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Constrained Parenting Decisions

Toward a General Model of Child Maltreatment

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Abstract Standard parental investment models from the biological sciences and economics suggest that parents can be expected to care for their children subject to personal characteristics (e.g. altruism) and resource constraints (e.g. money). While previous research has clearly established links between personal characteristics, resources, and maltreatment behaviors, the field lacks any examples of formal attempts to test the predictions of these models with respect to maltreatment behaviors. The goal of this paper is to test a biologically and economically informed model of behaviors associated with child maltreatment. Using data from the National Survey of Early Childhood Health (NSECH), the Consumer Expenditure Survey (CES), and the American Time Use Survey (ATUS), estimates of altruism, parental efficiency, income, and other control variables were calculated. A dependent measure of the probability that all reported discipline strategies would be Type-II strategies was also calculated. All variables were subjected to Bayesian Model Averaging (BMA) across quasibinomial GLMs to determine the most probable set of covariates. The BMA results estimate that the model with the highest posterior probability is a model which only includes the household and parental investments (household altruism) and the natural logarithm of their annual income. In other words, households with higher levels of altruism and higher incomes tend to report higher levels of discipline strategies that are not associated with maltreatment. Results are discussed in terms of implications for social work practice and child welfare practice in particular.

Keywords Income · Altruism · Child maltreatment · Child Abuse · Child Neglect · Discipline

Mathematics Subject Classification (2000) 91 · 92

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1 Introduction

A relatively underdeveloped area of household economic literature concerns the manner in which the maltreatment of children is formally understood or modeled. This deficit is due, at least in part, to the general perception that child maltreatment is best conceptualized as an irrational or even pathological act. Such perceptions are well-documented by Nelson (1986) who notes that modern conceptions of child maltreatment have been largely framed by the medical community which defines the problem of child maltreatment imprecisely in terms of social deviance and a defect in the character of parents who engage in maltreatment.

The central thesis of this paper is that maltreatment can be conceptualized as the non-pathological consequence of parenting under resource constraints. All parenting behavior (even maltreative[1] parenting behavior) can be reduced to decisions about how a parent chooses to invest their time and other resources in a given child. Under certain sets of resource constraints *any* parent can be expected to engage in parenting decisions that society would tend to judge as maltreative. While child maltreatment may be undesirable, in most cases it is not pathological. Recognition of this basic distinction has important implications for child welfare policy and practice.

1.1 Brief Overview of Maltreatment Literature

The basic relationship between resources and child maltreatment is well-established in non-economic social science literature with previous studies establishing links between resource constraints and substantiated allegations of child maltreatment as well as general involvement with the child welfare system (Gil 1970; Pelton 1981, 1994; Russell and Trainor 1984; Sedlak and Broadhurst 1996; Stith et al 2009; Berger and Waldfogel 2004). Studies examining administrative data sets of low-income populations (e.g. TANF recipients) have also shown that exogenous resource-decreasing shocks such as welfare-reform (Courtney et al 2005) or welfare sanctions (Slack et al 2007) will tend to increase a family's probability of child welfare system involvement. Other studies have exploited experimental income support programs to address income endogeneity problems inherent in other studies and still find an inverse relationship between family income and the probability of child maltreatment (Cancian et al 2013; Fein and Lee 2003). While there is a paucity of research examining connections between income and child maltreatment outside of the US

[1] Here, the word "maltreative" is used, as an adjective describing care which is characterized by violence or neglect without regard to malice. Such an adjective is important for the framework presented in this manuscript in order to avoid categorization of behaviors by way of adjectives such as "abusive" or "neglectful" while also avoiding the inherent presence of malice in the use of an adjective such as "malicious". While other candidate adjectives exist (e.g. *laesive* from the Latin adjective *laesus* meaning injured), "maltreative" is chosen due to the relative semantic comfort that most of this manuscript's probable readership will find with this word.

(Cameron and Freymond 2006), the evidence from the US seems to suggest a strong and reliable relationship between child welfare system involvement and resource levels.

While the literature provides multiple examples of research establishing a link between resources constraints and child maltreatment, the field is lacking in attempts to formally specify a mechanism to explain this relationship. Two exceptions to this rule include Brandon (1999) and Brandon (2001). In each of these studies, microeconomic models are proposed which outline the manner in which parental resource constraints can lead to maltreatment. The former study suggests that maltreatment is mainly effected by a parent's level of altruism, the latter suggests that maltreatment is a function of how efficiently a parent uses her available resources. Both effects are viewed as subject to income constraints. In this paper, a variation on these models is proposed followed by an attempt to test key predictions of the model.

2 Maltreatment from Biological Altruism

2.1 Hamilton's Rule

While a full review of the nature vs. nurture debate is beyond the scope of this manuscript, this discussion proceeds from an assumption that human beings are simultaenously biological *and* social beings (see for example Plomin et al 1994; Ridley 2003). In other words, human beings are not born as a *tabula rasa*. Humans are born endowed with tendencies to engage in certain activities such as learning languages, consuming nutrients, and engaging in bipedal locomotion. These activities are certainly moderated by the environment in which a human finds himself, but there is no doubt that human genetic makeup helps humans to engage in these activities regardless of an individual's environmental circumstances. Basic evolutionary theory demonstrates that such behaviors exist *because* they helped human genes to evolve to their present state.

One type of behavior that enabled human genes to survive is parenting behavior and parental altruism in particular. As described in such seminal works as Hamilton (1964) and Trivers (1974), parental altruism can be defined as those behaviors requiring the investment of time or other resources in a child in a way that benefits the child (in terms of her fitness as a future mate) but comes at a cost to the parent (in terms of her fitness as a future mate). This does not preclude the parent from receiving some sort of benefit from the altruistic act. Stuebe et al (2010), for example, find that breastfeeding decreases a mother's long term risk of developing certain chronic diseases. To the extent that an increased survival probability would allow a mother to produce more offspring, she can be viewed as benefiting from the activity to some extent. However, when considering the costs associated with breastfeeding (in terms of caloric loss, the opportunity cost of not bearing other children, etc.), there may be a net cost to the *mother's* long term fitness but a gain in the probabil-

ity that her genes are spread *into the population as a whole.* In such situations, parental behavior is said to be altruistic.

Hamilton (1964) has shown that such altruistic tendencies can, themselves, be conceptualized as genetic traits. Hamilton establishes further that such altruistic tendencies will spread in a population subject to the constraint

$$rb > c \tag{1}$$

where b indicates the benefit gained from an altruistic act (in terms of gene survival probability), c indicates the associated cost of the act and r indicates the relatedness parameter which specifies the proportion of genes that the recipient of an altruistic act shares in common with the individual performing the act. For simplicity, this paper focuses only on households and the altruistic acts of parents for their own children. As such, we can treat the constraint as simply

$$b > c. \tag{2}$$

The above constraint specifies that parents will not act altruistically toward their children beyond the point at which benefits outweigh the costs of the altruistic act in terms of gene survival. While there are many situtations in which this constraint can be violated (thus causing a parent to tend toward non-altruistic acts). One of the most obvious is a situation in which we assume a fixed level of resources for a parent. The increase in gene survival probability obtained from an altruistic act is dependent on the available resources to a parent. This is because when a parent makes a choice to invest in one child, they are necessarily making a choice to not invest in their other children (or their future children). Thus, under extremely low levels of fixed resources the marginal gain in survival probability for an investment in a given child may be so low that the parent chooses to invest in other (perhaps healthier) children or to simply reserve their resources for other children in a future state in which resources may be more abundant. In other words, parents can be expected to engage in triaging activities.

2.2 Triaging Activities

Under periods of extreme scarcity, animals (and humans) will reliably engage in triaging activities in which they will fail to invest in children if it appears likely that investments in that child will come at the expense of another child more likely to survive the scarcity (including future children). This point is well articulated in Chagnon (1983) where Chagnon's fieldwork revealed a Yanomam female who killed her newborn child for the sake of her older child who was still nursing. Indeed, Daly and Wilson (1988) surveyed a database of 60 anthropological ethnographies finding that a majority of the societies engaged in infanticide. Where reasons for the infanticide were provided, almost 90 percent of the reasons were consistent with triaging activities.

Until relatively recently in human history, such activities could also be seen in Western societies. Milner (1998) cites an 1860 British newspaper article noting that it had become commonplace for London police to routinely find abandoned infants in the park or other public places. He goes on to cite another British article referring to the large-scale infanticide noting that Middlesex had become a "carnival of slaughter". While infanticide is an extreme example, human behavior tends to exist along spectra and it is reasonable to assume that many parental investment decisions exist along a continuum from optimal to infanticide. At some point along the spectrum of parental investment decisions leading to infanticide, societies establish thresholds past which parental investment decisions are considered to be maltreative. As described in more detail below, thresholds will exhibit some heterogeneity across societies. This manuscript, however, proceeds from the assumption that in any society a threshold does exist at some point along this continuum. Beyond this point, parental investment decisions can be considered to be maltreative.

This manuscript is not the first to draw a connection between basic evolutionary principles, resource constraints, and child maltreatment. Echoing some early child maltreatment papers such as Burgess and Conger (1978), Belsky et al (1991) made arguments similar to those made above in which maltreatment was identified as an effective reproductive strategy for humans exposed to resource constrained environmental contexts. These papers received some attention in the field of psychology ((Baumrind 1993) and (Baumrind 1995)) in which an evolution-informed theory of child maltreatment was dismissed as overly reductive and failing to account for human agency. The current manuscript seeks to demonstrate how a theory of child maltreatment can be informed by evolutionary theory and still account for human agency without becoming overly reductive.

3 Maltreatment from Agent-Based Altruism

3.1 Relevant Non-Economic Literature

The above discussion describes how biological altruism can be defined as those acts of parental investment which increase the survival probability of a parent's genes in the general population. By conceptualizing altruism to be a genetic trait, it should be clear from the above why we would not expect what we can refer to as *true* biological altruism to exist in the general population. Any altruism based on a biological definition must, by definition, benefit the parent's genes. According to neo-Darwinian theory, any mutations which may have existed over the milenia to benefit the genes of other individuals would not have survived. In this way, we follow Dawkins (1976) in describing altruism on the basis of biology as "selfish".

Understanding parenting behavior, of course, requires a recognition of human agency - the conscious ability of humans to make decisions about how

they interact with their world[2]. While the field of neuroscience is still new and has only begun to develop a model of parental decision-making (see for example Ho et al 2014), general neuroscientific models of human decision-making provide some insight into how parents may avoid the maltreative threshold described above. Specifically, a growing body of evidence from brain-imaging studies in neuroscience suggests that humans make decisions with both automaticity (yielding the types of decisions that have allowed human genes to survive for millions of years) and as the result of more thoughtful deliberation (yielding the types of decisions that would cause a mother to avoid killing her children as the result of post-partum depression).

Greene (2014) outlines a model of this dual-process human brain in which humans are said to possess an automatic mode (primarily driven by structures such as the ventromedial prefrontal cortex) and a manual mode (primarily driven by structures such as the dorsolateral prefrontal cortex). The experimental evidence for this model is well-covered by Greene and will not repeated here. However, Greene demonstrates how a series of experimental studies show that the dual-process theory of the brain implies a dual-process theory of *morality*. The basis of Greene's theory is what he refers to as the Central Tension Principle in which "characteristically deontological judgments are preferentially supported by automatic emotional responses, while characteristically consequentialist judgments are preferentially supported by conscious reasoning and allied processes of cognitive control[(i.e. manual mode)]". In simple terms, moral decisions that require cost-benefit analysis and "thinking" (i.e. the types of decisions that would tend to lead to altruistic parental investment decisions in spite of resource constraints) require humans to engage in manual mode, deliberative thinking. Moral decisions that do not require cost-benefit analysis are viewed to be made automatically - without the need for higher level thought processes.

In terms of parenting, this manuscript assumes that something like Greene's automatic mode tends to serve human parents and children well most of the time. Human's have evolved to, under normal circumstances, care for their children as described above. This means that most of the time, default parental impulses will tend to avoid a Middlesex-style "carnival of slaughter". Placing a parent under resource constraints requires that the parent switch to manual-mode thinking in order to continue to make altruistic investments in their child in spite of the sorts of automatic impulses they might feel. However, recent experimental evidence gives reason to believe that switching to manual-mode thinking becomes difficult under resource constraints. Specifically, cognitive load (i.e. time pressure or a form of resource constraint) has been observed to decrease manual mode thinking in experimental subjects (Suter and Hertwig 2011; Paxton et al 2012). Other recent research by Mani et al (2013) suggests that the types of cognitive load that are induced in experimental settings are also induced by reductions in income. Taken as a whole, these recent findings

[2] To be clear, the author is explicitly agnostic about *how* humans make such decisions. The assumption is simply that they *do* make such decisions.

lead to the conclusion that relatively poor parents who are faced with choices of how to invest in their children will tend to rely more on automatic mode decision-making processes relative to wealthier parents. Under extremely low levels of resources, parents making decisions in such a manner can reasonably be expected to have a higher probability of engaging in maltreative behaviors.

3.2 Microeconomic Model

Proceeding from the above discussion, the remainder of this manuscript seeks to specify and test a microeconomic model which considers two types of individuals (i): p and c indicating a parent and child respectively. This is a simplifying assumption made for the purposes of this paper. The model proposed here, however, readily extends to multiple children and multiple parents as well as to children of varying ages and genders. The parent's total utility is given as $u_p(x_p)$ where x_p is a composite good consumed by the parent. The child's utility is given as $u_c(x_c)$ where x_c is a composite good consumed by the child. For the purposes of this paper, it is assumed that x_p and x_c are private goods. In other words, x_p is only consumed by p and x_c is only consumed by c. The overall framework utilized here is, however, general enough to accommodate both private and public goods through the application of a Gorman (1976) type linear technology function.

For present purposes, two composite goods that could be consumed by a child are considered: household-produced investments x_{ch} (e.g. making meals, reading to the child, playing with the child, etc.) and market purchased investments for the child x_{cm} (e.g. childcare, etc.). This manuscript implicitly follows Brandon (2001) and assumes that $x_c = x_{ch} + x_{cm}$ such that $u_c = u(x_{ch}, x_{cm})$.

Following Chiappori (1988), this manuscript relies heavily on the collective model of the household. In a collective model, household members are assumed to cooperate in order to achieve a Pareto efficient distribution of household resources. In this way this manuscript breaks from Brandon (1999) and Brandon (2001) in which a unitary model, in line with Becker (1981), is assumed to underlie the household decision-making process. While a full review of unitary and collective models of household decision-making is outside of the scope of this paper (see Donni and Chiappori (2011) for such a review), unitary models have fallen out of favor in recent years. In general, unitary models suffer from the assumption of a single decision-maker in a given household. In developing a theory of child maltreatment, a collective approach in which the preferences of the parent (or parents) *and* the preferences of the child (or children) are considered to be analytically preferable to a unitary model in which child preferences are typically ignored. Furthermore, with respect to maltreatment, the basic conclusions of Brandon (1999) and Brandon (2001) still hold under this model.

A specific assumption is made in this model that each member of the household seeks to maximize the household welfare W through a two-stage program. In the first stage of the program, the household identifies a sharing

rule ϕ_i in which the parent's share of income is governed by a sharing function $\phi_p = \phi(p_p, p_c, y, Z)$ and the child's share of income is governed by a sharing function $\phi_c = y - \phi(p_p, p_c, y, Z)$ where p_p and p_c represent labor-based wages of the parent and child respectively, y represents household income, and Z represents a vector of distribution factors which do not impact parental or child preferences but do influence the manner in which resources are distributed within the household. Such factors could include local child protection laws, the age of the child, cultural factors, and other considerations. The second stage of the program involves each member maximizing a household welfare function W^i according to the following program:

$$\begin{aligned} &\max\ W^i[u_p(x_p), u_c(x_c)] \\ &\text{s.t. } x_i = \phi_i \end{aligned} \tag{3}$$

While some readers may question the implicit human agency afforded to children in the above specification, we find that this approach is preferred to ignoring the preferences of children in the allocation of household resources (as in, e.g. Blundell et al 2007). As shown by Sodian et al (2004), even infants can be shown to exhibit human agency. This point will be well-taken by any reader who has ever parented a newborn child overnight; the preferences of the child as manifest through a desire to feed, play, or engage in other activities at any hour of the day or night clearly impact which household resources are available for the parent and which are available for the child.

What should be clear from the above discussion is that $p_c = 0 \rightarrow \phi_c = x_c/y$. In other words, when $p_c = 0$, ϕ_c is simply the proportion of household resources expended on the child in stage 1. Some additional resources (some portion of ϕ_p) may be expended on the child in stage 2 of the program according to a caring parameter α_p (i.e. altruism under Becker (1981)). Under an assumption that W takes a Cobb-Douglas form where α_p is defined as the output elasticity of u_c, it can be shown through Roy's identity (Roy 1947) that α is simply the proportion of ϕ_p which is expended on x_c. Thus, for present purposes, it assumed that the total household expenditures on x_c are equal to $\alpha_p + \phi_c$ and that any altruism based on biological tendencies is completely contained within the sum of these two parameters.

Following Brandon (2001) and Brandon (1999), we assume that a given society sets a minimum well-being threshold $\bar{u}$. When parents invest in their children above this level, society is generally accepting of the parent. When parents invest below this level, the state must intervene to ensure a minimum well-being for the child.

3.3 Major Theoretical Assumptions and Predictions

Based on the theory reviewed above, this remainder of this manuscript will proceed from the following theoretical Assumptions:

1. That biological altruism has evolved to elicit altruistic behaviors subject to environmental conditions such as resource constraints and that genes which promote triaging activities under relatively low resources levels can be expected to exist in the general population.
2. That agent-based altruism exists (or appears to exist) in humans (as suggested by recent neuroscientific evidence and collective economic models of the household) which allows parents to behave altruistically past the point at which such behaviors will promote the survival a parent's genes in the general population.

Based on these assumptions, we would predict the following to be true in emperical observations of parenting behavior:

1. That holding altruism and other factors constant, as resource levels increase, altruistic parenting behavior will also increase.
2. That holding resource level and other factors constant, as altruism increases, altruistic parenting behavior will also increase.

4 Data and Variable Definitions

4.1 Data

The National Survey of Early Childhood Health (NSECH) serves as the main data for this analysis. This survey involved telephone interviews with over 2,000 parents with children under 3 years of age in early 2000 (n=2,068). In addition to various demographic factors, the NSECH also collected information on the income of parents and their employment status, the time that children spend in the care of other individuals, the source of the care (childcare provider, etc.), the time that parents spend caring for their children in various activities (story-reading, etc.), and parental discipline strategies, (spanking, time-out, etc.).

A main barrier with the NSECH data is that the survey provides information on income, childcare, time-investments, and discipline strategies in ordinal scales which limits the possibility of basic mathematical operations requisite for the analysis conducted here (e.g. summing). The ordinal nature of the NSECH data is addressed by making use of other nationally representative data sets. Specifically, Bureau of Labor Statistics (BLS) data from the 2003 American Time Use Survey (ATUS) and the 2004 Consumer Expenditure Survey (CE) is utilized. Using this data to develop "prior" distributions for each measure, the following smoothing algorithm is implemented which provides a method to treat the data from these surveys as continuous:

1. Match the relevant variables from the NSECH and the relevant BLS survey,
2. Visually examine the distribution of the BLS data,
3. Calculate the MLE of a reasonable prior for the relevant variable,

4. Simulate a sampling distribution of relevant variable with a Monte Carlo function, and
5. Sample from the simulated data sets within intervals as identified in the ordinal NSECH data.

Two exceptions are made to this algorithm. The first exception is in the estimate of the total household expenditures on child care. For this measurement, CE-based estimates of the average expenditures for childcare in various childcare settings were obtained and multiplied by the total hours that NSECH respondents reported that their child spent in the corresponding settings. The variance in the hours reported in NSECH provides a continuous measurement of this expenditure without the need to incorporate the variance of a CE-based "prior". Also, in estimating a continuous measurement of income, a distribution as reported in a working paper by Bandourian, McDonald, & Turley (2002) is utilized which provides a reasonable prior distribution for US income.

Further details of the data preparation strategy (and subsequent steps in the analysis) are available in a GitHub repository at the following link.

4.2 Descriptions of Key Variables

Operational Definition of and Assumptions of Altruistic Parenting Behaviors Following the field of behavioral psychology, this manuscript distinguishes parental discipline strategies into those strategies involving the provision of a stimulus (e.g. spanking, yelling, etc.) and those involving the removal of a stimulus (e.g. time-out, removing a toy, etc.). The behaviorist literature classifies these strategies as Type I and Type II discipline respectively. Generally speaking, Type I strategies are less-likely to promote child well-being than Type II discipline strategies. It is known, for instance, that D_I strategies tend to be problematic for parent-child relationships and can sometimes lead to behavioral problems for children including delinquency and aggression (Gershoff 2002; Taylor et al 2010). Thus, a rational parent seeking to maximize his child's utility would be more likely to choose Type II behaviors than Type I behaviors. Intuitively, it seems clear that Type I behaviors will also tend to be more less resource intensive than Type II behaviors as Type I behaviors tend to be time-limited and not requiring the sorts of monitoring activities present in Type II strategies. These assumptions are bolstered by a line of literature which links D_I parenting strategies to resource constraints (Berger 2007; Berger et al 2008, 2009; Paxson and Waldfogel 2002) in a manner similar to the identified link between resource constraints and child maltreatment in the literature reviewed above.

Household Income (y) Income in the public-use NSECH data is reported in terms of total household income on an 8-point Likert scale starting at $\leq 7,500$ and proceeding in increments of 10,000 to $\geq 75,000$. Continuous income is

calculated to the algorithm specified above. As income is reported as "total household income", depending on the use, the estimated continuous value is divided by the number of adults in the household in order to arrive at an estimate of individual wages for parents who report some employment.

Household Resources Devoted to Child Well-Being ($\alpha_p + \phi_c$) The values of α_p and ϕ_c are not observed directly in the NSECH data. However, under the assumptions described above, it can be said that the sum of these parameters is equal to the total household resources devoted to the child A (this can be thought of imprecisely as a measure of "household altruism" toward the child). In order to calculate A the following steps are taken:

1. Taking the estimate of y calculated above, the count of adults in the home n_a, and the estimated number of work hours t_w, an estimate of the parent's wage p_p is calculated as $(y/n_a)/(365.25(t_w))$. For non-working mothers, time is valued at the estimated market rate for child-care calculated from the CES above.
2. The value of A is calculated by summing the total time value that a parent spends on home-based child care $p_p x_{ch}$ and the time value of market child care $p_p x_{cm}$ and then dividing by the time value of the total number of hours in the year $(p_p(365.25)(24))$ such that $A = (p_p x_{ch} + p_p x_{cm})/(p_p(365.25)(24))$.

Probability of All Type II Strategies $P(All\ D_{II})$ Since there is no direct observations of societally identified maltreatment, this paper utilizes information information concerning the discipline strategies of the parent. For each person, the probability that *all* of reported discipline strategies would be D_{II} is calculated. In using this measurement as a dependent measure, there is an implicit assumption that $P(u_c \geq \bar{u}) \propto P(\text{All } D_{II})$.

Parents in the NSECH were asked 5 questions regarding their discipline strategies. The specific question pattern is as follows:

> The next questions are about discipline. Parents vary a lot in how they discipline and children also vary in their response to being disciplined. I am going to read a list of methods of discipline parents might use with children (CHILD)'s age. For each, please tell me if you use that method often, sometimes, rarely, or never with (CHILD). First, how about raising your voice or yelling? How about spanking? How about taking away a toy or treat? How about giving a time-out, that is making (CHILD) take a break from whatever activity {he/she} is involved in? How about explaining to (CHILD) why {his/her} behavior is not appropriate."

Using this information, $P(\text{All } D_{II})$ is calculated as follows:

1. In order from first to last, the first, second, and last questions are classified as Type I strategies D_I as they are are providing a stimulus to the child. The third and fourth questions are classified as Type II strategies D_{II} as they remove a stimulus from the child.

Table 1 Descriptive Summary of Identified Variables

	Min	Max	Mean	Median
Probability of All Type II	0.00	1.00	0.47	0.50
Altruism	0.02	1.00	0.28	0.25
Income	132.11	186747.69	36412.74	26111.33
Child Count	1.00	4.00	2.18	2.00
Child Age (mos)	19.00	35.00	26.62	27.00
White Mother	0.00	1.00	0.54	1.00
Maternal Age	17.00	49.00	29.26	29.00
Married Mother	0.00	1.00	0.63	1.00
Maternal College	0.00	1.00	0.48	0.00
Maternal Frustration	0.00	1.00	0.54	1.00
Child Healthy	0.00	1.00	0.81	1.00
Devolpmental Concerns	0.00	1.00	0.79	1.00

2. Responses to each question were then dichotomized. Questions in which a subject answered "Never" were coded as 0 and 1 otherwise.
3. The probability for each subject k is then calculated as $P_k(\text{All } D_{II_k}) = \sum D_{II_k} / (\sum D_{II_k} + \sum D_{I_k})$.

Additional Variables In addition to the key variables of interest, additional variables utilized in previous NSECH research concerning discipline strategies are included in the analysis. Specifically, Regalado et al (2004) make use of child age, maternal race, maternal age, maternal marital status, maternal education, maternal frustration levels, child health, and developmental concerns as potential risk factors in their multivariate analysis. The current analysis also makes use of the count of children in the household as an additional variable. A descriptive summary of all the identified variables is provided in Table 1.

5 Statistical Analysis

All of the identified covariates were subjected to Bayesian Model Averaging (BMA) across generalized linear models (GLMs) to determine the most probable set of covariates. The details of BMA are beyond the scope of this paper. The reader is directed to Hoeting et al (1999) for a discussion of the overall approach. Briefly, BMA is a process through which a researcher identifies a set of potential k covariates and a candidate statistical model (e.g. a quasibinomial generalized linear model (GLM)). The analyst then estimates the statistical model for every possible combination of models (2^k models). Each model receives a weighting based on the posterior probability of the model beginning with a prior probability which represents the researcher's beliefs prior to conducting the analysis. For the current problem, we begin with a relatively conservative uniform prior. We then utilize a quasibinomial GLM to account for overdispersion in $P(\text{All } D_{II})$. The BMA is implemented via the `BMA` package authored by Raftery et al (2009).

Table 2 Model Results

	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	-1.3877	0.2091	-6.64	0.0000
Altruism	0.4446	0.1073	4.14	0.0000
Income	0.0803	0.0194	4.13	0.0000

6 Results

The results of the BMA indicate that the "most probable" of the 2^k fitted models is a model which only includes A and $\log y$. Specifically, this model has a posterior probability of 0.472 and the next most-probable model has a posterior probability of 0.16. The estimates for the chosen model are displayed in Table 2. As can be seen, the probability of choosing all D_{II} strategies is positively and significantly associated with A and $\log y$. The results are displayed graphically in Figures 1 and 2. The standardize coefficients for A and $\log y$ are 0.49 and 0.5 respectively. Thus, we can interpret the model as indicating a roughly equivilant effect size for both variables.

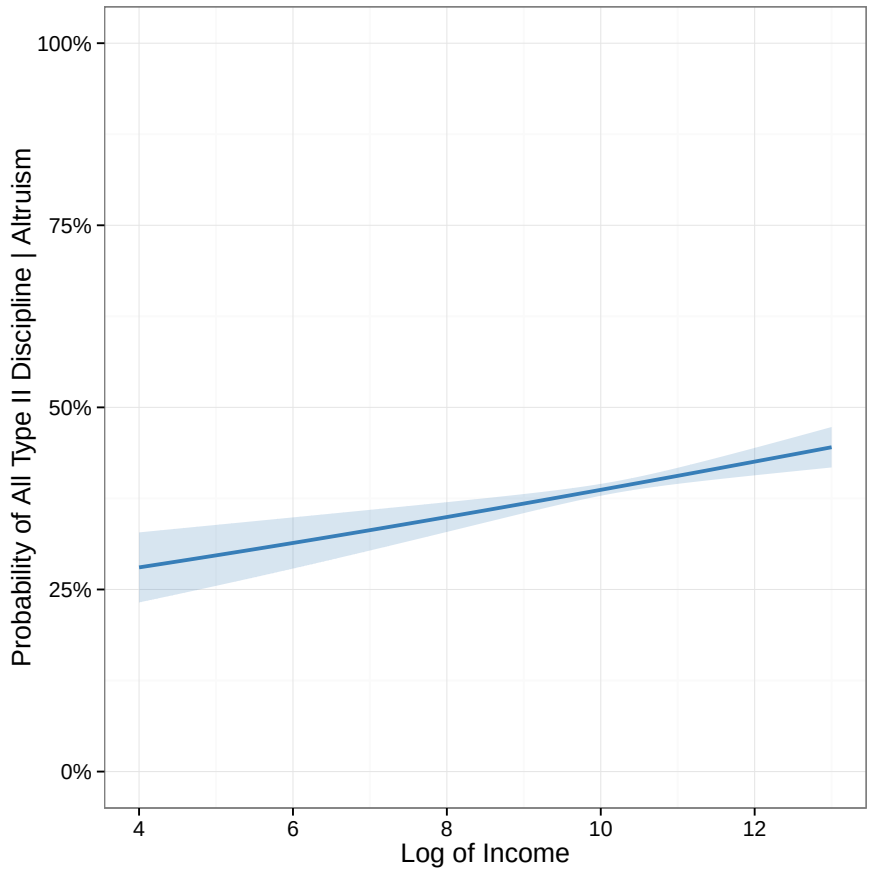

Fig. 1 $P(\text{All } D_{II})$ as a function of $\log y$

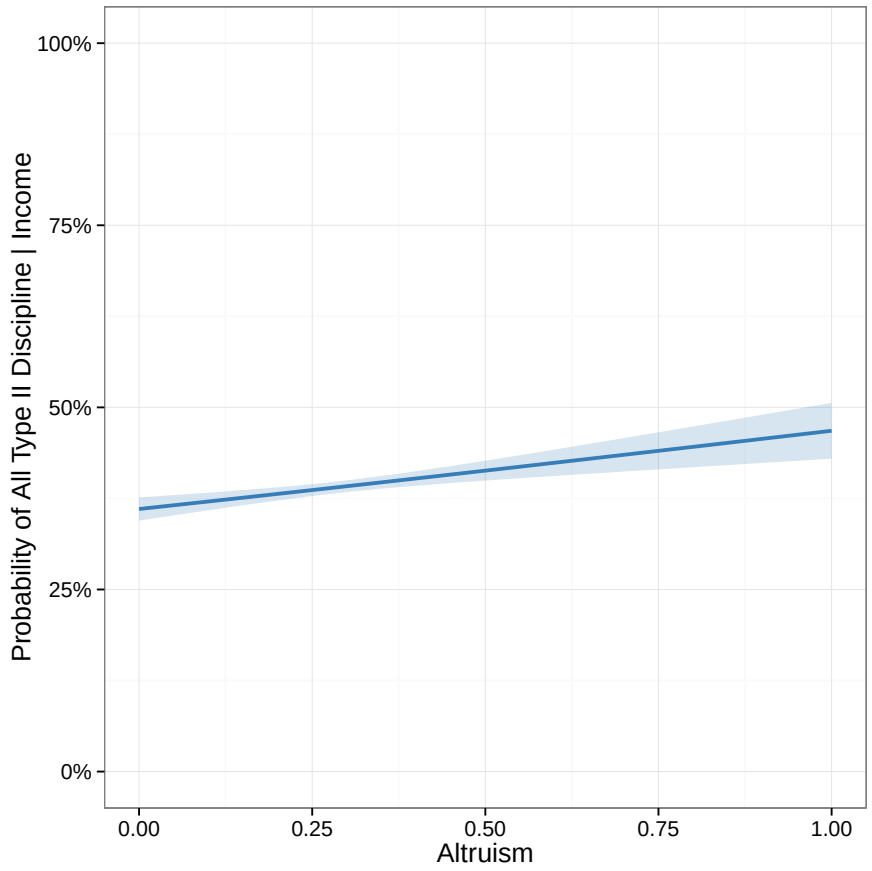

Fig. 2 $P(\text{All } D_{II})$ as a function of A

7 Discussion

The results of the analysis presented above confirm the hypothesis that more altruistic households will tend to engage in ostensibly higher-cost parenting strategies associated with wellbeing to a greater extent than less altruistic households. This effect of altruism observed above is independent of the income effect observed by other researchers. To the extent that the other assumptions of the theoretical model hold, the results of this analysis suggest that relatively simple models of human behavior might be able to explain how families become involved with the child welfare system.

What should be clear to the reader at this point is that the model developed and tested in this manuscript is implicitly defining child maltreatment as a problem of poverty. While previous researchers have certainly drawn the connection between child welfare and poverty, such literature usually attempts to examine the link between poverty and deviant parental behaviors. Here, an alternative approach is taken in defining maltreatment based on the manner in which poverty effects a given child (in terms of their well-being) and the biological and social context from which the parental behaviors emanate (resource constraints and level of parental altruism).

In defining maltreatment in this manner, this manuscript breaks from established lines of thinking about child maltreatment. Indeed, many statutes specifically preclude poverty and homelessness as factors to be considered when making legal determinations as to whether or not a given child has been maltreated. The model presented here also elucidates the dynamic nature of households and the variety of potential intervention points available to the child welfare social work community.

8 Limitations and Future Directions

Despite the usefulness of the model, it does suffer from an implicit assumption of a parent who desires to invest (at least some) resources in their child. The model presented here would suggest that all parents would have a propensity to harm their children under a certain mix of altruism and resource constraints, but that they typically seek to make investments in children which maximize the child's utility subject to the utility of other household members. However, some parents suffer from various forms of psychopathology which may yield a desire to harm children under any circumstances. Instances of pedophilic sadism seem to be evidence that such individuals do exist. For those individuals, a model of maltreatment focused on the Kempe et al (1962) "defect of character" seems more appropriate than the one presented here. The point of this manuscript, however, is that there is no reason to believe that such individuals are a normal part of society or even a normal part of the Western child welfare system. Such individuals likely represent the margins of both populations and policies and interventions should be developed with this theoretical framework in mind.

The analysis presented here is consistent with a resource constraint theory of child maltreatment. However, the available data did not allow for a direct test of all aspects of the model. A direct test of the model would require information on how much parents prefer one form of discipline to another given the relative monetary or cognitive "costs" or "benefits" of a given strategy and how these preferences vary as a function of resource constraints. Specifically, future research could explore the line of experiments conducted by Greene (2014). One could, for example, imagine a brain-imaging experiment in which parent-subjects were placed under cognitive load and asked to make decisions about various parenting strategies. Understanding how parenting decisions are made within the dual-process theory of morality (or a similar framework) seems critical to the understanding of maltreatment. Additional research could be undertaken to properly monetize various parenting strategies and specifically test the assumption that more resource intensive parenting strategies tend to increase the wellbeing of children.

From a social service practice perspective, the results of this analysis suggest that some families may be helped more by increases in income or other concrete resources than the sorts of psychotherapeutic interventions which tend to be prevalent in child welfare service plans. The study does not refute the value of psychotherapeutic interventions. It does, however, suggest that other forms of intervention may work better in certain families. Although the BMA does exclude maternal frustration as a covariate in the final selected model, the analysis does not imply that such factors (including forms of psychopathology) could play a causal role in a parent's level of altruism or wealth. For those parents where income is not a concern, this model would suggest that interventions should focus on changing preferences (i.e. altruism or caring and sharing) of parents and households.

The results of the BMA presented here also deserve more detailed examination. Although the BMA suggests a final model which excludes many of the control variables which would typically be included in a statistical model of parenting behavior (e.g. age, race, gender, etc.), the BMA does not rule out the possibility that such demographic variables may play a causal role in altruism per se. Such a question could be further explored through a multiple equation model (e.g. path analysis, etc.). Finally, additional research is needed (through the direct study of child protective services workers, family law judges or other means) to understand the societal variability of the wellbeing threshold. In other words, since the model presented here proceeds from the assumption that the wellbeing threshold is societally defined, research should be conducted to help the field understand precisely how the threshold varies within and between countries throughout the world; both presently and across time.

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