

A Retrospective Comparison of American Women's Spontaneous Conceptions and Gestational Surrogate Pregnancies

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Abstract

Purpose:

To evaluate the retrospective pregnancy experiences of American women by comparing spontaneous pregnancies with gestational surrogate pregnancies.

Methods:

Data were collected via structured interviews following an approved survey tool utilizing an online video platform. In total, 97 interviews were conducted.

Results:

Demographic data was collected on age, ethnicity, primary language, country of birth, education, and income level. Data revealed that a woman was more likely to have a pregnancy that was high-risk during a surrogate pregnancy than a non-surrogate pregnancy, independent of maternal age or gravidity (OR 7.22, $p < 0.001$). A surrogate pregnancy had 4 times higher odds of resulting in a c-section ($p < 0.001$) as well as delivering at an earlier gestational age ($p < 0.001$). Further, women were more likely to experience adverse effects, including postpartum depression, following delivery of a surrogate child than their own biological child ($p < 0.001$). Finally, the rate of new post-surrogacy chronic health issues for non-white women was significantly higher than for white women ($p < 0.001$). Women reported using the payment they received for their surrogacy for basic needs. Almost half of the women reported using the money to pay bills or get out of debt.

Conclusions:

These results are among the first of their kind. This study reveals that surrogate health disparities exist and that there may be long-term complications after a surrogate pregnancy. This raises important social, economic, and ethical issues related to surrogacy which must be further explored. Future work will build on this study and help elucidate the circumstances and consequences surrounding this complex issue.

Key Words: ethics, family, gestational surrogacy, in vitro fertilization, maternal bonding, perinatal, pregnancy

Introduction

The use of gestational surrogacy, a form of third-party reproduction, to assist infertile heterosexual couples, single men, or same-sex male couples to have a child, is fast growing [1, 2]. Gestational surrogacy takes place when a woman agrees to carry a nongenetic pregnancy on behalf of an intended parent or parents. This contrasts with traditional surrogacy where the woman uses her own egg, as well as her womb, to facilitate conception. In traditional surrogacy, the woman carrying the child is genetically related to the child, but expects to give the child to an intended parent or parents. This paper will be focused on gestational surrogacy arrangements.

The first successful gestational surrogacy in the United States, was achieved in 1985, and rates of surrogacy have been on the rise since this time [43]. Social structures are changing rapidly especially in the United States. Delayed childbearing age, increased infertility, and the rise of same-sex and transgender couples has created a demand for, and focus on, reproductive technologies that are still relatively nascent, including gestational surrogacy. This has created a burgeoning industry. Global Market Insights reports that the surrogacy market revenues are expected to cross \$27.5 billion by 2025 [3]. While the use of gestational surrogacy as a means to build a family for others is on the rise, there is still little scientific research about the medical and psychological risks and complications, both short- and long-term, for the women who serve as gestational surrogates. There is also little research investigating the types of women who decide to become a surrogate and the impact on children born of surrogacy.

Of the research that has been done to-date, none has explored, through interview, the experiences of a large sample size of women who have participated in gestational surrogacy in the U.S., a top destination for third-party reproduction [4, 36]. This knowledge gap is especially important to address given the newness of gestational surrogacy, the popularity of the U.S. as a surrogacy destination, and the profound impact that such technology will have on those involved (the surrogate herself, her family, the intended parents (I.P.), and the child of the surrogate pregnancy) and on society as a whole. Pregnancy and fertility, already deeply personal experiences, are complicated in surrogacy by the context in which the intended parents and surrogate find themselves. Cultural attitudes, laws, and restrictions surrounding surrogacy vary by state and by country throughout the world. Many laws are still being formulated as states and countries struggle to keep up with advancing reproductive technologies. In the U.S., differences among states yields different rights for the surrogate mother, the child(ren) she births, and the intended parents. Authors realize that the surrogacy industry prefers the term “gestational carrier” to “surrogate mother”; however, authors reject the term of calling women carriers as we find it to be dehumanizing and the reduction of a women to mere function.

Around the world, some countries have banned international surrogacy but allow it between citizens within their own borders, others restrict it to heterosexual couples with an underlying fertility issue, or only allow altruistic surrogacy (surrogacy without compensation), such as in Greece, Thailand, Portugal [5]. India recently imposed strict regulations on surrogacy in part due to exploitation of Indian women by foreign internationals [6]. Studies from different countries are varied in their sample sizes, methods and results with no easily generalizable conclusions. For example, in a study of Iranian women, Tehran and colleagues carefully articulated the emotional distress of surrogate mothers, but the study was limited by a sample size of only eight

[7]. A much larger study of the experiences of 184 Canadian surrogates described mixed results with both positive and negative experiences. Canada is remarkably different from the U.S. though because surrogacy in Canada is altruistic; that is, compensation or an offer of compensation to a woman acting as a surrogate is prohibited by law and subject to serious penalty [8, 44]. This is not the case for women in the U.S. Given these many factors at play, greater knowledge concerning surrogacy and the motivation of women who choose to act as surrogates in the U.S. is crucial to obtain.

Data concerning physical and mental health outcomes related to gestational surrogacy is similarly limited. The first study to document significant obstetrical complications in surrogate mothers was completed in 2005. In a study of ten gestational surrogate mothers, two had hysterectomies and blood transfusion [9]. This was the first study to illustrate potential health risks and long-term sequelae that surrogate mothers may experience. Almost a decade later, researchers in California sought to determine the impact of assisted reproductive technologies (ART) on pregnancy-related outcomes [10]. Although this study included all ART forms including artificial insemination in addition to surrogacy, researchers found a fourfold increase in stillbirths, a fourfold increase in cesarean sections for mothers who utilized ART, and a nearly fourfold increase in preterm birth [10]. A study in 2017 finally looked at pregnancy outcomes of gestational surrogate pregnancies alone [11]. This robust study examined the records of 124 surrogates and found a significant difference in physical outcomes between their own spontaneous pregnancies and their gestational surrogate pregnancies [11]. In surrogate pregnancies the incidence of cesarean section was higher, with higher twin pregnancy rates, and lower mean gestational age at delivery. It was also concluded, “neonates born from commissioned embryos and carried by gestational surrogates have increased adverse perinatal outcomes, including preterm birth, low birth weight, hypertension, maternal gestational diabetes, and placenta previa, compared with singletons conceived spontaneously and carried by the same woman” [11].

While surrogacy is often valorized as “the right to have children of one's own” and often thought of as a way for surrogate mothers to experience a sense of value and achievement [12], psychological distress in surrogacy has been described as “significant” [13]. As previously mentioned, a study in Iran documented significant emotional stress among surrogate mothers [7]. One study in Mumbai found that Indian gestational surrogate mothers experienced higher levels of depression across pregnancy and several months following birth and displayed lower emotional connection with the unborn baby [14]. Of course, there are many factors that make many surrogacies in India vastly different than in the U.S. Surrogacy in India, unlike the U.S., is frequently kept a secret by the surrogate and her family as it is considered immoral [15]. Surrogates can face social humiliation and criticism from family members and the wider community, and may be shunned by persons in these networks [16].

Presenting contrary findings, from the United Kingdom, Javda and colleagues reported that gestational surrogate mothers do not appear to experience psychological problems as a result of the surrogacy arrangement [17]. In their follow-up report with 20 surrogate mothers, they claimed that a majority of surrogate mothers did not experience psychological problems in the decade following the birth of a surrogate child [18]. Of the 18 women who completed the Beck Depression Inventory, there were no signs of depression and none of the surrogate mothers scored below a

normal range for self-esteem [18]. Unlike the social stigma women in India face, western countries like the U.S or U.K. seem to afford women more freedom and acceptance of what would be considered progressive values [50].

Not only are there medical risks to surrogate mothers and infants, but the decision to act as a gestational surrogate is also ethically complicated by financial inducement, which can function as coercion in cases of poverty or emergency financial need. In 1994 Eric Blyth published an article where his team interviewed just 19 British women about their surrogacy experiences. He found that, like women in the U.S., both financial gain and altruism are motivating factors in becoming a surrogate mother [19]. However, a majority of the women he interviewed claimed that money should not be the prime motivating factor [19]. Another researcher, Sheela Saravanan reported that “surrogacy [in India] was a bazaar where everything about women’s reproductive capacity and the children born was priced,” including the number, weight, and gender/(dis)abilities of the child(ren) born [20]. All of the Indian surrogate mothers Dr. Saravanan interviewed were facing severe economic difficulties at home. One woman stated “this process is so distressing that I would not have done it even if someone paid me ten times the remuneration, had I been well-off, but I am so desperate [for money] that I would do it even if I was paid just one third the amount” [20]. Because of risks to women’s health and the concern of exploitation, India has moved to prohibit commercial surrogacy and banned transnational surrogacy.

The present study sought to validate and explore some of the claims made by Woo and others through directly interviewing women with gestational surrogacy experience in the U.S. Using a network of women who had been gestational surrogates and consulting with experts, the CBC designed a questionnaire that contained quantitative and qualitative questions about their pregnancy experiences as well as standardized psychological tests on post-traumatic stress disorder (PTSD), depression, and dissociation. This research project investigated both the medical and psychological sequelae of commercial gestational surrogacy via in-depth interviews with a sample of 98 women from the U.S. which is currently a primary destination for commissioning parents to obtain children from surrogacy. There is an urgent need for such research, because legislation enabling or regulating commercial surrogacy has been passed in various locations in the U.S. [21].

Methodology

The Gestational Surrogacy Research Project draws upon the 2020 survey data from interviews with 97 gestational surrogates in the U.S. The survey tool was designed by the Center for Bioethics and Culture in Pleasant Hill, California and approved by Pearl Pathways Institutional Review Board (IRB) (#20-CBCN-101). Included in this research were the Beck Depression Inventory and the PTSD Checklist for DSM-5 (PCL-5). The survey contains five sections: Demographic Characteristics and Pregnancy History, Learning about Surrogacy and Physical Health History, PTSD Checklist for DSM-5 (PCL-5), Depression Inventory, and finally, Substance Use, Trauma, and Dissociation. The structured survey included both qualitative and quantitative questions. The survey included three open-ended questions and the last one allowed the interviewee to share any further thoughts and details. The final IRB approved survey, plus the Beck Depression Inventory and PCL-5, was then uploaded to Qualtrics^{XM} (July 2020).

Advertisements were placed on social media, i.e. Facebook and Instagram advertisements, in order to recruit women who met inclusion criteria. Respondents to the advertisement were first screened using the following inclusion criteria. Participation required a woman to be 21 years old or older, have acted as a gestational surrogate at least once, be able to give verbal informed consent, not be employed by a fertility clinic, reside in the U.S., and able to speak English. Those women who met inclusion criteria were scheduled for an interview using a secure online video platform. Surveys were structured and administered by an "interviewer." The 'interviewer' collected and recorded data while in the process of conducting the interview.

Consent to participate in the research was through an information sheet given to participants in advance of the scheduled interview. Participants gave their verbal consent after reading the information sheet and prior to starting the interview. Participants were guaranteed total anonymity in their responses and could skip any questions they did not want to answer, without any explanation. No personal identifying information was collected in the survey. Interviews were not audio or video recorded. Each participant was interviewed using the same standardized survey sequence, but not all women answered the same number of questions as each woman had different experiences. The survey was designed so that only pertinent questions to their experiences would be asked. For example, if a woman responded that 'no' she did not have a partner, questions were not asked about a partner's level of education or employment status. Participants were compensated with a fifty-dollar Amazon gift card for their time.

Data was examined using QualtricsSM Stats iQ Describe, Pivot, and Relate functions and in R version 3.6.3 [51]. Further quantitative analysis was performed, again using the Stats iQ package for QualtricsSM. Any text in quotation marks indicates extracts of participants' comments to open-ended questions. Using the Stats iQ toolkit, Custom Logic and Formula Variables were built using Survey Variable data criteria and Condition Sets for further use within Stats iQ Workspaces. Custom Variables in R were used to assess sets of combined Survey Variables. Variables were analyzed using ordinary linear and logistic and logistic regressions, T-tests, and Chi-Squared test where appropriate.

Results

Demographic Data

In total, 97 interviews were conducted; demographic data is found in Table 1a and Table 1b. Participants ranged in age from 24 to 58 with a median age of 34. Ninety-one women reported English as their first language and 86 women identified as white. Other represented ethnicities included Latino or Hispanic (7), biracial or multiracial (3), and Black or African American (1). Seventy women were employed at the time of the interview and the median annual family income reported was \$85,000; the minimum reported income was \$13,000 and the maximum \$225,000. Seventy-five of the 97 women had some post-secondary school education: 17 had an associate degree, 43 had a bachelor's degree, 14 had a master's degree, 22 were high school graduates; only one woman did not complete high school. No women had a doctorate or Ph.D. level education. Of the 87 women who had a husband or partner, 50% of the partners had only a high school education or associate degree.

Variable	Median	Mean	SD	Minimum	Maximum
Age	34	34.6	[5.65]	24	58
Annual Family Income	85,000	87,600	[42100]	13,000	225,000
Surrogacy Payment	37,000	37,700	[12700]	0	80,000
Total Pregnancies	4	3.9	[1.6]	1	12
Total Children Born	4	3.86	[1.42]	1	8
Surrogate Pregnancies	1	1.46	[0.791]	1	5
Surrogate Children Born	1	1.64	[0.981]	0	5

Table 1a. Demographic data for study participants, including age, income, and total pregnancies per participant.

Language	English	93
	Creole & French	1
	Spanish	3
Race/ Ethnicity	White	86
	Black	1
	Biracial	3
	Hispanic or Latina	7
Husband or Partner	Yes	89
	No	8
Employed	Yes	70
	No	27
Partner Employed	Yes	87
	No	2
Personal Education	Did not graduate H.S.	1
	GED/ High School	22
	Associates Degree	17
	Bachelor's Degree	29
	Master's Degree	8
	Doctoral Degree	0
Partners Education	GED or High School Graduate	31
	Associate Degree	18
	Bachelor's Degree	29
	Master's Degree	8
	Doctoral Degree	2

Table 1b. Demographic data for study participants.

Pregnancy Outcomes

The average number of pregnancies, including known abortions and miscarriages, per woman was four (minimum of one and maximum of twelve) and each respondent had a range from one to five surrogate pregnancies. Not every pregnancy ended in a live birth. There was a total of 142 surrogate pregnancies and 236 non-surrogate pregnancies among the 97 women interviewed; not every pregnancy ended in a live birth. There was a total of 159 surrogate children and 215 biological children born from the study population. *In vitro* fertilization (IVF) is required to achieve a gestational surrogate pregnancy. Some participants reported having multiple IVF

cycles, due to failed cycles, to achieve one surrogate pregnancy. One woman told her IVF story this way:

“During the IVF stage of taking hormones, Lupron gave me hot flashes and they didn't take me off it and I just tolerated it. At 7 weeks I had a positive pregnancy test but the ultrasound showed no heartbeat. I was told it was a blighted ovum so I had a D and C [Dilation and Curettage]. I did another transfer for the intended parents that was a failed transfer, so it took a while for me to finally get pregnant for them after the third transfer.”

Interviewers asked about complications during the IVF process using a list of common IVF side effects and the most common side effect was mood swings (reported by 53% of the women). Other reported side-effects included headache (44%), allergic reactions (17%), infection (2%), and “other” non-listed side effects such as weight gain (16%). Some participants commented on their weight gain at the end of the survey:

“I did experience weight gain with the fertility drugs. It was about 5-8 pounds of weight that I gained before I was even pregnant.”

“I did gain weight when on the fertility drugs, almost 30 pounds, for the 3rd surrogacy.”

Some women reported more than one side effect and others experienced no side-effects from the IVF process.

Data revealed that there was a statistically significant ($p < 0.001$) relationship between gestational age at delivery and pregnancy type (Table 2).

	Surrogacy	Biological	Total
Preterm (<37 weeks)	23 (18%)	3 (1.5%)	26
Early Term (37-38.6)	32 (24%)	36 (17%)	68
Term (39-40.6)	73 (56%)	137 (65%)	210
Late Term (41-41.6)	3 (2.3%)	21 (9.9%)	24
Post Term (>42 weeks)	0 (0%)	15 (7.1%)	15
Total	132	211	343

Table 2. Gestational age at delivery for surrogacy and biological pregnancies.

From Table 2 surrogate pregnancies were associated with delivery at an earlier gestational age, described as either early or preterm, with an OR of 3.2 (95% CI; 2, 5.3) higher chance than non-surrogate or biological births. Controlling for maternal age and gravidity leaves this largely unchanged, OR 3.3 (1.8, 6.2).

According to the University of California, San Francisco, between 6-8% of all pregnancies have high-risk complications [42]. In our survey, women were asked if each pregnancy was

considered high-risk by their doctor. Analysis revealed that a woman was more likely to have a pregnancy that was high-risk during a surrogate pregnancy than a non-surrogate pregnancy, with an OR of 10.7 (5.4, 23; $p < 0.001$). It is understood that maternal age and gravidity can impact pregnancy risks. Further analysis showed that when controlling in a logistic regression for age and gravidity, we found that surrogate pregnancies were still 7 times more likely to be high-risk than their non-surrogate, age matched counterparts (OR 7.22, 3.1-18; $p < 0.001$; Figure 1). That is, the rate of high-risk pregnancy is higher in surrogate pregnancies at each additional pregnancy threshold when compared to non-surrogate pregnancies. The same was true for age. As women aged, the risk was higher in surrogate pregnancies compared to age matched non-surrogate pregnancies. This is shown in Fig. 1.

FIGURE 1

Figure 1. Pregnancy risk rates for surrogate and non-surrogate pregnancies.

Figure 1 represents the logistic regression model on high-risk pregnancy as a function of pregnancy type, age, and controlling for gravidity. Each point on the graph represents the modeled probability of a high-risk pregnancy given a specific pregnancy type, maternal age and gravidity. This represents a predictive approach to the analysis, and is given by the predictive posterior of the model in a Bayesian sense, fit using default priors of the `rstanarm` package version 2.21.1, with the models fitted with the default number of four chains and of 10,000 iterations each. Details of the predictive approach can be found in Briggs [52].

Since gravidity was a feature of the model, specific values had to be picked for the Figure, as well as age and pregnancy type. A linear relationship of maternal age and gravidity was discovered: as maternal age increased, gravidity increased on average. The values we used in the Figure were based on a predictive linear regression of the two variables, with the results that ages 15-21 had a gravidity of 1, 22-29 a gravidity of 2, 30-35 a gravidity of 3, 36-41 a gravidity of 4, and 42+ a gravidity of 5. These values are in no way crucial, and were chosen merely to illustrate the predictive model. The value of the predictive approach to analysis is that any values thought useful can be used.

It is clear here that as maternal-fetal age and gravidity increase, the probability of a high-risk pregnancy also increases, and is always larger and rises faster for surrogacy pregnancies.

Participants were asked about any complications or adverse effects that they might have experienced during their pregnancies. These are summarized in Table 3. Women were asked about complications during their surrogate pregnancies and non-surrogate pregnancies as a whole. They were not asked about complications or adverse effects specific to each individual pregnancy. Complications or adverse effects were defined as: high blood pressure during pregnancy, preeclampsia or eclampsia, gestational diabetes, hemorrhage, infection related to pregnancy, pre-term labor, hyperemesis gravidarum, anemia, ectopic pregnancy, placenta previa, placental abruption, ovarian cysts, miscarriage, postpartum depression, high blood pressure in the postpartum period. Not all surrogate pregnancies resulted in complications or adverse effects. The most complications that one woman faced during her surrogate pregnancy, that she did not experience during her non-surrogate pregnancy or pregnancies, was seven. Overall,

surrogate pregnancies were more likely to result in complications or adverse effects than non-surrogate pregnancies ($p < 0.001$).

Complication/ Adverse Effect	Surrogate Pregnancy	Non-Surrogate Pregnancy
High Blood Pressure	22	6
Preeclampsia or Eclampsia	10	0
Gestational Diabetes	8	5
Hemorrhage	19	6
Infection (related to pregnancy)	3	2
Pre-term Labor	18	7
Hyperemesis Gravidarum	13	10
Anemia	18	21
Ectopic Pregnancy	3	2
Placenta Previa	7	2
Placental Abruption	2	0
Ovarian Cysts	5	9
Miscarriage	12	12
Postpartum Depression	22	14
High Blood Pressure (in the postpartum period)	15	2

Table 3. Complications or adverse effects during surrogate and non-surrogate pregnancies. Surrogate pregnancies were more likely to result in complications or adverse effects than non-surrogate pregnancies ($p < 0.001$).

A simple adverse effect score was created by summing the number of complications each woman experienced for each pregnancy type. Non-surrogate pregnancies had a mean score of 1, and surrogate pregnancies a mean score of 1.7; the average difference was 0.7 (0.29, 1.1; $p = 0.0007$).

Women were asked “since your surrogacy experience(s) has a doctor diagnosed you with any illness?” Eighteen women stated that their doctor had diagnosed them with a new illness or medical condition after their surrogate pregnancies. New condition(s) were recorded using a free-text response. Responses included, but were not limited to:

“I have a degenerated disc in my back from all the extra weight I gained from the twins”

“high blood pressure”

“rectocele”

“uterine fibroid and hypermobility”

“bilateral pulmonary embolism with lung infarct a week later with collapsed lung”

“irritable bowel syndrome and anxiety, clinical depression, and PTSD”

“pre-diabetes, hypothyroidism, pre-hypertension”

“I was diagnosed with uterine fibroids after my second surrogacy”

“I am dealing with uterine prolapse and had high blood pressure for 8 weeks.”

“Anemia with iron infusions followed with hysterectomy”

“I was diagnosed with hydronephrosis secondary to UPJ [Ureteropelvic junction] obstruction.”

Women were more likely to deliver via c-section during surrogate pregnancies when compared to deliveries from non-surrogate pregnancies ($p < 0.001$; Table 4). When analyzed, a woman with a surrogate pregnancy had 4 times higher odds of delivering via c-section rather than vaginally (OR 4.04; CI 2.4-7). The percent of c-sections in non-surrogate pregnancies was only 12.2% while that of c-sections in surrogate pregnancies was 35.3%. In total, 15 of the 47 surrogate C-sections were emergent (31.9%); the rest were planned. Six of the 26 non-surrogate c-section were reported as emergent (23.1%).

	Vaginal Deliveries	C-sections		
		<i>Non-emergent</i>	<i>Emergent</i>	<i>Total</i>
Surrogate Pregnancy	86	32	15	47 (35.3%)
Non-Surrogate Pregnancy	187	20	6	26 (12.2%)

Table 4. C-section and vaginal deliveries by pregnancy type. Women were more likely to deliver via c-section during surrogate pregnancies when compared to deliveries from their non-surrogate pregnancy ($p < 0.001$).

One woman shared her experience:

“My second surrogacy I aspirated after vomiting during the c-section. I have no memory of any the delivery of my section surrogacy. I had an amniotic fluid embolism and a hemorrhage. They had my husband tell me goodbye (as if I was dying). I had to go to the ICU. I was sedated for 36 hours. I had to go through physical therapy. I couldn't use my hands. It took a year to recover. I had a uterine ablation and cannot have any more kids.”

Another shared hers:

“I was 40 when I was surrogate, so I was high-risk because of my age. I had a CT and MRI that showed I had placenta percreta and it was attaching to my intestines and they said at that point I had to go to Minnesota and live in Minnesota to be near a high-risk hospital who could take care of me. Intended parent lived in Chicago and I lived in Wisconsin so we moved into a hotel for about two weeks. I was 32 weeks when they picked this up and I delivered at 34 weeks. I had a planned vertical c-section. My husband was so worried because when we did all the research, we saw this was so bad. They had all the blood on hand. I had seven transfusions. I delivered, they knocked me

out and took the baby and I had transfusions during and after. The intended parents felt horrible, they sent my whole family on an all-expenses paid vacation. I dipped into depression for about six weeks, as I had to grieve the loss of my uterus and then I bounced back.”

Pregnancy Outcomes Related to Mental Health, Postpartum Depression and Bonding

Postpartum Depression

Most women experience postpartum "baby blues" after giving birth. “Baby blues” may include mood swings, bouts of tearfulness or crying spells, anxiety and difficulty sleeping [45]. For some women, a more severe, long-lasting form of depression known as postpartum depression can occur. Exact postpartum depression rates are unknown and statistics on the topic vary, but it is suggested that postpartum depression occurs in 10-20% of new mothers. In this study, women were asked if they had a pre-pregnancy diagnosis of any mental illness, and if they received a diagnosis of postpartum depression. Participants were also evaluated using the Beck Depression Inventory, a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression [22]. A score of 1-10 on the Beck Depression Inventory is considered normal ups and downs, a score of 11-16 indicated mild mood disturbance, a score of 17-20 indicated borderline clinical depression, a score of 21-30 indicated moderate depression, 31-40 indicated severe depression and a score over 40 indicated extreme depression.

Although not statistically significant, this study showed that there was an increased rate of postpartum depression in surrogate pregnancies when compared to non-surrogate pregnancies (22.9% vs 14.6%, respectively). Two women talked about their postpartum depression in their closing remarks:

“I did have post-partum depression with my surrogacy which is odd because I didn't have it with my own pregnancy. I couldn't stop crying and I did go on Prozac for about a month and then I was weaned off. I didn't know what I was experiencing.”

“Regarding postpartum depression, I was sad and worried about the babies when they were in the NICU but once they were home, the sadness went away. I didn't do anything to cause their early birth but when you're pregnant for somebody you feel a huge sense of responsibility.”

Next, we investigated Beck Depression Inventory (BDI) and PCL5 Trauma scores for women, controlling for the number of high-risk biologic or non-surrogate and surrogate pregnancies they had.

For every non-surrogate pregnancy a woman had, her BDI rose on average by 1.1 points (95% CI -0.34 – 2.5; p-value = 0.14), but for every surrogate pregnancy she had, her BDI rose on average 2.4 points (0.42 – 4.4; p-value 0.019). The threshold for the BDI for some form of depression or disturbance is 10. The number of non-surrogate pregnancies a woman had was not predictive of scores greater than 10, with odds increasing 1.27 times for each non-surrogate

pregnancy, but with a confidence interval of (0.75 – 2.1; p-value 0.36). Number of surrogate pregnancies was also not predictive of scores greater than 10, with odds increasing 1.75 times for each surrogate pregnancy, with CI (0.89 – 3.37; p-value = 0.09).

For every non-surrogate pregnancy a woman had, her PCL5 score rose on average by 1.4 points, but with a 95% CI (-0.75 – 3.5; p-value = 0.21), and for every surrogate pregnancy she had, her PCL5 rose on average 2.8 points CI (-0.21 – 5.8; p-value 0.07). The threshold for the PCL5 for some form of trauma is 33. Here the effect was reversed. The number of non-surrogate pregnancies a woman had was predictive of scores greater than 33, with odds increasing 3.5 times for each non-surrogate pregnancy, with a confidence interval of (1.27 – 13.1; p-value 0.026). Number of surrogate pregnancies, on the other hand, was not predictive of scores greater than 33, with odds increasing 2.0 times for each surrogate pregnancy, but with a CI (0.48 – 7.4; p-value = 0.28).

We then looked at BDI and PCL5 as it related to only pregnancies that were high-risk. Controlling for non-surrogate and surrogate high-risk pregnancies simultaneously, the number of non-surrogate high-risk pregnancies was not associated with a BDI > 10, OR 2.78 (0.67, 14.9; p-value = 0.18), however the number of surrogate high-risk pregnancies was associated with a BDI > 10. For every increase in surrogate high-risk pregnancies, the odds of BDI > 10 increased 4.3 times (2.0, 11.5; p-value = 0.0008). Not only are high-risk surrogate pregnancies associated with a higher Beck Depression score, but a higher count of high-risk surrogacies served as a positive predictor of a mother's Beck Depression score (p-value <0.05).

Again, controlling for both non-surrogate and surrogate high-risk pregnancies simultaneously, the number of biologic high-risk pregnancies was associated with a PCL5 > 33, OR 3.5 (1.3, 13; p-value = 0.026), but the number of surrogate high-risk pregnancies was not, OR 2.0 (0.48, 7.4; p-value = 0.28).

Bonding and Contact

Maternal-fetal bonding is a well-known and widely studied phenomenon [23-27]. How surrogacy affects this bond is not, however, well understood. A study from 1991 using the Maternal-Fetal Attachment Scale indicated that surrogate mothers demonstrate less attachment to the fetus than non-surrogate mothers [37]; this parallels with how surrogate mothers are expected to react towards their surrogate pregnancy and fits the narrative presented to them by fertility clinics.

To help evaluate a perceived bond in the present study, women were asked how bonded they felt to the fetus or fetuses during a pregnancy on a scale of 0-100 where 0 indicated no bond at all and 100 indicated that the mother bonded intensely. Analysis of bonding showed that across pregnancies, the mean bonding score for non-surrogate pregnancies was 86.9 (on a 0-100-point scale), and for surrogate births a mean of 42.1. A t-test of the difference gave a p-value <0.000001. The difference of bonding score from surrogate pregnancies was -44.8 with a 95% CI (-50.6- -38.9).

Beyond statistical analysis, some of the participants voluntarily detailed their feelings and expectations concerning bonding in an open-ended response. When asked "If you had a close

friend who was curious about surrogacy or who was considering surrogacy, how would you explain surrogacy to your close friend?" some women replied:

"Surrogacy is carrying a baby that is not biologically yours for someone else."

"I would say the first thing is you have to go into it knowing that it is not your child and you have to learn separate. It's not your child and compartmentalize your feelings. You can't be selfish - it is your body but it is someone else's a child. The money is a big thing so be prepared to ask questions from ignorant comments from people are opposed to surrogacy."

"I would say that you have to enter the process knowing that it is not your child. That it is extremely fulfilling and that you are going to feel connected to the baby, and that is great, but you are connected as sort of the life source as opposed to the emotional connection a mother has for her child."

"I explain that it's my bun [in] another's oven. It's a very straightforward process. People need to be emotionally ready and not want to keep the baby."

"I would explain it as extreme babysitting. They just use my oven. I used my own medical insurance. You cannot have any emotional connection. If you have an emotional connection, it will be hard on you."

"It's like having your own child but you give it away at the end."

"I would explain to them that the emotional attachment is something they have to prepare for b/c that is different than your own pregnancy. And there is a bond that you build with a family that you are growing their baby for. Before you become pregnant you have to have the mindset that this baby isn't yours and separation after birth is going to happen."

"Babysitting a baby in your belly that you don't take home. You get to give it back to its parents."

One surrogate mother shared that even an intended mother, a physician, recognized that bonding was an important phenomenon:

"They asked me to nurse the baby, because the mom is a doctor and wanted the connection from the baby to her to be a slow connection - a smooth transition from surrogate to intended mother. She would do skin-to-skin with the baby but they wanted me to nurse for that first week. Compensation for breast milk was about \$1200 a month."

Even if a surrogate mother may admit that she is less attached to a fetus from a surrogacy contract, there may be a physical connection even deeper than anyone has thought. Scientific advances in the maternal-fetal cell exchange science have shown that intimate biological connections are established between the mother and fetus which creates a lifelong intimate biological connection between the two [28].

This study not only evaluated bonding during pregnancy, but explored contact after birth of the surrogate child or children. Each of the women were asked about their contact, or lack of contact, after each surrogate pregnancy. ‘Contact’ was defined broadly and included as much as in-person visits or as little as photo updates. During a first surrogacy (n=95), 86% of women stated that they were in contact with the intended parent(s) and 67% were in contact with the child(ren). During a second surrogacy (n=29), 83% of women were in contact with the intended parent(s) and 72% were in contact with the child(ren). During a third surrogacy (n=11), 82% of women were in contact with the intended parent(s) and 60% were in contact with the child(ren). During both fourth (n=2) and fifth (n=1) surrogacies, 100% of women were in contact with the intended parent(s) and 100% were in contact with the child(ren).

Participants were then asked if they were satisfied with the amount of contact they had with either the intended parent(s) and children after delivery for each surrogacy. During each surrogacy, the number of women who reported they were satisfied with the amount of contact with the intended parent(s) was: 76.6% (n=94, first surrogacy), 82.8% (n=29, second surrogacy), 81.8% (n=11, third surrogacy), 100% (n=2, fourth surrogacy), 100% (n=1, fifth surrogacy). During each surrogacy, the number of women that reported yes, they were satisfied with the amount of contact with the child(ren) was: 75.5% (n=94, first surrogacy), 92% (n=25, second surrogacy), 80% (n=10, third surrogacy), 100% (n=1, fourth surrogacy), 100% (n=1, fifth surrogacy).

Since each woman had one to several surrogate pregnancies, she had the opportunity to be in contact, or not, with the intended parent(s) one to several times, and again to be satisfied or not with that contact each time, and the same for contact and satisfaction with the children each time. Since the number of surrogacies was variable, we asked whether in any surrogacy the woman was not in contact with the parents, or whether she was not satisfied with that contact, or whether she was not in contact with the children, or whether she was not satisfied with that contact, all in any surrogate pregnancy. For instance, if a woman had three surrogate pregnancies and she was satisfied with two and unsatisfied with one, we counted that as “some dissatisfaction”, and so on for the remaining variables.

Only 20.6% of women had some level of non-contact with intended parent(s), and 29% had some dissatisfaction with that contact. Just over 40% of women had some level of non-contact with the children of the surrogate pregnancies, and 28.8% had some level of dissatisfaction with that contact.

We next examined these measures in conjunction with the BDI and PCL5. Some level of non-contact with intended parent (2) was associated with higher odds of BDI > 10 (OR 7.1; CI 2.3 - 23; p-value 0.0008) and higher odds of PCL5 > 33 (OR 13.4; CI 1.6 - 280; p-value 0.029). Some level of dissatisfaction with parental contact was associated with higher odds of BDI > 10 (OR 6.8; CI 2.26 - 22.3; p-value 0.0009) but not with PCL5 > 33 due to insufficient data (only 4 women had a PCL5 > 33, and so estimates could not be formed).

Some level of non-contact with the children was also associated with BDI > 10 (OR 3.4; CI 1.17 - 10.8; p-value 0.028), but not with higher odds of PCL5 > 33 (OR 4.7; CI 0.58 - 98; p-value 0.18). However, some level of dissatisfaction with child contact was associated with higher odds

of BDI>10 (OR 9.6; CI 3.1 - 34; p-value 0.00017), but again not with PCL5 > 33 and for the same reason of insufficient data.

Despite the women's overall reporting of high levels of satisfaction in their contact with both the intended parents and the children after birth in the questionnaire, in the open-ended response at the end, some women voiced significant dissatisfaction on both accounts. Two women explained:

“In the beginning, the intended fathers were open about expectations. I had told them I would like updates and videos. I wanted to be involved. The intended fathers were all for it. We had agreed that maybe the baby would get to meet me in the future. After delivery, it was very different. They didn't come see me. I had to go to their room. I have always had to reach out to them. I haven't seen the baby since delivery. I have had contact with the intended fathers four times since the delivery. I reached out on Facebook and now I can see some photos. I feel like they lied to me just to get a surrogate in California. That has been the hardest part to overcome. They are in Southern California and I am in Northern California. They haven't reached out to try and meet up even though I have traveled there and they have traveled north. I would like to do another journey, but I wouldn't do it with them.”

“I am in contact with the IP and children from my first two surrogacies, but I have no contact with the IP and children from my last surrogacy and that makes me sad.”

Further examination showed that if a surrogate mother admitted to having some lack of contact with intended parent(s) this was associated with a higher chance of feeling exploited with an OR=8.6 (CI 2.8 – 28; p-value = 0.0002). Having some level of dissatisfaction with the contact with intended parent(s) was also associated with a higher chance of feeling exploited with an OR=11.1 (CI 3.6 – 39; p-value = 0.00005). The same was true between the surrogate mother and the child(ren) she birthed. Having some lack of contact with the children from surrogacy was associated with a higher chance of feeling exploited with an OR=5.3 (CI 1.8 – 18; p-value = 0.004). Some level of dissatisfaction with her contact with the child was also associated with a higher chance of feeling exploited with an OR=25.4 (CI 7.2 – 122; p-value = 0.000004).

Additionally, women who felt they were less informed about the surrogacy process also reported feeling more exploited more frequently than mother's who were more informed about the process. Being informed was measured on a scale of 0 (not informed) to 100 (fully informed). For every increase in this scale by 1 point, the odds of feeling exploited decreased by 0.95 times (CI 0.93 – 0.97; p-value = 0.00002).

Chronic Health

It is well documented that women of color have higher rates of chronic health issues in the U.S. [46-49]. Consistent with literature, our data revealed that women who identified as white had far lower rates of chronic health issues post-surrogacy than women who identified as non-white (p<0.001). Non-white women had on average 1.47 more chronic problems post-surrogacy (CI 0.79 – 2.1). The difference in the number of chronic health issues from pre- to post-surrogacy

was also different for race. Non-white women had an average of 1.1 more chronic health issues (95% CI 0.51-1.6), with p-value 0.00027. It is important to note that the sample size of non-white women was 11.

Further analysis showed that individual chronic health problems worsened, despite race, post-surrogate pregnancy (Table 5).

Chronic Health Condition	Pre- Surrogate %	Post- Surrogacy %	Percent Change
Headaches or migraines	12.4	23.7	11.3
Stomach ache	7.2	10.3	3.1
Bloating	5.2	18.6	13.4
Nausea	2.1	9.3	7.2
Pain in breasts	1	4.1	3.1
Dizziness	0	4.1	4.1

Table 5. Chronic health conditions reported pre- and post-surrogate pregnancies.

Surrogacy Experience: Compensation and Respect

Women had learned about surrogacy in a variety of ways, although most had heard about it through a friend (28.9%). Others had heard about it through family (8.2%), advertisements through newspapers, magazine, or online sources (12.3%), media sources such as books (1%), television or movies (17.5%), social media (8.2%), news (5.2%), or none of the aforementioned (18.6%). When asked if a family member had ever been a surrogate, only 4 of 97 women answered “yes”. Advertising plays a key role in the recruitment of women who may be interested in surrogacy. When asked about their perception of accuracy in advertisements, on average, women felt that the advertisements for surrogacy were 67% accurate when asked on a scale of 0-100% where 0% was not accurate at all and 100% was completely accurate. Although women largely believed the advertisements to be accurate, one of the women who disagreed with the majority commented:

“As far as accuracy in ads, they focus on the money a lot and there is a lot more to surrogacy than ‘oh you can make \$40,000!’ I feel they try to bait and hook people with money.”

Compensation for a woman’s gestational surrogacy ranged from \$0 to \$80,000 with a median payment of \$36,800 and an average payment of \$37,626 (Table 1a). Four women out of the 96 that responded to this question reported zero compensation and eight women reported not receiving enough money to cover all of her pregnancy-related expenses. One woman told researchers:

“Pregnancy made a pre-existing neck injury worse. I had a lot of medical bills. The money I did make went to medical bills. It was gone in a flash.”

Overwhelmingly, women reported using the payment they received for their surrogacy for basic needs (Figure 5). Regardless of employment status, over a third of the women reported using the money to pay bills or get out of debt. The next three most commonly reported uses of payment were split amongst savings, buying or saving for a house, and educational expenses.

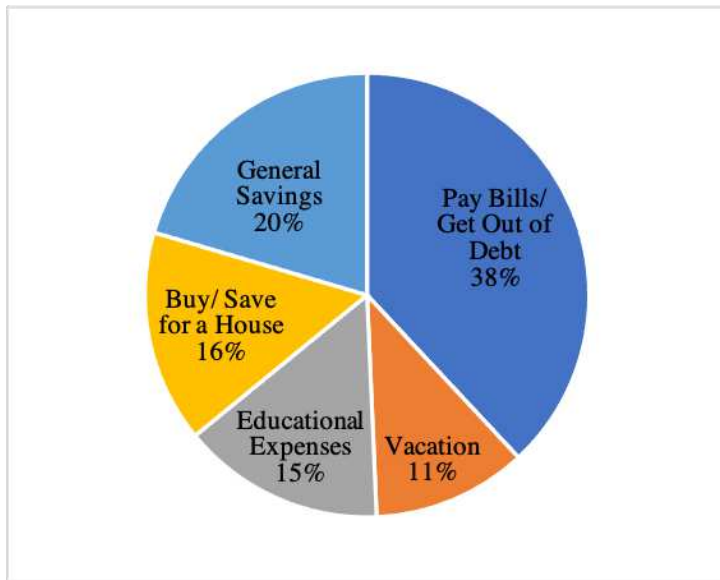


Figure 5. Reported use of payment, if any, for surrogate pregnancy.

Women provided more details at the end of the interview:

“This has helped us tremendously financially. We just recently purchased a house. I need major neck surgery, which I will have my whole neck cut open in a few weeks. Because I delivered in January of this year, the surrogacy took care of my high deductible, so I don't have to pay that.”

“We are now fully debt free of car, credit cards and student loans.”

“I would never do surrogacy for free unless I was doing it for one of my kids.”

“I avoid conversations where people say to me, ‘You're such an angel’. It makes me feel guilty because I got paid for it and I'm wasn't doing it because I was an angel. We were paying off a lot of credit card debt.”

“I used the money from the surrogacy to pay bills, pay for education and housing.”

“It is a very large chunk of money. We could pay off our car payment, we could buy a house.”

Women were asked to what extent money affected their own decision to become a surrogate (utilizing a scale of 0-100 where 0 indicated it had no affect and 100 indicated it was the only reason they decided to become a surrogate). Their responses ranged from 0 to 100 with an average of 41.5, and median of 40. Interestingly though, when asked “how much do you think women who serve as surrogates are influenced by the financial benefit” (using the same scale) women reported a range of 20-100 with an average of 63.4, and a median of 60.

When the amount of money paid for the surrogacy was greater than yearly income, participants were more likely to be influenced by money in their decision to act as a surrogate (p-value < 0.01).

One woman told interviewers about women participating in surrogacy that are on government assistance:

“There needs to be more information out there about surrogates being on government assistance. My agency allows women who are on government assistance to be surrogates that should be a big no-no because they are not financially stable. When the judge does the paperwork so the intended parents can have their baby, the surrogate doesn't have any rights, it may look like human trafficking because she did it for the money.”

Using the six 2020 federal tax brackets and the household income levels reported in the survey, authors organized and evaluated responses by taxable income reported by each participant (Table 6). Tier 1 corresponds to the lowest taxable income. Our study shows that no women were in the top tax tiers.

Tax Tier 1	Tax Tier 2	Tax Tier 3	Tax Tier 4
\$9,875 or less single	\$9,875, - \$40,125 single	\$40,125 - \$85,525 single	\$85,525- \$ 163,300 single
\$19,750 or less married	\$19,750- \$80,250 married	\$80,250- \$ 171,050 married	\$171,050- \$326,600 married
2 women	41 women	47 women	6 women

Table 6. Tax tiers of women derived using 2020 federal tax brackets and household income level reported in the survey.

Women were asked, in general, how respected they felt during their non-surrogate pregnancies as well as their surrogate pregnancies (on a scale of 0-100 where 0 is not respected at all and 100 is completely respected). Women reported feeling 93% respected during their non-surrogate pregnancies, but only 81% respected during their surrogate pregnancies, a statistically significant difference. Women who participate as gestational surrogate mothers are often praised for giving the gift of life so this difference in respect that women felt was unexpected. One woman explained:

“When you are pregnant with your own everyone wants to help you but with my surrogacy's my in-laws didn't want to help me at all - and my co-workers were like annoyed because I got time off after my surrogate delivery because ‘it's not your baby’”.

Women were then asked, more specifically, how respected they felt by the intended parent(s), the surrogate agency, and the healthcare staff during their surrogate pregnancies. Participants reported feeling respected 85.3% by the intended parents, 77.4% by the agency, and 87.4% by healthcare staff. Some women gave brief insight into their experiences in regards to respect:

“My care team giving birth was amazing, but I was discharged less than 24 hours after birth. Nobody asked me if I was okay or how I was feeling.”

“My first surrogacy I didn't feel the medical staff was properly prepared to handle a surrogacy but my second surrogacy I delivered at a Catholic hospital and it was a very good experience because they treated me like the mother.”

“My first two surrogacies, I felt very respected (100%) by the intended parents and the agency, but my last surrogacy I very disrespected (0%).”

Discussion

To date, this study is the first to compare spontaneous pregnancies with surrogate pregnancies by interviewing women in the U.S. about their pregnancy experiences utilizing a robust questionnaire. By employing online video communication to conduct interviews, interviews were conducted with women all around the U.S. using phones, tablets, and personal computers. With information gleaned from these interviews, future studies can be designed to focus on further details in surrogate pregnancies.

Our study corroborates the findings of Woo and colleagues [11]. Specifically, we found that surrogate pregnancies had a higher rate of delivery via c-section, and women were more likely to deliver at an earlier gestational age compared to their genetically related or spontaneous pregnancies. It is unclear exactly why c-section rates were higher in surrogate pregnancies, but as one woman told interviewers:

“They were expecting a c-section. I made [it] clear in the contract that they should match with someone else if they wanted a c-section. They want a c-section so they can be there; it's convenient.”

C-sections were developed to prevent or treat life-threatening maternal or fetal complications [38]. In the 1980's, the international healthcare community has considered the ideal rate for caesarean sections to be between 10-15% [39]. Since then, caesarean sections have become increasingly common around the world. Possible explanations for the increasing rate in cesarean sections could be: more frequently utilized in non-medically necessary contexts, increasing maternal age leading to more high-risk pregnancies that require c-section, and/or assisted reproductive technologies resulting in more high-risk pregnancies that require c-section. Medically unnecessary c-sections can expose the mother and child to consequences that are not fully understood [40, 41]. Not only might there be non-medical reasons for increased rates of c-section, but the increased rate of high-risk pregnancy for surrogate mothers may also help explain higher rates of c-section. Higher risk pregnancies are more likely to have complications and, therefore, might require c-section delivery. Regardless of the reason, authors of this publication agree with researchers in California that the goal must be to “reduce the human toll” in terms of operative deliveries and premature infants born “without unnecessarily burdening the limited resources of the health-care system” and, these authors would add, without harming women and children [10].

Not only did the present study show increased rates of c-sections, but, as previously mentioned, data showed the rate of high-risk pregnancy is higher with surrogacy at each additional

pregnancy threshold. This rebuts the argument that the rates in risk simply go up as women have more pregnancies. One woman expressed the following sentiment at the end of her interview:

“I wish there was a way for potential surrogates to get information on health risks. I wish there was more support. I have been kicked out of support groups for asking if anyone else experiences pulmonary embolism.”

Our study revealed that mothers tend to bond less with surrogate fetuses during pregnancy than fetuses from non-surrogate pregnancies, but this should continue to be explored as understanding of maternal-fetal bonding and maternal-fetal cell-exchange is still being studied and is less understood. Further, when women are recruited to become surrogate mothers and throughout her surrogate pregnancy, they are continually told that this is not their child and that they are not pregnant, but on a journey with the intended parents. Women are presented with a narrative that describes the womb as an oven or glorified babysitter. It is unknown whether this narrative could affect the bond a mother may or may not have as well as how a mother may respond when asked about bonding with an unborn child. Even if a mother does bond less with a baby from a surrogate pregnancy, contact, or lack of contact, with the child or intended parents does seem to have an effect on surrogate mothers. Some intended parent(s) and surrogate mothers prefer to have no contact after a baby is born. Many women in the present study, however, desired contact and preemptively made arrangements for this in their surrogacy contracts. In 2000 Van den Akker reported that of her sample of 29 intended mothers almost half expected to have a committed relationship with the surrogate mother and intended for this to be a close and respectful relationship [29]. However, another author pointed out that, despite positive intentions, such a continuing contact could end up being problematic [30]. Our study also uncovered a chasm between many surrogate mother’s post-partum expectations of contact and the reality. While our study was focused on women in the U.S., it is important to highlight that contact after a surrogate arrangement is unique within certain states and countries. Due to constraints, such as physical distance or language barriers, many surrogate mothers may not ever have an opportunity to remain in contact with the intended parent(s) or child(ren).

Compensation was an incentive, primary or otherwise, for many of the women interviewed. Women most commonly reported using their surrogacy payment to take care of basic needs and debts. Most of the surrogate mothers involved in this study (93.7%) were in the lower half of all tax brackets in 2020. While this data is imperfect, as it represents a woman’s financial status during the year of the interview and not the year of surrogacy, it highlights an important point. Many women who chose to participate in surrogacy were incentivized by the financial need or gain. In fact, women reported the strength of the financial incentive was inversely proportional to their financial status. This is potentially problematic, because studies have shown that those with less financial resources (or education) may be willing to take more risks and/or be targeted by those with vested interest. To this end, commercial surrogacy is disproportionately impacting women of low socioeconomic status, placing them at increased risk of adverse health outcomes both during and after their surrogate pregnancy.

This study cannot account for the full range of impacts related to surrogate pregnancy, but we wanted to ensure women were able to portray their experiences as accurately as possible. When

asked if there was “anything else important” they wanted to share, many interviewees commented on the challenges of (not) breastfeeding:

“Pumping was harder than the surrogate pregnancy. It was very emotionally hard on me. It is hard to pump when there is no physical baby present. It does something to your mind.”

“The breast milk portion is under-compensated financially. It was hard work and the surrogate still has to go through breast pumping. There are pressures with producing enough. There are worries about having the time and the right tools (freezer, bags, pump) especially since there is no baby around. I felt like the pumping was the harder part; especially going through the hormones.”

“Also, after my delivery, it was interesting how I felt my hormones coursing through my body, but not having a baby. There was a physiological response to not having the baby. But I knew intellectually that she wasn't mine. I pumped for them. I had a strong need to feed and take care of her.”

“Not nursing the surrogate child was the hardest because I had nursed my other children. I felt a disconnect between wanting to nurse the child but not being able to.”

Many hospitals have placed increasing importance on becoming “breastfeeding friendly” after multiple studies highlighted the importance of breastfeeding on maternal health, infant health and development, and the maternal-infant bond [31-34]. Comments by these surrogate mothers shows that further research evaluating the relationship between surrogate children and breastfeeding, or lack of, needs to be conducted.

The authors noted inconsistencies and contradictions that were observed in the participants responses when asked if there was anything else they wanted to share to help us better understand their experience as a surrogate. For example, the following quote is from a woman that endured many complications during her surrogate pregnancies:

“I think I'm done with surrogacy now - I always said I would do it again, but after the complications I had, I wouldn't do it again. But strangely enough if the IPs [intended parents] came back and asked me to do it again, I would.”

Another woman stated:

“My second surrogacy I aspirated after vomiting during the c-section. I have no memory of any the delivery of my section surrogacy. I had an amniotic fluid embolism and a hemorrhage. They had my husband tell me goodbye (as if I was dying). I had to go to the ICU. I was sedated for 36 hours. I had to go through physical therapy. I couldn't use my hands. It took a year to recover. I had a uterine ablation and cannot have any more kids...If my OB and family would let me do it again, I would.”

One woman reported her near death experience and yet regret that she could not participate in a surrogate pregnancy again:

“I delivered, they knocked me out and took the baby and I had transfusions during and after. The IPs felt horrible, they sent my whole family on an all-expenses paid vacation. I dipped into depression for about six weeks, as I had to grieve the loss of my uterus and then I bounced back. I'd do it again if I could and was planning to do it again for these IPs.”

Displayed here are just a few examples of where a surrogate mother seems to have some internal conflict between her reportedly complicated experience and conflicting desire to both be done with surrogacy and to continue to help others, even at the expense of her own health and well-being.

Finally, this data showed significant risks to physical and mental health in women acting as surrogate mothers. Further studies must be performed where researchers evaluate these same risks, or others, on the children born from surrogacy arrangements. These children should not be left out of the conversation.

Limitations

The survey was conducted during a global pandemic. This could have had an effect on reported employment, income, depression scores, etc. One woman commented:

“Some of my responses, like my fear for the future and feeling isolated is because of COVID.”

An online patient-reported survey might under-represent women without access to, or comfortability with, online platforms. Further, the self-reported nature of the survey is associated with potential corresponding biases such as inaccurate recall and false reporting, whether intentional or unintentional. Selection bias is also a known limitation when study participants choose themselves. Women who had extremely positive or negative experiences might be more likely to participate. One possible way to address this bias in the future would be a retrospective study of all women within an agency's database.

As with many surveys, time was also a limitation. There were many questions that we would have liked to include but did not out of respect for interviewees time. One such question was the employment choices of surrogate mothers. For example, military wives are often participants in third-party reproduction [35]. This type of demographic data (for both surrogates and intended parents) will be important for future studies to explore. We also did not inquire into how frequently women were surrogates for single people, for partnered gay men, heterosexual couples or international couples.

Our study also did not link women's educational level at the time of their decision to become a surrogate. It would be important to know if their ability to get out of debt afforded them to the

opportunity to seek higher education qualifications, which may or may not have affected their decision.

This research only examined the satisfaction of contact level in the mothers who birthed the children. However, other members of the family, such as a surrogate mother's biological children, or spouse or partner, can be affected by contact, or lack thereof, with the surrogate child. One mother explained the effect of not bringing the surrogate child home and the affect it had on her biological children:

“The negative experience for my children was due to our contract saying we all could visit with the babies, say goodbye and have closure. My children couldn't see the babies at all and the hospital wouldn't even let me visit after the first day... The older two children were disappointed that the hospital turned them away. My younger children were too young to understand why I didn't come home from the hospital with the babies. ...they [the intended parents] stopped communicating with me two days after the babies were born...I haven't heard from them since - and this past July the twins turned one.... I never thought in a million years they wouldn't show up for the birth or cut me off like they did.”

Participation in this study required that women had physically recovered from their most recent surrogate pregnancies. Two interviewees had only completed their surrogate pregnancy six weeks prior to the interview. Future studies could require a longer period of time postpartum, to better understand long-term health complications and/or satisfaction levels with contact between the women and the intended parent(s) or child(ren). As one woman stated in her closing comments:

“I did know, going into this, that over the years communication is going to drift away.

Furthermore, other studies showed that relationships between surrogate and intended parent(s) could be “harmonious at the onset” but strain with time due to differing expectations and management styles [8].

Conclusion

This study examined a large sample of American women who participated in gestational surrogate pregnancies. This study is a meaningful contribution to existing literature because it not only collected both qualitative and quantitative data from participants, but it also directly compared women's gestational surrogate pregnancies to their spontaneous pregnancies. Results showed that gestational surrogate pregnancies were significantly more likely to be high-risk, deliver earlier, and require cesarean section for delivery, than spontaneous pregnancies. There were also significant detriments to both the mental and physical health of women following a surrogate pregnancy. This study suggested that women who participated in gestational surrogacy were more likely to experience the adverse events stated above, and also more likely to be of lower socioeconomic status (SES) and education levels, and to cite that financial gain (at least in part) drove their decision to act as a surrogate.

Research has shown that Americans of lower SES are more likely (than their wealthier counterparts) to suffer from chronic health conditions, and this study highlights a concerning trend: women who are already more likely to experience poor health outcomes are those most likely to participate in gestational surrogacy and place themselves at even greater risk for such adverse outcomes. Many women participate in gestational surrogacy due to financial incentive and it is of the utmost importance that future research focus on these trends so that American surrogacy does not become a means to further already existing health disparities. This paper, and future research, can in turn meaningfully impact public health policy and American bioethics.

Declarations

Ethics approval and consent to participate:

The survey tool was designed by the Center for Bioethics and Culture in Pleasant Hill, California and approved by Pearl Pathways Institutional Review Board (IRB) (#20-CBCN-101).

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Competing interests:

The authors declare that they have no competing interests

Consent for publication:

Not Applicable

Availability of data and materials:

The datasets during and/or analyzed during the current study available from the corresponding author on reasonable request.

Authors' Contributions:

Jennifer Lahl, M.A., B.S.N., R.N. and Kallie Fell, M.S., B.S.N., R.N. designed the Gestational Surrogacy Research Project survey tool and were responsible for completing data collection. Kallie Fell was also responsible for obtaining IRB approval. Kate Bassett, B.A. and William M. Briggs, M.S., Ph.D. analyzed the data set and assisted Jennifer Lahl and Kallie Fell in data interpretation. Frances H. Broghammer, M.D. and Maggie Eastman, M.F.T. provided professional expertise in data interpretation and assisted in drafting and revising the final manuscript.

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