Author's response to reviews

Title: Maternal well-being and its association to risk of developmental problems in children at school entry

Authors:

Suzanne C Tough (suzanne.tough@albertahealthservices.ca)  
Jodi E Siever (jodi.siever@albertahealthservices.ca)  
Karen Benzies (benzies@ucalgary.ca)  
Shirley Leew (shirley.leew@albertahealthservices.ca)  
David W Johnston (davidw.johnston@albertahealthservices.ca)

Version: 2 Date: 14 October 2009

Author's response to reviews: see over
Thank you for the opportunity to respond to the reviewers’ comments. We appreciate the time and effort allocated to improving this manuscript. We have addressed the comments and concerns as noted below.

**Reviewer: Barbara Maughan**

This paper addresses an important issue: identifying factors that may impact on young children’s risk of developmental problems, and affect their readiness for school. The report is based on a sample studied prospectively from pregnancy to age 5, with a range of relevant measures included at each stage of the assessments. The authors conclude that maternal well-being is a key concern in this area.

The study has a number of important strengths; there are also, however, some areas where fuller details are required, and where possible limitations of the findings/their interpretation need clearer discussion/acknowledgement.

**Major compulsory revisions**

1. Definitions: the authors refer throughout the paper to ‘developmental problems’, but never give a detailed definition of what is included here: Speech and language problems? Motor development? Cognitive development? A clearer account of what the PEDS assesses is crucial to interpretation of the findings. It also seems unlikely that a 10-item instrument could satisfactorily identify ‘mental health’ problems in young children; these might be better referred to as emotional/behavioral difficulties. Finally, the high rate of ‘abuse’ reported by mothers (over 30% in a highly-educated, generally low risk sample) appears to include ‘financial’ abuse. What does this mean?

We have specified what we mean by developmental problems in the Introduction as follows:

> For the purposes of this paper, developmental problems refer to a child’s difficulties affecting development in any one, any combination, or all (i.e., global dysfunction) of the following domains: cognitive, social, language, motor, academics.

In the Methods section, we have more clearly outlined the areas that parents report concerns in with the
PEDS to provide a clearer account of what the PEDS assesses and those areas that are predictive of developmental problems as follows:

The questionnaire included six standardized measurement scales. One of these was the Parents’ Evaluation of Development Status (PEDS), a 10 item parent-report screening measure to facilitate detection of risk for developmental and behaviour/emotional problems [34]. This was our primary outcome measure. Using the PEDS, parents report their concerns in 10 areas: global/cognitive, expressive language, receptive language, fine motor, gross motor, behaviour, social-emotional, self-help, school, and other issues (typically medical or sensory) [35]. The PEDS screens children by level of risk for developmental disabilities and behavioural/emotional problems (i.e. assigns PEDS ‘paths’) with a sensitivity and specificity that ranges between 70% and 80% [34]. At 4½ to 6 years of age, concerns reported by parents in the global/cognitive, expressive language, receptive language, fine motor, gross motor, school, and other areas are predictive of developmental disabilities [35,36]. Scoring of the PEDS categorizes children into one of fives paths:

- Path A: high risk for developmental problems
- Path B: moderate risk for developmental problems
- Path C: low risk for developmental problems but elevated risk for behavioural/emotional problems
- Path D: parental communication difficulties
- Path E: low risk of developmental and behavioural/emotional problems.

As suggested, we have changed the wording from “mental health problems” in young children to “behavioural/emotional problems”.

Women who reported financial abuse were a small proportion of the overall sample. Many more women had experienced physical, emotional and sexual abuse. We have provided the reader with more information on the types of abuse experienced by women to aid in interpretation of these findings. We have added detail into the Methods section as follows:

During the prenatal period, women had been asked about abuse in the following way: “Abuse can take many forms: physical, emotional (including psychological or verbal), sexual, financial (e.g. withholding or controlling money) or neglect. We ask all participants in this study about abuse in their lives. Have you ever been physically abused, emotionally abused, sexually abused, financially abused, or neglected?” Women who indicated they had been abused in any form were considered to have a history of abuse.

We have also added detail into the Results section as follows:

Of the total sample, 61 women reported physical abuse (12.4%), 110 emotional abuse (22.4%), 65 sexual abuse (13.2%), 20 financial abuse (4.1%), and 16 neglect (3.3%).

2. Results and interpretation: The authors analyse a series of potential predictors of developmental difficulties, and develop a multivariate model including factors that show independent associations with child outcomes. Although some prior measures appear to have been included in earlier stages of these analyses, with the exception of child sex and maternal history of abuse, the predictors that remain in the final multivariate model all appear to have been collected at the age 5 assessments. As a result, although the study as a whole is longitudinal, the majority of ‘predictors’ identified were actually assessed at the same time as the child outcomes. This raises two main difficulties: (i) possible reporter effects (mothers in poor physical health, or with low parenting morale, may be especially sensitive to difficulties in their child); and (ii) causal ordering. In what are effect largely cross-sectional analyses, it is impossible to tell which way any causal arrow may run. In all likelihood, there will be reciprocal influences of children’s difficulties on mothers’ parenting morale, and at least potentially on mothers’ health, as well as effects that run from mother to child. These limitations – and their implications for any policy messages that might be derived
from the study must be acknowledged more clearly in the discussion. Although the authors may well be correct in their assertion that ‘...greater reductions in risk would be anticipated by also addressing maternal well being alongside child factors’ (p 16), the current findings seem to me to provide much less clear support for this conclusion than the authors currently acknowledge.

We have revised the regression model to include other prior measures collected during the perinatal period or when the children were three years of age. Of note, for some variables we did not have historical measures (e.g. Child Social Competence Scale). We have more clearly acknowledged the limitations of the regression model and restated the implications accordingly.

Discretionary revisions
Given that a number of comparable measures were collected at age 3, it should presumably be feasible to conduct additional analyses that are more clearly ‘predictive’, and that would at least establish the temporal ordering of any effects more clearly (though even these, of course, cannot directly establish causality).

We have revised the regression model to include only historical factors collected during the perinatal period or when the children were three years of age. Thus, the resulting regression analysis is more “predictive”.

Reviewer: Susan Dickstein
This paper, “Maternal well-being and its association to risk of developmental problems in children at school entry” extends a series of previously published articles based on the Community Perinatal Care Study, a longitudinal investigation following a cohort of women from pregnancy until their children were of school age. Specifically, this report examined concurrent and predictive (from 3 years of age) factors associated with poor outcomes of children at 5 years of age. A strength of this work is the comprehensive study design that allows for prospective longitudinal analysis of outcomes, accounting for previous conditions.

Major Compulsory Revisions
1. Defining the problem.
   • In general, the introduction was vague, emphasizing societal benefits and consequences of early identification of risk for later developmental problems. A brief discussion at this level might be warranted, but seems quite broad and well beyond the scope of the study aims and data collected. The introduction needs to better review the (relatively abundant) scientific literature on early risk factors (such as maternal mental health problems, poverty, limited prenatal care) as related to child outcomes, in general, as well as to the specific study questions at hand.

We have abbreviated the discussion on societal benefits and consequences of early identification of risk for later developmental problems. We have also provided a more detailed review of the literature on early risk factors.

   • It would be important to not only identify the specific questions/hypotheses to be addressed in this current paper, but also describe how this current work builds on and is distinct from what has already been reported from the larger study. It would be important (and quite interesting) to clearly elucidate the questions that this study may address above and beyond those in the 3 year follow up.

We have more clearly outlined the objectives of the study addressed in this paper in the Introduction, as follows:

The current study was conducted to answer questions about the health and development of a community based sample of children as they became of school age. The objectives of this study were to:
   • identify the child and maternal factors associated with children who screened at risk of
developmental and behavioural/emotional problems at five years of age,

- develop a model that predicts risk for developmental and behavioural/emotional problems at five years of age based on historical factors, and
- determine if the factors related to high risk for developmental problems at three years of age persisted as these children entered school.

We have also described how this current work builds on and is distinct from the previous studies. For instance, in the Discussion we have stated the following:

This study and the previous follow-up study at three years suggests that the direct relationship between the well-being of mothers and the development of their children begins in the early years and persists through to school entry [14]. These findings suggests that children may not ‘rebound’ from early threats to development that occur before age 3 simply through maturity, independence or through increased interactions outside the home. This work highlights the critical importance of maternal well being and parenting morale in child development, and emphasizes that these can be unrelated to economic security and maternal education.

**Further, there was minimal discussion in the introduction about hypotheses related to the impact of intervention (groups randomized to 3 different types of prenatal care) on outcomes.**

The type of prenatal care received did not impact children’s risk for developmental problems at the three year follow-up. We have noted that we had similar findings at 5 years in the Results section:

There was no association between the type of prenatal care women had received during the RCT and the risk of developmental problems in their children at school age.

2. Sample Characteristics.

- Further, there was minimal discussion in the introduction about hypotheses related to the impact of intervention (groups randomized to 3 different types of prenatal care) on outcomes.

The type of prenatal care received did not impact children’s risk for developmental problems at the three year follow-up. We have noted that we had similar findings at 5 years in the Results section:

There was no association between the type of prenatal care women had received during the RCT and the risk of developmental problems in their children at school age.

**2. Sample Characteristics.**

- The 5 year cohort seems to be a low-risk sample. This should be addressed with respect to fit with theoretical justification and specific aims of the paper. Research related to multiple risk models may be useful.

As the reviewer pointed out, this study was not intended to investigate families at high demographic risk (e.g. low income, low education, young maternal age). We have addressed the fact that this is a sample at low demographic risk and how it fits with our specific aims in the Introduction section as follows:

When the children in the Community Perinatal Care Study were followed up in a study at three years of age, the participants constituted a demographically low risk sample with regards to maternal education and income [14]. Of note, 73% of all Canadian families with kids under six years of age have a household income greater than or equal to $40,000 [33]… The current study was conducted to answer questions about the health and development of a community based sample of children as they became of school age.

We have also addressed this in the Discussion section more thoroughly as follows:

Although the women most likely to participate in the study had high levels of education and household incomes, the sample aligns with the income level of three-quarters of all Canadian families with kids under six years of age and the educational attainment of three-quarters of Canadian women giving birth [33,51]. The results then are generalizable to the majority of Canadian families with children under six. Furthermore, 15% of children screened at highest risk of developmental problems, as would be anticipated in a population based setting… Because this sample included few women who had a household income less than $40,000 and none who had less than a high school education, the current study did not find differences in developmental risk by education or income level. Nevertheless, this study raises the consideration that although children may not be at risk for developmental problems due to maternal education or family
income, other factors may place children at risk for developmental problems. It is noteworthy that the women in this study would be commonly defined as a “low risk” population considering their demographic information. However, one in four of these mothers had mental health issues and almost one in three had a history of abuse, which in turn may have placed their children at risk for developmental problems.

• The 5 year cohort (n=491) is significantly different from the 3 year cohort (n=791) on several reported factors; do the authors have some understanding for why the highest risk families were lost to the study? (Are either of these cohorts different from the original n=1737?) As stated in the discussion, this has implications for generalization, but might also be informative about study design.

Women who were not retained in the study were different from those who were retained in the study. Indeed, we did not retain mothers who were younger, had lower education and income, had poor physical health, single or divorced, and smoked. We have elaborated on some of the potential reasons for why these families were lost to the study in the Discussion section as follows:

It is important to consider that the factors associated with women who were not retained in the cohort (young maternal age, low education and income, poor physical health, being single, and smoking) are similar to the characteristics of women who are difficult to retain in studies and in longitudinal research [55]. These factors may signal complex health, lifestyle, and social issues that these women face which make it difficult to retain them [56]. Also, the original study was a community based study that was not initially designed to be a longitudinal follow-up study. Thus, traditional strategies to retain women (e.g. incentives, changes of address cards, and routine follow-up) were not implemented immediately after the first study. However, retention strategies were implemented between the follow-up study at 3 years and at 5 years (e.g. routine contact, asking women to inform us of an upcoming change in contact information). In all three studies, the participation rates were over 60%, and the women not retained in the cohort appear to be similar among all three studies.

3. Data Analysis/Results.
• Please clarify the meaning of the “paths” (p.11) and the rationale for conducting analyses in this manner. (It seems that this might be for the purpose of predicting developmental vs behavioral/mental health outcomes based on individual child and maternal characteristics; this agenda was not justified in the introduction).

The PEDS was the measure we used to screen children for developmental risk, and scoring of the PEDS put children in one of five paths. Because the PEDS was our primary outcome measure, we used these categories of risk (or paths) in conducting our analyses. Thank you, however, for the opportunity to clarify the meaning of the “paths” and ensure the reader understand our rationale for conducting the analyses using the paths. We have provided more detail on the paths in the Methods section, under Questionnaire, as noted below:

Scoring of the PEDS categorizes children into one of fives paths:
• Path A: high risk for developmental problems
• Path B: moderate risk for developmental problems
• Path C: low risk for developmental problems but elevated risk for behavioural/emotional problems
• Path D: parental communication difficulties
• Path E: low risk of developmental and behavioural/emotional problems.

We have also added the following to the Methods section, under Analysis:

Based on the PEDS scoring, children were categorized into one of the five PEDS paths (Path A, B, C, D, or E), which indicated the level of risk for developmental and behavioural/emotional
problems as noted above.

• Similarly, (p.13) the association among risk factors over time for mothers yielded potentially interesting information, but this was a) not indicated as a specific aim of this paper; and b) not linked to child outcomes.

We have deleted this section to focus the paper on its stated objectives.

• Analyses do not address the fact that the sample is comprised of families randomized into 3 groups. How did this factor into the results?

The original intervention did not factor into the results as there was no association between original RCT group and risk of developmental problems. Thus, we have added the following sentence in the results:

There was no association between the type of prenatal care women had received during the first study and the risk of developmental problems in their children at school age.

• It would be important to explain the reasons for the different sample sizes used for various analyses (e.g., Table 1 total n=491; Table 2 total n=490; Table 3 total n=477)

There is a note on Table 3 (formerly Table 2), which states:

Note: Denominator varies due to missing data on some survey items. The denominator is not 491 in this table because one mother completed only half of the PEDS survey as her questionnaire was missing a page.

Originally, Table 4 (formerly Table 3) had a denominator of 477 (not 490) because 13 women had missing information for the variables entered into the regression model and thus could not included in the model. However, with the more ‘predictive’ analysis in the revised version of the manuscript, the denominator is now 490 as there was no missing information for the variables included in the revised regression model.

4. Limitations/Conclusions
• This section was well written and described implications of the study findings, including relevant limitations.

Thank you!

• Given that this current work is part of a larger study with previously published papers, it would be helpful to clearly elucidate how this paper extends our knowledge and understanding of the subject matter beyond the 3 year follow up.

We have discussed how this paper extends our knowledge and understanding of the subject matter beyond the 3 year follow-up as noted above.

Discretionary Revisions
1. Participant characteristics are described both at the start of the Methods section and the start of the Results section; I might suggest combining this information in one place.

At the start of the Methods section, we have not described the characteristics of the participants but rather the process of developing the cohort that participated in the original study and the follow-up study at 3 years. We have also included the N of each cohort for the reader. At the start of the Results section, we have described the characteristics of participants remaining in the cohort for the study following up the children at 5 years. Because these two sections contain distinct, although related, information, we have not combined the information in one place.
2. Other than the PEDS, I am not familiar with the questionnaires used (p.8); additional information about the measures (including scales) would be helpful.

We have included more detailed descriptions on all of the standardized measurement scales used in the questionnaire in Table 1 to assist readers who may be unfamiliar with these scales.

3. On Tables 2 and 3, if p values are set a priori at <.05, there is no need to include a p-value column (the statistic is either significant or not).

While it is true that the statistic is either significant or not because we established a p-value a priori, we have provided the exact p-values for some readers who may be interested in information on the strength of the associations.

Again, we sincerely appreciate the opportunity to respond to the reviewers' comments and to make the subsequent improvements in this manuscript. We look forward to your response regarding this manuscript.

Sincerely,

Suzanne Tough, PhD
Associate Professor, Paediatrics & Community Health Sciences
University of Calgary