present study are, for the most part, similar to those reported in the original NutriSTEP® study (Randall Simpson et al., 2008). In both studies, the proportion of female caregivers was high, with over 90% of participants being female. Likewise, over 85% of the caregivers in the studies were married. The original NutriSTEP® study and the present study also both have a high proportion of caregivers who graduated post-secondary school, however the original NutriSTEP® is slightly more homogeneous than the present sample in this characteristic (NutriSTEP®: 69% validation sample, 81% reliability sample; Toddler NutriSTEP®: 59% validation sample, 75% reliability sample) (Randall Simpson, 2008). The validation sample of the Toddler NutriSTEP® is also more heterogeneous than the validation sample of the original NutriSTEP® in that a greater proportion of parents were immigrants in the present study versus the original (mothers: 50% vs 35%; fathers: 48% vs 38%) (Randall Simpson, 2008). The validation samples also appear to differ in terms of the proportion of parents with incomes greater than $60,000 a year, with the current study having fewer parents with high incomes than the original study (32% vs 60%) (Randall Simpson, 2008).

Of the toddlers participating in the study, 43% were identified as being overweight (BMI > 85th percentile for their age and gender). This proportion is higher than that estimated by the 2004 Canadian Community Health Survey (26%) and that estimated by the National
Health and Nutrition Examination Survey 2007-2008 (32%) (Ogden et al., 2010; Shields, 2008). Furthermore, this percentage for toddlers was higher than the percentage of overweight preschoolers identified in the original NutriSTEP® study (21%) (Randall Simpson et al., 2008). The higher prevalence of overweight children seen in the present study may have occurred for a variety of reasons. Firstly, it is known that the childhood obesity rate is currently increasing (American Dietetic Association, 2004; Shields, 2008; Ogden et al., 2010; Siega-Riz et al., 2010); therefore, this high prevalence of overweight toddlers may be reflective of current trends. Secondly, recruitment of participants for the validation study was purposive, in an attempt to make the sample reflective of the Canadian population, as well as sample from high-risk groups to allow for a robust validation. The purposive recruitment of certain high-risk groups, for example First Nations toddlers, may have affected the prevalence of overweight seen in this study, since a greater prevalence of childhood obesity is often reported in First Nations children (Hanley, Harris, Gittelsohn, Wolever, Saksvig, & Zinman, 2000). Thirdly, the new WHO Growth Charts were used in this study. These growth charts have recently been revised to reflect an ideal weight in Canada, and therefore have shifted the growth curves downward. This increases the proportion of children identified as overweight, and therefore likely influenced the high overweight rate seen in this study.

6.2 Test-Retest Reliability

For the reliability study, a two-week time period was selected as an appropriate length of time between administrations. This was an appropriate time interval in between the visits, as this length of time is long enough to ensure participants did not complete the questionnaire by memory, yet not long enough for the participants to have changed their behaviour in between filling out the two questionnaires (Streiner & Norman, 1995). As a result, non-
significant differences between responses across administrations can be attributed to the reliability of the tool, as opposed to memory effects.

The total Toddler NutriSTEP® score was found to be reliable, displaying excellent reliability (ICC > 0.8, Pearson’s correlation > 0.8), with total scores not being significantly different across administrations. The high intraclass correlation for the total score was found to be very similar to that found for the original NutriSTEP® screening tool (ICC = 0.89) (Randall Simpson et al., 2008). Similarly, all attribute scores on the Toddler NutriSTEP® were found to display reliability across administrations, with all attributes having a Pearson’s correlation of greater than 0.8. This is slightly greater than the reliability of the CEBQ, since the latter tool had two attributes out of eight with Pearson’s correlations of less than 0.8 (Wardle et al., 2001). Comparisons to total and attribute score reliabilities cannot be made on the PEACH or PNSC questionnaires, as reliability was not evaluated in these tools (Campbell & Kelsey, 1994; Schlenker et al., 2003).

Individual questions on the Toddler NutriSTEP® displayed significant kappa values across administrations, with kappa values ranging from 0.39 (frequency of grain consumption) to 0.89 (drinks from a baby bottle). All questions except for one (frequency of grain consumption) had at least fair reliability (kappa scores greater than 0.4). Furthermore, the question regarding the frequency of grain consumption had a significant Wilcoxon test, indicating that responses to this question were significantly different across administrations. This could be the result of large day-to-day variation in carbohydrate intake (grains are a major source of carbohydrates) that has been reported in young children (Deheeger, Akrout, Bellisle, Rossingol & Rolland-Cachera, 1996). Parents could potentially be answering this specific question based on the most recent dietary pattern of their child, which may have
changed since the first occasion of completing the questionnaire. Another reason for actual change in behaviour, could be a result of completion of the tool (learning effect); parents may have learned what level of servings was preferred from the way the question was stated (Streiner & Norman, 1995). These findings suggest that the question of frequency of grain consumption has questionable reliability, and therefore may need to be altered.

Two questions in addition to the grain question (frequency of milk consumption, child decides how much to eat) also had significant Wilcoxon tests, indicating that responses from time 1 to time 2 were significantly different. However, these two questions had significant and adequate kappa statistics (0.70 and 0.53 respectively), indicating that, although the absolute score on the question from time 1 to time 2 differed, the risk rating category did not. Therefore, these two questions are considered to have adequate reliability, as they are still able to reliably classify a child into a particular risk-rating category across administrations.

The only other childhood nutrition risk screening tool found to assess test-retest reliability of individual questions was the original NutriSTEP® questionnaire. Results between the two questionnaires were similar, with only one question on the original NutriSTEP® (frequency of milk consumption) being found to have less than fair reliability (Randall Simpson et al., 2008). Those questions on the original NutriSTEP® with fair reliability were found to have children classified as at decreased risk on the second administration of the questionnaire, and therefore a learning effect was suspected to be perceived by the parents in between administrations (Randall Simpson et al., 2008).

The test-retest reliability of the Seniors in the Community: Risk Evaluation for Eating and Nutrition (SCREEN©) tool can also be compared to the reliability assessment of the
Toddler NutriSTEP®. Although SCREEN© assesses nutrition risk in the elderly, it was a tool that was designed following a very rigorous protocol similar to that used in the development of Toddler NutriSTEP® and therefore may be comparable (Keller et al., 2001). The ICC on the total score of SCREEN© was found to be 0.57, lower than that of the Toddler NutriSTEP® (Keller et al., 2001). However, once items of low individual reliability were removed from the tool to create an abbreviated version, the total score ICC increased to 0.72 (Keller et al., 2001). The reliabilities of individual questions on SCREEN© were evaluated using paired sample correlations which, although different from the use of kappa statistics on Toddler NutriSTEP®, showed at least fair reliability in all but two questions (Keller et al., 2001).

6.3 Construct Validity

6.3.1 Comparison of Parent Demographics to Toddler NutriSTEP® Scores

Several characteristics were compared to Toddler NutriSTEP® scores using ANOVA to determine whether or not theoretical hypotheses of high-risk groups of toddlers were consistent with the NutriSTEP® total risk score. The characteristics compared to the total score included: parental income, parental education, and parental birth country.

Analysis of the validation data demonstrated that toddlers from families with lower incomes and toddlers of parents with less education had significantly higher scores on the Toddler NutriSTEP® than toddlers from families of higher income and more education. This was expected based on previously-documented associations between familial socioeconomic status (SES) and nutrition; specifically, that children from families of lower SES have been shown to have inadequate nutrition (Bradley & Corwyn, 2002). In particular, toddlers from families of lower income may be exposed to environments and behaviours that increase the
child’s nutritional risk, and may be affected by food insecurity (American Dietetic Association, 2004; Ponza et al., 2004). Additionally, toddlers who have mothers with lower education have been found to exhibit less positive eating behaviours then toddlers with mothers with higher education, therefore indicating these toddlers may be at greater nutritional risk (Hendricks et al., 2006). Also, as hypothesized, children from families with immigrant parents had significantly higher scores on the Toddler NutriSTEP® than children with Canadian-born parents. Children of immigrant parents have been reported to be at nutritional risk because of many issues, including food insecurity and consumption of foods high in calories and fat (Flaskerud & Kim, 1999; Satia-Abouta, Patterson, Neuhouser, & Elder, 2002). These findings reflect the relationships between education, income, immigration status and nutritional status of children seen in the literature, and therefore demonstrate construct validity in Toddler NutriSTEP®.

In terms of BMI z-score, total scores on Toddler NutriSTEP® were not found to differ significantly between weight groups, nor to correlate significantly with absolute values of BMI z-scores. These findings contradict the initial hypothesis that children with extreme BMI z-scores would have higher nutritional risk and therefore higher Toddler NutriSTEP® scores. This result, although unexpected, may be explained by parents’ inability to correctly classify their child’s weight, as will be discussed in section 6.3.2. As parents are often unable to correctly identify their children as either over- or underweight, parents may be unaware of how to respond to certain questions on the Toddler NutriSTEP® involving their child’s weight. Therefore, this may reflect an inability of the Toddler NutriSTEP® total score to identify children of extreme weights. However, the purpose of the Toddler NutriSTEP® is to identify toddlers at nutritional risk, which involves many other factors in addition to weight.
Therefore, although the total NutriSTEP® score and BMI z-scores were not significantly associated, this finding does not necessarily compromise the validity of the Toddler NutriSTEP®. It does however suggest that NutriSTEP may not be appropriate to screen for obesity.

A “negative behaviour” score was also compiled consisting of the four questions related to negative eating behaviours (juice consumption, fast food consumption, eating while distracted, and hours of TV watching) to see if BMI z-score was correlated to this. In this case, a small but significant correlation was seen indicating that these four questions may show potential to be used as a subscale of the Toddler NutriSTEP® which may be able to screen for obesity on their own, separate from the total tool.

A few studies were found to assess construct validation on nutrition risk screening tools. Construct validation was assessed and determined by Keller et al. (2001) on SCREEN© using a process similar to that used in this study, where extreme groups were compared to determine if hypothesized associations were present. Finding a tool that used similar procedures to assess construct validity gives strength to the methodology used in this study. The Satter Eating Competence Model was also found to have construct validity though the comparison of various eating behaviours with the tool (Lohse et al., 2007). Unfortunately, no other tools were identified that directly assessed construct validity, nor were any tools found that assessed construct validity of a tool using the same characteristics used in this study. Therefore, no direct comparisons of Toddler NutriSTEP® to other tools in terms of construct validity can be made.
6.3.2 Comparison of Child’s Actual Weight to Parent Perceptions

It was hypothesized that parents of overweight children would not likely correctly classify their child’s weight based on documentation in the scientific literature (Carnell et al., 2005; Etelson et al., 2003). Comparison of toddler’s actual weights to parent responses on question 17 of the Toddler NutriSTEP® confirm this hypothesis, with only 4 of 86 parents (5%) of overweight toddlers correctly identifying their child as overweight. This number is similar to that from previous studies where just 1.9% and 10.5% of parents of overweight children were able to correctly identify their children as being overweight (Carnell et al., 2005; Etelson et al., 2003). This finding is alarming, since a parent must perceive his/her toddler as being overweight before being able to take steps to help prevent his/her toddler from continuing to be overweight (Etelson et al., 2003).

Interestingly enough, some parents of normal weight toddlers also had difficulty correctly classifying their child’s weight, with 42% of the parents of normal weight toddlers incorrectly classifying their child’s weight. Of these parents, 24% thought their child should weigh more, 5% thought their child should weight less, and 13% were unsure of how to classify their child’s weight. This finding is similar to that documented in a previous study, which found 41% of parents of normal weight children being unable to correctly identify their children’s weight as normal (Etelson et al., 2003). Especially concerning is the proportion of parents who believe their normal weight children need to weigh more than they currently do. This is particularly alarming, since the current study had a very high prevalence of overweight toddlers (43%) and it has been found that parents have a great influence over the weight of their children because they play a large role in modeling the eating environment of children (Etelson et al., 2003; Savage et al., 2007). Parents model the feeding
environment for their children, and can therefore provide environments that either encourage or prevent a child from being overweight (Savage et al. 2007). Parents therefore may modify the eating environment for their children depending on how they perceive the weight status of their child. If a parent perceives his/her child who is normal weight as underweight, he/she may change the eating environment to encourage consumption of more food in an attempt to help them gain weight (Myers & Vargas, 2000). This may lead to the development of overweight, thereby exacerbating the problem of childhood obesity.

These findings strengthen the validity of the Toddler NutriSTEP® by aligning with theoretical hypotheses of how parents are expected to behave when filling out the screening tool, as well as by aligning with findings of previous literature.

6.3.3 Factor Analysis

Both exploratory and confirmatory factor analyses were conducted on the combined data from both the reliability and validity phases of the Toddler NutriSTEP® project. This was done to further assess the construct validity of the Toddler NutriSTEP®. Since Toddler NutriSTEP® was designed to measure nutritional risk, a multidimensional and complex construct, a factor solution consisting of multiple factors would further confirm the construct validation of the NutriSTEP® by demonstrating that it assesses a variety of attributes. This was seen in the results, where a five factor solution was found to be the best fitting model for the tool, thereby confirming that Toddler NutriSTEP® measures a multidimensional construct. To further confirm that this was the case, a factor analysis was run on the data forcing a one factor solution. This model was not found to have a good fit or make logical sense when assessing the solution. The inability for the one factor model to adequately fit the questions
indicates that nutritional risk of toddlers is indeed multi-factoral, and not a unidimensional construct.

Although some factor solutions in both the exploratory and confirmatory factor analyses were better than others, all models had issues associated with them and none appeared to be an ideal representation of the best factor solution of the Toddler NutriSTEP®. However, factor analysis may not be an ideal method to use when developing a nutrition risk screening tool (Jones, 2004a; Streiner & Norman, 1995). This is because the purpose of a nutrition risk screening tool is not to simply measure a multidimensional trait, but to differentiate between those people who are at risk and those who are not (Jones, 2004a; Streiner & Norman, 1995). Therefore, although the results of the factor analysis may not appear to be ideal, they suit the purpose of adding some construct validity to the Toddler NutriSTEP®, in that they identify that the concept of nutritional risk in toddlers is complex and multidimensional. This point is further strengthened by the increased complexity seen in the five factor, best-fitting solution, in comparison to the hypothesized attribute structure of the Toddler NutriSTEP®.

This increased complexity is seen in that the best-fitting five factor model has two questions loading on multiple factors, whereas the proposed structure only had one question loading on multiple factors. These two questions are asking whether or not the toddler feeds themselves and how many hours per day does the toddler participate in sedentary activities. When looking at the final model and the factors these questions are loading on, it is easy to see that logical associations can be made between the questions and the factors. Questions loading on multiple factors are often cited as being problematic, impure, and needing to be removed from the tool because it is thought that they may be measuring some construct other
than what the developer of the tool intended them to measure (Streiner & Norman, 1995). However, this may not necessarily be the case with factor analysis of nutrition risk screening tools because of the method by which they are developed.

The development of a nutrition risk screening tool requires a variety of question selection methods to be combined to ensure the concept of nutritional risk is fully captured by the tool (Keller et al., 2000). It is recommended that researchers combine clinimetric, psychometric, and criterion methods of item selection in order for the best tool to be produced (Keller et al., 2000). Clinimetric methods involve using experts and clinicians in item development, allowing their expertise to drive the writing and weighting of the items for the tool (Keller et al., 2000). On the other hand, psychometric and criterion methods are statistically driven, and involve using various statistical methods to select which items best fit in the tool (Keller et al., 2000). Using methods that are entirely statistically driven may not be the most appropriate method in screening tool development, as the results of the statistical analysis depend on the population in which the data is collected, and therefore may change based on different samples (Keller et al., 2000). Consequently, although factor analysis can be useful in nutrition screening tool development, as it enables the researchers to determine whether or not the items on the tool fall into the categories they were hypothesized to fall into, it should not be the only analysis taken into consideration, since clinical judgment in this case is also critical (Keller et al., 2000).

Because of this, no questions are recommended for removal from the Toddler NutriSTEP® even though in the best fitting model some did not load onto any factors (drinks from a bottle), some loaded on multiple factors (feeds self; sedentary activity), and some did not have “good” beta statistics (eats while distracted; feeds self). Since the questions were
developed using a thorough clinimetric method involving the input of various experts and pediatric nutrition professionals, all questions were deemed to be clinically relevant and therefore necessary to retain. Further, the questions loading onto multiple factors in the best fitting model may be loading doubly as a result of their ability to capture the overall concept of nutritional risk at multiple levels. In spite of this, the originally hypothesized attribute structure of Toddler NutriSTEP® may need to be reevaluated, as some questions were found to load more frequently with others in multiple models as not previously hypothesized; for example, the question on sedentary activities often loads with juice drinking and fast food consumption. Additionally, correlations between error terms may need to be considered, as some may strengthen the final factor model of the Toddler NutriSTEP®.

Four other nutrition risk screening tools were found in the literature that conducted factor analyses on the questions of their tool (Birch, Fisher, Grimm-Thomas, Markey, Sawyer, & Johnson, 2001; Keller, 2006; Seiverling et al., 2011; Wardle et al., 2001). Seiverling et al. (2011) and Wardle et al. (2001) both utilized exploratory factor analysis and appeared to have found factors with questions that had factor loadings (in general) slightly higher than those seen on the questions in the Toddler NutriSTEP®. The loadings found by Wardle et al. (2001) appear to be, for the most part, at least greater than 0.55, while Seiverling et al., (2011) found all questions to have factor loadings of at least 0.6. These are greater than the factor loadings seen in this analysis, as the factor loadings of the Toddler NutriSTEP® questions were generally less than 0.6. However, this result is somewhat expected, as the questionnaires developed by Wardle et al. (2001) and Seiverling et al. (2011) were developed to measure concepts that may not be as variable as the construct of nutritional risk measured by NutriSTEP®. These questionnaires were developed to measure
only parts of the construct of nutrition risk, with one questionnaire designed specifically to measure feeding problems, and the other designed to specifically measure eating behaviours (Seiverling et al., 2011; Wardle et al., 2001).

Keller (2006) and Birch et al. (2001) used confirmatory factor analysis to confirm the factor structure of questionnaires that were hypothesized when developing the tools. The results of these two analyses were more similar to the results seen in this study, with adequate, but not ideal, factor models emerging (Birch et al., 2001; Keller, 2006). These two studies also reported similar CFI and RMSEA goodness-of-fit statistics to those seen on the best-fitting model found in this study (Birch et al., 2001: CFI=0.92, RMSEA=0.05; Keller, 2006: CFI=0.956, RMSEA=0.028), indicating that the best-fitting model in this solution has a similar fit to other best-fitting models in the literature. The similarity between the results of these studies to the results of the Toddler NutriSTEP® is likely the result of the tools assessed here both being designed to measure complex constructs. Keller’s tool, SCREEN© I, measures the complex concept of nutritional risk in seniors, which is the same concept being measured by Toddler NutriSTEP® only in a different population (Keller, 2006). Birch’s tool, the Child Feeding Questionnaire was also developed to measure a multidimensional construct of parental attitudes, beliefs and practices regarding the feeding of their children (Birch et al., 2001). Therefore, it can be determined that complex, multidimensional constructs have been seen previously in the literature with less than ideal factor solutions emerging from confirmatory factor analysis.

6.4 Strengths

There are many strengths associated with this phase of the Toddler NutriSTEP® development. First of all, the initial development, as well as validity and reliability testing of
the tool, have been conducted in accordance with the guidelines for nutrition risk screening
tool development set out in the literature (Jones, 2004a, b, c; Keller et al., 2000; Streiner &
Norman, 1995). Following standardized design guidelines when developing and evaluating a
screening tool increases the value of the tool through allowing it to be critically compared to
similar tools. Furthermore, following the guidelines proposed in the literature ensure that
there is strength in the methods used when testing the validity and reliability of the tool with
minimal bias introduced in the study. Some of these methodological strengths include
selecting an appropriate length of time in between administrations in the reliability study, as
well as blinding the dietitian to the results of the NutriSTEP® in the validity study.
Furthermore, following these guidelines allowed appropriate sample size estimations to be
made, as well as appropriate statistical analysis procedures to be followed.

Secondly, the purposive recruitment of parents of toddlers from different regions of
Ontario gives strength to the study. Parents were recruited from numerous locations for both
the reliability and validity studies, including Brampton, Waterloo, Aldershot, Sudbury,
Thunder Bay, Manitoulin Island, Milton, Stratford, Peterborough, Toronto and the Greater
Toronto Area. Furthermore, in the validation study, purposive recruitment of parents born in
other countries, as well as First Nations participants was conducted, to increase the
generalizability of the sample. As a result, the validation sample was quite diverse and
included parents of many different backgrounds, incomes, birth countries, education levels,
ages, and ethnicities, reflecting the diversity of Canada, as previously discussed. This allows
for the results of the construct validation study to be fairly generalizable to the greater
Canadian population, thereby establishing the construct validity of the Toddler NutriSTEP®
for use in Canada.
The purposive recruitment in the validation study also allowed for high proportions of high-risk toddlers to be recruited. This ensured that robust statistical analysis of the data could be done, and therefore allowed construct validity to be determined in this study. Without a high proportion of toddlers from high-risk groups, many of the statistical tests comparing groups may not have yielded significant results because of too small of sample sizes. Purposive recruitment gave the study large enough samples of various risk groups in order for the statistical analyses to show significant results. Therefore, this sampling, although somewhat different from the Canadian population, can be seen as a study strength.

Thirdly, the reliability and validity studies were carried out in the community, in settings in which the Toddler NutriSTEP® will likely be used. This adds strength to the methods in ensuring that the screening tool is valid and reliable in a real world setting. Conducting similar studies in different environments may not yield results relating to settings in which the tool will actually be used. Therefore, the results of this study ensure that the tool is valid and reliable for use in community-based, parent-child centers in Ontario.

Another strength in the study was the low drop out rate seen in both the reliability (11%) and validity (8%) stages. These low drop-out rates minimize the possibility of non-response bias in the study (Remler & Van Ryzin, 2011).

6.5 Limitations

Although there are many strengths associated with this phase of the Toddler NutriSTEP® development study, the research is not without its limitations. Firstly, although the researchers did their best to recruit a diverse sample of participants, convenience sampling was used in the reliability study. Participants in the reliability study were mainly recruited from Ontario Early Years Centers during weekdays. The final sample consisted of
parents who were mostly Canadian-born females, of high education and high family incomes. This is likely the result of recruiting through parent-child weekday programs, and therefore recruiting parents who did not need to work during the day to support their families. This could limit the generalizability of the reliability study to the greater Canadian population; however, because analysis of separate income groups did not indicate any decrease in reliability, it is still believed that the Toddler NutriSTEP® is reliable. In the validation study, Peer Nutrition Programs (targeted towards new Canadians) and various community health centers were also used as recruitment locations, thereby creating a more diverse sample through access to participants with a variety of backgrounds. Both samples, however, were subject to coverage bias, which leads to questionable generalizability (Remler & Van Ryzin, 2011). In the case of both the reliability and validity samples, the recruitment from various centers and programs excludes all parents of toddlers who do not participate in parent-child programs or attend such centers. These parents may in some way be different from the parents attending the centers, and therefore may affect the results by limiting the generalizability of these studies to a greater population. However, this recruitment is not expected to affect the results of the validation study, as purposive recruitment was done to ensure robust statistical analyses could be done on the data. Furthermore, the convenience sampling strategy may have played a role in the limited recruitment of fathers of toddlers. Since the main visitors to the various recruitment centers and programs were mothers with their children, a limited number of fathers participated in the study. Thus, we may not be able to extrapolate the results to imply that Toddler NutriSTEP® is valid and reliable when being completed by fathers of toddlers.
Another limitation involves the anthropometric measurements of the toddlers. Although the pediatric dietitian was well trained in the standardized procedures for measuring weight, length and height in toddlers, it was a challenge to obtain accurate measurements. Several children in the study were uncomfortable being weighed and therefore refused to stand or lie still on the pediatric scale while having their weight taken. As a result, their weight was most likely not equally distributed across the scale, which is required to ensure accuracy (Gibson, 2005). This may have introduced some error into the weight measurements. Likewise, some toddlers were uncomfortable having their height/length taken, making it difficult to ensure they were standing/laying in the correct position (Gibson, 2005). Since BMI and weight-for-length use these measurements in their interpretations, the error present in taking the weight, length and height measurements is therefore compounded into these growth indices. This could bias the results of the construct validation comparing anthropometric measurements to results of the Toddler NutriSTEP® because the measurements used in the analysis may not accurately reflect the real parameters of the toddlers. If this is the case, the comparison of the Toddler NutriSTEP® to BMI z-scores may be insignificant because of measurement error, as opposed to because of actual insignificant findings.

There are also several limitations associated with measuring the test-retest reliability of the Toddler NutriSTEP®. First of all, since the participants completed the Toddler NutriSTEP® on two occasions, two weeks apart, both the learning and memory effects may have affected the results of the study (Remler & Van Ryzin, 2011). The learning effect occurs during test-retest reliability studies when participants are exposed to certain concepts the first time completing the questionnaire, which cause them to change their behaviour and
therefore complete the questionnaire differently the second time reflecting the new behaviour. The memory effect refers to participants remembering their answers between administrations (Remler & Van Ryzin, 2011). A time period of two weeks between administrations was selected to avoid these effects; however it is unknown whether or not they influenced the participants’ responses.

Social desirability bias may also be present in this study, since the Toddler NutriSTEP® is a self-administered screening tool (Remler & Van Ryzin, 2011). In both the validation and reliability studies, participants may have changed their responses on the Toddler NutriSTEP® to reflect the answers they assumed would be most desirable by the researchers. This may have altered both the reliability and validation study results through changing the individual responses and therefore total scores of the Toddler NutriSTEP®; however individual questions were still found to be reliable.

Another limitation that may affect the results of the studies is the systematic differences between those participants who completed the study versus those participants who dropped out of the study. In the reliability and validity studies, the participants who completed the studies were found to be significantly different in terms of several characteristics, as previously discussed, than those participants who did not complete the study. This could limit the generalizability of the studies to a population that is reflective of the participants who completed the studies.

6.6 Summary

In summary, Toddler NutriSTEP® was found to be test-retest reliable and construct valid. Test-retest reliability was seen in the ability of the total score, attribute scores, and individual questions to be reliable across administrations. Construct validity was shown with
the ability of at-risk groups to be identified as having higher scores on the Toddler NutriSTEP® than groups not at risk. Additionally, factor analysis of Toddler NutriSTEP® yielded a five factor model with an adequate fit for the data, indicating that the construct of nutritional risk is multidimensional and complex. Moreover, the results of all analyses are comparable to similar studies found in the literature. This implies that the Toddler NutriSTEP® is reliable and construct valid, and therefore may be used to screen for nutritional risk in Canadian toddlers.

6.7 Next Steps

The research in this thesis marks the successful completion of phase C of the Toddler NutriSTEP® development study: test-retest reliability and construct validity. The next step in this research project will be to complete the final development phase, phase D: criterion validity. This phase will be completed using the data collected in the validation phase of the current research. Criterion validity will be assessed through the creation of receiver operating characteristic curves, which will give estimates of sensitivity and specificity of the tool at every possible score. These sensitivity and specificity estimates will be used to establish cut-points for the Toddler NutriSTEP® which will categorize toddlers into various groups based on their level of nutritional risk. The final step in the development of the Toddler NutriSTEP® will be finalizing the questionnaire and making it available to parents in Canada, through offering licensed copies of the questionnaire on the NutriSTEP® website (www.nutristep.ca), as well as through allowing parents to complete the questionnaire on the Dietitians of Canada website.
7.0 Conclusions

In summary, this thesis completes phase C of the Toddler NutriSTEP® development study. This phase involved recruiting over 300 families from all across Ontario to participate in two separate research studies. Data collected from these studies were analyzed to determine the test-retest reliability, construct validity, and factor structure of the newly developed Toddler NutriSTEP®. Toddler NutriSTEP® was found to be test-retest reliable, with total score, attribute scores, and individual questions indicating excellent reliability across administrations. Construct validity of the Toddler NutriSTEP® was also proven though the ability of Toddler NutriSTEP® to differentiate significantly between high-risk groups and groups at less risk. Additionally, a five factor structure was proposed to adequately fit the questions in Toddler NutriSTEP®, indicating that the nutritional risk construct being measured by the questionnaire is complex and multidimensional. The data collected in this phase of the study will be further analyzed to determine the criterion validity of the questionnaire, as well as to establish risk cut-points before Toddler NutriSTEP® will be ready and available for use in Canada.
8.0 References


Briefel, R. R., Kalb, L. M., Condon, E., Deming, D. M., Clusen, N. A., Fox, M. K.,


9.0 Appendices

Appendix A: Preschooler NutriSTEP®

Nutrition Screening Tool for Every Preschooler

Instructions

Below are questions about your preschool child’s (3 to 5 year old) eating and other habits.
• Think about your child’s every day habits when answering. Check (✓) only one answer for each question.
• There is a number from 0 to 4 beside each answer. This number is a score for that question. At the bottom of each page is a box for the score for the page. For each page, add up the scores for each question.
• At the end of the questionnaire, you will add the page scores to get the total score.

1. My child usually eats grain products:
   Examples are bread, bagel, bun, cereal, pasta, rice, roti and tortillas.
   
   □ More than 5 times a day
   □ 4 to 5 times a day
   □ 2 to 3 times a day
   □ Less than 2 times a day

2. My child usually has milk products:
   Examples are white or chocolate milk, cheese, yogurt, milk puddings or milk substitutes, such as fortified soy beverages.
   
   □ More than 3 times a day
   □ 3 times a day
   □ 2 times a day
   □ Once a day or less

3. My child usually eats fruit:
   
   □ More than 3 times a day
   □ 3 times a day
   □ 2 times a day
   □ Once a day
   □ Not at all

Total Score for Page 1
4. My child usually eats vegetables:
   - ☐ More than 2 times a day
   - ☐ 2 times a day
   - ☐ Once a day
   - ☐ Not at all

5. My child usually eats meat, fish, poultry or alternatives:
   *Alternatives can be eggs, peanut butter, tofu, nuts, or dried beans, peas and lentils.*
   - ☐ More than 2 times a day
   - ☐ 2 times a day
   - ☐ Once a day
   - ☐ A few times a week
   - ☐ Not at all

6. My child usually eats “fast food”:
   - ☐ 4 or more times a week
   - ☐ 2 to 3 times a week
   - ☐ Once a week
   - ☐ A few times a month
   - ☐ Once a month or less

7. I have difficulty buying food to feed my child because food is expensive:
   - ☐ Most of the time
   - ☐ Sometimes
   - ☐ Rarely
   - ☐ Never

8. My child has problems chewing, swallowing, gagging or choking when eating:
   - ☐ Most of the time
   - ☐ Sometimes
   - ☐ Rarely
   - ☐ Never

9. My child is not hungry at mealtimes because he/she drinks all day:
   - ☐ Most of the time
   - ☐ Sometimes
   - ☐ Rarely
   - ☐ Never

☐ Total Score for Page 2
10. My child usually eats:
   ☐ Less than 2 times a day
   ☐ 2 times a day
   ☐ 3 to 4 times a day
   ☐ 5 times a day
   ☐ More than 5 times a day

11. I let my child decide how much to eat:
   ☐ Always
   ☐ Most of the time
   ☐ Sometimes
   ☐ Rarely
   ☐ Never

12. My child eats meals while watching TV:
   ☐ Always
   ☐ Most of the time
   ☐ Sometimes
   ☐ Rarely
   ☐ Never

13. My child usually takes supplements:
   Examples are multivitamins, iron drops, cod liver oil.
   ☐ Always
   ☐ Most of the time
   ☐ Sometimes
   ☐ Rarely
   ☐ Never

14. My child:
   ☐ Needs more physical activity
   ☐ Gets enough physical activity

15. My child usually watches TV, uses the computer, and plays video games:
   ☐ 5 or more hours a day
   ☐ 4 hours a day
   ☐ 3 hours a day
   ☐ 2 hours a day
   ☐ 1 hour or less a day

☐ Total Score for Page 3
16. I am comfortable with how my child is growing:
\[\square\] Yes
\[\square\] No

17. My child:
\[\square\] Should weigh more
\[\square\] Is about the right weight
\[\square\] Should weigh less

Total Score for Page 4

To get a total score, add the scores for each page.

\[\text{Score for Page 1} + \text{Score for Page 2} + \text{Score for Page 3} + \text{Score for Page 4} = \text{Total Score}\]

What does your NutriSTEP® score mean?

If the total score is 20 or less:
Your child’s eating and activity habits are good. There may be things that you want to work on; check out the educational material provided for tips and more information.

If the total score is 21 to 25:
Your child’s eating and activity habits can be improved by making some small changes. Check out the educational material provided or contact your local public health department for tips and more information.

If the total score is 26 and greater:
Your child’s eating and activity habits can be improved by making some changes. For suggestions, talk to a health professional such as a registered dietitian, your family doctor or paediatrician or contact your local public health department for more information.

May 2009.
Appendix B: Draft Toddler NutriSTEP®
Nutrition Screening Tool for Every Toddler
NutriSTEP® for 18 to 35 months

Below are questions about your toddler’s (18 to 35 months old) eating and other habits. Think about your child’s everyday habits when answering. Check (✓) only one answer for each question.

1. My child usually eats grain products:
   Examples are bread, bagel, bun, roti, tortillas, crackers, hot or cold cereal, pasta, rice. ..
   □ 0 More than 5 times a day
   □ 1 4 to 5 times a day
   □ 2 2 to 3 times a day
   □ 4 Less than 2 times a day

2. My child usually has milk products:
   Examples are breastmilk, formula, white or chocolate milk, cheese, yogurt, milk pudding and milk substitutes, such as fortified soy beverages...
   □ 0 More than 3 times a day
   □ 1 3 times a day
   □ 2 2 times a day
   □ 4 Once a day or less

3. My child usually eats vegetables and fruit:
   These can be fresh, frozen or canned.
   □ 0 More than 4 times a day
   □ 1 3 to 4 times a day
   □ 2 2 times a day
   □ 3 Once a day
   □ 4 Not at all

4. My child usually eats meat, fish, poultry or alternatives:
   Alternatives can be eggs, peanut butter, tofu, nuts, and cooked beans, chickpeas and lentils.
   □ 0 More than 2 times a day
   □ 1 2 times a day
   □ 2 Once a day
   □ 3 A few times a week
   □ 4 Not at all
5. My child usually eats restaurant or take-out “fast foods”:
   *Examples are pizza, hamburgers, hot dogs, chicken fingers, fish sticks and French fries.*
   - 4 □ 5 to 7 days a week
   - 3 □ 3 to 4 days a week
   - 2 □ 2 days a week
   - 1 □ 1 day a week or less
   - 0 □ Not at all

6. My child usually drinks juice or flavoured beverages.
   *Flavoured beverages can be fruit drinks, pop, Kool-Aid® or sports drinks.*
   - 4 □ More than 4 times a day
   - 3 □ 3 to 4 times a day
   - 2 □ 2 times a day
   - 1 □ Once a day
   - 0 □ Not at all

7. I have difficulty buying food I want to feed my child because food is expensive:
   - 4 □ Most of the time
   - 2 □ Sometimes
   - 1 □ Rarely
   - 0 □ Never

8. My child has problems chewing, swallowing, gagging or choking when eating:
   - 4 □ Most of the time
   - 2 □ Sometimes
   - 1 □ Rarely
   - 0 □ Never

9. My child feeds his/her self at meals and snacks.
   - 0 □ Always
   - 1 □ Most of the time
   - 2 □ Sometimes
   - 3 □ Rarely
   - 4 □ Never
10. My child drinks from a baby bottle with a nipple.
   - 4 □ Always
   - 3 □ Most of the time
   - 2 □ Sometimes
   - 1 □ Rarely
   - 0 □ Never

11. My child is hungry at mealtimes:
   - 0 □ Always
   - 1 □ Most of the time
   - 2 □ Sometimes
   - 3 □ Rarely
   - 4 □ Never

12. My child usually eats meals and/or snacks:
   - 4 □ Less than 2 times a day
   - 3 □ 2 times a day
   - 2 □ 3 to 4 times a day
   - 1 □ 5 to 6 times a day
   - 0 □ More than 6 times a day

13. I let my child decide how much to eat:
    - 0 □ Always
    - 1 □ Most of the time
    - 2 □ Sometimes
    - 3 □ Rarely
    - 4 □ Never
14. My child eats meals and/or snacks while watching TV, or being read to, or playing with toys:
   - □ Always
   - □ Most of the time
   - □ Sometimes
   - □ Rarely
   - □ Never

15. My child usually watches TV, or uses the computer, or plays video games:
   - □ 4 or more hours a day
   - □ 3 hours a day
   - □ 2 hours a day
   - □ 1 hour a day
   - □ Less than 1 hour a day

16. I am comfortable with how my child is growing:
   - □ Yes
   - □ No
   - □ Not sure

17. I think my child:
   - □ Should weigh more
   - □ Is about the right weight
   - □ Should weigh less
   - □ Not sure
Appendix C: Reliability Recruitment Flyer

Nutrition Research Project - Toddler NutriSTEP® Development

Dear Parents

Professors Janis Randall Simpson and Heather Keller, research assistant Nicole Holland and students Kim Booker and Kylie Whyte from the Department of Family Relations and Applied Nutrition at the University of Guelph and Joanne Beyers from the Sudbury & District Health Unit are currently working together on a Nutrition Research Project called Toddler NutriSTEP®. This project has been approved by the University of Guelph Research Ethics Board. Funding is from the Canadian Institutes for Health Research.

What is Toddler NutriSTEP®?

Toddler NutriSTEP® is a project taking place in your community right now. It’s for the benefit of you and your children who are between the ages of 18 - 35 months. NutriSTEP® stands for Nutrition Screening Tool for Every for Preschooler. NutriSTEP® is a nutrition screening checklist that parents/caregivers of preschoolers (3-5 years) can fill out to see if their child is well nourished and a healthy eater and can direct parents to nutrition services. We want to develop a similar checklist for toddlers.

What Are the Long Term Benefits of Being Involved in this Research Project?

• Right now, there is no questionnaire to screen toddlers for nutritional problems. You can be part of important research that will lead to a Toddler NutriSTEP® questionnaire being available soon.
• Toddler NutriSTEP® will make parents more aware of the nutrition concerns of toddlers and help identify if their child needs other community nutrition resources.
• The questionnaire will reassure parents of young children who are doing well.
We Need Your Help!

- Are you a parent of a toddler aged 18-35 months?
- Have you lived in Canada for at least the past 5 years?
- Do you have good use of the English language?
- Are you able to provide about 20 minutes of your time?
- Can you be available in 2 weeks time to retake the Toddler NutriSTEP® questionnaire?

If so, you can help us develop a Toddler NutriSTEP® by taking part in this study.

You will be asked to:

- Provide written consent to participate in the study
- Fill out a form that includes information on your marital status, education level, ethnicity, your child’s age and gender and your family income.
- Fill out the new Toddler NutriSTEP® checklist the same way on two separate occasions.

The total time for participating will be about 40 minutes.

What do you get for participating?
- Free nutrition education booklets on healthy eating for toddlers
- Contacts for nutrition information
- Grocery voucher for $20

To participate talk to:

Nicole Holland or your Ontario Early Years Contact Person

To schedule an interview time between
May and June 2011.

Nicole Holland
nholla01@uoguelph.ca
519-824-4120 ext 56174

Thank you very much!
Appendix D: Reliability Recruitment Poster

Nutrition Research Project

Who’s Invited? Moms and Dads of toddlers (children 18 – 35 months of age)

To do What? To fill out a brief nutrition questionnaire about your toddler on two separate occasions

Why? To help us make sure that the checklist can be filled in the same way on both occasions

What do you get for participating?

- Free nutrition education booklets on healthy eating for toddlers
- A grocery store voucher ($20)
- Contacts for nutrition resources in your community

When and Where? This will take place at (______________________________) and each interview takes approximately 20 minutes.

To sign up, please give your name to (______________________________)

If you have further questions about the project, please call:

Nicole Holland, Research Assistant
nholla01@uoguelph.ca (519) 824-4120 ext 56174
Thank you very much!

This project is funded by the Canadian Institutes for Health Research through the University of Guelph
Appendix E: Validity Recruitment Flyer

Nutrition Research Project - Toddler NutriSTEP® Development Validation Phase

Dear Parents

Professors Janis Randall Simpson and Heather Keller, and student Kylie Whyte from the Department of Family Relations and Applied Nutrition at the University of Guelph and Joanne Beyers from the Sudbury & District Health Unit are currently working together on a Nutrition Research Project called Toddler NutriSTEP®. This project has been approved by the University of Guelph Research Ethics Board. Funding is from the Canadian Institutes for Health Research.

What is Toddler NutriSTEP®?

Toddler NutriSTEP® is a project taking place in your community right now. It’s for the benefit of you and your children who are between the ages of 18 - 35 months. NutriSTEP® stands for Nutrition Screening Tool for Every for Preschooler. NutriSTEP® is a nutrition screening checklist that parents/caregivers of preschoolers (3-5 years) can fill out to see if their child is well nourished and a healthy eater and can direct parents to nutrition services. We want to develop a similar checklist for toddlers.

What Are the Long Term Benefits of Being Involved in this Research Project?

- Right now, there is no questionnaire to screen toddlers for nutritional problems. You can be part of important research that will lead to a Toddler NutriSTEP® questionnaire being available soon.
- Toddler NutriSTEP® will make parents more aware of the nutrition concerns of toddlers and help identify if their child needs other community nutrition resources.
- The questionnaire will reassure parents of young children who are doing well.

We Need Your Help!

- Are you a parent of a toddler aged 18-35 months?
- Have you lived in Canada for at least the past 5 years?
- Do you have good use of the English language?
- Are you able to provide about 2 ½ hours of your time?

If so, you can help us develop a Toddler NutriSTEP® by taking part in this study.
You will be asked to do the following:

Part 1: (should take about half an hour)

• Read this information letter about the project
• Read and sign a consent form
• Fill out a form that includes information about your age, marital status, education level, language, etc.
• Fill out the new Toddler NutriSTEP®, a checklist that has 17 questions including information on dietary patterns and physical activity
• Your toddler will be weighed and measured (in light clothing) by the Registered Dietitian
• You will be asked to record everything that your toddler eats and drinks for a 3-day period before the nutritional assessment. You will be given the forms and instructions for filling this out for 3 days
• A follow up appointment will be made within one month with the Registered Dietitian

Part 2: (should take about an hour)

• A nutritional assessment interview for your toddler will take place either in your home or at the (your child may or may not be present for this interview)
• The 3-day food record will be reviewed
• At the nutrition assessment interview, information will also be collected on your child’s diet history, eating behaviour, use of vitamin/mineral supplements, physical activity and television viewing of your toddler
• The Registered Dietitian will ask you questions about the nutritional health history of your child such as birth history and history of health problems that might affect nutritional status.
• You will be advised of the Registered Dietitian’s assessment of your child and you will be provided with nutrition education materials and appropriate referrals
• If appropriate, a letter will be sent to your health care provider

What do you get for participating?

• Free nutrition education booklets on healthy eating for toddlers
• Contacts for nutrition information
• Grocery vouchers for $40

To Participate

Jane Lac RD (647) 882-8936

OR

janelac.work@gmail.com

Thank you very much!

This research project is funded by the Canadian Institutes of Health Research and is conducted by the University of Guelph
Appendix F: Validity Recruitment Poster

NutriSTEP
Nutrition Screening Tool for Every Preschooler Évaluation de l’alimentation des enfants d’âge préscolaire

Nutrition Research Project

Who’s Invited?  Moms and Dads of toddlers (children 18 – 35 months of age)

To do What?  A comprehensive assessment of your toddler’s nutritional status by a Registered Dietitian

Why?  To help us ensure that a brief nutrition questionnaire completed by parents reflects their child’s nutritional health

What do you get for participating?

- Your child will be assessed for growth and eating behaviours and the Registered Dietitian will provide you with feedback and suggestions for improvement
- A grocery store voucher ($40)
- Free nutrition education booklets on healthy eating for toddlers
- You will be provided with contact for nutrition resources in your community

When and Where?  This training will take place at (__________________________) and will take about 2 1/5 hours (1 1/4 hour on each of two occasions)

To sign up, please give your name to: (______________________________)

If you have further questions about the project, please call:  
(Contact Information to be placed here)

Thank you very much!

This project is funded by the Canadian Institutes for Health Research through the University of Guelph
Appendix G: Certification of Ethical Acceptability of Research

<table>
<thead>
<tr>
<th>UNIVERSITY OF GUELPH</th>
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<tr>
<td>RESEARCH ETHICS BOARD</td>
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<tr>
<td>Certification of Ethical Acceptability of Research</td>
</tr>
<tr>
<td>Involving Human Participants</td>
</tr>
</tbody>
</table>

| APPROVAL PERIOD: | March 18, 2011 to March 18, 2012 |
| REB NUMBER: | 11FE033 |
| TYPE OF REVIEW: | Delegated Type 1 |
| RESPONSIBLE FACULTY: | JANIS RANDALL SIMPSON |
| DEPARTMENT: | Family Relations & Applied Nutrition |
| SPONSOR: | CIHR OPERATING GRANT |
| TITLE OF PROJECT: | Development of a Toddler NutriSTEP: Training, Validation & Test Retest Reliability |

The members of the University of Guelph Research Ethics Board have examined the protocol which describes the participation of the human subjects in the above-named research project and considers the procedures, as described by the applicant, to conform to the University’s ethical standards and the Tri-Council Policy Statement.

The REB requires that you adhere to the protocol as last reviewed and approved by the REB. The REB must approve any modifications before they can be implemented. If you wish to modify your research project, please complete the Change Request Form. If there is a change in your source of funding, or a previously unfunded project receives funding, you must report this as a change to the protocol.

Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Responsible Faculty, the safety of the participants, and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-council Policy Statement requires that ongoing research be monitored by, at a minimum, a final report and, if the approval period is longer than one year, annual reports. Continued approval is contingent on timely submission of reports.

Membership of the Research Ethics Board: M. Bowring, CME; F. Caldwell, Physician (alt); J. Clark, PoliSci (alt); J. Dwyer, FRAN; M. Dwyer, Legal; D. Dyck, CBS; D. Emslie, Physician; M. Fairburn, Ext.; J. Hacker-Wright, Ethics; G. Holloway; CBS (alt); V. Kanetkar, CME (alt); L. Kuczynski, FRAN (alt); M. Lachapelle, COA; L. Mann, Ext.; J. Minogue, EHS; P. Saunders, Alter. Health Care; S. Singer, COA (alt); L. Son Hing, Psychology; V. Shalla, SOAN (alt); L. Spriet, CBS; L Trick, Chair; T. Turner; SOAN; L. Vallis, CBS (alt).

Approved: ___________________ Date: _______________

Chair, Research Ethics Board
Appendix H: Reliability Study Participant Information Letter

Department of Family Relations and Applied Nutrition
College of Social and Applied Human Sciences

Toddler NutriSTEP® Development
Test-Retest Phase
Research Study Participant Information

Purpose of the Study

You are asked to take part in a research study by Janis Randall Simpson, Heather Keller, Kylie Whyte and Kim Booker from the Department of Family Relations and Applied Nutrition at the University of Guelph, and Joanne Beyers from the Sudbury & District Health Unit. This research project is funded by the Canadian Institutes for Health Research.

This research is part of an ongoing program, Nutrition Screening Tool for Every Preschooler (NutriSTEP®) (www.nutristep.ca). NutriSTEP® is a simple checklist of 17 questions parents complete to see if their preschool children (ages 3-5 years) are well nourished and are healthy eaters. This checklist is called a screening tool. This is the first nutrition screening tool for parents of preschoolers to be developed anywhere in Canada. NutriSTEP® helps parents be more aware of the nutrition issues of preschoolers and helps show if their children are at nutrition risk. As well, nutrition screening directs parents to community health and nutrition resources and reassures the parents of young children who are doing well.

There have been many requests across Ontario and Canada for a version of NutriSTEP® that would be suitable for toddlers (ages 18-35 months). The Toddler NutriSTEP® has been developed and refined over the past year. We wish to make sure that the checklist is answered the same way by the same person at two different times.

The NutriSTEP® nutrition screening tool is now in its final phases. This means that the screening tool has been developed and refined over the past few years. We are now ready to make sure that it does what it is supposed to do. We wish to make sure that the checklist is answered the same way by the same person at two different times.
Study Steps
If you participate in this study, you will be asked to do the following:

• Read this information letter about the project
• Read and sign a consent form
• Fill out a form that includes information about your age, marital status, education level, language, etc.
• Fill out the new Toddler NutriSTEP® on behalf of your preschooler on two (2) separate times. The second time will be 2 - 4 weeks after the first. The questionnaire has 17 questions about your child’s dietary intakes, patterns and physical activity.

Potential Risk and Discomforts
The risk involved with taking part in this project is low. Concerns about feeding your child and your child’s nutritional health may create worry. Should you have concerns about your child’s nutrition, you can contact Janis Randall Simpson, a Registered Dietitian, to discuss your concerns.

Potential Benefits to Participants and/or to Society
How will you benefit? You will get feedback on the project results. You will get nutrition resources for toddlers and contacts for nutrition and health resources in your community. The overall benefit of this phase of the Toddler NutriSTEP® project is to have a nutrition screening checklist for toddlers available for the first time in Canada.

Confidentiality
Every effort will be made to maintain confidentiality in all aspects of this research. Your name will not appear in any report, publication or presentation resulting from this project as individual results and data will be coded with an identification number only. All information or computer files related to the project will be stored in a locked office to further ensure protection of your confidentiality. Data will be stored for a period of 7 years at the University of Guelph. Data collected from this project will be used as part of graduate and undergraduate student projects, and will be presented at conferences and published in journal articles.

Participation and Withdrawal
You can choose to take part in this project or not. You may stop at any time without consequences. You may also ask to have your child’s data withdrawn from the project removed from the study by contacting one of the researchers. Your decision to withdraw will not influence your child’s access to programs or services at this agency.
Project Incentives
To thank you for taking part in this study, we will give you a $25 grocery voucher and nutrition education resources.

Rights of Research Participants
You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board. If you have any questions of your rights as a research participant, please contact the Research Ethics Officer, Sandy Auld University of Guelph, 437 University Centre, Guelph, ON N1G 2W1. Phone: 519 824-4120, ext. 56606; FAX: 519 821-5236; E-mail: reb@uoguelph.ca.

Toddler NutriSTEP® Questionnaire
This project will result in a questionnaire that will be licensed for distribution by the University of Guelph. Any income generated by the distribution of this questionnaire will be used by the NutriSTEP® research team for future research.

Research Institute and Researchers
The researchers at the University of Guelph who are conducting this project are listed below. Please feel free to contact them at any time with any questions.
• Janis Randall Simpson, PhD, RD, Assistant Professor, Department of Family Relations and Applied Nutrition, University of Guelph, 519-824-4120, ext. 53843; rjanis@uoguelph.ca.
• Heather Keller, PhD, RD, Associate Professor, Department of Family Relations and Applied Nutrition, University of Guelph, 519-824-4120, ext. 52544; hkeller@uoguelph.ca.
• Joanne Beyers, MA, RD, Community Nutrition Specialist, Sudbury & District Health Unit, 705-522-9200, ext. 355; beyersj@sdhu.com.
• Nicole Holland, MSc, Research Assistant, Department of Family Relations and Applied Nutrition, University of Guelph, 519-824-4120, ext. 56174 nholla01@uoguelph.ca
• Kylie Whyte, BASc, Graduate Research Assistant, Department of Family Relations and Applied Nutrition, University of Guelph. kwhyte@uoguelph.ca
• Kim Booker, BASc, Graduate Research Assistant, Department of Family Relations and Applied Nutrition, University of Guelph kbooker@uoguelph.ca
Appendix I: Validity Study Participant Information Letter

Department of Family Relations and Applied Nutrition
College of Social and Applied Human Sciences

Toddler NutriSTEP® Development
Validation Phase
Research Study Participant Information

Purpose of the Study
You are asked to take part in a research study by Janis Randall Simpson, Heather Keller, and Kylie Whyte from the Department of Family Relations and Applied Nutrition at the University of Guelph, and Joanne Beyers from the Sudbury & District Health Unit. This research project is funded by the Canadian Institutes for Health Research.

This research is part of an ongoing program, Nutrition Screening Tool for Every Preschooler (NutriSTEP®) (www.nutristep.ca). NutriSTEP® is a simple checklist of 17 questions parents complete to see if their preschool children (ages 3-5 years) are well nourished and are healthy eaters. This checklist is called a screening tool. This is the first nutrition screening tool for parents of preschoolers to be developed anywhere in Canada or the United States. NutriSTEP® helps parents be more aware of the nutrition issues of preschoolers and helps show if their children are at nutrition risk. As well, nutrition screening directs parents to community health and nutrition resources and reassures the parents of young children who are doing well.

There have been many requests across Ontario and Canada for a version of NutriSTEP® that would be suitable for toddlers (ages 18-35 months). In 2010, we began development of a Toddler NutriSTEP® that is now in its final "validation" phase. This means that the checklist has been developed and refined over the past few years and we are now ready to make sure that it measures what it is supposed to. This involves comparing a child’s rating on the checklist with a nutritional assessment of the child by a Registered Dietitian; 200 toddlers and their parents in Ontario will be involved.

Study Steps
If you agree to participate in this project, it will take place in two parts and you will be asked to do the following:
Visit 1: (should take about half an hour)
- Read this information letter about the project
- Read and sign a consent form
- Fill out a form that includes information about your age, marital status, education level, language, etc.
- Fill out the new Toddler NutriSTEP® , a checklist that has 17 questions including information on dietary patterns and physical activity
- You will be asked to record everything that your toddler eats and drinks for a 3-day period before the nutritional assessment. You will be given the forms and instructions for filling this out
- A follow up appointment will be made within one month with the Registered Dietitian

Visit 2: (should take about an hour)
- A nutritional assessment interview for your toddler will take place either in your home or at the office/centre where you were first contacted about this study
- The 3-day food record will be reviewed
- At the nutrition assessment interview, information will also be collected on your child's diet history, eating behaviour, use of vitamin/mineral supplements, physical activity and television viewing
- The Registered Dietitian will ask you questions about the nutritional health history of your child such as birth history and history of health problems that might affect nutritional status
- You will be advised of the Registered Dietitian's assessment of your child and you will be provided with nutrition education materials and appropriate referrals
- If appropriate, a letter will be sent to your health care provider
  - At one of the two visits, your toddler will be weighed and measured (in light clothing) by the Registered Dietitian

Risks and Benefits
There is minimal risk for participating in this project. Feeding your child and concerns about your child's nutritional health may create worry. The growth measurements and clinical assessment of your child are safe and non-invasive. Should you have concerns about your child’s nutrition, you can contact Janis Randall Simpson, a Registered Dietitian, to discuss your concerns.

Potential Benefits to Participants and/or to Society
How will you benefit? You will get feedback on your child's growth measurements and on the project results. You will get nutrition resources for toddlers and contacts for nutrition and health resources in your community. The overall benefit of this final phase of the Toddler NutriSTEP® project is to have a nutrition screening checklist for toddlers.
Confidentiality
Every effort will be made to maintain confidentiality in all aspects of this research. Your name will not appear in any report, publication or presentation resulting from this project as individual results and data will be coded with an identification number only. All information or computer files related to the project will be stored in a locked office to further ensure protection of your confidentiality. Data will be stored for a period of 7 years at the University of Guelph. Data collected from this project will be used as part of graduate and undergraduate student projects, and will be presented at conferences and published in journal articles.

Participation and Withdrawal
You can choose to take part in this project or not. You may stop at any time without consequences. You may also ask to have your child’s data withdrawn from the project and removed from the study by contacting one of the researchers. Your decision to withdraw will not influence your child’s access to programs or services.

Project Incentives
To thank you for taking part in this study, we will give you a $40 grocery voucher and nutrition education resources.

Rights of Research Participants
You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board. If you have any questions of your rights as a research participant, please contact the Research Ethics Officer, Sandy Auld University of Guelph, 437 University Centre, Guelph, ON N1G 2W1. Phone: 519 824-4120, ext. 56606; FAX: 519 821-5236; E-mail: reb@uoguelph.ca.

Toddler NutriSTEP® Questionnaire
This project will result in a questionnaire that will be licensed for distribution by the University of Guelph. Any income generated by the distribution of this questionnaire will be used by the NutriSTEP® research team for future research.
Research Institute and Researchers

The researchers at the University of Guelph and the Sudbury & District Health Unit who are conducting this project are listed below. Please feel free to contact them at any time with any questions.

- Janis Randall Simpson, PhD, RD, Assistant Professor, Department of Family Relations and Applied Nutrition, University of Guelph, 519-824-4120, ext. 53843; rjanis@uoguelph.ca.
- Heather Keller, PhD, RD, Associate Professor, Department of Family Relations and Applied Nutrition, University of Guelph, 519-824-4120, ext. 52544; hkeller@uoguelph.ca.
- Joanne Beyers, MA, RD, Community Nutrition Specialist, Sudbury & District Health Unit, 705-522-9200, ext. 355; beyersj@sdhu.com.
- Kylie Whyte, BASc, Graduate Research Assistant, Department of Family Relations and Applied Nutrition, University of Guelph, kwhyte@uoguelph.ca.
- Jane Lac, BASc, RD, Validation Registered Dietitian, Department of Family Relations and Applied Nutrition, University of Guelph, 647-882-8936; janelac.work@gmail.com.
Consent Form

Signature of Parent/Legal Guardian

• I, __________________________, have read the information for the Toddler NutriSTEP® Development Study – Test-Retest Phase. My questions have been answered to my satisfaction, and I am therefore providing informed consent on behalf of myself and my child ____________________________, as indicated by my signature below.

• I know that I am free to stop taking part in the study at any time and that my confidentiality will be protected.

• I have been given a copy of this form.

___________________________________  __________________________
Name of Parent/Legal Guardian (Please print)  Name of Witness (Please print)

___________________________________  __________________________
Signature of Parent/Legal Guardian:  Signature of Witness

Date: __________________________

I have received: □ $25 grocery voucher

I would like to receive a summary of the results of the NutriSTEP® project  Yes □  No □

If yes, please give your mailing address

____________________________________________________________________________

____________________________________________________________________________

Appendix J: Reliability Study Informed Consent Form
Appendix K: Validity Study Informed Consent Form

Department of Family Relations and Applied Nutrition
College of Social and Applied Human Sciences

Toddler NutriSTEP® Development
Validation Phase

Consent Form

Signature of Parent/Legal Guardian

• I, ________________________, have read the information for the Toddler NutriSTEP® Development Study – Validation Phase. My questions have been answered to my satisfaction, and I am therefore providing informed consent on behalf of myself and my child ____________________________, as indicated by my signature below.

• I know that I am free to stop taking part in the study at any time and that my confidentiality will be protected.

• I have been given a copy of this form.

_________________________ ___________________________
Name of Parent/Legal Guardian (Please print) Name of Witness (Please print)

_________________________ ___________________________
Signature of Parent/Legal Guardian: Signature of Witness

Date: ____________________

I have received: □ $40 grocery voucher

I would like to receive a summary of the results of the NutriSTEP® project
Yes □ No □

If yes, please give your mailing address

_________________________ ___________________________
## Appendix L: Reliability Study Research Protocol Training Guide

### Toddler NutriSTEP® Development

**Guidelines and Tips for Recruiting and Interviewing - Test Retest Phase**

### The Recruiting Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Ensure you are wearing identification.</td>
<td>Have a nametag visible when you meet the parent to help increase his/her comfort and trust.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Help the parent (and child) become comfortable with you.</td>
<td>Find a comfortable location to do the test and retest.</td>
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<tr>
<td></td>
<td></td>
<td>Minimize distractions (i.e. decrease background noise, move away from larger groups, etc). Introduce yourself. Tell or remind the parent - your name, your position (i.e. public health nurse, resource staff), and the organization you are working with (SDHU, U of Guelph, host agency). Ask the parent how they prefer you to address them (i.e. Mr. or Mrs. vs first name). When communicating be aware of your non-verbal communication (i.e. show courteous attention, demonstrate interest in what they are saying, make eye contact).</td>
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<tr>
<td>Step 3</td>
<td>Briefly explain why you are doing the nutrition screening research.</td>
<td>Identify that you are meeting with him/her to see if they are interested in participating in this research project about their toddlers’s eating habits and nutritional health. It involves completing the Toddler NutriSTEP® questionnaire on two separate occasions, today and within the next month at this agency/site/location (e.g. Early Years program). Review in detail the parent information letter and consent form including the steps in the research: parent completing Toddler NutriSTEP® and the demographic survey; and then completing the same Toddler NutriSTEP® within the next month. Go over the inclusion criteria: parent of toddler (18-35 months of age); speak and read English or French at a grade 6 level; been in Canada for at least five years; child’s primary caregiver. Go over incentives to participation. Parent will receive a $20/$25 (Peterborough/Waterloo) grocery voucher and two parent education resources. Explain that the study results will be used to help finalize a toddler nutrition screening tool which will be available in 2012 for use by all parents of toddlers in Ontario and Canada.</td>
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<tr>
<td>Step 4</td>
<td>Become aware of potential barriers to communication.</td>
<td>Try to become aware of how well the parent can hear, see and understand you. Language Barrier: If it seems that he/she is having difficulties understanding you because their first language is not English, you may need to ask how well she/he can</td>
</tr>
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</table>
understand spoken English/French and written English/French. If he/she is having a lot of difficulties, the parent does not meet the inclusion criteria and will need to be excluded from the study. If appropriate, note this on the “Parent Recruitment Tracking Form”.

**Step 5**
Inform the parent about confidentiality.
- Review parent information letter re: confidentiality. U OF G LETTERHEAD PAPER
- Assure the parent that you will keep their responses and results private.

**Step 6**
Obtain consent to conduct the NutriSTEP© research.
- Review with the parent the content of the consent form, have them read it themselves and then sign it. Provide the parent with their copy of the parent information letter and consent form. PARENT COPY WITH U OF G LETTERHEAD PAPERS
- Assign parent a code number and record on “Data Checklist”. Explain to the parent that each parent receives a separate code number that will be used throughout the research process and will be on all of their forms such as the demographic form and screening tool.
- Place consent form (GREEN) in designated envelope (BEIGE U OF G ENVELOPE) and check off completed on “Data Checklist” (BRIGHT YELLOW)

**Step 7**
Explain how the research will be done.
- Explain to the parent that the research consists of two parts: today and a follow-up interview within a month (preferably two weeks later) at the same location.
- Today the parent will be asked to complete Toddler NutriSTEP© (CREAM) and the demographic survey (BLUE).
- At the follow-up interview, the interviewer will ask the parent to complete Toddler NutriSTEP© (YELLOW) for a second time. At the end of the second interview, the parent will receive a $20/$25 (Peterborough/Waterloo) grocery voucher and nutrition education materials.

**Step 8**
Ask the parent if she/he has any questions before completing NutriSTEP© and the demographic form.
- Ask the parent if she/he has any questions or concerns before they complete the Toddler NutriSTEP© tool and demographic form.
- Some parents may just need reassurance about confidentiality and/or about how the results of screening will be used. Ensure that the parent has received and understood all of the ethical principles outlined in the consent form.
- Place completed Toddler NutriSTEP© (CREAM FOR FIRST ONE) in the beige University of Guelph envelope and check off completed on “Data Checklist” and on the "Data Collection Checklist & Receipt".
- Place completed demographic form (BLUE) in designated envelope (BEIGE U OF G ENVELOPE) and check off completed on "Data Checklist" (BRIGHT YELLOW) and on the "Data Collection Checklist & Receipt" (PURPLE).
**The Follow-up Interview**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9</strong></td>
<td><strong>Interview with Parent</strong></td>
</tr>
<tr>
<td></td>
<td>- date for a follow-up interview within the next month.</td>
</tr>
<tr>
<td></td>
<td>‣ Let the parent know that you will be calling to remind them of the appointment and confirm it is still OK to meet.</td>
</tr>
<tr>
<td></td>
<td>‣ Record on the SUPPLEMENTARY RESEARCH STUDY INFORMATION FORM (BRIGHT PINK) the follow-up interview date for the parent to take with them.</td>
</tr>
<tr>
<td></td>
<td>‣ Check off completed on “Data Checklist” (BRIGHT YELLOW)</td>
</tr>
<tr>
<td></td>
<td>‣ Record on “Parent Contact Information Sheet-Test Retest” (GREY) the following details: assigned code number, parent’s and child’s name, contact number (work/home), appointment date, time (AM/PM) and location.</td>
</tr>
<tr>
<td><strong>Step</strong></td>
<td><strong>End Recruitment Session</strong></td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>- Thank parent for their time and interest in participating in the Toddler NutriSTEP® research project.</td>
</tr>
<tr>
<td></td>
<td>‣ Ask them if they have any further questions at this time.</td>
</tr>
<tr>
<td></td>
<td>‣ Let them know you look forward to meeting them again in the next month.</td>
</tr>
</tbody>
</table>

---

**Step 1** Confirm interview appointment

- Refer to “Parent Contact Information Sheet-Test Retest” (GREY) for contact information.
  - Phone the parent at least one week prior to the interview to remind the parent of the upcoming date, time and location of interview. Refer the parent to their copy of the parent information letter and consent form and go over the purpose of the appointment if necessary. Ask the parent if this appointment will still be convenient for them. If not, ask if an alternative appointment can be made and reschedule. Record any changes on “Parent Contact Information Sheet-Test Retest”. If the parent declines, ask the reason and record on the “Parent Contact Information Sheet-Test Retest” and thank the parent for their participation.
  - Check with the parent if they wish a reminder call the day before the appointment.
  - Check off appointment confirmed on “Data Checklist” (BRIGHT YELLOW) and on the "Data Collection Checklist & Receipt" (PURPLE).

**Step 2** Help the parent become comfortable with you at the appointment.

- Have a nametag visible when you meet the parent to help increase his/her comfort and trust. Remind the parent - your name, your position (i.e. public health nurse, resource staff), and the organization you are working with (SDHU, U of Guelph, host agency).
  - Find a comfortable location to do the interview.
  - Minimize distractions (i.e. decrease background noise, move away from larger groups).
  - Ask the parent how they prefer you to address them (i.e. Mr. or Mrs. vs first name).
| Step 3 | Briefly remind the parent of the interview purpose. | Remind them that you are meeting with him/her to do the follow-up interview component of the Toddler NutriSTEP® research project. This includes completing the NutriSTEP® tool (YELLOW) for the second time. At the end of the interview, you will give them a $20/$25 (Peterborough/Waterloo) grocery voucher and two parent education resources.  
  ▸ If necessary, review the parent information letter including the steps in the research project including the inclusion criteria and incentives.  
  ▸ Explain that the study results will be used to help finalize a toddler nutrition screening tool which will be available in 2012 for use by all parents of toddlers in Ontario and Canada. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 4</td>
<td>Become aware of potential barriers to communication.</td>
<td>Try to become aware of how well the parent can hear, see and understand you.</td>
</tr>
</tbody>
</table>
| Step 5 | Remind the parent about confidentiality. | Review parent information letter re: confidentiality.  
  ▸ Assure the parent that you will keep their responses and results private. |
| Step 6 | Check to see if the parent has any questions before you begin. | Ask the parent if she/he has any questions or concerns before you begin.  
  ▸ Some parents may just need reassurance about confidentiality and/or about how the results of screening will be used.  
  ▸ Place completed Toddler NutriSTEP® (YELLOW) in the designated envelope (BEIGE U OF G ENVELOPE) and check off completed on “Data Checklist” (BRIGHT YELLOW) |
| Step 8 | End interview component | Thank parent for their participation and provide them with the $20/$25 (Peterborough/Waterloo) grocery voucher and parent education materials. Please get parent signature for incentive on both the “Data Checklist” (BRIGHT YELLOW)  
  ▸ Ask parent if they have any questions or concerns and direct them to the appropriate service provider (i.e. public health unit, community health centre, Early Years Centre, family physician). |
| Step 9 | Complete data entry form | Record any comments on “Data Checklist” (BRIGHT YELLOW). |
Appendix M: Validity Study Research Protocol Training Guide

**Toddler NutriSTEP® Validation Guidelines and Tips for Recruiting and Interviewing**

### The Recruiting Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Briefly explain why you are doing the nutrition screening research.</th>
<th>Identify that you are meeting with him/her to see if they are interested in participating in this research project which includes completing the Toddler NutriSTEP® questionnaire to find out about their preschooler’s eating habits and nutritional health.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Briefly explain why you are doing the nutrition screening research.</td>
<td>Review in detail the parent information letter including the steps in the research:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o parent completing Toddler NutriSTEP® and the demographic survey;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o obtaining the toddler’s weight and height on-site;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o parent receiving instructions on completing a three day food intake record;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o parent completing the record and participating in follow-up interview with the validation RD to review child’s intake and nutritional health.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Go over the inclusion criteria:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o parent of preschooler (18-35 months of age);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o speak and read English at a grade 6 level; been in Canada for at least 5 years;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o child’s primary caregiver;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o ability to obtain food intake record (especially if in day care).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Go over incentives to participation. Parent will receive $40 in grocery vouchers, parent education resources and nutrition advice. The validation RD will determine if he/she might benefit from education about eating and diet, a referral to see a Dietitian or other health professional, or information or referrals about food related services available in their community.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explain that the study results will be used to help finalize a preschool nutrition screening tool which will be available in 2012 for use by all parents of toddlers in Ontario and Canada.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>Become aware of potential barriers to communication.</th>
<th>Try to become aware of how well the parent can hear, see and understand you.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Become aware of potential barriers to communication.</td>
<td>Language Barrier: If it seems that he/she is having difficulties understanding you because his/her first language is not English, you may need to ask how well she/he can understand spoken English and written English. If he/she is having a lot of difficulties,</td>
</tr>
<tr>
<td>Step 3</td>
<td>Inform the parent about confidentiality.</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Review parent information letter (WHITE) re: confidentiality.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ensure the parent that you will keep his/her responses and results private.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Explain that you will only share the results with professionals to whom you may be suggesting or making referrals.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 4</th>
<th>Obtain consent to conduct the NutriSTEP® research.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Review with the parent the content of the consent form (copy for parent is the fourth page of the information letter), and have them read it themselves. Provide the parent with their copy of the parent information letter and consent form.</td>
</tr>
<tr>
<td></td>
<td>Explain to the parent that each parent receives a separate code number that will be used throughout the research process and will be on all of his or her forms such as the demographic form and screening tool.</td>
</tr>
<tr>
<td></td>
<td>Have the parent/caregiver sign the GREEN copy of the consent form. Place signed GREEN consent form in SMALL WHITE ENVELOPE and check off completed on the checklist on the small white envelope.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 5</th>
<th>Explain how the research will be done.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explain to the parent that the research consists of two parts; today and a follow-up interview within a month.</td>
</tr>
<tr>
<td></td>
<td>Today, the parent will be asked to complete Toddler NutriSTEP® and the demographic survey. Then the recruiter will instruct the parent on completing the three day food record (WHITE).</td>
</tr>
<tr>
<td></td>
<td>If the recruiter is the Validation RD, she may obtain weight/length and height measurements and will book the follow-up interview.</td>
</tr>
<tr>
<td></td>
<td>If the recruiter is NOT the RD, the contact information for the parent will be given to the Validation RD to book the follow-up appointment (PURPLE FORM). At the follow-up interview (Visit 2), the Validation RD will review the completed three day food intake and ask questions about the child’s eating and other habits (and do weight and length/height if not previously done). The Validation RD will discuss any of the parent’s nutrition questions or concerns and provide the parent with education materials and recommendations for follow-up if necessary. At the end of the interview, the parent will receive a $40 grocery voucher and nutrition education resources.</td>
</tr>
<tr>
<td>Step</td>
<td>Instruction</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 6     | Ask the parent if she/he has any questions before completing NutriSTEP® and the demographic form. | ✈ Ask the parent if she/he has any questions or concerns before they complete the Toddler NutriSTEP® tool and demographic form.  
✦ Some parents may just need reassurance about confidentiality and/or about how the results of screening will be used. Ensure that the parent has received and understood all of the ethical principles outlined in the consent form.  
✦ Have parent complete and then place completed Toddler NutriSTEP® (WHITE) in the SMALL WHITE ENVELOPE and check off the box on the small white envelope.  
✦ Have the parent complete and then place completed demographic form (BLUE) in the SMALL WHITE ENVELOPE and check off the small white envelope. |
| 7     | Instruct parent on completing three day food intake record. | ✈ Go over the directions on the first page of food record, sample menu, etc. (WHITE) Ask them if they have any questions. Place the food record in the BROWN U OF GUELPH ENVELOPE to give to parent/caregiver.  
✦ Remind them to complete and bring the record with them or have ready for the next appointment with the validation RD. |
| 8     | Obtain toddler’s weight and height/length measurement (CAN BE DONE AT RECRUITMENT) | ✈ Record toddler’s full name, weight (kg) and height/length (cm) in the white sticker section located on the top right-hand corner of the PURPLE Second Visit Schedule & Contact Information Sheet. This sheet can be found in the LARGE WHITE ENVELOPE. Once the information is complete, the recruiter will keep the PURPLE form. |
| 9     | Book follow-up interview with parent (USUALLY DONE BY VALIDATION RD) | ✈ Record on “Second Visit Schedule & Contact Information Sheet” (PURPLE) the following details: date, assigned code number, parent’s and child’s name, mailing address, contact number (work/home), appointment date, time and location and directions (if applicable at time of recruitment).  
✦ Remind parent that the toddler does not need to be at the interview if weight and length/height have already been taken.  
✦ Let the parent know that the validation RD will be calling to remind him/her of the appointment and confirm it is still OK to meet at that date, time and location.  
✦ Record on the Supplementary Research Study Information Form (BRIGHT PINK) the interview date, time and location for the parent to take with them (if known). The validation RD’s contact information is also on the BRIGHT PINK form. Place the BRIGHT |
<table>
<thead>
<tr>
<th>Step 10</th>
<th>End recruitment session</th>
</tr>
</thead>
</table>

- Thank parent for their time and interest in participating in the Toddler NutriSTEP® research project.
- Ask them if they have any further questions at this time.
- Let them know that the validation RD will be looking forward to contacting the parent/caregiver regarding Visit 2 within the month.
- Checklist of documents the recruiter should have at the end of Visit 1:
  - In the LARGE WHITE ENVELOPE:
    - PURPLE “Parent Contact Information Sheet” with the top half completed, including the child’s name, weight and height/length
    - SMALL WHITE ENVELOPE, unsealed and the following:
      - 1. WHITE completed Toddler NutriSTEP® questionnaire
      - 2. GREEN signed consent form
      - 3. BLUE parent demographics form
Appendix N: Participant Background Form

Department of Family Relations and Applied Nutrition
College of Social and Applied Human Sciences

Toddler NutriSTEP® Development

Participant Background Form

We are interested in obtaining some information about you and your family in order to better understand who is coming to our focus groups. Please complete the following questions to provide us with some background information on your child and family. Provide only one response for each question. Feel free to not answer certain questions if they make you uncomfortable.

Please do not put your name on this paper.

1. a) How old is your toddler ______ (months)
b) What is the gender of this child? [ ] Male [ ] Female
c) Does your toddler have a medical condition diagnosed by a doctor? [ ] Yes [ ] No
   If Yes, please describe_______________________________________________________

2. For the following people, what is the language they first learned as a child, the country they were born in, and ethnic or cultural background?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Your Toddler</th>
</tr>
</thead>
<tbody>
<tr>
<td>First language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country born in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnic or cultural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Background (e.g.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Nations, Italian,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Age and Gender
   a) Your age: __________
   b) Are You: [ ] Male [ ] Female

4. Your Marital Status:

5. a) How many PEOPLE live in your household (include all adults and children) __________
   b) How many ADULTS live in your household? __________
   c) How many CHILDREN live in your household? __________

6. What is YOUR highest level of education?
   [ ] Elementary
   [ ] Some High School
   [ ] Graduated High School
   [ ] Some College/University
   [ ] Graduated College/University

7 What is your TOTAL household income after taxes?
   [ ] less than $15,000
   [ ] $15,000-$29,999
   [ ] $30,000-$59,999
   [ ] $60,000-$89,999
   [ ] over $90,000
   [ ] don’t know

Thank you for your input!
Appendix O: Nutritional Assessment Guide
Toddler NutriSTEP® Validation Phase
Standardized Criteria for Nutritional Risk Rating

*Child’s Name: ___________________ *Date of Assessment (dd/mm/yy): ___________
*Parent’s Name: ___________________ *Child’s DOB (dd/mm/yy): ____________
*Child’s Sex: □ M □ F *Child’s Age: ____ *Gestational Age: ____ *Corrected Age: ____

GROWTH, PHYSICAL AND HEALTH INDICATORS

*Weight for age: _____ kg ( ____ %ile)  *Length/height for age: _____ cm ( ____ %ile)
*Weight for length: _____%ile(< 24 months) *BMI for age: ____ ( ____%ile) (≥ 24 months)
*Recent unexpected/unusual weight change or no weight gain over time: □ Yes  □ No
*If yes, describe briefly (e.g. due to illness, % weight lost or gained)

* Physical assessment concerns:

☐ Past/present health problems that may have an impact on appetite, intake, growth and/or
nutritional health (e.g. iron deficiency, dental/oral health, GI-constipation, diarrhea, nausea, vomiting):

☐ Hospitalizations/surgeries that may have an impact on intake, growth and/or nutritional
health:

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Weight for age 3rd-85th%ile</td>
<td>☐ Weight for age &lt;3rd %ile</td>
<td>☐ Weight for age &lt; 0.1 st</td>
</tr>
<tr>
<td>☐ Length/height for age 3rd-85th%ile</td>
<td>☐ Length/height for age &lt; 3rd %ile</td>
<td>☐ Length/height for age &lt; 0.1 st</td>
</tr>
<tr>
<td>☐ Weight for length 3rd-85th%ile (&lt; 24 months only)</td>
<td>☐ Weight for length &lt; 3rd or &gt; 85th%ile (&lt; 24 months only)</td>
<td>☐ Weight for length &lt; 0.1st or &gt; 97th%ile (&lt; 24 months only)</td>
</tr>
<tr>
<td>☐ BMI for age 3rd-85th%ile (≥ 24 months only)</td>
<td>☐ BMI for age &lt; 3rd or &gt; 85th%ile (≥ 24 months only)</td>
<td>☐ BMI for age &lt; 0.1st or &gt; 97th%ile (≥ 24 months only)</td>
</tr>
<tr>
<td>☐ Healthy</td>
<td>☐ Recent illness, surgery or hospitalization</td>
<td>☐ Lengthy illness or medical condition</td>
</tr>
</tbody>
</table>
FOOD INTAKE, RESTRICTIONS AND SUPPLEMENTS

☐ Review and evaluate three-day food intake records in comparison to CFGHE:

For toddlers 12-24 months:
There is no recommended number of servings for each food group. Therefore, focus on the variety of foods from the four food groups in Canada’s Food Guide every day. The toddler decides how much he/she will eat depending on what the caregiver provides at meal and snack times.

For toddlers 24-36 months:
☐ 4 Food Guide servings from the vegetables and fruit group
☐ 3 Food Guide servings from breads and cereals group
☐ 2 Food Guide servings from the milk and milk products group
☐ 1 Food Guide serving from the meat and alternatives group

Note: The amount of times the child consumes the foods from the four food groups will be greater than the number of Food Guide servings. E.g., a toddler is more likely to have two half servings of meat in a day than one Food Guide serving at one sitting.

☐ Complete a ‘typical day’ 24 hour recall, identifying variations to determine current dietary intake if incomplete/missing 3 day intake record:

☐ Medications/ Vitamin, Mineral and Herbal Supplements (if questionable efficacy or concerns with potential toxicity and/or relevant to nutritional health):

* Note: Data can be completed at time of recruitment by a Registered Dietitian (see Guidelines and Tips for Recruiting and Interviewing)
Food Allergies/Sensitivities/Therapeutic Diet (if impacting on food selection and intake; parent having difficulties; and/or requires further assessment or education):

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Eats a variety of age appropriate foods from the four food groups</td>
<td>☐ Eats some variety of age appropriate foods from the four food groups</td>
<td>☐ Does not eat a variety of age appropriate foods from the four food groups</td>
</tr>
<tr>
<td>☐ Usually consumes ≥ the minimum recommended Food Guide servings</td>
<td>☐ Usually consumes &lt; the minimum recommended Food Guide servings</td>
<td>☐ Diet missing one food group entirely</td>
</tr>
<tr>
<td>☐ Not eating a variety of table foods containing iron</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Minimal use of animal products including milk and eggs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Usually eats at regular times throughout the day (breakfast, lunch, supper)</td>
<td>☐ Occasionally eats at regular times throughout the day (breakfast, lunch, supper)</td>
<td>☐ Rarely eats at regular times throughout the day (breakfast, lunch, supper)</td>
</tr>
<tr>
<td>☐ Usually offered small snacks 2-3 times a day</td>
<td>☐ Offered 1 small snack a day or a few times a week</td>
<td>☐ Rarely offered snacks</td>
</tr>
<tr>
<td>☐ Drinks or grazes throughout the day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Drinks 2-3 cups (16-24 oz) of milk daily (can be milk, breast milk or formula)</td>
<td>☐ Milk intake &lt; (16 oz) 2 cups or &gt; (24 oz) 3 cups a few days of the week</td>
<td>☐ Milk intake &lt; (16 oz) 2 cups or &gt; (24 oz) 3 cups most days of the week</td>
</tr>
<tr>
<td>☐ Drinks less than 6 oz (3/4 cup) juice daily</td>
<td>☐ Juice intake &gt; 6 oz (3/4 cup) but ≤ 8 oz (1 cup) daily</td>
<td>☐ Juice intake &gt; 8 oz (1 cup) daily</td>
</tr>
<tr>
<td>Drinks flavoured beverages ≤ 1 time(s) a week</td>
<td>Drinks flavoured beverages 2-4 times a week</td>
<td>Drinks flavoured beverages ≥ 5 times a week</td>
</tr>
<tr>
<td>☐ Eats fast foods ≤ 1 time(s) a week</td>
<td>☐ Eats fast foods 2-4 times a week</td>
<td>☐ Eats fast foods ≥ 5 times a week</td>
</tr>
<tr>
<td>☐ Frequently given inappropriate foods, e.g. herbal teas, pop, fruit drinks, and rice/almond beverages; and soy beverages before 24 months of age (except soy formula)</td>
<td>☐ Frequently given unsafe, inappropriate foods, e.g. raw eggs, unpasteurized milk, and foods that are choking hazards</td>
<td>☐ Frequently given unsafe, inappropriate foods, e.g. raw eggs, unpasteurized milk, and foods that are choking hazards</td>
</tr>
<tr>
<td>☐ No food allergy, restriction or diet concerns</td>
<td>☐ Some food allergy, restriction or diet concerns</td>
<td>☐ Significant food allergy, restriction or diet concerns</td>
</tr>
<tr>
<td>☐ Good appetite and intake most days of the week</td>
<td>☐ Frequent poor appetite with decreased intake</td>
<td>☐ Chronic poor intake with decreased intake</td>
</tr>
</tbody>
</table>

151
DIET AND FEEDING RELATED FACTORS INCLUDING AGE APPROPRIATE BEHAVIOURS

Age appropriate behaviours to consider:

- fluctuating appetite
- plays with foods
- weaned from bottle by ~15 months
- may eat only preferred foods
- may take 5-10 tries before accepting new foods
- eats with a utensil with little spilling
- may have periods of disinterest in foods
- may have resistance to new foods
- may refuse all but 4 to 5 foods
- refuses previously accepted foods

Feeding environment concerns:

- Meals at the table with parent or adult role model and/or presence
- Parent/child interactions; division of responsibility around food and feeding
- TV viewing during mealtimes

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Occasional or rare mealtime battles and/or parental anxiety/stress</td>
<td>☐ Frequent mealtime battles and/or parental anxiety/stress</td>
<td>☐ Significant (daily) mealtime battles and/or parental anxiety/stress with meals rarely pleasant</td>
</tr>
<tr>
<td>☐ Self feeds most meals and snacks</td>
<td>☐ Self feeds some meals and snacks</td>
<td>☐ Rarely self feeds meals and snacks</td>
</tr>
<tr>
<td>☐ Occasional bottle use</td>
<td>☐ Still drinking from a bottle a few day a week</td>
<td>☐ Still drinking from a bottle most days a week</td>
</tr>
<tr>
<td>☐ Mealtimes reasonable length (20-30 minutes)</td>
<td>☐ Usually spends a long time at meals (e.g. an hour) or unable to sit for about 15 minutes at meals</td>
<td>☐ Meal length times always less than 15 minutes and/or more than one hour</td>
</tr>
<tr>
<td>☐ Meals rarely consumed while watching TV or with distractions</td>
<td>☐ Food is used as a reward or punishment frequently</td>
<td>☐ Food is used as a reward or punishment most of the time</td>
</tr>
<tr>
<td>☐ Adult or parent role model and/or presence at mealtimes</td>
<td>☐ Meals frequently consumed while watching TV or with distractions</td>
<td>☐ Meals always/almost always consumed while watching TV or with distractions</td>
</tr>
<tr>
<td>☐ No difficulty with eating, chewing, swallowing, gagging and/or tactile sensitivities</td>
<td>☐ Meals seldom consumed with adult or parent role model and/or presence</td>
<td>☐ Meals rarely or never consumed with adult or parent role model and/or presence</td>
</tr>
<tr>
<td></td>
<td>☐ Some difficulty with eating, chewing, swallowing, gagging and/or oral tactile sensitivities</td>
<td>☐ Significant difficulties with eating, chewing, swallowing, gagging and/or oral tactile sensitivities</td>
</tr>
</tbody>
</table>
OTHER RISK FACTORS AND RELEVANT ISSUES OR CONCERNS

- Food security
- Physical activity/inactivity
- Psychosocial environment
- Other, specify

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Adequate food storage and cooking facilities</td>
<td>☐ Limited food storage and cooking facilities</td>
<td>☐ Inadequate food storage and cooking facilities</td>
</tr>
<tr>
<td>☐ Sufficient income and food available to offer quality, quantity and variety at all times</td>
<td>☐ Limited income and food available to offer quality, quantity and variety at all times</td>
<td>☐ Inadequate income and food available to offer quality, quantity and variety at all times</td>
</tr>
<tr>
<td>☐ Daily active play</td>
<td>☐ Active play only a few times a week (less than once a day)</td>
<td>☐ Restricted or minimal active play</td>
</tr>
<tr>
<td>☐ Time spent watching TV, using the computer or playing video games is limited to &lt; 2 hours daily</td>
<td>☐ Watches TV, uses computer or plays video games for ≥ 2 hours most days of the week</td>
<td>☐ Watches TV, uses the computer or plays video games for ≥ 4 hours most days of the week</td>
</tr>
<tr>
<td>☐ Stable family, childcare, social, emotional situation</td>
<td>☐ Changes or stresses in family, childcare or social life influencing some changes in usual appetite and/or intake and/or growth</td>
<td>☐ Changes or stresses in family, childcare or social life influencing significant or prolonged changes in usual appetite, intake and/or growth</td>
</tr>
</tbody>
</table>

OVERALL EVALUATION

<table>
<thead>
<tr>
<th>Nutrition Indicators</th>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth, Physical and Health Concerns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Intake, Restrictions and Supplements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diet and Feeding Related Factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Risk Factors and Relevant Issues</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overall Risk and Score Assigned Between 1-10:
- ☐ Low (1-4) _____
- ☐ Moderate (5-7) _____
- ☐ High (8-10) _____

Comments/ Explain Rationale:
### Appendix P: Question Stem Short Forms used in Confirmatory Factor Analysis

<table>
<thead>
<tr>
<th>Question Stem</th>
<th>Short Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>My child usually eats grain products:</td>
<td>Consumes grains</td>
</tr>
<tr>
<td>My child usually has milk products:</td>
<td>Consumes milk</td>
</tr>
<tr>
<td>My child usually eats vegetables and fruit:</td>
<td>Consumes fruits &amp; vegetables</td>
</tr>
<tr>
<td>My child usually eats meat, fish, poultry or alternatives:</td>
<td>Consumes meat</td>
</tr>
<tr>
<td>My child usually eats restaurant or take-out “fast foods”:</td>
<td>Consumes fast food</td>
</tr>
<tr>
<td>My child usually drinks juice or flavoured beverages:</td>
<td>Drinks juice</td>
</tr>
<tr>
<td>I have difficulty buying food I want to feed my child because food is expensive:</td>
<td>Food is expensive</td>
</tr>
<tr>
<td>My child has problems chewing, swallowing, gagging or choking when eating:</td>
<td>Problems chewing</td>
</tr>
<tr>
<td>My child feeds his/her self at meals and snacks:</td>
<td>Feeds themselves</td>
</tr>
<tr>
<td>My child drinks from a baby bottle with a nipple:</td>
<td>Drinks from bottle</td>
</tr>
<tr>
<td>My child is hungry at mealtimes:</td>
<td>Hungry at meals</td>
</tr>
<tr>
<td>My child usually eats meals and snacks:</td>
<td>Eating frequency</td>
</tr>
<tr>
<td>I let my child decide how much to eat:</td>
<td>Child decides how much</td>
</tr>
<tr>
<td>My child eats meals or snacks while watching TV, or being read to, or playing with toys:</td>
<td>Eats while distracted</td>
</tr>
<tr>
<td>My child usually watches TV, or uses the computer, or plays video games:</td>
<td>Sedentary activity</td>
</tr>
<tr>
<td>I am comfortable with how my child is growing:</td>
<td>Comfortable with growth</td>
</tr>
<tr>
<td>I think my child: (in terms of weight)</td>
<td>Child weighs?</td>
</tr>
</tbody>
</table>