Suicide Risk in Postpartum Mothers: A Test of the Kin-Selection Hypothesis of Suicidality

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**Abstract**

This study evaluates two hypotheses that can be used to make predictions about post-partum depression and suicidality: (1) The kin-selection hypothesis of suicidality, and (2) the bargaining hypothesis of suicidality. According to the analytical rumination hypothesis, an individual goes into depression as a tool to systematically solve problems that threaten their inclusive fitness (Andrews & Thomson, 2009). The kin-selection hypothesis and bargaining hypothesis make competing predictions regarding the problems that are solved by proposed adaptations promoting suicidal behavior. Specifically, the kin-selection hypothesis suggests that suicide is evolved to benefit kin in periods of severe resource scarcity, whereas the bargaining hypothesis suggests that nonfatal suicidal gestures evolved to benefit the suicidal individual directly by soliciting support. In the current study, the analytical rumination hypothesis and bargaining hypothesis are used to generate distinct predictions regarding the circumstances under which postpartum mothers—a group that is typically vulnerable to depression, but protected against suicidality—would experience suicidality. Participants completed a questionnaire regarding their postpartum experiences, postpartum depression, and suicidality. Results indicate that burdensomeness was the only significant predictor for both suicide attempts and severe attempts. This provides support that the kin-selection model more strongly predicts suicidality.

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Evolutionary psychology studies the mind and describes it through psychological adaptations that have been ancestrally favored by natural selection. These adaptations, whether they are behaviors or thoughts, have evolved because they specifically benefit the survival, and ultimately the reproduction, of our ancestors. One example is the protective aversions we have to foods because they could have been toxic to our ancestors (Curtis, Aunger, & Rabie, 2004). We are also “biologically prepared” to fear animals that were dangerous to our ancestors, like snakes, rather than more relevant dangers in today’s society, like weapons (Öhman, Flykt, & Esteves, 2001). This evolutionary framework is easy to understand in contexts where the behaviors are clearly benefitting the individual, like the examples above. However, it is less intuitive when using this adaptive approach to explain things that seem maladaptive and harmful to the individual. Adaptations are meant to weed out behaviors that threaten fitness. A behavior that seems maladaptive, but continues to be prevalent, is an important cue from an adaptationist point of view that something else may be at play. This does not mean that adaptation means the behavior is beneficial or “good,” rather it is an explanation of why this behavior may still be prevalent. For example, the act of suicide completely eradicates any future reproductive prospects for the individual. This seems like it could not be valuable for our ancestors, but it continues to be prevalent. Suicide was the tenth leading cause of death in the United States in 2017, second for ages 10-34 and fourth for ages 35-54 (National Institute of Mental Health, 2019). The rate of suicide in 2017 was 14 for every 100,000 people (National Institute of Mental Health, 2019).

On the surface, suicide is an act that ends any chance of increasing survival for the individual. While this is true, there are some aspects of suicide that may suggest it is an adaptation similar to the other examples above. Suicide presents hallmark traits of adaptations, specifically within the context of the individual. It has continued to be prevalent throughout the population of humans as a species, it reliably occurs under certain conditions, and it has consistent features when presented, like depression and hopelessness. Depression is an important link that can help describe suicide as an adaptation, as they are often comorbid. Henriksson and colleagues (as cited in Hawton et al., 2013) found that depression is the most common psychiatric disorder in suicide cases, occurring in one half to two thirds of patients that committed suicide. Some evolutionary researchers have suggested that depression can be an earlier warning sign that there is a large threat to fitness.

The analytical rumination hypothesis suggests that some of the core symptoms of depression are tools designed by natural selection to systematically solve the problems threatening the sufferer’s inclusive fitness (Andrews & Thomson, 2009). In contrast, the psychic pain hypothesis suggests a different evolutionary function. It suggests that depression is a psychological pain, comparative to physical pain, that draws awareness to and promotes the avoidance of the situation that threatened inclusive fitness (Thornhill, R. & Thornhill, N. W., 1989).

While the previous hypotheses suggest depression as an adaptation, there are other lesser explored hypotheses that explain suicide and suicidal behavior in adaptive terms. For example, the kin-selection hypothesis suggests that the act of suicide could have been favored because under certain extreme circumstances, the genetic benefits of helping one’s own kin outweighed the personal costs of the act (Osterman, 2012, unpublished dissertation). Specifically, suicide is conceptualized to benefit genes by freeing up resources for close kin during periods of extreme shortage. A competing adaptive account is the bargaining hypothesis (Hagen, 2011), which suggests fatal suicide is a byproduct of an adaptation promoting suicidal thoughts and gestures, which are hypothesized to directly benefit individuals by garnering them social support. This support has the overall goal to improve one’s inclusive fitness. According to this hypothesis, suicidal behavior is used as a signal to others that the individual needs help, so the adaptation’s purpose is improving their social contracts and gain support (Hagen, 2011), rather than to promote a fatal behavior, as the kin-selection hypothesis suggests. Thus, fatal suicides according to the bargaining hypothesis are not predictable, but are a random outcome from trying to gain anticipated support (Hagen, 2011).

The current study focused on suicidality in the specific population of postpartum mothers. This population commonly suffers from postpartum depression; thus, it would be an interesting sample to concentrate on. It may seem that a mother experienced a positive fitness event, as she has successfully reproduced offspring and can invest, however postpartum depression remains a common outcome after birth. While there has been literature that explores the potential adaptive functions behind postpartum depression, Hagen (1999) suggests that postpartum depression is a signal to the mother that the child is too costly and that they are lacking resources to care for it. Postpartum depression serves to improve the fitness of the mother, so that she does waste her investment energy on a costlier child (Hagen, 1999). While the research has worked to explain the function of depression in this population, the connection with suicide has not been explored as extensively. Nevertheless, hypotheses like the bargaining and kin-selection hypotheses can be applied to make specific and competing predictions within this population of interest.

The kin-selection hypothesis suggests that suicidal behavior is an adaptation designed to produce fatal behavior in response to environmental threats and a perceived lack of ability to contribute to inclusive fitness (Osterman, 2012, unpublished dissertation), whereas the bargaining model suggests suicidal behavior is designed to elicit investment and support from others, and that fatalities are an unintentional by-product (Hagen, 2011). In the current study, I examined the competing predictions regarding suicide that can be generated for each of these hypotheses. I also evaluated the predictions of the analytical rumination hypothesis of depression in conjunction with suicidal behavior. The analytical rumination hypothesis suggests that depression is an adaptation to analyze and improve one’s own fitness (Andrews & Thomson, 2009). The current research study investigates postpartum experiences of mothers, specifically focusing on their inclusive fitness indicators, as well as depression and suicide.

**Evolutionary Hypotheses of Depression**

As introduced above, there are several hypotheses that have been put forward to account for depression within an adaptive framework. For instance, the psychic pain hypothesis (Thornhill, R. & Thornhill, N. W., 1989) suggests that depression follows fitness-threatening events in order to promote avoidance of similar events in the future. In other words, according to this hypothesis, depression produces psychic pain in the same way that burning your hand on a hot stove produces physical pain, and has similar benefits (i.e., avoiding placing your hand on a hot stove in the future). Other researchers have proposed that depression results from status losses in order to promote submissive behavior, and thereby avoid further fitness losses from higher-status aggressors (Gilbert, 2000).

Another recent and promising hypothesis, which will be the primary focus in this paper, is the analytical rumination hypothesis (Andrews & Thomson, 2009). As mentioned above, this hypothesis explores key symptoms of depression as psychological adaptations to solve problems that are threatening one’s inclusive fitness. One of the main symptoms of depression is rumination, which is argued to be a way of solving the adaptive problem. Also, it suggests that complex problems, things that are harder to solve, are the most likely triggers of major depression. Among the most complex problems for humans, are social problems. Therefore, ruminating on the social problem would be a way to find a solution. For example, most depressed people will withdraw themselves and think often of their problems. These behaviors are the proposed adaptations, to ruminate about specific issues and find possible ways to fix them. Another feature of depressive rumination is distraction resistance towards the cause of their depression, which, according to this hypothesis, is a feature designed to focus attention on the problem and possible solutions, rather than on other potentially competing goals (e.g., foraging, mating). These features and behaviors of depression are the very thing the individual can supposedly use to eliminate the threat and increase fitness. However, this is not implying that the depression is beneficial for the individual because they are experiencing emotional suffering. There are adaptations that are negative or possibly harmful. An example is that most people still get their wisdom teeth and end up needing them removed, which entails a procedure. These teeth have no purpose, but they continue to be an adaptation that has been passed on. Another example is the appendix, it continues to be a prevalent organ; however, it had not found real function and can actually kill people. Therefore, adaptations are not always enjoyable or positive, but an explanation of previous ancestral experiences.

**Evolutionary Hypotheses of Suicide**

**Kin-selection hypothesis.** The kin-selection hypothesis, introduced above, has been applied to explain why a behavior as directly damaging as suicide might have been genetically beneficial to our ancestors. It is based on Hamilton’s (1964) kin selection theory, which suggests that even behaviors that are detrimental to the individual directly can still be favored by natural selection if they sufficiently benefit kin of that individual. Hamilton’s focus in this original paper was on the evolutionary origins of altruism, particularly altruism toward kin. Hamilton’s rule (Hamilton, 1964) describes the cost-benefit analysis that the kin-selection model describes. The rule states that a characteristic is favored by natural selection when the benefits to others (B), times the genetic relatedness to the individual (r) is larger than the cost to the individual (C): B\*r > C. One classic illustration of the B\*r > C analysis is when determining to save a close verse a distant kin when they are drowning in a lake. An individual will evaluate the cost and benefit of the situation based on these circumstances described above. An individual that can swim would be more likely to save their sibling drowning in a lake (larger r), than a second cousin. It would be minimal cost to them and it would produce greater benefit. While a person that cannot swim well may still work to save their sibling (larger r), they would be much less likely to save the distant kin; much higher cost to them and little benefit. Hamilton never directly applied this hypothesis to suicide, but his formulation can easily be applied to make predictions regarding when lethal self-sacrifice could be favored by natural selection.

The kin selection hypothesis of suicide applies Hamilton’s theory to the problem of suicide by Osterman (2012, unpublished dissertation) suggesting that suicide within our ancestors could have been favored under circumstances when it would have benefited kin. Overall, the gain to kin outweighed the cost to the individual. For example, think of a famine that overtakes a family of nine. They only have enough food to keep eight members from starving and dividing the food equitably among the entire nine harms everyone involved. If one member were to stop using the resources, the rest of the family would benefit greatly.

However, it is important to note that not all members of the family would be equally likely to self-sacrifice in these circumstances, due to the fact that some members would do more harm than good to the family if they were to die. Therefore, there are factors, described by Hamilton’s rule, that may make an individual more likely to self-sacrifice in certain situations. The distinction between benefit to kin and cost to self is complicated, but has distinct features that separate them. Conditions for each variable that are relevant to suicide can be a combination of things. The benefits to kin (B) can be greater when there is a lack of resources (e.g., low income). An individual may feel they can increase benefits and allow more to be given to other kin, if they were gone. The proportion of shared genes that would receive the benefits of self-sacrifice (r), can increase with larger families because there are more kin to benefit. A suicidal individual may feel they are a burden on the family, so eliminating themselves would result in advancement for all. The cost (C) to the individual would be death from suicide, but it is derived from the subjective evaluation of their ability to improve their fitness in the future (e.g., via their future reproductive prospects, or their ability to help and support their existing close kin). The overall analysis of cost is a combination of these factors, while also including other relevant influences that may impact the value.

Depending on developmental stage, these factors could be things like lesser health, lower mate-value, or otherwise the inability to aid close kin. This suggests that the individual may feel they cannot add to the fitness of the family because they do not have prospects available to them. Further evaluation could determine that there are enough genetic kin to pass on genetic material, so they are costing the family more by remaining a part of it. Predictors of this suicidal behavior in correlation with Hamilton’s (1964) kin selection hypothesis have been explored among researchers. These factors can result in a perception of having lesser value to their family, which may trigger the belief that the individual is a burden on their family. I expect feelings of burdensomeness to be the outcome of these factors and be a psychological mediator between these factors and suicidality.

Each variable in Hamilton’s equation can be represented in different ways depending on the circumstances. Existing research can be interpreted through this lens, and seems to be consistent with the predictions that one would make from Hamilton’s rule. For example, it has been found that suicidal individuals feel like a burden to their families and that suicide is perceived to be a way to resolve these feelings (Joiner et al., 2002). Also, Osterman (2012, unpublished dissertation) has found initial evidence that those from low economic backgrounds with larger families were at a higher risk of suicide, but only if they felt that they were unable to contribute to inclusive fitness. These conditions are entirely consistent with the predictions of Hamilton’s rule, because it matches the cost-benefit analysis relevant to kin. Furthermore, while information about feelings of burdensomeness were not available Hamilton’s this study, one could easily predict based on the research of Joiner and others that individuals in such circumstances likely felt burdensome and that this was central to their experience of suicidality.

De Catanzaro (1984) hypothesized a relationship between suicidal ideation and life experiences regarding inclusive fitness, as suggested above. He found that correlates of suicidal ideation were poor future health, poor relationships with the opposite sex, and feeling burdensome. De Catanzaro (1995) did further investigation and found again that poor health and burdensomeness towards family, as well as poor finances and low reproductive health also correlated to suicidal behavior. The support for inclusive fitness with regards to burdening one’s own kin is a predictor of suicidal ideation and suicidal behavior. The difference between the original work of de Catanzaro and further investigation is determining suicide as an explicit adaptation or not. While explored by de Catanzaro (1984; 1995), suicide was never clearly described as an adaptation to improve kin’s fitness, but an explanation of why suicide could persist in a population despite its lack of function. He suggested that individuals who had no ability to contribute to inclusive fitness would not be *harming* their fitness by committing suicide, but he did not suggest that suicide provided a genetic *benefit* to kin. Nonetheless, his results are consistent with the predictions one would make from an adaptationist perspective, and with the results of others who have approached suicide as a kin-selected adaptation (Osterman, 2012, unpublished dissertation).

**The bargaining model hypothesis.** Other adaptationist hypotheses suggest that fatal suicidal behavior is not the intended outcome of adaptations that produce suicidality. Hagan’s (2011) bargaining hypothesis, introduced above, may seem controversial at first as it characterizes suicide as a “cry for help.” The bargaining model hypothesis implies that the “intent” of the adaptation producing suicidality is not to actually commit suicide, but to signal to others that the sufferer needs help and thus to solicit investment from other people. The suicidal behavior is a way to acquire help to improve the inclusive fitness that is being threatened (Hagen, 2011). The evidence for this is that most suicide attempts are not successful, but they are using the strongest marker to identify that they need help to others. This would suggest that the adaptation is to facilitate one’s own survival and reproduction, but it is not possible without the assistance of others. Therefore, suicide is a byproduct of the costly mechanisms to achieve support.

**Suicide in Postpartum Mothers**

Postpartum mothers are an interesting population within which to examine depression and suicide. As a general context, most people would not think about this population with concern to these negative behaviors. The population of postpartum mothers may lead one to believe that they have substantial positive indicators of fitness because they successfully created offspring. Thus, this population should be protected against depression and suicide. Some studies have found that pregnancy and the months following birth are protective against suicide (see Vijayakumar, 2015 for a review). However, mothers often feel depressed in a variety of ways ranging in severity from depressed moods to major depression (postpartum depression in this population) after birth. One study found that the maternal mortality rate (including all types of death) was 17.8 per 100,000 and that suicide accounted for 28% of maternal deaths in the United Kingdom from 1997-1999 (Oates, 2003). However, despite their elevated risk of depression, postpartum mothers are at a lower risk of suicide than the general population of depressed individuals. A common explanation is that postpartum depression is due to a hormonal imbalance after the ever-stressing journey of pregnancy and birth, but there may be deeper explanations. A mother is not done once they give birth to their child, they still have more investment to put towards the child. Due to this continued investment, postpartum mothers face adaptive problems related to caring for themselves and their child. These problems include obtaining enough resources from their mates, getting support from others, and the large cost of parenting, which necessarily reduces mothers’ investments in existing offspring or potential future offspring.

Hagen (1999) suggests that postpartum depression is the indicator to the mother that her inclusive fitness is being threatened by the child. That it had caused more harm than benefits to the mother and family, so they should stop investing (Hagen, 1999). This indicator is to alert the mother to stop investing because it is not likely to benefit her inclusive fitness. For example, a child could be costlier to a mother if it is in poor health because the mother must invest even more than she intended, while there still may not be an increase in fitness from this child. Also, the child could be costlier if the mother is younger. She still has strong opportunities to reproduce in the future, perhaps when more resources are available. There could be a greater outcome from a future child later in life, rather than the current child. In each situation the child has caused too great of a fitness cost to the mother, which could be seen through health and behavioral problems, so the mother withdraws from investing. These predictions about the assertions of infant health, resources, social support, etc. have been empirically supported by several researchers (Hagen, 1999; Wilson & Daly, 1994, as cited in Hagen, 1999). The support links these predictors with the risk of postpartum depression and the connection to the possible functions of the adaptation.

Depression is a signal of a fitness problem to the mother and the decision of what to do is based on how much inclusive fitness could be potentially restored. Daly and Wilson (1988) were the first to suggest that this depression served as an adaptation to determine the cost of the child. Hagen (1999) found that this was the function of postpartum depression and that the risk factors above served as indicators. The question for the function of postpartum depression became will this child be detrimental to the mother and her fitness when measured in comparison to her other successful offspring? In the context of a costly child, the mother may have depression to activate the possible protective measures of neglect, abuse, and infanticide. This would be to solve and escape the problem of the child. However, this is different from the problem of the mother’s inclusive fitness. The adaptive behaviors should be directed toward the mother’s problem and trying to garner support for the mother herself. This is where the bargaining model suggest that suicidal behavior is an adaptation to garner support and that fatality is a by-product (Andrews, & Thomson, 2009). The explanation of depression and suicide as an adaptation or a by-product come from specific hypothesis predicted outcomes. Each of the above described hypotheses have different expectations for the reason and outcomes of depression and suicide within postpartum mothers.

**Postpartum Depression Explained by Hypotheses**

The National Institute of Mental Health (2013) found that 80% of mothers experience “baby blues” after birth, which is mild symptoms of depression and go away on their own. While, 15% of mothers experience postpartum depression that has more severe symptoms (National Institute of Mental Health, 2013.) The hypotheses described above explain why this population is at risk for depression in two distinct ways.

Firstly, the analytical rumination hypothesis could explain the way the mother is thinking post birth. She may be ruminating about her situation after birth, which would describe the postpartum mother as examining her situation in depth (Andrews & Thomson, 2009). From this perspective, the depression symptoms are indicative of a fitness problem that needs to be solved. In a postpartum population, these problems are likely to relate to maternal care, for example, whether to invest in the child (e.g., is this child likely to pay “fitness dividends” in the future by surviving to reproductive age?), and modulating the amount of investment in the context of other competing beneficiaries (e.g., existing and future offspring). Thus, one would predict based on the analytical rumination hypothesis that depression in postpartum mothers should lead to a variety of outcomes based on the specific content of the problems they are facing. If the problem is related to the “quality” of the infant as an investment, the depression may mediate neglect vs. care decisions. If the problem is related to one’s own ability to invest adequately in the child, the depression may be more likely to prompt other kinds of behaviors, perhaps including suicidal behaviors. This possibility will be discussed in more depth later.

Although suicide is less common among pregnant and postpartum women compared to the population of other depressed individuals, it is still the second to leading cause of death within that population (Lindahl, Pearson, & Colpe, 2005). As this would seem counterintuitive to commit suicide after having a child, it is important to investigate the population more thoroughly with hypotheses prevalent to suicide.

**Integration of suicide and depression hypotheses.** There could be some potential connections between depression and suicide hypotheses. The analytic rumination hypothesis for depression could be applied to both the kin-selection hypothesis for suicide and the bargaining hypothesis. If the function of depression is partly to help people focus on and solve fitness-relevant problems, as the analytical rumination hypothesis suggests, then the kin-selection and bargaining hypotheses would make very different predictions about when depression should lead to suicidal behavior. These two hypotheses make very distinct claims about the adaptive problems that shaped suicidal behavior, and the fitness benefits that suicide confers on individuals. Thus, the conditions under which depressive rumination leads to suicide can be examined as a way of evaluating the fit of each of these hypotheses to observed suicidal behavior.

The analytic rumination hypothesis of depression suggests the individual must weigh the benefits and costs of committing suicide to determine an outcome. This hypothesis under the kin-selection hypothesis would predict that suicide would be more likely of an outcome when the individual felt they had few resources and like a burden towards their kin. The individual may find they are harming their own family’s fitness and by having genetic relatives they can eliminate themselves, but their genetics can still be passed on. It could be suggested that the individual would have high levels of analytical rumination for their fitness problem and if they were high risk, they may come to the conclusion that suicide is the most plausible solution. This would be seen as suicidal behaviors based on the individual’s perception of their benefit to kin.

The bargaining model hypothesis would produce different outcomes based on the analytical rumination hypothesis. The individual would experience the depressive symptom of rumination, but the analysis of the situation would be different than with the kin-selection hypothesis. The elements of concern would be social support, resources, and heath of the individual and the child. The individual would still ruminate, but they would be high risk of suicidal behavior when they feel they do not have adequate social support, resources, and negative health. However, the potential solution to this problem would be behaviors consistent with the bargaining model hypothesis. That once the signal is recognized, the suicidal behaviors have the adaptation to gain social support. The support would have the goal of increasing the individual’s own fitness. Therefore, the situations that trigger the rumination and depression are different from the kin-selection hypothesis and the goal is not actually suicide. Each hypothesis has specific mechanisms and predictions that are exclusive to them. While these proposed functions are focused on increasing fitness, this does not mean the adaptation is a positive event or that it is successful in the function.

**Hypotheses of Current Study**

 The kin-selection and bargaining hypotheses differ centrally in whom they suggest a suicidality-producing adaptation is intended to benefit: the individual, or the individual’s kin. The kin-selection hypothesis says that suicidality is designed to benefit kin by reducing one’s own consumption of resources (de Catanzaro, 1995). The bargaining model suggests that suicidality is designed to acquire more resources for the individual, and that fatal suicides are an unintended and maladaptive byproduct (Hagen, 1999). Thus, these two hypotheses make competing predictions about the ways in which suicidal behaviors, and especially severe suicidal behaviors that are likely to be fatal, should be predicted in postpartum mothers. While the analytical rumination hypothesis explains both hypotheses, there is stronger emphasis of rumination as a risk factor in the kin-selection model. The bargaining hypothesis does describe the triggering signal of a problem to be fitness based, which the analytical rumination hypothesis does as well. However, the focus of the bargaining hypothesis is social support and getting attention and help from others, while the analytical rumination hypothesis is about withdrawing to allow all focus on the depressive rumination. This suggest that rumination would be higher with the kin-selection model because the individual is likely trying to solve their inclusive fitness with great attention to their kin; rather than themselves.

The kin-selection model could apply well to explain suicide in conjunction with the analytical rumination hypothesis for this population. For example, postpartum mothers that feel their inclusive fitness is being threatened and that their kin would be better off without them would be more likely to commit suicide. However, an individual that has successfully given birth would have different indicators of fitness than the population normally investigated. If we were to use the original model of predictors of fitness then the mothers age, their own health, the child’s health, the family size, and the mothers’ reproductive health would be most important. These are important in evaluating inclusive fitness from the general model, however, this would not make complete sense for evaluating solely the mothers’ fitness. Other predictors, explained below, would be more relevant because mothers face new and different problems of fitness. Suicide is still suggested as the adaptation, which still contradicts the bargaining model because it suggests suicide is not the adapted outcome, but the investment from others. Each of these hypotheses has very specific outcomes that would be predicted in the context of a postpartum mother experiences dependent on the risk factors.

 If suicidality is designed to help kin, as the kin-selection hypothesis suggests, one would expect that depression—and especially the depressive rumination that is purportedly designed to solve complex problems—would only result in suicidal behavior among mothers who feel that they are not personally able to care adequately for their children. The risk factors within this hypothesis would be burdensomeness and analytical rumination as the symptom of depression. Thus, mothers who are experiencing high levels of depressive rumination, and who also feel a great deal of burdensomeness, and have low socioeconomic status should be at particular risk of suicidality from this perspective.

 If suicidality is designed to help the individual, as the bargaining hypothesis suggests, one would expect that depressive rumination would result in suicidal behavior when mothers do not have satisfactory social support or access to the resources that they need to care for their children and self, which would be an attempt to garner social support. The depressive rumination would not be as high in this context because withdrawing would interfere with the goal of gaining social support. The risk factors for the mother become central to the individual because they feel they are lacking in the necessary aspects of social survival. Thus, mothers who are experiencing depression, who have low access to resources, who are young, who have an infant that requires especially high investment, and who perceive their social support to be inadequate, should be at higher risk of suicidal behavior.

 In the current study, we measured postpartum depression, depressive rumination, and suicidality in a sample of mothers. We also asked them about their feelings of burdensomeness, their access resources, their age, and their social support in the year following the birth of their most recent child. Additionally, we measured a proxy of health for the mother’s most recent child, birthweight, which is related to a number of health outcomes. We used these variables to predict postpartum suicide attempts, and observed whether the relationships conformed more to the following predictions, derived from the kin-selection and bargaining hypotheses.

**Kin-selection derived predictions.**

***Hypothesis 1a*.** High levels of feelings of burdensomeness will be a strong predictor of and have a significantly strong positive relationship with suicide attempts.

***Hypothesis 1b.*** High levels of feelings of burdensomeness will be a strong predictor of and have a significantly strong positive relationship with severe suicide attempts.

***Hypothesis 2a.*** High levels of depressive analytical rumination will be a strong predictor of and have a significantly strong positive relationship with suicide attempts.

***Hypothesis 2b.*** High levels of depressive analytical rumination will be a strong predictor of and have a significantly strong positive relationship with severe suicide attempts.

***Hypothesis 3a.*** Socioeconomic status will have a significantly negative relationship with suicide attempts.

***Hypothesis 3b.*** Socioeconomic status will have a significantly negative relationship with severe suicide attempts.

**Bargaining derived predictions.**

***Hypothesis 4a.*** Low social support will be a strong predictor of and have a significantly negative relationship with suicide attempts.

***Hypothesis 4b.*** Low social support will be a strong predictor of and have a significantly negative relationship with severe suicide attempts.

***Hypothesis 5a.*** Low socioeconomic status will be a strong predictor of and have a significantly negative relationship with suicide attempts.

***Hypothesis 5b.*** Low socioeconomic status will be a strong predictor of and have a significantly negative relationship with severe suicide attempts.

***Hypothesis 6a.*** Birthweight of the child will have a significantly negative relationship with suicide attempts.

***Hypothesis 6b.*** Birthweight of the child will have a significantly negative relationship with severe suicide attempts.

***Hypothesis 7a.*** Depressive rumination will have a significantly positive relationship with suicide attempts.

***Hypothesis 7b.*** Depressive rumination will have a significantly positive relationship with severe suicide attempts.

***Hypothesis 8a.*** The age of the mother at the time of birth will have a significantly negative relationship with suicide attempts.

***Hypothesis 8b.*** The age of the mother at the time of birth will have a significantly negative relationship with severe suicide attempts.

**Method**

**Participants**

The participants (*N* = 511) were recruited through Prolific Academic (www.prolific.ac), which is an online research participant recruitment service. The restrictions were that participants must be biologically female, a mother to at least one biological child, and speak English fluently. The participants were paid $1.30 for their responses through the Prolific Academic system. Attention checks (e.g., “I have been answering these questions accurately and honestly”) were placed throughout the survey to ensure quality and relevant responses. Seven participants (1.17%) were excluded from analyses because of failures to pass attention checks or other problems. One participant was excluded because their biological sex was male, another because they answered in another language, the other four were excluded because of failures to pass attention checks. All of these participants were excluded from the final analyses and data set (resulting in a final *N* = 504). All participants were biologically female, and ranged in age from 22 to 72 with a mean age of 39.40 (*SD* = 9.69); one participant neglected to provide their age. The ages of participants at the time of birth of their most recent child ranged from 17 to 44 with a mean age of 30.70 (*SD* = 5.50). Regarding race, 437 (86.70%) participants identified as White, 16 (3.20%) identified as Hispanic or Latino, 15 (3.00%) identified as Black or African American, 23 (4.60%) identified as Asian/Pacific Islander, and 13 (2.60%) identified as “other.”

**Design and Materials**

The study session was a 7-14-minute (*M* = 12.80 minutes, *SD* = 10.20 minutes) survey completed on Qualtrics. It began with a consent form to explain to the participants the nature of the study with any relevant risks. If they did consent, they would take the survey on Qualtrics on any device that could access the internet. When they finished the survey, they saw a page regarding mental health and the encouragement for those to seek help that need it, as the nature of the study was sensitive. Upon completion they received their compensation and were thanked for their participation.

**Construction of survey.** The survey was divided by questions asking participants to think retrospectively about their most recent postpartum experiences and then questions relating to current experiences. There was a clear separation between these sections and instruction to answer the items relevant to the time period. The survey began with past experiences, followed by present experiences. However, within each section, the questions were randomized in order. The survey ended with demographic questions. The informed consent and each survey item can be found in Appendix A.

**Past measures.** The following measures were explained to only be asking participants about past experiences, usually using the statement “in reference to the year following the birth of your most recent child…”

***Depressive symptoms*.** There were questions regarding depressive symptoms of the participants in different circumstances. The Analytical Rumination Questionnaire was used to assess participants’ experience of depressive rumination (Barbic, Durisko, & Andrews, 2014). The questionnaire was adapted for the purpose of past experiences regarding postpartum experiences. The questions were framed explaining they should be answered in reference to the year following the birth of the participant’s most recent child. The twenty different items had been changed to past tense, so participants were aware it was not relevant to their current state. This scale includes items like “I tried to understand why I had these problems,” “I tried to figure out how to best avoid future problems,” “I tried to find an answer to my problems,” and “I tried to find a goal or purpose that was meaningful to me” with answers on a four point Likert-type scale from “all of the time” to “none of the time” (Bartoskova et al., 2018). A reliability analysis was carried out on the Analytical Rumination Questionnaire comprising of the twenty items. Cronbach’s alpha showed the questionnaire to reach acceptable reliability, α= 0.94.

***Postpartum experiences*.** A different measure for depression was part of the post-partum questions measured for postnatal depression via the Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987). This section had also been altered for the questions to be framed in past tense. There was the same explanation before all of these questions explaining to answer them in reference to the year following the birth of their most recent child. There was also a warning to pay careful attention to the scales for each questions because, while they are all Likert based, they change drastically item to item. Some example items are “I had been able to laugh and see the funny side of things” on a scale from “as much as I always could” to “not at all” and “I had been anxious or worried for no good reason” on a scale from “no, not at all” to “yes, very often.” (Cox, Holden, & Sagovsky, 1987). A reliability analysis was carried out on the Edinburgh Postnatal Depression Scale comprising of the 10 items. Cronbach’s alpha showed the questionnaire to reach acceptable reliability, α= 0.92.

There were simple questions about postpartum depression like had the participant felt depressed at all and if they had been diagnosed with postpartum depression (yes or no). There were also questions regarding certain after birth experiences of the participant, but these were not measuring for depression. These included items like how old the participant was during the most recent birth of a child, what their marital status was during the birth of their most recent child, and what that child’s birth weight was. There were also retrospective questions regarding all of their postpartum experiences like whether they had ever felt depressed after any of their pregnancies, whether they had ever been diagnosed with postpartum depression, as well as whether they had more children after experiencing this depression, what their age was during this depression, and the birth weight of the child during the depressive experiences. Health is one indicator of inclusive fitness, so birth weight could be a reliable way to measure the health of the child. There have been studies suggesting children that were low birth weight infants have more negative outcomes compared to children that did not. Geoffroy, Gunnell, and Power (2013) followed a cohort for fifty years measuring the participants’ suicidal attempts and determined low birth weight and young maternal age to be the strongest risk factors. Hack and colleagues (2009) measured the behavioral outcomes of children in normal birth weight and extremely low birth weight (2.2 pounds or less) groups and found that those in the extremely low birth weight group had significantly more behavioral problems. Therefore, low birth weight has some effect on the child’s health, which could be a signal to the mother that investing in the child may not have substantial benefits compared to the cost of birthing and investing in the child. These questions about postpartum experiences will help differentiate between groups that were diagnosed, those that may have felt depression, and those that did not.

***Suicidality.*** Another part of the survey referenced suicidal ideation and behaviors. This included things like self-harm and suicide attempts. The suicide measures included three questions asking about their behaviors and ideations. The measured included were “in the year following the birth of your most recent child, had you had any thoughts of suicide,” “in the year following the birth of your most recent child, how many times had you attempted suicide,” and “in the year following the birth of your most recent child, how many times had you had a suicide attempt so severe that it required medical attention?” These questions are asked again, in the current experience section. These questions are very important for measuring suicidal behavior, which is the most important variable being measured.

***Other factors*.** One factor measured, identified as a primary predictor for the bargaining model, was social support for the individual, whether they feel supported or not. The Multidimensional Scale of Perceived Social Support was used and there are questions regarding relationships to kin, friends, and significant others about whether the participant felt they had support (Zimet, Dahlem, Zimet & Farley, 1988). The questions were adapted to be in the past tense with the same previous instructions. The responses were on a five point Likert scale from “strongly disagree” to “strongly agree” and they include items like “my family really tried to help me,” “my friends really tried to help me,” and “there was a special person in my life who cared about my feelings” (Zimet, Dahlem, Zimet & Farley, 1988). A reliability analysis was carried out on the Multidimensional Scale of Perceived Social Support comprising of the 12 items. Cronbach’s alpha showed the questionnaire to reach acceptable reliability, α= 0.94. This allows social support to be measured through the perception of the individual during their postpartum experiences.

Another factor measured in the survey was perceived burdensomeness, which is identified as a primary predictor through the kin-selection model for suicidal behavior. This was measured using the Perceived Burdensomeness Scale (Van Orden, Cukrowicz, Witte, & Joiner, 2012). The scale was adapted to be in past tense, with the same instructions to respond and was on a scale from “not at all true for me” to “very true for me.” This includes items like “I thought the people in my life would have been better off if I were gone,” “I thought I was a burden on society,” and “I thought my death would have been a relief to the people in my life.” This scale allowed for the perceived burdensomeness of the individual to be measured in their own perspective during their most recent postpartum experiences. A reliability analysis was carried out on the Perceived Burdensomeness Scale comprising of the 6 items. Cronbach’s alpha showed the questionnaire to reach acceptable reliability, α= 0.96. This is a potential risk factor because feeling burdensome to others could affect the cost analysis of the kin-selection model.

Lastly, socioeconomic status was measured as a predictor for depression and suicide for both models. There were three items regarding socioeconomic status that have been adapted to the past tense, with instruction to answer items based on the year following the birth of their most recent child. The scale was adapted from Hill, Rodeheffer, Delpriore, and Butterfield (2013) to only measure current status (relevant to the year after birth), but still uses the seven point Likert scale from “strongly disagree” to “strongly agree.” Some example items are “I had enough money to buy things I wanted,” and “I didn’t need to worry too much about paying my bills” (Hill et al., 2013). A reliability analysis was carried out on the Socioeconomic Status scale comprising of the 3 items. Cronbach’s alpha showed the questionnaire to reach acceptable reliability, α= 0.89. Socioeconomic status could be a risk factor for the mother to experience depression and suicidality because they do not have enough resources to take care of themselves and their offspring.

**Current measures.** These measures were all focused on the participants’ current experiences and frame of mind. There was obvious separation and instruction from the past experiences section.

***Depressive symptoms*.** The Patient Health Questionnaire-9 (Spitzer, Kroenke, & Williams, 1999) was used to measure current depressive symptoms. This questionnaire has nine items concerning a variety of different domains of life based on the participants’ experiences over the last month. The responses were on the scale of “not at all,” “several days,” “more than half the days,” and “nearly every day” and include items like “little interest or pleasure in doing things,” “poor appetite or overeating,” “trouble concentrating on things, such as reading the newspaper or watching TV,” and “thoughts that you would be better off dead, or of hurting yourself” (Spitzer, Kroenke, & Williams, 1999). There was a follow up question after asking whether the problems one may have checked off have made it difficult to do work or get along with people and to what degree it has made these things difficult (Kroenke, Spitzer, & Williams, 1999). A reliability analysis was carried out on the Patient Health Questionnaire-9 comprising of the 9 items. Cronbach’s alpha showed the questionnaire to reach acceptable reliability, α= 0.90.

***Postpartum experiences*.** There were fewer questions regarding postpartum experiences framed in the current tense. The only one was how many biological children does the participant currently have.

***Suicidality*.** Another part of the survey referenced suicidal ideation and behaviors. This, again, included things like self-harm and suicide attempts. The suicide measures included the same three questions asking about their behaviors and ideations. The present tense measures were worded slightly differently as “in the past year, have you had any thoughts of suicide,” “in the past year, how many times have you attempted suicide,” and “in the past year, how many times have you had a suicide attempt so severe that it required medical attention?” The past versus present can be useful to explore and possibly determine if there are differences, if they still experience suicidality, or if it is not related to the postpartum experiences.

***Demographics.*** The last part of the survey was demographic questions asking age, ethnicity, sex, gender identity, sexual orientation, marital status, weight, and height. This gives general background information regarding participants and ensured they met the requirements of participation. This information is useful to see the variability in the sample and if there are any possible significant demographic factors that impact results.

**Results**

**Descriptive Statistics**

**Depression.** These statistics are based off the participants’ experience following the birth of their most recent child. Of the 504 total participants, 345 (68.50%) reported feeling depressed after the birth of their child. Also, 79 (15.70%) participants reported being diagnosed with postpartum depression (see Table 1). Based on the Edinburgh Questionnaire, 330 (65.50%) participants scored 12 or above, which is the diagnostic cutoff associated with postpartum depression (Cox, Holden, & Sagovsky, 1987).

**Suicide.** 102 (20.20%) participants reported having thoughts of suicide for the year following the birth of their most recent child (see Table 1). Additionally, 14 (2.80%) reported attempting suicide in the year following the birth of their most recent child (see Table 2). Within this group, 9 (1.80%) participants reported attempting suicide once in the year following the birth of their most recent child, 3 (0.60%) reported attempting suicide twice, and 2 (0.40%) reported attempting suicide 3 or more times in that following year. Lastly, 9 (1.80%) participants reported for the year following the birth of their most recent child having a suicide attempt so severe that it required medical attention. In this group, 8 (1.60%) participants reported having this severe attempt once in that following year and 1 (0.20%) participant reported having three severe attempts. Due to the low frequency of attempts and medically severe attempts of suicide (less than 3% of the sample), both the questions “in the year following the birth of your most recent child, how many times had you attempted suicide?” and “in the year following the birth of your most recent child, how many times had you had a suicide attempt so severe that it required medical attention?” were dichotomized into having an attempt or not for the descriptive analyses, but were kept continuous for later analyses.

**Preliminary Correlations**

**Suicidal thoughts and depression.** Spearman correlations were run between the predictors and suicidal thoughts, depression, and postpartum diagnoses. Spearman was used for these correlations because suicidal thoughts, depression, and postpartum depression were nominal responses of “yes” or “no.” In the analyses “yes” is coded as 1 and “no” is coded as 0. These correlations were run to identify significant predictors for suicidal thoughts derived from the hypotheses (see Table 3). There were several different relationships found to be significant based on the different predictors. The hypotheses based on the kin-selection model were found to remain true in the circumstances of suicidal thoughts and depression. Burdensomeness had a moderate positive relationship with feeling depressed, postpartum diagnoses, and suicidal thoughts. Depressive analytical rumination was positively correlated with feeling depressed, postpartum, and suicidal thoughts. Also, socioeconomic status was negatively correlated with depression, postpartum, and suicidal thoughts. These correlations provide support that the kin-selection model is supported and should be further investigated with attempts.

The predictors involved in the bargaining hypothesis model were also found to be significant. Along with the relationship with socioeconomic status, social support, represented by the total social support the participant reported, was negatively correlated with suicidal thoughts, and depression. The Edinburgh Questionnaire was positively correlated with feeling depressed, diagnosed postpartum, and suicidal thoughts. Age at the time of birth was negatively correlated with feeling depressed, postpartum, and suicidal thoughts. Birthweight was not found to have a significant relationship with the dependent variables. These correlations support the connection between several of the predictors and suicidal ideation, depression, and postpartum. This is a strong support to continue the examination of the relationship of these predictors with suicidal behaviors.

**Kin-Selection hypotheses**. The model surrounding the kin-selection hypothesis should show specific relationships with suicide attempts and severe suicide attempts. Pearson correlations were used for all relationships between the predictors and number of suicidal attempts and severe attempts (required medical attention) in the year following the birth of their most recent child (responses were either 0,1,2, or 3 or more). All of the variables were scaled to be continuous, which allows for these correlation (see Table 4). Hypotheses 1a and 1b that predicted burdensomeness would be positively correlated with suicide attempts and severe attempts was found to be significant and was supported. Also, hypotheses 3a and 3b that predicted socioeconomic status would be significant and negatively correlated with suicide attempts and severe attempts was supported as well. However, the hypotheses 2a and 2b that predicted depressive rumination would be positively correlated with suicide attempts and severe attempts was not supported.

**Bargaining model hypotheses.** The bargaining model suggested that social support, socioeconomic status, depressive rumination, birthweight, and mothers age would all have significant relationships with suicide attempts and severe attempts (see Table 4). As hypotheses 4a and 4b predicted, social support was significant and negatively correlated with suicide attempts and severe attempts. Also, hypotheses 5a and 5b that predicted socioeconomic status would be negatively correlated with attempts and severe attempts was supported. However, hypotheses 7a and 7b that predicted analytical rumination would have a significant relationship with suicide attempts and severe attempts was not supported. Also, hypotheses 6a and 6b that predicted birthweight of the most recent child would have a negative correlation with suicide attempts and severe attempts was not supported. Hypotheses 8a and 8b were not supported because age of mother had no significant correlation for suicide attempts or severe suicide attempts. Edinburgh depression was significantly correlated with both suicide attempts and severe attempts. This shows that there are meaningful relationships between the predicting variables and both kinds of suicide attempts. However, the meaning of each relationship based on the predictive value of suicidal behaviors dependent is lacking in these correlations.

**Regression Models**

**Kin-Selection hypotheses.**

***Hypotheses 1a and 2a*.** These two hypotheses predicted that both burdensomeness (1a) and depressive analytical rumination (2a) would be the strong predictors of suicide attempts. After examining the zero-order correlations between these variables, I examined how well these variables predicted suicidal behavior using multiple regression analysis, which allowed for the examination of the predictive value of each variable, accounting for the effects of other variables (see Table 5). I first translated each predicting variable into a Z-score, so that they would all have the same mean to analyze from.

The first model regressed the number of suicide attempts in the postpartum year on analytical rumination, burdensomeness, and socioeconomic status to evaluate the kin-selection hypothesis. The result indicated that these three predictors explained 8.60% of the variance for suicide attempts (*R2* = .086, *F*(3,487) = 15.37, *p* < .001). It was found that, while controlling for the three predictors, that feelings of burdensomeness was the only significant predictor and positively predicted suicide attempts (β = .28, *p* < .001).

 The second step of this multiple regression was run to compare the two hypotheses. The second step regressed the number of suicide attempts in the postpartum year on analytical rumination, burdensomeness, socioeconomic status, social support, Edinburgh Questionnaire depression, birthweight of the child, and the mothers age at the time of birth. The results indicated that these predicts explained 8.70% of the variance of suicide attempts (*R2* = .087, *F*(7,483) = 6.59, *p* < .001). This shows that the variance of suicide attempts only increased by 0.10% when the predictors relevant to the bargaining model were added in. Also, it was found that, while controlling for each predictor, that the burdensomeness was the only significant predictor and it was positively predictive (β = .28, *p* < .001). This second model explains slightly more variance, but burdensomeness is still the only significant predictor. This would support the hypothesis that the kin-selection hypothesis model creates.

***Hypotheses 1b and 2b*.** These two hypotheses predicted that burdensomeness (1b) and depressive analytical rumination (2b) would be strong predictors of severe suicide attempts.A multiple regression model was also necessary to evaluate the predictive relationships with severe suicide attempts, ones that required medical attention (see Table 6). The same models above were run for this relationship. The first model regressed the number of suicide attempts in the postpartum year on, analytical rumination, socioeconomic status, and burdensomeness. The results indicated that this model predicts 7.90% of variance for severe suicide attempts (*R2* = .079, *F*(3,487) = 13.94, *p* < .001). Burdensomeness was again the only significant predictor when accounting for both (β = .27, *p* < .001). This supports the hypothesis 1b, that burdensomeness is a strong predictor of severe attempts. However, 2b was not supported because analytical rumination was not found significant when accounting for each predictor.

A second step for this model was run to include the predictors related to the bargaining model. This model regressed severe attempts on burdensomeness, analytical rumination, socioeconomic status, social support, Edinburgh depression, birthweight of the child, and the mothers age at the time of birth. The results indicated that this model predicts 8.0% of variance in severe suicide attempts (*R2* = .080, *F*(7,483) = 5.99, *p* < .001). However, when accounting for each predictor, only burdensomeness was found to be significant (β = .27, *p* < .001). This shows that burdensomeness is still the main predictor of severe attempts, even when including variables significant to the bargaining model.

**Bargaining model hypotheses.**

***Hypotheses 4a and 5a*.** These hypotheses predicted that social support (4a) and socioeconomic status (5a) would be strong predictors of suicide attempts. Another model was created to run the previous ones in reverse order to account for the bargaining hypothesis model first (see Table 7). This model regressed the number of suicide attempts on analytical rumination, socioeconomic status, social support, birthweight of the child, and the mothers age at the time of birth. The results indicated that these predict 3.0% of variance of suicide attempts (*R2* = .030, *F*(5,484) = 2.99, *p* = .011). Both hypotheses 4a and 5a were found to be supported because while controlling for each predictor, socioeconomic status and social support were significant. Socioeconomic status was negatively predictive (β = -.10, *p* = .045) and social support was negatively predictive (β = -.10, *p* = .036). This provides support for the bargaining hypothesis model derived hypothesis, but the variance was not as strong compared to the kin-selection model. A second step was run after this that included all of the predictors before, but added burdensomeness and Edinburgh Questionnaire depression as predictors. This was to include the predictors relevant to the kin-selection hypothesis and see how variance increased. The results of this model predict 8.80% of the variance of suicide attempts (*R2* = .088, *F*(7,482) = 6.61, *p* < .001). Also, while controlling for each predictor, burdensomeness was the only significant predictor and it was positively predictive (β = .28, *p* < .001). The variance that was predictive of suicidal attempts increased by 5.80% when the model was changed.

***Hypotheses 4b and 5b*.** These hypotheses predicted that social support (4b) and socioeconomic status (5b) would be strong predictors of severe suicide attempts. The regression models were again reversed, so that the bargaining model predictors would be regressed first. This model regressed severe suicide attempts on analytical rumination, socioeconomic status, social support, birthweight of the child, and the mothers age at the time of birth (see Table 8). The results indicated that these predict 2.40% of variance of suicide attempts (*R2* = .024, *F*(5,484) = 2.38, *p* = .038). Further investigation to account for each predictor showed that none were significant, both socioeconomic status and social support statistical levels fell below the significance level from the previous model. Therefore, both hypotheses were not supported in relation to severe suicide attempts.

 Another step was added to this regression model to include burdensomeness and Edinburgh Questionnaire depression, as well as the predictors listed above. This model again regressed severe suicide attempt on burdensomeness, Edinburgh Questionnaire depression, analytical rumination, socioeconomic status, social support, birthweight of the child, and the mothers age at the time of birth. The results indicated that these predict 9.0% of variance in severe suicide attempts *R2* = .090, *F*(7,482) = 6.80, *p* < .001). However, when accounting for each predictor, both burdensomeness and age were found to be significant. Burdensomeness positively predicted (*β* = .29, *p* < .001) severe attempts, as well as age of the mother at the time of birth (*β* = .10, *p* = .023). This supports that burdensomeness is again one of the strongest predictive variables and this actually contradicts that young age would be a risk as in the bargaining model.

**Discussion**

 This study was structured to investigate possible predictive variables for suicidal behavior in postpartum mothers. Specifically, to investigate what the adaptive intended outcomes of suicidal behaviors are. It separated the bargaining hypothesis and the kin-selection model by the adaptive behaviors to be centered toward the self or kin. The findings of this study suggest that the kin-selection hypothesis more strongly predicts suicidal behavior based on the predictive variables. Burdensomeness was found to be the most predictive variable for both suicide attempts and severe attempts. However, depressive analytical rumination was not found to be predictive, so the relationship between the analytical rumination hypothesis and the kin-selection model may not have been as strong as originally thought. It is also possible that the way in which depressive rumination fits into this picture requires more complicated analyses than those we conducted here, which will be discussed further under Future Directions. The models did find support for the bargaining hypothesis, but it was not strong when compared to the kin-selection hypothesis. This explains why there has been support for the bargaining hypothesis, but there are other variables that should be accounted for as well. This supports that suicide itself is an adaptation in context of the kin selection model as previously supported by Osterman (2012, unpublished dissertation).

 The relationships found among depressive and suicidal ideation were the groundwork for further analysis into suicidal behaviors. However, actual suicidal behaviors were vital to this study because the key investigation was adaptation. Therefore, it would be difficult to assume adaptation if there were only thoughts and not actual behaviors. The bargaining model’s predictors of social support, socioeconomic status, and depression were all supported to have significant relationships with suicide attempts and severe suicide attempts. Therefore, correlation part of hypotheses 4a, 4b, 5a, and 5b were all supported. Both socioeconomic status and social support was found to have negative correlations with both kinds of suicide attempts. Low socioeconomic status, and Edinburgh’s depression were also found to be correlated (see Table 4). This explains why previous research has found support for the bargaining hypothesis to suggest that the adaptation is to garner support, not to help their kin (Hagen, 1999). Hypotheses 4a and 5a showed to be initially supported as well because social support and socioeconomic status were had accounted for some variance of suicide attempts (see Table 4). However, they were not supported in terms of severe suicide attempts.

Hypotheses 4a and 5a were no longer supported when the models were then compared through regression, the results indicated that burdensomeness had much more explanatory power in predicting suicidal behavior. This showed that hypotheses 1a and 1b were supported in all contexts of the regression models. Previous research has found that feelings of burdensomeness are strong indicators of suicidal behavior because they feel they are not adequate for their family (Joiner et al., 2002). There was much more variation explained when burdensomeness and analytical rumination were included. A variable that was not used in analyses, but was collected was an explanation from the participant of why they thought they had felt depressed. A large number of these responses were that the individual planned to breastfeed their child, but found that they were unable to do so. This was interesting because not being able to breastfeed is not fatal to a newborn, but it was a prevalent issue for mothers. However, this would have been detrimental to our ancestors because they did not have formula to feed the child. This is an example of how the necessary skills and the world our ancestors lived in is mismatched with our world today, which is discussed more in Future Directions. With regard to this specific population, the individual may feel inadequate if they cannot “do the job of a mother.” This could then increase the feelings of burdensomeness because they most likely come from their belief of their own adequacy of motherhood.

 It was surprising to find that hypotheses 2a and 2b were not supported in terms of prediction, as analytical rumination did not account for any significant predictive value, because I had thought it was a key relationship. This outcome does not mean that there is no relationship with analytical rumination. Analytical rumination had a significant relationship with depression. It is also important to note that suicidality is not the only thing that triggers rumination, so there could be a different kind of relationship here. I do not believe this takes away from the explanation power that burdensomeness has and the support for the kin-selection model. Suicidal behaviors were still supported as adaptations in the context of feeling a burden to your kin. The bargaining model was not originally supported by the regression models because it accounted for some variance of suicidal behaviors. However, when burdensomeness was presented as a predictor in the models, the predictive factors associated with the bargaining hypothesis failed to stay significant. This would mean that the bargaining hypothesis was not supported overall because it did not explain a large amount of variance for suicide attempts. This suggests that postpartum depression and suicidal behavior does not have the adaptation to garner individual support. However, it was also surprising to find that age was significant for severe suicide attempts. Interestingly, the opposite relationship that the bargaining hypothesis suggested was found, that older women in these circumstances were more likely to attempt suicide. This could actually be support for the kin-selection model because it only showed as significant when in the model with burdensomeness. An older female may feel more burdensome on their family and that suicide may be their only option.

 There is a logical conclusion that the kin-selection hypothesis was supported in this study because hypotheses 1a and 1b were supported in this study. Although hypotheses 2a and 2b were not because depressive analytical rumination was not proven to be significant, there was still strong significance prior to the predictive value based on each predictor. This would support that it has some value, but burdensomeness is really the key predictor in this study. These results are important because it suggest that suicide may be an adaption for individuals in circumstances that they feel they are a burden and could improve their kin’s outcomes. This adaptation does not mean it is the better outcome or something that should happen, but it is an description for the history of these feelings. The fact that feeling burdensome is so important should push focus to that aspect when studying suicidal individuals. Evolutionary explanations of these behaviors seem to be strongly supported and explanatory.

**Limitations**

While the findings of this study are important, there are some limitations that are relevant to the outcomes. Firstly, the retrospective and self-report construction of the survey could have been a problem because of the biases these present. The individual reporting on themselves is always troublesome and things are never remembered as accurate when it is further in the past. Although I believed that I had given clear directions, participants may have still been confused and not answered in the way we wanted them to or remembered events as clearly as I had hoped. Assessing the experiences of currently postpartum mothers would be one way for future investigations to address this limitation.

Also, it may have been beneficial to include a measure of general health for the participant. A simple question determining the participant’s perspective of their own health could have been important. We only asked about mental health and not physical health. Physical health can also be a factor that would influence evaluation of their self and their environment. It would have been interesting, for instance, to examine whether maternal health predicted suicidality, and whether this relationship was mediated by feelings of burdensomeness. Such a relationship would lend strong support to the kin-selection hypothesis. Conversely, if the relationship between maternal health and suicidality were mediated by lack of social support, this would be more consistent with the bargaining hypothesis.

It also may have been helpful to have a measure of investing and feelings toward the individual’s child. The participants were only asked the birth weight of their child, but not other measure that could have represented the child’s fitness. It could be beneficial to include other health indictors, as well as overall feelings toward the child after birth. While burdensomeness is a strong indicator of their perceptions of themselves for the benefit of others, we did not collect information of the that respect for the child.

This study did include the general perception of support the participant felt by their family, friends, and significant others, but it could be useful to include a measurement of whether the individual was seeking any help or how likely they are to reach out. Some studies have found that women may be more protected against suicide because they are more willing to reach out than men to find support (as cited in Vijayakumar, 2015). This could provide some explanation as to why attempts are lower than the large sample of participants feeling depressed and what they may be doing to decrease their risk for fatality. This same review suggested that being married is a protective factor in developed countries, but not in developing countries (Vijayakumar, 2015). It could be interesting to pay more attention to marital status at the time of birth and see what findings could be supported or rejected there. Also, due to the sparse measurements of social perceptions, there may be a lack of comparison in this study. It may have been more comprehensive to include a measurement of social support before and after experiencing suicidality. This would allow for a comparison of social support before and after experiencing suicidality, which the bargaining hypothesis proposes that social support would improve as function of the suicidal behavior and ideation. A more in-depth measurement of social perceptions may have given a more complete model for the bargaining hypothesis.

Finally, while the analyses run in this study were useful and gave strong interpretable information, the simple structure of the relationships may have left some possible significant factors unfound. The complexity of comparing the two hypotheses through their predictive variable restrained the possibility of complex models. Further focus for analyses is discussed more in Future Directions.

**Future Directions**

 This study provides important assumptions for suicidal behaviors and the mental processes behind them. It is important for prevention and assistance to include evolutionary theories. Evolutionary psychology is a very useful tool to explore possible relationships and explanations that one would not normally expect. This is partly because there is a mismatch between how the world was for our ancestor and the way it is now. This mismatch can lead to behaviors that were once useful, but may not be necessary anymore to still be prevalent. Adaptations are not “good” is the normal sense of the word, meaning they may not be desirable or positive things. The explanation that evolutionary psychology and adaptations can give, using the history of the mind, may be very useful to help those understand their feelings. An individual that is suicidal may not even understand why, so being able to give them some context is useful. These findings should provide some possible explanations of why a person is feeling burdensome and ways to alleviate those thoughts. It could be applicable to postpartum depression therapies to make mothers more aware that they are not alone or a problem to their families. Currently, postpartum depression has started to receive more attention and let mothers know that it is not strange to feel depressed after giving birth. However, the only common explanation for postpartum depression is a hormonal imbalance. This may not help the mothers to understand their situations, which could leave them feeling confused and helpless in the long run.

 Future research can expand on this research is several different ways. There could be more expansion on the same population of postpartum mothers, as explained above. However, it could also be expanded on in a general population. The research could first try to expand more on the kin-selection model in this population and then reach to generalize outward. Also, the focus could really shift to burdensomeness and the processes behind that. It could be interesting to investigate the specific causes of burdensomeness and if it changes. All of these possible expansions would be useful and important because it is imperative to find answers before providing effective treatment and therapy.

This was a very specific population to investigate, which could be less generalizable to the hypothesis as a whole. The feelings of burdensomeness were supported to be influential for this population, but that may not be the same for other situations. This study could be reconstructed to be parents or just adults in general, although that presents the issue that there are different inclusive fitness signals depending on a person’s stage of life. The measure for suicidal behaviors could also be expanded on because they were not fatal. While there is still rich information from behaviors, there may be more from fatality; especially in the context of this study. Our findings indicate that suicide is an adaptation from the kin-selection model, but that is difficult to support when all of the participants only attempted.

While analytical rumination was not found to be predictive for suicidal behavior in this model, I think there may be a relationship through a more complex analysis. There could be an interesting relationship between rumination and the risk factors like maternal health and socioeconomic status; which then create the feelings of burdensomeness. Feeling burdensome was found to be predictive in every model, but I do not think the entire explanation of this relationship was explained through the analyses I ran. There could be a new direction with relationships that determine burdensomeness, which then in turn create depression and suicidal ideation.

 Future research could also work to focus on therapy with these findings focused on burdensomeness and the kin-selection model. There could be comparisons of previous therapies for both postpartum depression and just depression with an included therapy used techniques to alleviate burdensomeness. Findings like those presented here suggest that targeting feelings of burdensomeness in particular among those who are suffering from postpartum depression may be highly effective in preventing suicidal behavior. An important question for future research is what specifically in the postpartum experience is likely to lead certain mothers to feel burdensome, and how those perceptions might be changed. Postpartum depression and suicidal behaviors in that population continue to be prevalent and important. Working to understand and provide support and help for those suffering should be future focus.

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| **Table 1** |
| *Frequencies Table for Depression and Suicidality*  |
|   | Yes  | No |
|   | Frequency  | % | Frequency | % |
| Ever felt depressed after the birth of child | 345 | 68.50 | 159 | 31.50 |
| EQ score (12 and above is yes) | 330 | 65.50 | 174 | 34.50 |
| Diagnosed with postpartumdepression | 79 | 15.70 | 425 | 84.30 |
| Suicidal thoughts  | 102 | 20.2 | 402 | 79.80 |
| *Note.* All percentages are based on total sample size(*N* = 504). The questions are all based on the year following the birth of the participants’ most recent child.  |

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| **Table 2** |
| *Frequencies Table for Suicide Attempts*  |
|   | Yes  | No |
|  | 1 | 2 | 3+ | 0 |
|   | Frequency  | % | Frequency | % | Frequency | % | Frequency | % |
| Suicide attempts | 9 | 1.80 | 3 | 0.60 | 2 | 0.40 | 490 | 97.20 |
| Severe suicide attempts | 8 | 1.60 | 0 | 0 | 1 | 0.20 | 495 | 98.20 |
| *Note.* All percentages are based on total sample size(*N* = 504). The questions are all based on the year following the birth of the participants’ most recent child.  |

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| **Table 3** |   |   |   |   |   |  |   |  |  |  |
| *Zero-Order Correlations Between all Predictors, PPD, Depressive Mood, and Suicidal Thoughts* |
|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1. Felt Depressed | 1  |  |  |   |  |  |  |  |  | . |
| 2. Suicidal Thoughts | .321\*\* |  1 |  |  |  |  |  |  |  |  |
| 3. Postpartum Depression | .293\*\* | .326\*\* |  1 |  |  |  |   |  |  |  |
| 4. Social Support | -.357\*\*   | -.296\*\* | -.081 |  1 |  |  |  |  |  |  |
| 5. Socioeconomic Status | -.257\*\* | -.242\*\* | -.10\*\* | .333\*\* |  1 |  |  |  |  |  |
| 6. Burdensomeness | .445\*\* | .570\*\* | .381\*\* | -.409\*\* | -.356\*\* | 1 |  |  |  |  |
| 7. Analytical Rumination  | .256\*\* | .136\*\* | .138\*\* | .012 | -.148\*\* | .243\*\* | 1 |  |  |  |
| 8. Mother’s age  | -.114\* | -.168\* | -.112\* | .028 | .050 | -.226\*\* | -.087 | 1 |  |  |
| 9. Birthweight of Child (kg) | -.059 | -.088 | -.074 | .013 | .006 | -.104\* | -.045 | .045 | 1 |  |
| 10. Edinburgh Depression | .580\*\* | .535\*\* | .442\*\* | -.456\*\* | -.357\*\* | .717\*\* | .311\*\* | -.195\*\* | -.108\* | 1 |
| *Note.* \**p*<0.05 level; \*\**p*<0.001 level; 2-tailed. *N* = 504. These relationships are based on the participants’ answers to the year following the birth of their most recent child |

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| **Table 4** |   |   |   |   |  |   |  |  |  |
| *Zero-Order Correlations Between all Predictors and Suicidal Attempts* |
|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1. Suicide Attempts | 1  |  |   |  |  |  |  |  | . |
| 2. Severe Suicide Attempts  | .705\* |  1 |  |  |  |  |  |  |  |
| 3. Social Support | -.118\*\*   | -.092\* |  1 |  |  |  |  |  |  |
| 4. Socioeconomic Status | -.168\*\* | -.125\*\* | .333\*\* |  1 |  |  |  |  |  |
| 5. Burdensomeness | .232\*\* | .222\*\* | -.409\*\* | -.356\*\* | 1 |  |  |  |  |
| 6. Analytical Rumination  | .062 | .041 | .012 | -.148\*\* |  | 1 |  |  |  |
| 7. Mother’s age  | -.084 | -.019 | .028 | .050 | -.226\*\* | -.087 | 1 |  |  |
| 8. Birthweight of Child (kg) | -.054 | -.041 | .013 | .006 | -.104\* | -.045 | .045 | 1 |  |
| 9. Edinburgh Depression | .212\*\* | .176\*\* | -.456\*\* | -.357\*\* | .717\*\* | .311\*\* | -.195\*\* | -.108\* | 1 |
| *Note.* \**p*<0.05 level; \*\**p*<0.001 level; 2-tailed. *N* = 504. These relationships are based on the participants’ answers to the year following the birth of their most recent child |

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| **Table 5** |
| *Hierarchical Regression Analysis of Predictors of Suicide Attempts* |
|  | Step 1 | Step 2 |
| Predictors  | β | t-test | β | t-test |
| Burdensomeness | .280\*\* | 5.998 | .280\*\* | 4.505 |
| Depressive Rumination | -.035 | -.780 | -.034 | -.716 |
| Socioeconomic Status | -.049 | -1.049 | -.046 | -.953 |
| Social Support |  |  | -.011 | -.211 |
| Depression(Edinburgh) |  |  | -.005 | -.082 |
| Birthweight of child (kg) |  |  | -.012 | -.268 |
| Age of mother at birth |  |  | -.021 | -.479 |
| R2 | .086 | .087 |
| F | 15.369\*\* | 6.592\*\* |
| Change in Rr |  | .001 (NS) |
| *Note:* \*p<0.05: \*\*p<0.001. These relationships are based only on responses to the year following the birth of the participants’ most recent child. NS = not significant.  |

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| **Table 6** |
| *Hierarchical Regression Analysis of Predictors of Severe Suicide Attempts* |
|  | Step 1 | Step 2 |
| Predictors | β | t-test | β | t-test |
| Burdensomeness | .273\*\* | 5.816 | .266\*\* | 4.261 |
| Depressive Rumination | -.037 | -.834 | -.041 | -.881 |
| Socioeconomic Status | -.037 | -.791 | -.035 | -.715 |
| Social Support |  |  | .006 | .109 |
| Depression(Edinburgh) |  |  | .018 | .272 |
| Birthweight of child (kg) |  |  | .021 | .481 |
| Age of mother at birth |  |  | -.019 | -.437 |
| R2 | .079 | .080 |
| F | 13.936\*\* | 5.991\*\* |
| Change in Rr |  | .001 (NS) |
| *Note:* \*p<0.05: \*\*p<0.001. These relationships are based only on responses to the year following the birth of the participants’ most recent child. NS = not significant.  |

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| **Table 7** |
| *Hierarchical Regression Analysis of Predictors of Suicide Attempts* |
|  | Step 1 | Step 2 |
| Predictors  | β | t-test | β | t-test |
| Socioeconomic Status | -.098\* | -2.014 | -.046 | -.940 |
| Social Support | -.101\* | -.2.105 | -.009 | -.167 |
| Depressive Rumination | .010 | .220 | -.033 | -.707 |
| Birthweight of child (kg) | -.029 | -.645 | -.012 | -.273 |
| Age of mother at birth | -.032 | -.702 | .020 | .455 |
| Burdensomeness |  |  | .284\*\* | 4.505 |
| Depression (Edinburgh) |  |  | -.003 | -.050 |
| R2 | .030 | .088 |
| F | 2.988\* | 6.611\*\* |
| Change in Rr |  | .058\*\* |
| *Note:* \*p<0.05: \*\*p<0.001. These relationships are based only on responses to the year following the birth of the participants’ most recent child. |

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| **Table 8** |
| *Hierarchical Regression Analysis of Predictors of Severe Suicide Attempts* |
|  | Step 1 | Step 2 |
| Predictor Variables  | β | t-test | β | t-test |
| Socioeconomic Status | -.091 | -1.854 | -.032 | -.663 |
| Social Support | -.089 | -1.840 | .016 | .316 |
| Depressive Rumination | .013 | .275 | -.040 | -.845 |
| Birthweight of child (kg) | .000 | .009 | .020 | .458 |
| Age of mother at birth | .045 | .999 | .102\* | 2.275 |
| Burdensomeness |  |  | .285\*\* | 4.555 |
| Depression (Edinburgh) |  |  | .028 | .424 |
| R2 | .024 | .090 |
| F | 2.376\* | 6.799\*\* |
| Change in Rr |  | .066\*\* |
| *Note:* \*p<0.05: \*\*p<0.001. These relationships are based only on responses to the year following the birth of the participants’ most recent child. |

Appendix A

 Roanoke College
 IRB Study #200600
 Informed Consent Statement
 Postpartum Experiences

**Key Information About This Study:**
We would like to invite you to be in a research study about postpartum experiences (i.e., experiences following the birth of a child). Some questions are about whether you have had experiences with depression, suicidal thoughts, and/or suicidal behavior, and may be sensitive or distressing to some people. If you are uncomfortable answering questions on these topics, you are under no obligation to participate in this study, and you may withdraw from the study at any time.   Participation in this study is voluntary; you do not have to take part if you do not wish to. If you do take part in the study you will take a brief 10-12-minute survey asking a series of questions regarding your own postpartum experiences. The survey will be completely done online and it will only last for the amount of time you take the survey. We do not believe there are any potential risks beyond that of everyday, but some of the questions pertaining to depression and suicide could be distressing. There could be potential benefits for society from this research. Participants will be compensated $1.30 for their complete and mindful answers.

**Study Information**
You are being asked to participate in a research study about postpartum experiences, the time following the birth of a child. Some of the questions are in regards to history of depression, suicidal behaviors, and thoughts. This may be distressing to some individuals and you are free to stop the study at any time.

The purpose of this study is to better understand postpartum experiences (i.e., experiences following the birth of a child).
**What will I do if I choose to be in this study?**
You will be asked to complete a series of questions regarding your postpartum history and experiences, social support, personal history with depression, suicidal thoughts and/or behaviors, and demographic information.

 **Study time:**The survey takes most people 10-12 minutes to complete.

 **Study location:** Completely online through the Prolific system.
**What are the possible risks or discomforts?**
Some questions asked in this survey pertain to participant histories with depression and suicide, and may be sensitive or distressing to some participants. Participants are under no obligation to participate in this survey if they do not wish to answer these questions.

**What are the possible benefits for me or others?**
To compensate you for a complete and thoughtful response (i.e., one that passes at least 80% of validity checks), you will receive $1.30 (€1.00). We also believe this research will benefit greater society and potentially help others.

**How will you protect the information you collect from me, and how will that information be shared?**
Results of this study may be used in publications or presentations. Your data will be handled with as confidential as possible. If this study is published individual information will not be shared. Data gathered in this study will be averaged across a large number of participants, and those results may be published in a psychology journal and/or presented at a psychology conference.
To minimize the risks to confidentiality, you will not be asked to provide any personal or identifying information in this study, and thus your responses will be in no way linked with your identity. Your responses will be stored in a password-protected file, and no one other than the investigators will have access to them, unless required by law. If you do not complete the survey, your data will be destroyed.

**What are my rights as a research participant?**
Participation in this study is voluntary.  You do not have to answer any question you do not want to answer.  If at any time and for any reason, you would prefer not to participate in this study, please feel free not to. You may withdraw from this study at any time, and you will not be penalized in any way for deciding to stop participation. If you decide to withdraw from the study your data collected will not be used and will be destroyed.

**Will the data collected be used in future studies?**
No private identifiable information will be collected in this study, so the data may be used in future studies without additional consent from the subject or legal representative.

**Who can I contact if I have questions or concerns about this research study?**

For other questions about the study, you should contact the Principal Investigator, Hayley Mulford (hjmulford@mail.roanoke.edu) or faculty advisor, Dr. Lindsey Osterman at the Department of Psychology, Roanoke College, Salem, VA 24153 or by email (osterman@roanoke.edu). You may also contact the office at Roanoke College, Institutional Review Board, Roanoke College, 221 College Lane- Admin 204A, Salem, Virginia 24153, 540-375-2409, email: irb@roanoke.edu with questions about participants' rights.

**Consent Statement**

 I have read and understand the study described above.  I am 18 years of age or older and I freely consent to participate.  I understand that I am free to withdraw myself and/or any data I provide from the study at any time during the experimental session without penalty.
   Please select “yes” if you consent to participation in this study.

* Yes
* No

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|  |

ID:

Please enter your Prolific ID.

Past

 The following questions will be asking about past experiences. These questions will be in reference to the time following the birth of your most recent child. Please respond to each question in reference to that past postpartum experience, not your current state.

Social Support

 Respond to the following items in reference to the year following the birth of your most recent child.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| There was a special person who was around when I was in need.  |  |  |  |  |  |
| There was a special person with whom I could share my joys and sorrows.  |  |  |  |  |  |
| My family really tried to help me.  |  |  |  |  |  |
| I got the emotional help and support I needed from my family.  |  |  |  |  |  |
| I had a special person who was a real source of comfort to me.  |  |  |  |  |  |
| My friends really tried to help me.  |  |  |  |  |  |
| I could count on my friends when things went wrong.  |  |  |  |  |  |
| I could talk about my problems with my family  |  |  |  |  |  |
| I had friends with whom I could share my joys and sorrows  |  |  |  |  |  |
| There was a special person in my life who cared about my feelings.  |  |  |  |  |  |
| My family was willing to help me make decisions  |  |  |  |  |  |
| I could talk about my problems with my friends.  |  |  |  |  |  |

Attention

Respond to the following items in reference to the year following the birth of your most recent child.
Please pay CAREFUL attention to the response options for each question, as they change.

Edinburgh Questionnaire

I had been able to laugh and see the funny side of things.

* As much as I always could
* Not quite so much now
* Definitely not so much now
* Not at all

I had looked forward with enjoyment to things.

* As much as I ever did
* Rather less than I used to
* Definitely less than I used to
* Hardly at all

I had blamed myself unnecessarily when things went wrong.

* Yes, most of the time
* Yes, some of the time
* Not very often
* No, never

I had been anxious or worried for no good reason.

* No, not at all
* Hardly ever
* Yes, sometimes
* Yes, very often

I had felt scared or panicky for no very good reason.

* Yes, quite a lot
* Yes, sometimes
* No, not much
* No, not at all

Things had been getting on top of me.

* Yes, most of the time I hadn't been coping as well as usual
* Yes, sometimes I hadn't been coping as well as usual
* No, most of the time I had coped quite well
* No, I had been coping as well as ever

I had been so unhappy I had difficulty sleeping.

* Yes, most of the time
* Yes, sometimes
* Not very often
* No, not at all

I had felt sad or miserable.

* Yes, most of the time
* Yes, sometimes
* Not very often
* No, not at all

I had been so unhappy that I had been crying.

* Yes, most of the time
* Yes, quite often
* Only occasionally
* No, never

The thought of harming myself had occurred to me.

* Yes, quite often
* Sometimes
* Hardly ever
* Never

I have been answering these questions honestly and accurately.

* Yes, completely.
* Yes, somewhat.
* No, somewhat not.
* Never

Socioeconomic Status

Respond to the following items in reference to the year following the birth of your most recent child.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Strongly Disagree | Disagree | Somewhat Disagree | Neither Agree nor Disagree | Somewhat Agree | Agree | Strongly Agree |
| I had enough money to buy things I wanted  |  |  |  |  |  |  |  |
| I didn't need to worry too much about paying my bills  |  |  |  |  |  |  |  |
| I didn't think I'd have to worry about money too much in the future.  |  |  |  |  |  |  |  |

Analytical Rumination Questionnaire

Indicate how often the following statements applied to you in the year following the birth of your most recent child.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | None of the time | Some of the time | Half of the time | Most of the time | All of the time |
| I tried to understand why I had these problems  |  |  |  |  |  |
| I tried to figure out what I had done wrong  |  |  |  |  |  |
| I thought about what I may have done to avoid these problems  |  |  |  |  |  |
| I thought about all the ways my life had become more difficult  |  |  |  |  |  |
| I thought about all the aspects of the problems I was facing that needed to be solved  |  |  |  |  |  |
| I thought about all the options for dealing with my problems  |  |  |  |  |  |
| I tried to figure out the best option for dealing with my dilemma  |  |  |  |  |  |
| I tried to figure out which of the problems I was facing were the most important and which I should do first  |  |  |  |  |  |
| I thought about whether some of the options I could take were likely to solve my problems or make things worse  |  |  |  |  |  |
| I thought about whether my options for dealing with one problem would make other problems worse  |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | None of the time | Some of the time | Half of the time | Most of the time | All of the time |
| I tried to figure out how to make the best out of a bad situation  |  |  |  |  |  |
| I tried to figure out how to best avoid future problems  |  |  |  |  |  |
| I tried to figure out what was wrong in my life  |  |  |  |  |  |
| I tried to learn from my mistakes  |  |  |  |  |  |
| I tried to figure out how to stick to my goals  |  |  |  |  |  |
| I tried to find an answer to my problems  |  |  |  |  |  |
| I tried to find a goal or purpose that was meaningful to me  |  |  |  |  |  |
| I tried to find a way to resolve an important issue  |  |  |  |  |  |
| I tried to understand the past and the present  |  |  |  |  |  |
| I tried to think through my difficulties  |  |  |  |  |  |
| I have been answering these questions honestly  |  |  |  |  |  |

Burdensomeness

 Respond to the following items in reference to the year following the birth of your most recent child.
Please respond using your own beliefs and experiences, not others.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Not at all true for me | Not true for me | Somewhat not true for me | Neutral | Somewhat true for me | True for me | Very true for me |
| I thought the people in my life would have been better off if I were gone  |  |  |  |  |  |  |  |
| I thought the people in my life would have been happier without me  |  |  |  |  |  |  |  |
| I thought I was a burden on society  |  |  |  |  |  |  |  |
| I thought my death would have been a relief to the people in my life  |  |  |  |  |  |  |  |
| I thought the people in my life wished they could be rid of me  |  |  |  |  |  |  |  |
| I thought I made things worse for the people in my life  |  |  |  |  |  |  |  |

How many biological children do you have? (This answer will be current)

* 1
* 2
* 3
* 4
* 5 or more (please specify how many) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

At what age did you have your first child?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What was your age during the birth of your most recent child?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What was the birth weight of your most recent child? (Specify measurement, pounds, ounces, kilograms)

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What was your marital status at the birth of your most recent child?

* Married
* In a committed relationship
* Widowed
* Divorced
* Separated
* Single, never married

In the year following the birth of your most recent child, did you ever feel depressed?

* Yes
* No

In the year following the birth of your most recent child, were you diagnosed with postpartum depression?

* Yes
* No

What do you think was the reason for your depression?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Postpartum Suicide

In the year following the birth of your most recent child, did you have any thoughts of suicide?

* Yes
* No

In the year following the birth of your most recent child, how many times had you attempted suicide?

* 0
* 1
* 2
* 3 or more

In the year following the birth of your most recent child, how many times had you had a suicide attempt so severe that it required medical attention?

* 0
* 1
* 2
* 3 or more

Did you ever feel depressed after the birth of any of your children?

* Yes
* No

Were you ever diagnosed with postpartum depression after the birth of any of your children?

* Yes
* No

Did you have any children after experiencing postpartum depression?

* Yes
* No

What was the birth weight of the child you experienced postpartum depression with? (Specify measurement, pounds, ounces, kilograms) If you experienced this with multiple children, use commas to separate birth weights.

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How old were you when you had the child you experienced postpartum depression with? If you experienced this with multiple children use commas to separate ages.

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Current

The follow questions will be asking about current experiences. Please respond to the following questions based on your current experiences, not your past.

Patient Health Questionnaire- 9

Over the last month, how often have you been bothered by any of the following problems?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Not at all | Several days | More than half the days | Nearly every day |
| Little interest or pleasure in doing things  |  |  |  |  |
| Feeling down, depressed, or hopeless  |  |  |  |  |
| Trouble falling or staying asleep, or sleeping too much  |  |  |  |  |
| Feeling tired or having little energy  |  |  |  |  |
| Poor appetite or overeating  |  |  |  |  |
| Feeling bad about yourself or that you are a failure or have let yourself or your family down  |  |  |  |  |
| Trouble concentrating on things, such as reading the newspaper or watching TV  |  |  |  |  |
| Moving or speaking so slowly that other people could have noticed. Or the opposite, being so figety or restless that you have been moving around a lot more  |  |  |  |  |
| Thoughts that you would be better off dead, or of hurting yourself  |  |  |  |  |
| Please select "Nearly every day" if you have been answering these questions honestly  |  |  |  |  |

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

* Not difficult at all
* Somewhat difficult
* Very difficult
* Extremely difficult

Present Suicide

In the past year, have you had any thoughts of suicide?

* Yes
* No

In the past year, how many times have you attempted suicide?

* 0
* 1
* 2
* 3 or more

In the past year, how many times have you had a suicide attempt so severe that it required medical attention?

* 0
* 1
* 2
* 3 or more

Demographics

Please identify your biological sex.

* Male
* Female

What is your gender identity?

* Man
* Woman
* Non-Binary
* Other (Please Specify) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is your sexual orientation?

* Straight
* Gay/Lesbian
* Bisexual
* Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Age

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ethnicity

* White
* Hispanic or Latino
* Black or African American
* Native American or American Indian
* Asian / Pacific Islander
* Other

Marital status

* Married
* In a committed relationship
* Widowed
* Divorced
* Separated
* Single, never married

What is your weight? (Please specify measurements, pounds/kilograms)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is your height (specify feet/inches, centimeters)?

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End of Survey

Thank you so much for taking the time to answer our questions about your postpartum experiences. Some of the questions you answered in this survey were about psychological distress, especially following the birth of a child. If you have ever, or are currently, struggling with depression or thoughts of suicide, please know that you are not alone. More than 1 out of every 10 mothers struggle with postpartum depression, and even more experience some of the symptoms of postpartum depression (e.g., depressed mood, difficulty concentrating), but are not diagnosed.

If you're struggling, please consider reaching out to a mental health professional in your area, or finding a qualified professional online who offers remote sessions (if you're interested, you can check out [this article](https://www.verywellmind.com/best-online-therapy-4691206) for information on 9 online mental health providers).

We would also like you to know that the national suicide prevention hotline (1-800-273-TALK, www.suicidepreventionlifeline.org) has people available to talk with you 24 hours a day, 7 days a week.

Please click the arrow to the next screen to complete the survey.

