

**Assessment of Parenting Stress as Measured by the Parenting Stress Index-Short  
Form Related to Treatment and Management of a Child with  
Phenylketonuria**

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# Phenylketonuria

## Description of Disorder

Phenylalanine is one of many amino acids the body metabolizes and recycles to generate other amino acids. It is an essential amino acid. Phenylketonuria (PKU) is an inherited genetic metabolic disorder that results in phenylalanine hydroxylase (PAH) deficiency (Blau, van Spronsen, & Levy, 2010; Williams, Mamotte, & Burnett, 2008). A deficient amount of PAH impairs the hydroxylation of Phe to tyrosine (Blau et al., 2010; Brosco, Sanders, Seider & Dunn, 2008). Individuals with a PKU have varying levels of phenylalanine (Phe) tolerance depending on the individual's level of PAH activity. Most individuals with PKU (PAH deficiency) can tolerate 250-500 mg of dietary Phe per day to maintain safe plasma Phe concentrations. (Blau et al., 2010; Mitchell, Trakadis, & Scriver, 2011).

Sustained high plasma Phe concentrations are associated with irreversible and harmful neurodevelopmental effects such as intellectual disability, cognitive impairment and behavioral problems (Feillet et al., 2010b; Hellekson, 2001; Williams, Mamotte, & Burnett, 2008). There is currently no confirmed mechanism that explains how increased Phe concentration is linked to neurologic damage. Physical manifestations of undiagnosed or untreated PKU (sustained and elevated Phe concentrations) include seizures, irritability, lack of motor skills, and growth failure (Blau et al., 2010; Hellekson, 2001; Williams et al., 2008). Some propose that high Phe concentrations can disrupt the blood brain barrier and impede synthesis or transport of other metabolites. Other theories suggest that brain dysfunction may be due to either white matter changes or low dopamine levels due to high Phe levels inhibiting the passage of tyrosine, a precursor to dopamine, to enter the brain (Blau et al., 2010; Hellekson, 2001; Williams et al.,

2008). Despite unconfirmed theories on the pathophysiology of high Phe levels on brain function, the outcomes are negative. Prevention of neurological damage and complications is possible through newborn screening and appropriate treatment.

### Identifying the disorder

A Norwegian physician, AsbjornFolling, first discovered PKU in 1934 (Blau et al., 2010; Williams et al., 2008). After the Second World War, a series of scientists (Bickel, Hickmans, Gerrard, and Woolf) prepared the first low Phe formula as treatment for PKU (Gerrard, 1994). In the 1960s, a pediatrician namedRobert Guthrie developed screening methods to identify the disorder before symptoms became evident.His screening method is known today as the Guthrie Bacterial Inhibition Assay and was widely used for decades (Gentile,Fickie, &Waisbren, 2008; Guthrie & Susi, 1963; Williams et al, 2008). Today, Tandem mass spectrometry makes it possible to identify an array of metabolic disorders, including PKU, from a single sample by measuring various compounds in an efficient and relatively low-cost manner (Guthrie & Susi, 1963;Hellekson, 2001). Newborn screening for PKU (and a number of other disorders) is mandated in all 50 states. The efficiency and relatively low cost of newborn screeningsis attributed to modern technology.

An estimated 1 of every 15,000 newborns in the United States is diagnosed with PKU (Hellekson, 2001). Similar rates are found in the Northern European population, with 1 out of every 10,000 newborns having the PAH deficiency. Other regions, like Africa, have a lower prevalence (1 out of every 100,000) of PAH deficiency (Mitchell et al., 2011). Prevalence of PKU is reported to be higher in Caucasian and Native American populations (Hellekson, 2001).

## Management & Treatment of PKU

Infants diagnosed with PKU by newborn screening begin treatment as soon as possible. Medical nutrition therapy (MNT) typically starts once elevated Phe levels are confirmed by screening and diagnostic blood draws (Hellekson, 2001). Dietary treatment is the accepted therapy for PKU. It consists of limiting intake of phenylalanine, mainly foods with high and moderate amounts of protein, and use of medical formula containing tyrosine to maintain desirable plasma Phe levels. Other treatment options (or adjunct treatments) such as tetrahydrobiopterin (BH4), enzyme replacement and hepatocyte transplant are being explored.

### Overview of PKU Management

An “ideal” range of 2-6 mg/dL plasma Phe levels has been recommended for normalized Phe and tyrosine concentrations in the blood to prevent potential cognitive harm (Lindegren et al., 2012; Mitchell et al., 2011). Some clinicians relax the acceptable range for plasma Phe levels to 2-10 mg/dL during adolescence (beginning at 12 years of age) through adulthood (Hellekson, 2001; Seashore et al., 1999). Phe level monitoring is more frequent in the younger age groups and tapers at adolescence on through adulthood (Hellekson, 2001; Seashore et al., 1999). A meta-analysis of studies that compared intelligence quotient (IQ) to mean Phe levels found that children with PKU who maintained levels below 6 mg/dL had a significantly higher IQ than those who had higher Phe levels (Waisbren et al., 2007).

Metabolic control of plasma Phe levels and prevention of neurologic deficits has traditionally consisted of a low Phe diet. Recent evidence from a randomized controlled trial, and from a meta-analysis of observational studies confirms dietary manipulation as optimal treatment for PKU. The meta-analysis of 69 retrospective and concurrent studies investigated the correlation between blood Phe level and IQ measurements (Lindegren et al., 2012). Lower IQ measurements

were found to be more likely with higher blood Phe levels, substantiating the current Phe level ranges for treatment of PKU (Holtzman, Kronmal, van Doorninck, Azen, & Koch, 1986). The longitudinal trial (20 years) looked at the prolonged effects of diet continuation versus discontinuation on mean Phe levels of children into adulthood (Koch et al., 2002). Participants, after reaching six years of age, were randomly assigned to either continue or discontinue the diet for PKU. Follow-up on the study population three years after the initial trial found that children with controlled Phe blood levels until at least eight years of age had IQ and behavior scores similar to their unaffected siblings and parents, while individuals with uncontrolled diet had lower IQ and behavior scores than their unaffected siblings and parents. (Holtzman et al., 1986). Another follow-up 20 years after the initial trial found that medical complications such as mental problems were more frequent in adults ( $p=0.02$ ) who discontinued the diet than those who continued the diet, therefore, supporting PKU treatment into adulthood (Koch et al., 2002).

### **Dietary Treatment**

Dietary control of PKU in most individuals necessitates use of medical food (formula with no phenylalanine, but with supplemental tyrosine) to meet nutrient needs (Mitchell et al., 2011). Medical foods meet more than 80% of energy needs and 90% of protein needs of most children with PKU and are essential for effective PKU management (van Calcar & Ney, 2012). As infants and young children begin eating solid foods, parents or caregivers plan low-protein meals as part of the Phe restricted diet. A diet low in Phe will consist of fruits and vegetables with tightly controlled amounts of potatoes and grains; some individuals require low protein pasta and bread products. Restrictions include dairy products, meats, poultry, fish, eggs, nuts, and seeds (Blau et al., 2010). It is recommended that children over two years age consume

approximately 25 mg/kg/day of tyrosine and a total amino acid intake of 2 g/kg/day (Mitchell et al., 2011).

### **Current & Potential Approaches to Treatment**

Adjuvant treatments to the current prescribed low Phe diet are receiving increased attention. A dietary supplement of large neutral amino acids (LNAA) is still undergoing clinical trials. The proposed mechanism for the use of LNAA is their potential to compete with Phe for transport across the blood brain barrier (Gentile et al., 2008). A systematic review concluded that even though LNAA supplementation did have more of an effect on those who were unable to comply to medical treatment, the pooled results offered little to improving clinical outcomes (Lindegren et al., 2012).

The FDA approved synthetic tetrahydrobiopterin (BH4), also known as sapropterin dihydrochloride for use in PAH deficiency in 2007 (Bélanger-Quintana et al., 2011). For some individual with PKU, BH4 increases PAH enzyme activity, thus lowering Phe levels in conjunction with a low Phe diet (Gentile et al., 2008; van Calcar & Ney, 2012). Long-term studies are underway to study the effects of the drug. There is moderate strength of evidence of harmful side effects, such as mucositis and headaches, associated with BH4 (Lindegren et al., 2012). Studies looking at whether age and dietary compliance could potentially play a factor in drug reaction are still needed (Bélanger-Quintana et al., 2011).

Clinical trials for enzyme replacement therapy with phenylalanine ammonia lyase are underway. At present, the enzyme is administered subcutaneously, however, trials of an oral PEGylated form and a genetically modified probiotic are being investigated as alternative delivery methods (Bélanger-Quintana et al., 2011; Feillet et al., 2010b). Gene therapy for PKU

and other metabolic disorders are also currently being studied in animal models (Bélanger-Quintana et al., 2011; Feillet et al., 2010b).

Presently, the most effective treatment for PKU is to control blood Phe via dietary restriction. This is best accomplished with the support of a specialized health care team.

### **Compliance related to Current PKU Management Practices**

Compliance to PKU management recommendations requires that families of children with PKU participate in a host of tasks, including preparing and providing formula, planning low protein meals, and taking their children to clinic. The extent to which families comply with these recommendations have not yet been studied. One survey assessed current management practices of patients with PKU and their primary caregivers (n=50) in the state of Utah (Bilginsoy, Waitzman, Leonard, & Ernst, 2005). Most caregivers and patients (84%) reported understanding the importance of diet and how it impacts Phe test results. However, 46% of families admitted to altering typical behavior, such as avoidance of high Phe containing foods, prior to testing blood levels. The discord between understanding and applying PKU management practices may be related to some of the main obstacles mentioned by respondents, which included difficulty maintaining dietary records and dealing with PKU in social situations. Other obstacles identified to effective PKU management included time constraints (66-74%), dissatisfaction with foods in special diet (58-67%) and stress associated to preparation of foods (23-39%). Though this is a limited sample, the survey results indicate parents do understand importance of PKU management, however, stress and limitations surrounding PKU management impacts proper parent involvement.

Although families receive nutrition education through their clinics and report being compliant to the diet, actual management practices may indicate potential barriers in applying

what the family has learned. This may include financial barriers, as medical foods are expensive. Families' out-of-pocket costs can vary. Some states provide medical food to families at no charge, insurance can also provide reimbursement in other states; however, some families are responsible for some or all of the costs for medical foods. Costs for blood tests, which vary by program, can be another financial burden to families (Bilginsoy et al., 2005; Seashore et al., 1999).

A cross-sectional study identified potential determinants that affect compliance to PKU treatment (Crone et al., 2005). A questionnaire was distributed to 238 parents of patients with PKU (children who are less than 22 years old), asking questions related to their knowledge of the PKU treatment and attitudes about their child's compliance to the diet. Responses were based off a 5-point scale where respondents stated they "totally agree" or "totally disagree" with a statement. These responses were compared to the child's mean Phe level. Mean Phe levels were lower in children whose parents reported "giving formula three times a day was easy" ( $p=0.007$ ) and those who "felt that their child adhered well to the diet even if his or her Phe concentration was sometimes too high" ( $p=0.000$ ). Higher Phe levels were more likely ( $p=0.004$ ) when parents reported their extended family did not approve when their child deviated from the diet. There exists an association between parent attitudes and behaviors in controlling certain aspects of treatment and the child's mean Phe levels, however, whether this is a causal relationship is unknown (Crone et al., 2005). This study seeks to add to the information in this area.

### **Local Treatment Services in Washington State**

The Cristine M. Trahms Program for Phenylketonuria (UW PKU Clinic) provides clinical services for all individuals with PKU in Washington State. This program is part of the University of Washington Biochemical Genetics Program. The clinical team consists of the following:

geneticist, developmental pediatrician, registered dietitians, social worker, genetic counselor, psychologists and patient care coordinator.

Monthly clinics are offered groups by age or school year. The monthly visit includes a brief neurologic exam, medical and nutrition assessment, nutrition education, and parent support. Providing visits by similar age and developmental level allows the clinic to provide age-appropriate nutrition education. Psychometric testing is done when children are about three years old, around the time they start kindergarten, and about every three years thereafter. Each child's anthropometrics are taken as well as a blood draw for measuring plasma Phe and tyrosine levels. While children are attending a nutrition education session, parents meet in a group setting with the social worker and clinical staff where they can share challenges and problem solve together. The nutrition education program uses a developmental approach and is focused on skills needed for self-management of PKU. During a nutrition assessment, registered dietitians meet with each family to discuss each child's food and formula intake. A recipe is shared with families to demonstrate new low protein products and/or approaches to low protein meal planning. At the conclusion of the clinic, parents are given information to reinforce nutrition education topics discussed with the child. After each clinic, the staff follows up with a phone call to each family to review lab results and adjust formula and food patterns. The clinical staff is also available for private appointments. For families who live in Eastern Washington, five clinics each year are held in Spokane, Washington.

In addition to monthly clinics and nutrition education, the clinic offers extensive resources online. This includes low Pherecipes, links to other websites, parent education handouts and the nutrition education curriculum. The clinic also holds annual picnics and a "PKU Science Night" where families and individuals can learn about research related to PKU. In

efforts to continue to provide helpful resources to attendees of the UW PKU Clinic, this study has the potential to inform the UW PKU Clinic concerning patient preferences for support and factors associated with parenting stress.

## **Parenting Stress**

An increase in parenting stress is more likely among parents of children with developmental delays, behavioral disorders and chronic diseases (Abidin, 1995). Potential outcomes of increased levels of parenting stress are an increased risk for behavioral problems in children, which can disrupt a functioning parent-child relationship (Williford, Calkins, & Keane, 2007). Predictors and influences related to compliance have been identified in the PKU population; however, few studies have measured specific levels of parenting stress related to PKU in comparison to other conditions (MacDonald, Gokmen-Ozel, van Rijn, & Burgard, 2010; Read, 2003).

### **Parenting Stress related to PKU**

The demands of constantly restricting food intake, close monitoring of protein content in foods and other aspects of PKU management may be cumbersome to individuals with PKU and their families. Sources of stress may be related to the parents' ability to motivate or assist their child to comply with their low Phe diet (Feillet et al., 2010a). In addition, parents are typically aware that their child's development and growth is dependent on how diet is implemented (Bilginsoy et al., 2005; Reber, Kazak, & Himmelberg, 1987). As children get older, parents become less involved with management and ideally assist in transitioning their children to self-manage PKU (Feillet, MacDonald, & Burton, 2010a). There can be relative difficulty of this transition for individuals who exhibit delays in functioning level from sustained plasma Phe level

(Feillet et al., 2010a). Higher blood Phe concentrations are also typical with increased age (Ievers-Landis et al., 2005; MacDonald et al., 2010).

Parents' influence on compliance with treatment for PKU and other metabolic disorders has been examined. Predictors and factors include knowledge and understanding of PKU and social support. Barriers to good compliance such as lack of stability in the home, poor family support and difficulties with insurance may interfere with optimal PKU management (MacDonald et al., 2010). Poor compliance to diet treatment may potentially be related to a parent's understanding of the disorder (Bekhof et al., 2003; MacDonald, et al., 2008; MacDonald et al., 2010). Difficulties in having a child comply with diet can be related to the insufficient parent involvement or social support (MacDonald et al., 2010; Olsson, Montgomery, & Alm, 2007). Knowledge of diagnosis and its associated risks were variables identified in one study that used an adapted Interaction Model of Client Health Behavior for elements that theoretically contribute to parenting stress in parents of children with metabolic disorders (Cox, 1982; Waisbren, Rones, Read, Marsden, & Levy, 2004). Not only has sufficient social support been correlated to improved compliance, but lack of social support been identified as a predictor of parent stress (Ipsoruglu et al., 2005; Waisbren et al., 2004).

Lack of knowledge about PKU and its management has been identified as an element contributor to parenting stress, however, no studies have yet confirmed this relationship. There have been studies, however, on the influence of parents or caregivers' knowledge of diet and PKU on compliance (or blood Phe concentrations), which have had mixed conclusions (MacDonald et al., 2008; Mackner, McGrath, & Stark, 2001). One study was done in 2008 in the United Kingdom with a fairly small sample ( $n=46$ ); there was almost significant correlation ( $p=0.062$ ) between higher caregiver knowledge of diet and PKU and their child's annual

Phenylalanine levels being within treatment ranges (MacDonald et al.). A review of compliance to treatment in several chronic conditions, including PKU, concluded there is insufficient evidence that knowledge alone is a determinant to improve compliance. Investigation in whether knowledge in addition to psychosocial factors (i.e. social support) may present more conclusive findings (Mackner et al., 2001). Other potential factors that may impact compliance in general include attitudes towards treatment, parents' marital status, social support and age (Ipsiroglu et al., 2005; Olsson et al., 2007; Mackner et al., 2001; Williford et al., 2007). Aside from social support, it is not clear if these variables and barriers affect compliance are the very same sources of stress in parenting a child with PKU have not yet been investigated in its entirety.

In two studies lower parenting stress was associated with a higher level of social support received (Read, 2003; Waisbren et al., 2004). One of these studies compared stress of parents of children with PKU to stress in mothers of children with mitochondrial disease. A telephone survey was administered to mothers of children with mitochondrial disease (n=29) or PKU (n=29) in the New England region using the Interaction Model of Client Health Behavior (Cox, 1982; Read, 2003). The survey gathered information regarding demographic characteristics including socioeconomic status and used the PSI-SF to measure parent stress levels. The child's level of development was assessed with the Vineland Adaptive Behavior Scales. The sample demographics and characteristics were comparable between the two groups. Mean scores on the PSI-SF between the two groups were significantly different ( $p < 0.00001$ ). Mothers of children with mitochondrial disease had a mean score of 96.9, which is above the clinically significant raw score of 90. Mothers of children with PKU had a mean score of 67.5, which was within normal limits (Read, 2003). Although, the study above had fairly limited sample sizes and generalizability, parents of children with PKU reported relatively minimal levels of stress in

comparison to parents of children with mitochondrial disease. Lower parenting stress among parents of children with PKU was attributed to extensive social and clinical support to parents or caregivers. Mothers of children with PKU reported their level of satisfaction with their social support network on a 5-point scale (1= highly satisfied to 5=highly dissatisfied). The mean response was 4.7, which was significantly different from the mean response (3.4) of mothers of children with mitochondrial disease ( $p<0.00001$ ).

Waisbren et al. examined parenting stress using the PSI-SF in a large cohort ( $n=263$ ) of parents of children with biochemical genetic disorders; 43% percent were parents of children identified with PKU (2004). Mean score on the PSI-SF was 76, which was comparable to the normative mean; however, 32% of parents ( $n=84$ ) reported clinically significant levels of stress. Similar to the study by Read, parents were asked to rate their level of satisfaction with their social support on a 5-point scale. Mean response for the cohort was 4.1. Although parenting stress was generally within normal limits, factors associated with parenting stress in this cohort included the child's developmental level ( $p<0.0001$ ), difficulties meeting child's health care needs ( $p<0.0001$ ), and the level of satisfaction with their social support network ( $p<0.0001$ ).

Family and clinic involvement (i.e. social support) does influence the level of compliance to dietary treatment and has been linked to parent stress in metabolic disorders. Specific challenges or potential stressors related to PKU, however, have yet to be investigated. Whether or not variables such as attitudes towards treatment and caregiver knowledge of PKU affect parenting stress as they do with compliance, are also still unconfirmed.

## **Specific Aims and Hypothesis**

### **Purpose of the Study**

To assess the level of parenting stress in parents with young children diagnosed with PKU and to examine factors associated with stress levels. Factors of interest include social support, age of the child, challenges in managing care of the child and compliance with the dietary treatment regimen. Parent's ability to comply with the treatment of PKU is reflected in the Phe levels of the child. In addition, the study aims to describe parent-reported challenges and supportive resources used.

### **Research Question**

What factors related to the management and treatment of a child with PKU are associated with significant parental stress for parents of children with this disorder?

### **Hypothesis**

1. Parents or caregivers of children with PKU who have higher stress levels have lower social support for the management and treatment of PKU that contribute to stress levels.
2. The children with PKU of parents or caregivers who have higher stress levels have higher plasma Phe levels.

### **Aims & Objectives of the Study**

Primary Aim: To evaluate the association between parenting stress (using the PSI-SF) and a) social support and b) management challenges among parents or caregivers of children with PKU.

Secondary Aim: Explore additional factors, including age of child, related to PKU management and treatment that are associated with parenting stress levels.

Objective: Identify sources of parenting stress and potential approaches to alleviate this stress.

## Methods

### Overview

This cross-sectional study used data from children and their parents or caregivers who currently receive care at UW’s PKU Clinic. Participants responded to a survey with a series of questions about their current PKU management methods. They also completed the Parenting Stress Index-Short Form, which is a tool developed to screen and assess parents for potentially harmful levels of stress related to parenting. The child’s plasma Phe levels 12 months prior to survey completion were examined as well. The study was approved by the University of Washington’s Institutional Review Board and took place between June and August 2012.

### Participants

**Table 1.** Criteria for Participation in Study

Inclusion Criteria	Exclusion Criteria
≤12 years of age	>12 years of age
Currently living with at least one parent or caregiver for >12 months	Recent legal guardianship within past 12 months
Requires medical food (formula) to maintain appropriate Phe levels	Pre-existing illnesses or disorders other than PKU

Participants in this study were parents and children recruited from the UW PKU Clinic. Eligibility criteria for the child included being 12 years of age and under with classic PKU. For the purpose of this study, “classic PKU” was defined as PKU caused by PAH deficiency that

requires the use of medical food to maintain Phe levels in the treatment range. Inclusion and exclusion criteria are listed in Table 1.

Due to a limited sample size, families with multiple children with PKU were not excluded, and the youngest child was chosen as the index child. For the Phe level analysis, values for only the index child were included in the analysis. Although mean Phe levels of the past 12 months prior to survey completion were used, infants younger than 1 year of age who had fewer than 12 months of blood Phe history were also not excluded from the study.

With the assistance of the staff at the UW PKU Clinic, all qualifying parents/caregivers were identified and contacted via e-mail or telephone using a pre-approved script to invite them to participate in the study. Parents and caregivers were given a brief introduction to the purpose of the study, the nature in which it would be distributed and information about the incentives for being part of the study. A recruitment flyer was also posted at the clinic, which is located at the University of Washington's Center on Human Disability and Development, in June and July 2012.

## **Procedures**

After initially agreeing to participate in the study via phone and email, parents received a packet in the mail with the following items: (1) a cover letter reviewing the contents of the packet and directions for completing the forms, (2) a written consent form for using data from the child's medical records, (3) two copies of consent for HIPAA authorization, one copy to be returned to the clinic, (4) the Parenting Stress Index-Short Form, (5) the PKU Questionnaire, (6) a checklist of materials to return, and (7) a pre-addressed, stamped envelope to be used to return materials. Participants were asked to complete the forms and return them in one month. Reminder phone calls were made and emails were sent one week prior to the deadline.

When a completed packet was received, a number was generated; this number was used in a random number generator to identify two participants who each received a small incentive (\$10 gift cards to Safeway).

### **Measures: PKU Questionnaire**

A survey instrument, the PKU Questionnaire, was developed for use in this study. It is a 21-item form with questions about the family's demographics and sources of support used for PKU management. The survey was modeled after the MCAD questionnaire used in a previous study of parenting stress of parents of children with Medium Chain Acyl CoA dehydrogenase Deficiency (MCAD). Reliability and content validity were established and confirmed by expert review (Torkelson&Trahms, 2010). Similar to its model, the PKU Questionnaire developed for this study includes general questions regarding the family's demographics. Parents were also asked to identify factors that influence PKU management, such as potential stressors, preferred sources of information and current social support. Participants were instructed to check boxes for items that applied to them and/or write open-ended responses. The PKU Questionnaire was also confirmed by expert review for its content validity.

### **Parenting Stress Index-Short Form**

All participants completed The Parenting Stress Index-Short Form (PSI-SF), which was developed using questions from the original Parenting Stress Index (PSI) form. Both have been used extensively to measure stress related to subpopulations such as individuals with chronic disease. The original PSI was based on the Theoretical Model for the PSI and was intended as a screening tool for health professionals to identify dysfunctional levels of parenting stress (Abidin, 1995). Identification and intervention for significant parenting stress levels can preserve healthy parent-child relations and remediate potential negative influences on child

development. The PSI-SF has 36 statements and a five-point response scale ranging from “strongly agree” to “strongly disagree.” It was developed at the request of clinicians and researchers who needed a test that could be administered in less time than the PSI. The PSI-SF has three domains: Parental Distress, Parent-Child Dysfunctional Interaction and Difficult Child. Scores are divided in subscales (domains), enabling clinicians to identify potential sources of parent stress. Parental Distress subscale determines the potential for maladjustment to parenting due to personal factors such as parenting competence, lack of social support, and/or stresses in other life roles. Scores in the Parent-Child Dysfunctional Interaction domain focus on the state of the relationship between a parent and children and whether or not the parent may have negative feelings (e.g. disappointment, alienation) towards his or her child. High scores in the Difficult Child subscale suggest stress related to regulating the child’s behavior, which may be temperamentally or physiologically related. The scores can be summed into a Total Stress score. Total stress scores within the 15<sup>th</sup>-80<sup>th</sup> percentiles are considered to be within the normal range. Scores at or above the 85<sup>th</sup> percentile are considered to be high scores. A raw score of 90 or greater than the 89<sup>th</sup> percentile is indicative of clinically significant levels of stress.

The normative sample provided by the PSI-SF was based on data gathered from two samples (n=800), in the 1980s, of mothers who took their children to a clinic for annual check-ups in Virginia. The PSI-SF was approved for use in parents or caregivers of children ages one month up to 12 years (Abidin, 1995). There is currently no data on test validity, however, test-retest reliability is high, and its correlation to the original PSI is also high ( $r=0.92$ ). Total Stress scores are highly correlated between the two forms ( $r=0.94$ ). The short form also has a Defensive Responding scale that identifies individuals who may have responded low, creating bias. A Defensive Responding raw score of 10 or less indicates this bias. This occurs when respondents

state that they “strongly disagree” with certain statements that screen for this bias. Respondents may be attempting to minimize their stress or their issues between themselves and their child to create a favorable impression. A significant Defensive Responding score does not necessarily confirm that a true bias exists, only a potential for a bias. The respondent may be, in actuality, handling parenting well or unaware of the child’s needs (e.g. may be a secondary caregiver). These responders were therefore not excluded from the main analysis.

Due to convenience of its short administration time the PSI-SF has been extensively used in clinical and research settings (Bennett, English, Rennoldsen, &Starza-Smith, 2012; Nereo, Fee, & Hinton, 2003). Estimated completion time for the PSI-SF is 30-40 minutes (Abidin, 1995). The PSI-SF is expected to increase in use as it has been recognized as an acceptable measuring tool for parent stress (Haskett, Ahern, Ward, &Allaire, 2006).

### **Mean Phe Levels**

Compliance with treatment was evaluated in the child using meanplasma Phe levels 12 months prior to survey completion. This information was obtained from each child’s medical records. Plasma Phe levels were used to indicate good PKU management (mean level 1-6 mg/dL) or poor management (mean level >6 mg/dL). Frequency of Phe levels obtained within the past 12 months was also recorded.

### **Data Collection &Analysis**

Demographic information obtained from the first section of the PKU Questionnaire was used to describe the sample population. Income was dichotomized at \$30,000 or below; and education was dichotomized at high school degree or equivalent. Confidence intervals for proportions with low income, low mother’s education, and low father’s education were calculated using the normal approximation to the binomial, with correction for continuity, to

facilitate comparisons with the normative sample. Mean raw scores, standard deviation and 95% confidence interval values were computed for the PKU study sample and compared to the normative mean for each subscale, including Total Stress and the Defensive Response Scale on the PSI-SF. To evaluate differences between participants and non-participants, the mean age of children that participated was compared to those who qualified for the study but did not participate using a two-sample *t* test for equal variance, with alpha set at 0.05.

The sample was grouped, for comparison, in either the higher or lower tier stress responses by subscales of the PSI-SF. Using natural breaks in the frequency distribution of scores in each subscale, tiers were identified by taking the top quarter to a third of responses as one group. All participants were included in the main analysis. We ran the analysis excluding defensive responders as a sensitivity analysis and results were comparable to the main analysis. For each group, mean age of the child in months, mean Phe levels, and mean number of clinic visits for blood draws(12 months prior to survey completion) were calculated. Challenges with PKU management and level of social support received from family and friends identified by respondents in the second portion of the PKU Questionnaire were tallied for each subscale by tiers as well. Two-sample *t* tests were conducted to compare mean values between highest and lower tiers in each subscale for mean age of the child, mean Phe levels, and mean number of clinic visits. The Fisher's Exact Test was performed for comparing proportion of respondents identifying a type of challenge (six in total) and reported lack of social support (replied "not so" or "somewhat" satisfied on a 4-point scale) between tiers in each subscale, including Total Stress. All tests were performed with a alpha level of 0.05.

An additional method to characterize the age of the child was developed, which was based on the child's school grade and correspond with monthly groups that attend the UW PKU

Clinic. Children were categorized into the following age and school groups: 0 to 2 years and 11 months; 3 years to 5 years and 11 months or beginning pre-school in September 2012; and 6 years to 12 years and 11 months or children in kindergarten through 8th grade starting September 2012. Mean scores (and associated 95% confidence intervals) were compared for each subscale and were described by these school and age groups. Linear trend of stress scores across age and school groups was evaluated using simple linear regression, using a dummy variable to represent age and school groups.

Other questions in the PKU Questionnaire related to topics surrounding management of PKU and resources used by respondents were recorded for descriptive analysis. Responses were categorized and represented as bar graphs by school and age groups to display frequently reported needs and make recommendations appropriate to developmental level.

## **Risks**

The study was evaluated to have minimal risk to parents and their children. Use of the PSI-SF may have presented a minor risk for some parents and caregivers, potentially causing unwanted feelings of guilt or frustration regarding parenting, particularly in the Parent-Child Dysfunctional Interaction subscale (Torkelson&Trahms, 2010).

## **Results**

Forty-two families met the inclusion criteria; 36 families (one parent per child with PKU) initially agreed to participate via phone or email, and the PSI-SF, questionnaire and consent forms were sent to these families. Of those families who were sent the survey materials, 20 families returned the survey prior to the study's deadline (response rate: 55%). Three of the families that responded had more than one child with PKU. One of these families had two

children under the age of 12, both qualifying for inclusion in the study. Only one set of consent forms, questionnaire, and PSI-SF were filled out for these families and mean Phe levels were only obtained for the youngest child with PKU in this family (the index child).

**Figure 1.** Age Comparisons of Children Qualified for PKU Study by Participation

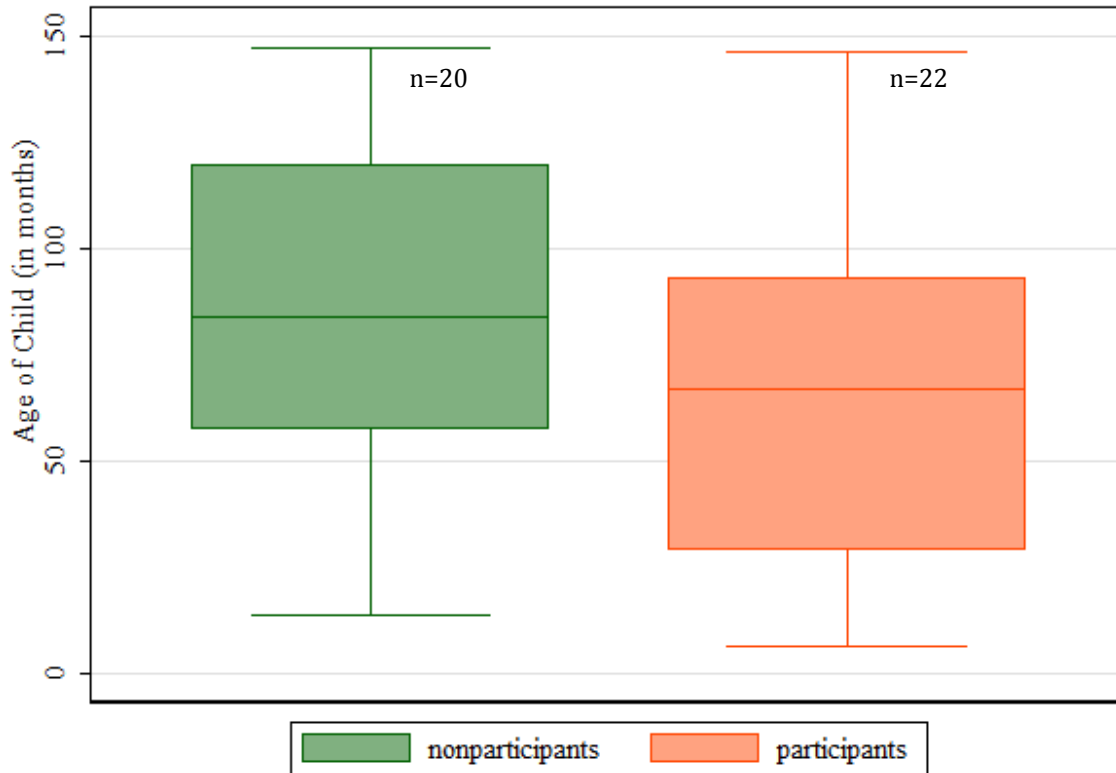


Figure 1 shows the age distribution of those who participated and those who qualified, but did not participate in the study. The mean age for non-participants (n=22) and participants in this study (n=20) were 86 and 67 months, respectively, but the difference was not statistically significant (p=0.13).

### Demographics of Responding Families

Table 2 shows demographic variables for our study population and includes information from the normative for reference. The normative sample provided by the PSI-SF was based on data gathered from two groups (n=800) of mothers. The median age for a child with PKU was

approximately 5 years (mean = 68 months). Ages ranged from 6.5 to 146 months. Mothers of children with PKU had a median age of 36 years (mean = 36.5), with a range from 23 to 53 years. Fathers of children with PKU had a median age of 37 years (mean = 38.6), with a range from 25 to 50 years.

The majority of respondents (80%) were mothers or female caregivers. Four fathers or male caregivers (20%) responded to the survey. Ten children with PKU were female (50%); and ten were male (50%).

All but two respondents identified their child's race as non-Hispanic white. One respondent identified their child as "White" and "Asian/Pacific Islander," and another identified their child as "White" and "Native-American."

Nineteen out of twenty surveys listed the mother's education. Two mothers cited having at most a high school education or equivalent. Six listed having some college or an Associate's Degree. The remaining (n=11) listed having a college degree or higher. Seventeen surveys listed the father's education. The confidence interval for the proportion of mothers with a high school degree or equivalent was between 0% and 28%. The normative sample had approximately 60% in this category. Two fathers had at most a high school degree or equivalent. Six listed having some college or an Associate's Degree while the remaining (n=9) listed having a college degree or higher. The confidence interval for the proportion of fathers with a high school degree or equivalent was between 0% and 31%. The normative sample had approximately 59% in this category.

**Table 2.** Comparison of Demographic Variables: Normative sample (n=800) and PKU sample (n=20)

Variable	PKU	Normative <sup>†</sup>
Child's sex		
Male	55.0%	53.0%
Female	45.0%	47.0%
Child's age (in months)		
Mean	68.0m	43.0m
Range	6-146m	10 - 84m
SD	42.9	9.7
Child's race		
White	90.0%	87.0%
African American	0.0%	10.0%
Other	10.0%	3.0%
Mother's age (mean age in years)	36.5y	32.4y
SD	7.8	4.9
Father's age (mean age in years)	38.7y	NA
Mother's education		
1st - 8th grade	0.0%	22.5%
9th - 12th grade	11.0%	37.4%
Vocational training/some college	31.0%	27.3%
College graduate	58.0%	12.6%
Father's education		
1st - 8th grade	0.0%	27.7%
9th - 12th grade	12.0%	30.9%
Vocational training/some college	35.0%	23.3%
College graduate	53.0%	18.1%
Total annual family income		
Less than \$20,000	0.0%	27.0%
\$20,001-\$30,000	11.0%	27.0%
\$30,001-\$40,000	21.0%	26.0%
More than \$40,001	68.0%	20.0%

<sup>†</sup>Abidin, 1995.

All but one respondent listed their family income (n=19). Income levels ranged from \$20,000 to more than \$95,000 per year. Four families reported income levels less than \$30,000. Four respondents reported income levels between \$30,001 and \$40,000 per year, and

thirteen families reported incomes greater than \$40,001. The confidence interval for the proportion of families reporting income levels less than \$30,000 was between 0% and 28%. The normative sample had 54% in this category.

### **Parenting Stress Index-Short Form (PSI-SF): Results**

The PSI-SF includes an overall Total Stress Score as well as three domains (subscale) of stress: Parent-Child Dysfunctional Interaction, Difficult Child and Parental Distress. Unusually low levels of stress (below 15%) were identified for 4 out of 20 respondents, while the remaining (n=12) fell within the normal range for parenting stress. Of the four respondents with Total Stress scores percentiles below the 15<sup>th</sup> percentile, three had reported a significant score on the Defensive Responding Scale. The Defensive Responding scale raw score of 10 or below indicates a potential for strong bias by the respondent. Clinically significant levels of stress (>89%) were identified in 3 out of 20 respondents. All three respondents with clinically significant levels of stress had significant levels of stress in at least one subscale of the PSI-SF as well.

Mean scores, standard deviations and confidence intervals for the normative group and the PKU sample were compared (see Table 3). The mean parenting stress (or Total Stress) score of the PKU sample was 67.9, while the PSI-SF normative mean was 71. Table 3 also lists the mean scores for the subscales of the PSI-SF and Defensive Responding Scales. The normative means for Total Stress, Parental Distress, Parent-Child Dysfunctional Interaction, Difficult Child, and Defensive Response were within the confidence intervals for the PKU sample.

**Table 3.** Comparison of Means and Confidence Intervals: Normative sample with PKU

	PKU Mean	PKU SD	PKU 95% CI	Normative Mean (SD) <sup>†</sup>
Total Stress	67.9	20.0	(59.1, 76.7)	71.0 (15.4)
Defensive Response	15.0	5.1	(13.9, 16.1)	13.9 (5.2)
Subscale:				
Parental Distress	25.6	7.7	(22.2, 29.0)	26.4 (7.2)
Parent-Child DI	18.3	6.0	(17.0, 19.6)	18.7 (4.8)
Difficult Child	24.1	8.7	(22.2, 26.0)	13.9 (5.2)

CI: Confidence Intervals SD: Standard Deviation. DI: Dysfunctional Interaction.

<sup>†</sup>Abidin, 1995.

### Phe Levels in Children with PKU

Recommended Phe treatment level at the UW PKU Clinic is currently 1-6 mg/dL. Mean Phe levels for the past 12 months of each individual ranged from 1.3 to 7.3 mg/dL. The median Phe level for children with PKU was 3.05 mg/dL (mean = 3.68), which is well within the treatment range. Two out of twenty children had levels outside the recommended treatment range, 7.3 and 6.7 mg/dL respectively.

The mean Phe levels of the children of parents with higher and lower stress scores are shown in Table 4. Frequency of visits to the clinic ranged from 1 to 30 within the past 12 months. There was no statistically significant difference in mean Phe levels or the number of clinic visits for obtaining blood draws between children of parents with higher levels of parenting stress and those of children with parents having lower levels of stress (in each subscale) at the pre-defined alpha level of 0.05.

**Table 4.** Comparison of Variables Between Higher and Lower Tiers of PSI-SF Scores by Subscale

Variables	PSI-SF Scores by Subscale							
	Highest Tier Total Stress (n=8)	Lower Tier Total Stress (n=12)	Highest Tier Parental Distress (n=5)	Lowest Tier Parental Distress (n=15)	Highest Tier Parent-Child DI (n=4)	Lowest Tier Parent Child DI (n=16)	Highest Tier Difficult Child (n=6)	Lowest Tier Difficult Child (n=14)
Mean Phe Level in mg/dL(SD)	3.6 (1.7)	4.0 (1.7)	3.6 (1.9)	4.0 (1.7)	2.8 (0.9)	4.1 (1.8)	3.2 (1.4)	4.1 (1.8)
Mean # of Clinic Visits <sup>a</sup> (SD)	11.3 (8.6)	12.8 (5.3)	9.4 (5.2)	13.1 (6.9)	9.5 (4.7)	12.8 (7.0)	9.0 (4.5)	13.5 (7.1)
Lack of Social Support <sup>b</sup>	50%	8%	40%	20%	75%*	13%*	50%	14%
Mean Age in Months (SD)	97.0 (37.1)*	47.8 (35.1)*	82.7 (39.5)	62.4 (43.9)	104.8 (37.6)*	58.2 (39.7)*	106.2 (37.4)**	50.9 (33.9)**
Challenges by Type <sup>c</sup>								
Explaining PKU	38%	58%	20%	60%	50%	50%	33%	57%
Time Involved with PKU	50%	33%	60%	33%	50%	38%	33%	43%
Planning Time (i.e. meals)	88%	75%	80%	80%	75%	81%	83%	79%
Visiting Clinic	13%	17%	0%	20%	0%	19%	17%	14%
Cost associated with PKU	50%	83%	20%**	93%**	50%	81%	67%	71%
Other	38%	25%	40%	27%	25%	31%	50%	21%

DI= Dysfunction Interaction. SD=Standard Deviation.

<sup>a</sup>Visits within past 12 months from survey completion for blood draws.

<sup>b</sup>From PKU Questionnaire who answered “not” or “somewhat” satisfied with social support from family and friends.

<sup>c</sup>From PKU Questionnaire

\* $p < 0.05$ .

\*\* $p \leq 0.005$ .

## Factors Associated with Stress Levels

The hypothesis that lower social support for management and treatment of PKU would be associated with high stress levels was tested using the Fisher’s Exact Test, revealing an association ( $p=0.032$ ) between parents with higher stress in the Parent-Child Dysfunctional Interaction subscale and the lower tier of stress scores in this subscale (see Table 4). The mean age (in months) of children was significantly different between the higher and lower tiers of each subscale: Total Stress ( $p=0.008$ ), Parent-Child Dysfunctional Interaction ( $p=0.032$ ) and Difficult Child subscales ( $p=0.004$ ), as shown in Table 4. The results of the Fisher’s Exact Test of types of challenges identified by respondents on the PKU Questionnaire for each subscale on the PSI-SF did not vary by score except the potential stressor of cost associated with PKU ( $p=0.005$ ) between higher and lower stress scores in the Parental Distress subscale.

**Table 5.** Comparison of Means and Confidence Intervals: PSI-SF Scores by Age and School Groups

	0-2 years, 11 mos. n=6	3-4 years, 11 mos. (Pre-K) n=6	5-12 years, 11 mos. (K-8) n=8	<i>p</i> for trend
Total Stress	56.4 (46.0, 67.1)	68.2 (56.4, 80.0)	72.1 (53.4, 90.9)	0.1
Defensive Response	14.2 (10.3, 18.1)	25.0 (9.3, 20.7)	15.4 (11.2, 19.6)	0.6
Subscale:				
Parental Distress	23.5 (17.5, 29.5)	26.0 (16.5, 35.5)	26.1 (19.4, 32.9)	0.6
Parent-Child DI	14.2 (12.2, 16.1)	17.0 (14.5, 19.5)	20.4 (15.2, 25.6)	0.01
Difficult Child	18.8 (14.1, 23.5)	25.2 (19.4, 30.9)	25.6 (18.0, 33.3)	0.1

Note:  $\bar{x}$  (95% Confidence Interval).

DI: Dysfunctional Interaction. Pre-K: Preschool. K-8: Kindergarten through 8<sup>th</sup> grade.

To better understand the association between age and parenting stress, further exploration of PSI-SF scores per subscale stratified by age (and school year) of the child is shown in Table 5. Some of the stress scores across the three categories of child’s age tend to increase, and the trend

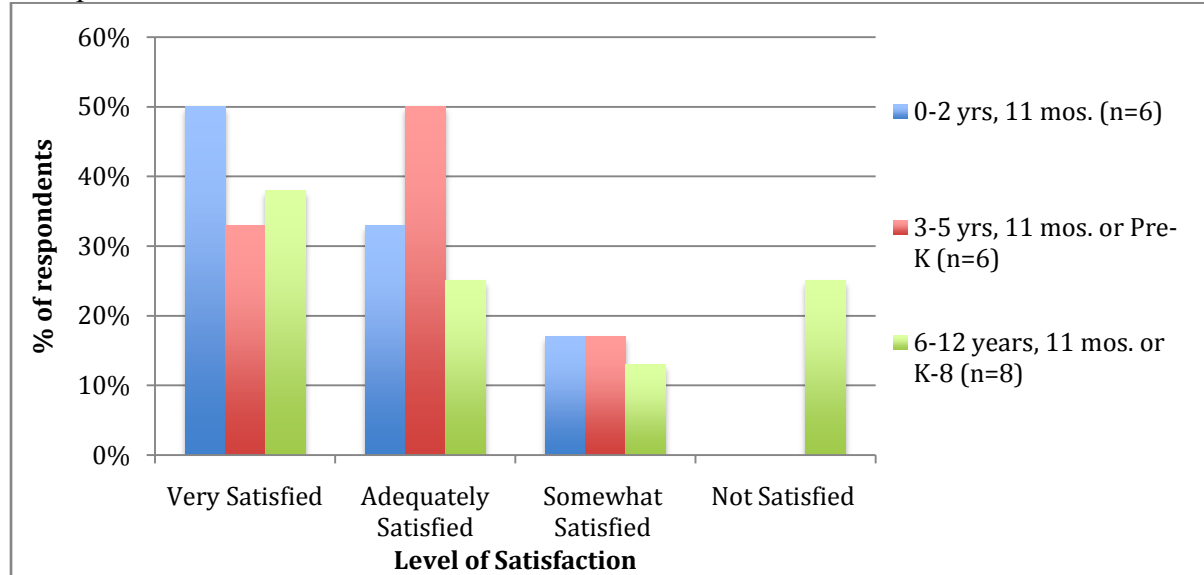
by age approaches significance for the Total Stress and Difficult Child subscales ( $p \approx 0.10$ ) and reaches significance for the Parent-Child Dysfunction Interaction subscale ( $p = 0.01$ ). There is also overlap in confidence intervals of the mean score by age and school year when comparing by PSI-SF subscale.

### **Responses on Social Support**

Respondents were asked a series of questions regarding social support from family and friends in PKU management (see Figure 2). Overall, there was 75% of respondents reported adequate or greater satisfaction by parents with their current support from family and friends ( $n = 20$ ). Those that reported less than adequate satisfaction (25%) reported that they did not expect their family or friends to support them due to lack of motivation to understand PKU, other existing circumstances such as medical conditions, or felt they had no need to have extended social support. The respondents identified the clinic (95%), family and friends (20%), and media (15%) as being helpful to them. Media resources identified as supportive included the National PKU News ([www.pkunews.org](http://www.pkunews.org)) and the Cook for Love ([www.cookforlove.org](http://www.cookforlove.org)) websites. Current support from the UW PKU Clinic is satisfactory; however, the respondents listed the following as areas where the clinic can offer additional support: (1) more feedback on diet records, (2) identifying new foods (including medical formulas) appropriate for their child, (3) an “easier” transition at the initial diagnosis of PKU, (4) assistance with insurance companies, and (5) introducing appropriate topics related to child’s age and development.

When the results were stratified by age and school year, 63% of parents of children between the ages of six and twelve years were more than adequately satisfied with support received from family and friends. Ten out of twelve parents of newborns to five years (83%) were either adequately or very satisfied with their social support.

**Figure 2.** Parent Report of Satisfaction of Support from Family and Friends by Age and School Groups



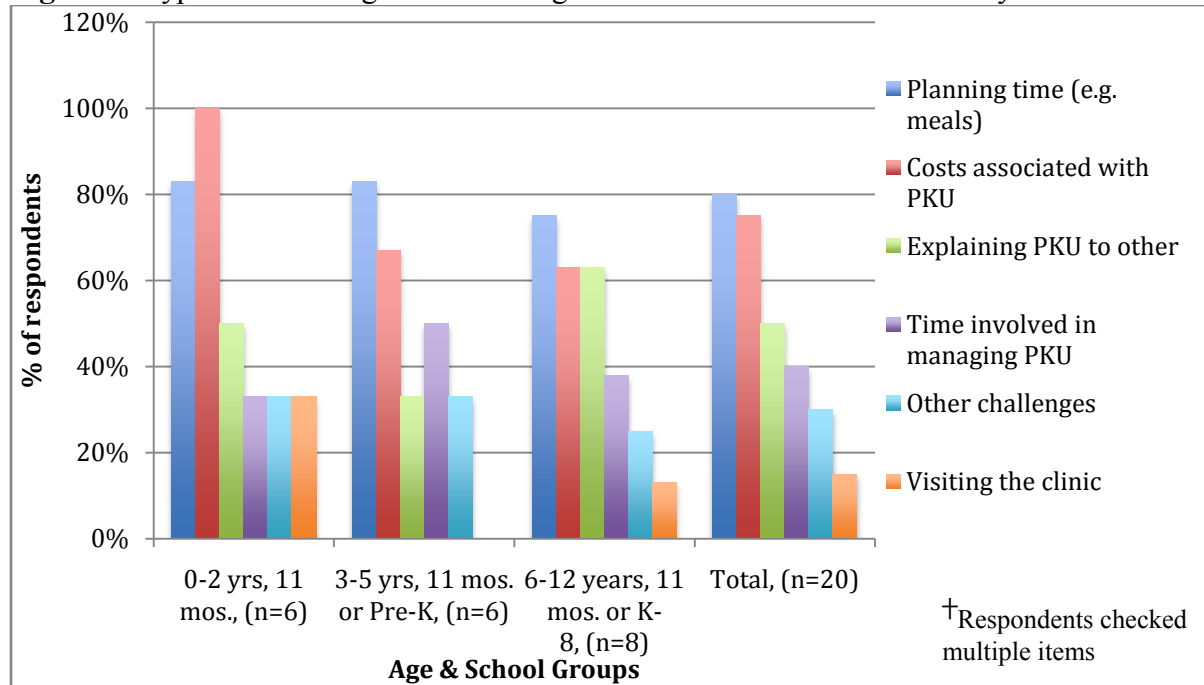
### Potential Sources of Stress

Respondents were asked to “check all” on the statements regarding potential sources of stress that applied to them. Respondents answered statements on various topics such as challenges perceived in PKU management, concerns regarding the child’s health and future. As previously described in Table 4, there was only an association in costs associated with PKU between high and low stress scores in the Parental Distress subscale. One respondent identified five challenges (or stressors) in raising their child with PKU despite having relatively normal levels of parenting stress. Five respondents (25%) identified four stressors and seven respondents (35%) identified at least three stressors. The remaining respondents identified one (15%) to two (15%) stressors.

A common type of stressor identified by parents or caregivers in all groups was the time involved in planning meals (>75%) and costs (>63%) associated with managing PKU (see Figure 3). Costs associated with PKU were identified as a challenge for all (100%) parents with children in the youngest age group. Explaining the disorder to others (>33%) and general time involved

with managing PKU, such as recording food logs (>33%), were also identified as two of the more common challenges across age and school groups.

**Figure 3.** Types of Challenges to Parenting a Child with PKU as Identified by Parents<sup>†</sup>

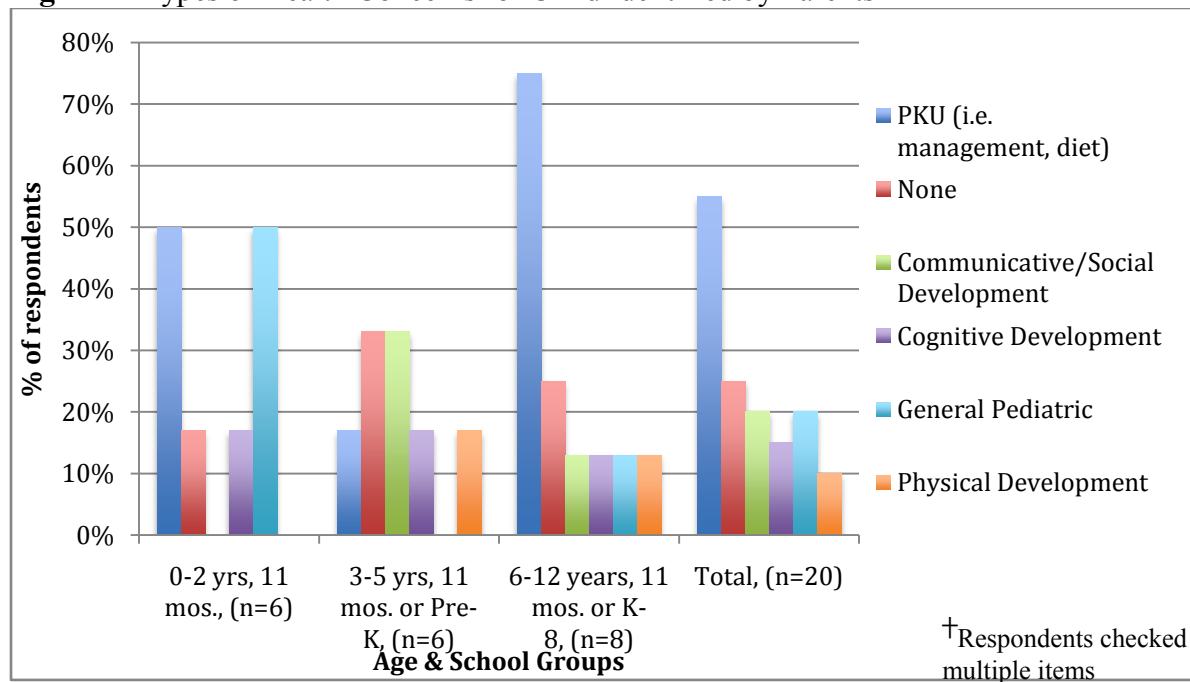


Other challenges specifically written by respondents included difficulty in saying “no” to a child who wants to try new foods and evolving management practices as the child matures or new situations arise. Although visiting the clinic was a minor challenge reported, one parent in the youngest age group reported difficulty in connecting with other families of children with PKU due to distance from the clinic. Another parent in the oldest age group reported difficulty taking time off to attend the clinic and being easily frustrated with their child with PKU in social situations.

Respondents also were instructed to “check all items that apply” regarding their concerns for their child’s health (see Figure 4). Although 25% (n=5) of respondents cited they had no health concerns for their child, eleven of twenty total respondents (55%) reported health concerns related to PKU; six of those respondents had children between the ages of six and

twelve years. These concerns included PKU’s effect on other areas of development and difficulty in keeping up with daily PKU monitoring, such as daily food logs. One respondent of a child in the oldest age group reported the concern to be the effect of other illnesses on PKU management. The tediousness of daily food logs “was hard to keep up with” for another parent of a child in the oldest age group. Another respondent of a child between the ages of three and five years (and 11 months), was concerned about the emotional challenges or social developmental delays of a child with accepting PKU and being accepted by his or her peers.

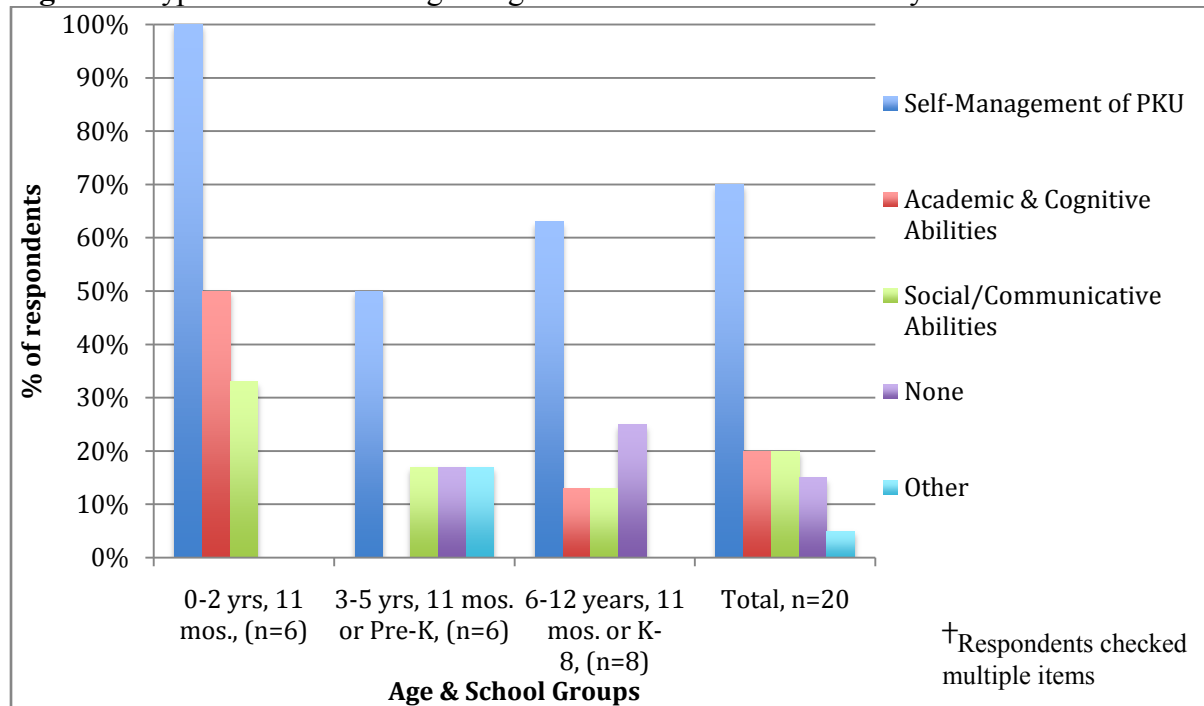
**Figure 4.** Types of Health Concerns for Child Identified by Parents<sup>†</sup>



The majority of respondents (70%) had concerns regarding the child’s ability to self-manage PKU as he or she matured (see Figure 5). All respondents with children in the youngest age group as well as the majority of the older age groups (50% and 63%, respectively) reported future concerns regarding PKU. One respondent in the youngest age group reported the concern of how his or her child will academically perform and manage PKU when in school. Respondents in three to twelve year old age group also identified other future concerns to include having the

child cope with maternal PKU, the first few years of independence (i.e. college years), availability of and ability of appropriate low Phe foods and the ability of the child to pay for appropriate low Phe foods.

**Figure 5.** Types of Concerns Regarding Child’s Future as Identified by Parents<sup>†</sup>



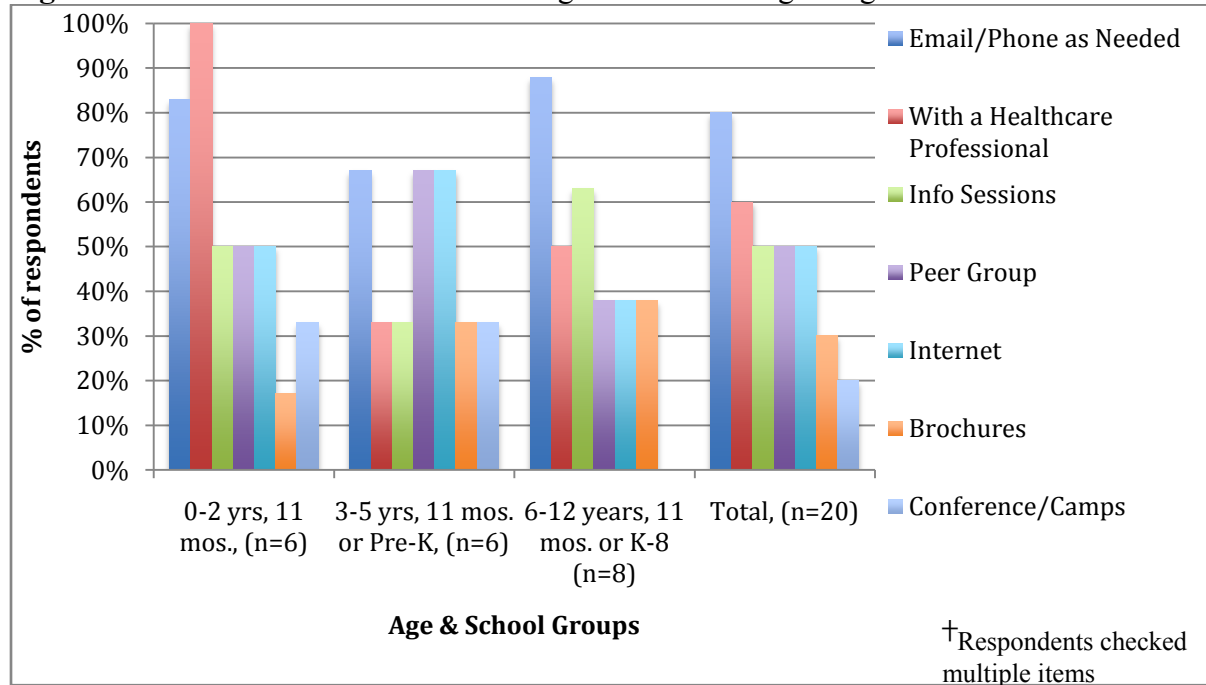
### Obtaining and Preferences for Obtaining Information on PKU

All respondents reported feeling (at minimum) adequately prepared to make health-related decisions for their child with PKU. Parents and caregivers all identified the UW PKU Clinic as a resource that helps them be more informed about PKU. PKU-specific or related organizations (45%), family and friends (30%), and the Internet (20%) were other common resources identified. Other resources identified included mention of a PKU list with a food index to be very helpful.

Respondents were asked to identify the ways that they would like to receive information regarding PKU (see Figure 6). Most of the respondents preferred information verbally as needed

via email or phone (80%), privately with a healthcare professional (60%), in a peer focus group (50%), and/or through the means of information sessions (50%). Preference for email/phone as needed was the major preference for receiving information within all age groups.

**Figure 6.** Parents’ Preference for Receiving Information Regarding PKU<sup>†</sup>

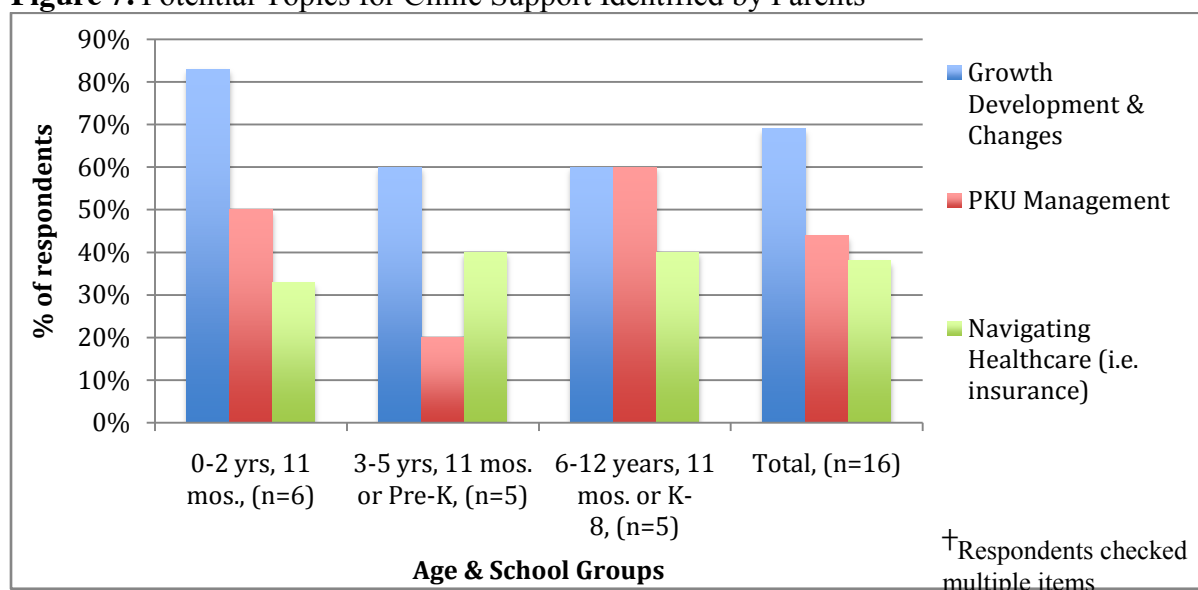


Respondents identified the preference to receive written information via brochures (30%), and/or the Internet (50%). Some of the respondents (20%) were open to attending conferences or sessions where they obtained a concentrated amount of information. When responses were stratified by age, all parents of younger children preferred discussing PKU with their primary care provider. Preference for information through information sessions and on an “as needed” basis appears to be more often selected with the increase by age group.

Respondents were asked to “check all” additional resources that may be helpful to them (see Figure 7). Sixteen out of twenty (80%) responded to this question. Eleven out of sixteen (69%) reported additional support with PKU in regards to growth and developmental changes with age. One respondent of a child in the oldest age group, in retrospect, stated that it would

have been helpful to receive age-appropriate guidance reduced feelings of being overwhelmed, especially transitioning with the initial diagnosis. Dealing with insurance was a topic of interest for at least two respondents in each age group. A parent of a child in the three to five year old group reported identified the need for having more guidance on foods appropriate for their child, especially with new medical foods.

**Figure 7. Potential Topics for Clinic Support Identified by Parents<sup>†</sup>**



## Discussion & Conclusion

### Parenting Stress and Social Support

This study found no statistically significant differences in social support between higher and lower Total Stress scores. This is not consistent with previous studies, which identified greater satisfaction with social support to contribute to lower stress scores as well as a predictor of parental stress (Read, 2003; Waisbren et al., 2004). Previous studies have included specialty clinics and other organizations as part of the social support network, and in this study, social support was specified to be from family and friends. When participants were asked about other

resources that provide support for PKU management, 95% of participants identified the clinic as one of the more helpful resources. It may be that the clinic is a support in the context that it is considered a source of information about PKU, including the network of health care professionals for guidance. Utilizing the clinic as a source of information is consistent with Waisbren's adapted Interaction Model of Client Health Behavior and theoretically contributes to reducing stress levels of parents of children with metabolic disorders (Waisbren et al., 2004).

When evaluating social support within specific domains of parenting stress, as presented in the PSI-SF, statistical significance in the level of the satisfaction with social support (from family and friends) was upheld for only the Parent-Child Dysfunction Interaction subscale. External social support received from family and friends may directly alleviate stress in this particular domain due to the difficulty of the relationship between parent and child. For this study population, social support, exclusive of PKU clinics and other related organizations, may alleviate a degree of stress in some parents who have a difficult relationship with their child, but may not be sufficient support to alleviate overall parenting stress.

### **Potential Stressors (Challenges) of PKU Management on Parenting**

Barriers such as financial burden and limited time have been identified by parents as reasons for reduced compliance to dietary treatment recommendations (Bilginsoy et al., 2005). In this study, common barriers to reduced compliance were identified as potential challenges to PKU management. Exploration of these challenges in this study found statistically significant associations between the challenge of costs associated with managing PKU and differences in stress scores within the Parental Distress subscale of the PSI-SF. Reasons for a increased stress in this domain, and not in other domains, may mean that the other potential stressors identified in the questionnaire are being adequately addressed.

The majority of respondents in every age group identified the challenge of cost associated with PKU. Parents identified other financially related concerns in reply to future and current concerns with managing PKU. When parents were asked about potential topics that required more support, they identified requiring additional support from the clinic in navigating healthcare (e.g. insurance) and the ability of their child to afford medical foods as an independent adult.

Parents and caregivers in this study expressed similar sentiments; the majority (across all age groups) identified general PKU management as a current and future concern. This included specific concerns about difficulties restricting diet as the child is introduced to solid foods, social difficulties implementing the diet in school, and the ability of the child to self-manage PKU in college and to pay for medical foods. Education efforts in the UW PKU Clinic should focus (or continue to focus) on management needs specific to the individual's developmental stage.

### **Parenting Stress and Age of Child**

This study found a significant difference between the age of child in the higher and lower stress levels within the Total Stress, Parent-Child Dysfunction Interaction and Difficult Child subscales. Trends of higher mean stress scores with age were observed to reach and approximately reach significance for all subscales except Parental Distress. Several studies have observed higher blood Phe levels as children get older and ideally, as the child's self-management increases (Feillet et al., 2010a; Ievers-Landis et al., 2005; MacDonald et al., 2010). The observed trend of increased parent stress with age is, unexpectedly, contrary to the assumption that parenting stress reduces as the child develops autonomy in self-care. Interviews with parents of children with PKU have indicated that primary topics of concern during the child's infancy were related to "adapting and changing to the life conditions of PKU" (Awiszus&

Unger, 1990). As the child matures, parents had more concerns regarding how to positively influence their child to adhere to the prescribed diet. Potential explanations for higher stress scores among parents of older children may be due to conflict between parent and child on how to control certain aspects of treatment as the child's independence increases.

### **Parenting Stress and Compliance with Dietary Treatment**

This is the first study to investigate whether or not parenting stress is associated with compliance to PKU treatment (as measured by plasma Phe levels). This study found no statistically significant relationships between children's mean Phe levels and parenting stress (as measured by the PSI-SF and its subscales). Therefore, the influence of parenting stress on compliance with treatment was found to be null in this study population when examining compliance based on the child's mean Phe levels.

It is possible that no association between compliance with treatment and parenting stress was found because there were an insufficient number of Phe levels outside the recommended treatment range. Future research about parenting stress and compliance would require a larger study population.

### **Comparisons with Other Populations**

In this study, comparisons of mean Total Stress scores (and for each subscale) between the study and the normative population were found to overlap within the calculated 95% confidence intervals for this study population. Thus, parenting stress scores of participants in this study were comparable to the normative mean provided by the PSI-SF. This is consistent with other studies that have utilized the PSI-SF to assess stress in metabolic disorders, including PKU (Read, 2003; Waisbren et al., 2004).

Comparisons of the study population with other groups in demographic variables had mixed results. Normative sample proportions of socioeconomic indices suggest that the study population had higher annual family income and education levels of mothers and fathers. State proportions for a high school degree or equivalent in females is 33.1% and in males is 34.3%, which supports this suggestion even in relation to Washington State as a whole (U.S. Census Bureau, 2011a). On the other hand, the state proportion for income levels of \$30,000 or lower is 26%, which is consistent with that of our study population (U.S. Census Bureau, 2011b). Finally, the participating families were similar to those who qualified, but chose not to participate with respect to child's mean age.

#### **Limitations of Methodology: PKU Questionnaire, PSI-SF & Obtaining Mean Phe Levels**

Providing the PKU Questionnaire and PSI-SF together in the context of PKU management may have influenced the results of either survey. Parents or caregivers may have limited their PSI-SF responses to how they handle stress related to PKU management rather than in terms of general parenting stress. For example, the PSI-SF asks respondents whether they agree or disagree on the following statement: "I often have the feeling that I cannot handle things very well." Their response may be in the context of how they perceive they are handling PKU management rather than how they are handling things generally as parents (Torkelson&Trahms, 2010).

The PKU Questionnaire has not been validated. Similarly, the reliability and validity of the questionnaire used in the MCAD study (used as model for PKU Questionnaire) has not yet been verified through repeated use (Torkelson&Trahms, 2010). Unanswered questions were taken into account during data collection and analysis.

Instructions to administer the PSI-SF required a quiet testing environment with a trained administrator. The PSI-SF was administrated as a mail-in survey complete with instructions; use in this method is not validated and any impact on the results is unknown. Any missing data from the PSI-SF was handled according to established protocol (Abidin, 1995).

In this study, the average of each child's plasma Phe levels 12 months prior to survey completion was obtained. Mean plasma Phe levels are often used in studies as markers of metabolic control because they are thought to more accurately reflect compliance than single measures (Bilginsoy et al., 2005; MacDonald et al., 2010). The frequency of each child's plasma Phe levels varied widely and therefore, the mean levels of those children with fewer recorded Phe levels may not accurately reflect the child's PKU management.

The sample size was small because the study was limited to Washington State's PKU program. The PSI-SF is verified for testing to parents with children up to 12 years of age, which further narrowed the available sample population. Despite these limitations, the population in this survey represents all available potential subjects living in Washington State, since PKU is a relatively rare disorder. Insights gained will be a resource for statewide interventions. This study had a relatively high response rate (55%), which is higher than the commonly reported rate of 44.5% (Shih & Fan, 2008). Potential reasons for an above-average response rate may be special interest in contributing to PKU research and development. Other reasons may include the incentive provided or loyalty to the UW PKU Clinic. Future research should include multiple clinics from different areas to provide a larger study population and verify or not the results found within this study.

## Conclusion

This study was able to describe some of the factors associated with parenting stress in parents of children with PKU, which included lack of social support, age of the child and costs associated with PKU. Social support, when defined as exclusively from family and friends, was only associated with parenting stress in a certain subscale of the PSI-SF. However, the majority of respondents identified the clinic as being one of the more helpful resources in managing PKU, which is consistent with other studies that have extended the social support network to include clinics and similar organizations and have found a similar relationship between social support and parenting stress. It is recommended that future research investigate whether social support remains a predictor of parenting stress when excluding variables, such as a specialized clinic.

Costs associated with PKU were associated with parenting stress for respondents who had high scores in the Parental Distress domain. Perhaps the financial burden of PKU is a distinguishing stressor because many of the other potential stressors are already remediated through other means (i.e. social support). Burdens from other life roles may be reason to why the majority of respondents (85%) preferred email or phone correspondence with the clinic as needed. The UW PKU Clinic traditionally calls each family after a clinic visit to share plasma Phe test results and to make adjustments to diet or formula. The high response for this type of correspondence may also indicate satisfaction with the current system and/or parents' preference for individualized information. As stated previously, providing adequate information related to PKU treatment, methods and approaches have been correlated with blood Phe concentrations (Crone et al., 2005). Continuing to provide information in the manner preferred by parents might improve compliance to recommended PKU treatment practices and potentially alleviate any stress related to managing PKU.

The age of the child was associated with overall parenting stress, having an upward trend as the child matures. This is contrary to assumption that there is reduced parental stress as the child's self-management increases. In this study, the majority of concerns identified were regarding how to manage PKU and the ability their child has to self-manage in the future. The majority of respondents, especially parents of younger children, reported needing additional support with PKU in context of growth and developmental changes. The UW PKU Clinic should continue to provide support to parents of younger children (0-3 years) during years of developmental growth.

Although the small study sample limits the ability to generalize these findings beyond Washington State, findings in this study will be informative to the UW PKU Clinic and benefit their clientele. There is still a need, however, for a national, multi-center study that addresses parental stress in parents/caregivers of children with PKU, in order to meet the end goal of optimal PKU management. Other clinics similar to the UW PKU Clinic would benefit in performing a similar study to identify and alleviate predictors of parenting stress in their clientele.

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## Appendix A

### Telephone Prompt for Recruitment

Hello (insert name here),

We are currently recruiting parents of children with PKU for a study at the University of Washington. This research will be on PKU management and how it can affect parenting stress levels. We will also be requesting access to your child's medical records. The study will be through mailed surveys and questionnaires. The questions will consist of a parenting stress questionnaire along with a survey regarding the management of your child with PKU. It should take no more than 40 minutes of your time to complete. You will be allowed to withdraw from the study at any time. Those who participate in this research will enter a drawing held at the end of the study in July for 1 of 2 \$10 gift cards to Safeway. Would you be interested in participating in this study?

If yes: Great! We will be mailing you a packet in the next few weeks with the study materials and instructions. The packet will also include consent forms to participate in the study as well.

If no: We appreciate the time you've taken for our call. Have a great week!

Updated: June 6, 2012

### Email Prompt for Recruitment

Dear (insert name here),

We are currently recruiting parents of children with PKU for a study at the University of Washington. This research will be on PKU management and how it can affect parenting stress levels. The study will be through mailed surveys and questionnaires. We will also be requesting access to your child's medical records. The questions will consist of a parenting stress questionnaire along with a survey regarding the management of your child with PKU. It should take no more than 40 minutes of your time to complete. Those who participate in this research will enter a drawing held at the end of the study in July for 1 of 2 \$10 gift cards to Safeway.

If you are interested, we'd appreciate a reply to this email so we can be sure to include you in the study. We will be mailing you a packet in the next few weeks with the study materials and instructions. The packet will also include consent forms to participate in the study as well.

Thank you and we hope to hear from you soon,

Angela Tam  
Graduate Student  
University of Washington  
Updated: June 6, 2012

Beth Ogata, MS, RD  
Nutritionist  
UW PKU Biochemical Genetics Clinic

## Appendix B

### Recruitment Flyer



## PARENTING STRESS & MANAGING PKU

### What do we need to do?

- Have a child that is age 12 or under with PKU
- Fill out a survey about parenting stress
- Access your child's medical records
- Answer a questionnaire about managing your child's PKU
- Mail the forms back by July 30th
- Get entered into a drawing for \$10 gift cards to Safeway

We invite you to participate in a study describing treatment of children with PKU and the stresses their parents may feel because their child has PKU. As a parent, your experience could help us to better understand these issues.

The goal of our study is to identify causes of stress related to having a child with PKU and find ways the health care community can contribute to reducing this stress.

Please contact the Project Coordinator if you are interested in participating in this study at (206) 598-1800 or you can e-mail Beth Ogata at [bogata@uw.edu](mailto:bogata@uw.edu)

UW PKU CLINIC • Box 357920 UW, Seattle, WA 98195 • 206-598-1800 • [pku@u.washington.edu](mailto:pku@u.washington.edu)

Updated June 6, 2012

## Appendix C

### Cover Letter to Questionnaire Packet

Dear (parent/guardian),

Thank you for considering participation in the study on phenylketonuria (PKU) described in the previous letter to you. (If you have not received a letter describing this study, please call the Project Coordinator at (206) 598-1800 or 1-877-685-3015.) Please feel free to look over the study materials enclosed to help you make your decision on whether or not to be part of this study. Our goal is to identify causes of stress related to having a child with PKU. Your experience as the parent of a child with PKU can help us better understand these issues. If you would like to participate, please complete the following items and return all items in the stamped, addressed envelope provided.

1. University of Washington Consent Form. Please read and sign this form if you decide to participate in this study and include it in the return envelope. If you have any questions, please feel free to contact the Project Coordinator at either (206) 598-1800 or 1-877-685-3015.
2. PKU-specific Questionnaire. This questionnaire asks about parenting a child with PKU and some general questions about your family demographics.
3. Parenting Stress Index-Short Form Questionnaire. This is a general questionnaire designed to determine stress levels of parents of any children, not only those with PKU. Some of the questions may not be relevant to you but please try to answer all of the questions, even if they do not seem to apply.
4. 1 copy of signed HIPAA Authorization Consent Form. This consent form gives permission to researchers to access medical information regarding your child. It states when and how the information will be accessed and used.
5. Checklist of items to be returned.
6. Stamped, addressed return envelope.

We hope you will decide to participate in this study. Although there may be no direct benefit to you or your child for your participation, identifying sources of parenting stress related to treatment and management of PKU may help the health care community find ways to contribute to the reduction of parenting stress related to PKU. Thank you,

Angela Tam  
Graduate Nutrition Student  
Dietetic Intern

Shirley Beresford, PhD  
Professor, Epidemiology  
Adjunct Professor, Health Services

Beth Ogata, MS, RD, CD  
Nutritionist  
Biochemical and Genetics Clinics

*Form created 1/17/2012*

## Appendix D

### Consent Form for Questionnaires and Access to Medical Records



**SCHOOL OF PUBLIC HEALTH**  
UNIVERSITY of WASHINGTON

#### CONSENT FORM FOR QUESTIONNAIRES AND ACCESS TO MEDICAL RECORDS

Title of study: Assessment of parenting stress related to the management and treatment of children with phenylketonuria identified by newborn screening.

Researchers: Angela Tam, Principal Investigator, UW Nutritional Sciences

Email: [latam@u.washington.edu](mailto:latam@u.washington.edu)

Shirley Beresford, PhD, Professor, Epidemiology

Beth Ogata, MS, RD, CD, Nutritionist, PKU & Biochemical Genetics Clinic

Email: [bogata@u.washington.edu](mailto:bogata@u.washington.edu)

Phone: (206) 598-1899

Please note that we cannot guarantee the confidentiality of information sent by e-mail.

#### Researchers' statement

We are asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called "informed consent." We will give you a copy of this form for your records.

#### PURPOSE OF THE STUDY

The goal of the study is to identify the causes of stress related to having a child with PKU and to find ways the health care community can contribute to reducing this stress.

#### STUDY PROCEDURES

You will also be asked to complete two questionnaires, a total of 58 questions. This should take about 40 minutes to complete. One questionnaire includes questions that apply specifically to the parent of a child with PKU. This questionnaire includes questions about your concerns for your child and the support you receive as a parent. There are general

questions about your family demographics and questions that provide opportunities for you to share your feelings. The second questionnaire, called the Parenting Stress Index – Short Form, has been designed to determine stress levels of parents of any children, not just those with PKU. Some of the questions may not seem to apply or may seem sensitive such as “there are quite a few things that bother me about my life” and “my child turned out to be more of a problem than I had expected”. You may refuse to answer any question by leaving it blank.

As part of the study, we would also like to obtain information from your child’s medical record about your child’s serum Phe levels taken at the PKU Clinic this past year. This information will allow us to look at the relationship between parenting stress and PKU management.

#### RISKS, STRESS, OR DISCOMFORT

Some people may feel uncomfortable answering some of the questions in the Parenting Stress Index – Short Form questionnaire or giving personal information about their family. Some people feel that providing information for research is an invasion of privacy. Concerns about privacy are addressed in the “Other Information” section of this consent.

#### ALTERNATIVES TO TAKING PART IN THIS STUDY

If you choose not to take part in this study, you do not have to fill out the questionnaires or provide information about you or your child to the researchers. In that case, I will not record information from your child’s medical records for the purpose of this study.

#### BENEFITS OF THE STUDY

There may be no direct benefit to you or your child from taking part in this study. However, information you provide will help us identify causes of stress related to having a child with PKU and help the health care community find ways to reduce this stress.

#### OTHER INFORMATION

Taking part in this study is voluntary. You can stop at any time. All information provided by you will be kept confidential. The Consent Forms with your name and address will be kept for a period of five years following the end of the study to prove that consent was given. At the end of five years, forms will be shredded.

The information you provide will be used only for this study. Any link between your personal information and the questionnaires you answered will be broken after data analysis and research submission is complete (before March 2013). No identifying information will be used in any publications that might result from this study.

Although we will make every effort to keep your information confidential, no system for protecting your confidentiality can be completely secure. Government or university staff sometimes review studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your records may be examined. The reviewers

will protect your privacy. The study records will not be used to put you a legal risk or harm.

You will not be charged for taking part in this study nor will you be paid to do so. However, you will be entered into a raffle at the end of July for 1 of 2 \$10 gift certificates to Safeway as a thank you for your participation in this survey.

Printed name of study staff obtaining consent          Signature          Date

Subject's statement

This study has been explained to me. I volunteer to take part in this research and consent to providing medical information about my child. I have had a chance to ask questions. If I have questions later about the research, I can ask one of the researchers listed above. If I have questions about my rights as a research subject, I can call the Human Subjects Division at (206) 543-0098. I give permission to the researchers to use my child's medical records as described in this consent form. I will receive a copy of this consent form.

Printed name of subject                                  Signature of subject                                  Date

Printed name of your child

Printed name of parent or guardian          Signature of parent or guardian                                  Date

Copies to:          Researcher  
                                Subject

Form updated 6/6/2012

## **Appendix E**

### **Summary of Consent Form for HIPAA Authorization**

The following form is required for you to participate in this study. It is a consent form authorizing the researchers of this study for the parents or caregivers to provide permission to obtain patient information regarding their child. The HIPAA Authorization form proceeds to list the exact manner in which the information will be obtained, used and protected. To give permission, simply sign the form. The form also provides you with information on how to cancel your permission.

You will be provided with two copies. Please sign both copies.

Please keep one copy for yourself and mail the other copy with the rest of the study materials.

## **Appendix F**

### **Introduction to Parenting Stress Index-Short Form**

#### Parenting Stress Index – Short Form Questionnaire

This is a questionnaire designed to determine stress levels of parents of any children, not only those with PKU. This questionnaire has been used in many studies because it is able to capture the feelings of all parents, including those who have children with serious problems. Even if the questions do not seem to apply, they can be answered on the scale from “strongly agree” to “strongly disagree”. Please try to answer all of the questions by circling the response that best reflects your feelings.

Please do not fill out the top portion of the form.  
Do not provide your name, nor your child’s name and birthdate.

Updated: June 6, 2012

## Appendix G

### Phenylketonuria (PKU) Questionnaire

Section I: These are questions regarding the “demographics.” They will be kept confidential. The answers will be grouped to help interpret survey results and make this survey comparable to similar surveys that may be conducted by other studying PKU. You may skip any question you do not wish to answer.

1. Who is answering this survey?

- Mother of child with PKU<sup>1</sup>
- Father of child with PKU<sup>2</sup>
- Other (Please identify relationship to child)<sup>3</sup>

2. What are the ages of the child’s parents? Please state in number of years.

- Mother’s age: \_\_\_\_\_<sup>1</sup>
- Father’s age: \_\_\_\_\_<sup>2</sup>

3. Please list the ages of all children (under 18) living in your household (that you are parenting) and circle the age of the child with PKU.

---

4. What is the highest level of education completed by the child’s mother?

- Some high school<sup>1</sup>
- High School diploma<sup>2</sup>
- Some college<sup>3</sup>
- Associates degree<sup>4</sup>
- Bachelor’s degree<sup>5</sup>
- Master’s degree<sup>6</sup>
- Doctoral degree<sup>7</sup>

5. What is the highest level of education completed by the child's father?

- Some high school<sup>1</sup>
- High School diploma<sup>2</sup>
- Some college<sup>3</sup>
- Associates degree<sup>4</sup>
- Bachelor's degree<sup>5</sup>
- Master's degree<sup>6</sup>
- Doctoral degree<sup>7</sup>

6. What is the occupation of the child's mother?

---

7. What is the occupation of the child's father?

---

8. What was the household level of income before taxes in the year 2011?

- <\$20,000<sup>1</sup>
- \$20,000-34,999<sup>2</sup>
- \$35,000-49,999<sup>3</sup>
- \$50,000-64,999<sup>4</sup>
- \$65,000-79,999<sup>5</sup>
- \$80,000-94,999<sup>6</sup>
- >\$95,000<sup>7</sup>

9. Please indicate your ethnic origin. Check one box that best applies.

- White, not of Hispanic origin<sup>1</sup>
- Black, not of Hispanic origin<sup>2</sup>
- Hispanic<sup>3</sup>
- Asian or Pacific Islander<sup>4</sup>
- American Indian, Alaskan Native, or Hawaiian Native<sup>5</sup>
- Other (please specify)<sup>6</sup>

---

10. Does your child who has PKU have any other non-PKU related diseases or conditions?

Yes<sup>1</sup>

No<sup>2</sup>

If yes, please list the conditions and/or diseases your child has:

---

Section II: This part of the questionnaire gives you a chance to share some of the positive and negative aspects of raising a child with PKU. Feel free to share and say what might have helped make things easier for you. You may be as brief or as lengthy as you like. You may skip any question you do not wish to answer.

1. What are the biggest challenges to raising your child with PKU? (Check all that apply to you)

Explaining PKU (to family, friends, healthcare providers, etc.)<sup>1</sup>

Time involved in PKU management<sup>2</sup>

Planning time (e.g., for special events, meal preparation)<sup>3</sup>

Visiting the PKU clinic<sup>4</sup>

Cost(s) associated with PKU management (e.g., medical visits, formula, special foods)<sup>5</sup>

Other challenges (please specify)<sup>6</sup>:

---

2. Does your child use formula/medical food on a daily basis to maintain blood Phe levels in the treatment range?

Often or Yes<sup>1</sup>

Sometimes<sup>2</sup>

Rarely<sup>3</sup>

Never<sup>4</sup>

3. Who (person or organization) has been of most help to you?

Family member (specify relationship):<sup>1</sup> \_\_\_\_\_

Primary care physician<sup>2</sup>

PKU clinic staff<sup>3</sup>

Other families with children with PKU<sup>4</sup>

PKU listserv or other internet sources<sup>5</sup>

Specific health professional (specify):<sup>6</sup> \_\_\_\_\_

4. How prepared do you feel for making health-related decisions for your child with PKU?  
(Please check one)

- Extremely prepared<sup>1</sup>
- Very prepared<sup>2</sup>
- Adequately prepared<sup>3</sup>
- Somewhat prepared<sup>4</sup>
- Not prepared<sup>5</sup>

5. What are some resources or means that help you feel prepared to make health-related decisions for your child with PKU? (Please check all that apply)

- PKU Clinic and staff<sup>1</sup>
- PKU-specific or related organizations<sup>2</sup>
- Primary care physician<sup>3</sup>
- Support from family and friends<sup>4</sup>
- Listserv or internet emails<sup>5</sup>
- Internet resources<sup>6</sup>
- Other (specify): <sup>7</sup> \_\_\_\_\_

6. How do you like to receive information regarding PKU? (Please check all that apply to you)

- Verbally, through information sessions<sup>1</sup>
  - Verbally, through one-on one with a healthcare professional<sup>2</sup>
  - Verbally, through discussions with other peers in a focus group<sup>3</sup>
  - Written, through information via internet<sup>4</sup>
  - Written, through information via brochures and flyers given to me<sup>5</sup>
  - Telephone or email communication with health care providers, questions come up<sup>6</sup>
  - Conferences and sessions where I get exposed to a lot of information at once<sup>7</sup>
  - Other (Please tell us any other ways you like to receive information)<sup>8</sup>
-

7. Do you feel well-informed about PKU? If not, please list your questions or concerns.  
(Please check one)

- I currently feel very informed about PKU<sup>1</sup>
- I currently feel adequately informed about PKU<sup>2</sup>
- I currently feel somewhat informed about PKU<sup>3</sup>
- I currently feel not informed about PKU<sup>4</sup>

...and this is because:

---

8. How supported do you feel by the health care professionals (RDs, physicians, PKU Clinic staff) that help you care for your child? (Please check one)

- I currently feel very supported by health care professionals<sup>1</sup>
- I currently feel adequately supported by health care professionals<sup>2</sup>
- I currently feel somewhat supported by health care professionals<sup>3</sup>
- I currently feel not so supported by health care professionals<sup>4</sup>
  - Please list concerns that you feel are not supported:

---

9. What additional help or resources do you feel you need to help you with managing your child's condition? (Check all that apply)

- Specific information related to PKU and its management<sup>1</sup>
- Support in navigating the health care system<sup>2</sup>
- Information and support (such as specific developmental<sup>3</sup> stages) as my child gets older
- Other (specify):<sup>4</sup> \_\_\_\_\_

Continue on the next page

10. How satisfied are you with the support you receive from friends and family? (Please check one)

- I feel very satisfied with the support from friends and family<sup>1</sup>
  - I feel adequately satisfied with the support from friends and family<sup>2</sup>
  - I feel somewhat satisfied with the support from friends and family<sup>3</sup>
  - I feel not so satisfied with the support from friends and family<sup>4</sup>
- ...and this is because:
- 

11. What concerns do you have about the health of your child? (Check all that apply)

- Concerns about general pediatric issues (typical illnesses, wellness)<sup>1</sup>
- Concerns about my child's physical development <sup>2</sup>
- Concerns about my child's cognitive development (mental, learning capacity)<sup>3</sup>
- Concerns about my child's communicative/social development<sup>4</sup>
- Concerns regarding my child's PKU (monitoring, diet, etc.)<sup>5</sup>
- None<sup>5</sup>
- Other (specify):<sup>6</sup> \_\_\_\_\_

12. What concerns do you have about the future of your child? (Check all that apply)

- Concerns regarding my child's PKU management (ability to self manage and diet)<sup>1</sup>
- Concerns regarding my child's academic/cognitive abilities<sup>2</sup>
- Concerns regarding my child's social/communicative abilities with others<sup>3</sup>
- None<sup>4</sup>
- Other (specify):<sup>5</sup> \_\_\_\_\_

Thank you. This concludes the PKU Questionnaire.

## Appendix H

### Checklist

#### Checklist for Returning Materials

Consent Form

1 copy only the consent form for HIPAA Authorization

PKU Questionnaire

Parenting Stress Index-Short Form

Please return the checked items into the provided envelope.

## Appendix I

### Prompts for Reminders to Return Surveys

Hello (insert name here)!

We just wanted to remind you that the materials for the study you are currently participating are due soon. Please remember to turn in all study materials on the checklist that came with your packet. Once we have received your packet of study materials, we can enter your name to win 1 of 2 \$10 gift cards to Safeway.

Please contact the Project Coordinator at (206) 598-1800 or 1-877-685-3015, for any questions you may have.

Thank you!

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