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A Comparison of American Women's Experiences with Both Gestational Surrogate Pregnancies and Spontaneous Pregnancies

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Abstract

This article evaluates the pregnancy experiences of American women by comparing their spontaneous or non-surrogate pregnancies with their gestational surrogate pregnancies. Data were collected through structured interviews using an online video platform. In total, 96 interviews were conducted. Data revealed that a woman was more likely to have a pregnancy that was high-risk during a surrogate pregnancy than during a non-surrogate pregnancy, independent of maternal age or gravidity (OR 11.4, 3.5-36.6; $p < .0001$). A surrogate pregnancy had three times higher odds of resulting in a cesarean section ($p < .0001$) and was five times more likely to deliver at an earlier gestational age ($p < .0001$). Women in this study were significantly more likely to experience postpartum depression following the delivery of surrogate children than after delivering their non-surrogate children ($p = .01$), and overall, they were more likely to have adverse outcomes during a surrogate pregnancy. The rate of new post-surrogacy chronic health issues for women of color was significantly higher than for women identified as white ($p < .0001$). We found that women's economic disadvantage was a major contributor to the decision to proceed with surrogacy. This study confirms that health disparities exist for women with surrogate pregnancies compared to non-surrogate pregnancies, which can lead to long-term complications after a surrogate pregnancy. In terms of biomedical ethics, it raises important social, economic, and political issues related to surrogacy, all requiring further exploration. Future research will build on the present work in further helping us to understand the circumstances and consequences involved for women in surrogacy.

Keywords

United States, surrogacy, pregnancy, gestational surrogacy, in vitro fertilization, maternal bonding, perinatal, biomedical ethics

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A COMPARISON OF AMERICAN WOMEN'S EXPERIENCES WITH BOTH GESTATIONAL SURROGATE PREGNANCIES AND SPONTANEOUS PREGNANCIES

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ABSTRACT

This article evaluates the pregnancy experiences of American women by comparing their spontaneous or non-surrogate pregnancies with their gestational surrogate pregnancies. Data were collected through structured interviews using an online video platform. In total, 96 interviews were conducted. Data revealed that a woman was more likely to have a pregnancy that was high-risk during a surrogate pregnancy than during a non-surrogate pregnancy, independent of maternal age or gravidity (OR 11.4, 3.5-36.6; $p < .0001$). A surrogate pregnancy had three times higher odds of resulting in a cesarean section ($p < .0001$) and was five times more likely to deliver at an earlier gestational age ($p < .0001$). Women in this study were significantly more likely to experience postpartum depression following the delivery of surrogate children than after delivering their non-surrogate children ($p = .01$), and overall, they were more likely to have adverse outcomes during a surrogate pregnancy. The rate of new post-surrogacy chronic health issues for women of color was significantly higher than for women identified as white ($p < .0001$). We found that women's economic disadvantage was a major contributor to the decision to proceed with surrogacy. This study confirms that health disparities exist for women with surrogate pregnancies compared to non-surrogate pregnancies, which can lead to long-term complications after a surrogate pregnancy. In terms of biomedical ethics, it raises important social, economic, and political issues related to surrogacy, all requiring further exploration. Future research will build on the present work in further helping us to understand the circumstances and consequences involved for women in surrogacy.

KEYWORDS

United States, surrogacy, pregnancy, gestational surrogacy, in vitro fertilization, maternal bonding, perinatal, biomedical ethics

If you are thinking about being a surrogate, I understand your heart might be in a good place. But I tell you, it's not worth the chance of going through what I, and so many others that I have found out since, have gone through. (Toni, 2019, p. 125)

GESTATIONAL SURROGACY TAKES PLACE when a woman agrees to carry a non-genetic pregnancy on behalf of an intended parent or parents, who may be a heterosexual couple, same-sex male couple, or a single person. Gestational surrogacy contrasts with *traditional surrogacy* where the woman uses her own egg, as well as her womb, to facilitate conception. Gestational surrogacy has become the preferred method and is a fast-growing means of building a family (Armour, 2012; Gugucheva, 2010). The focus in this paper is *gestational surrogacy* arrangements.¹

The first gestational surrogacy in the United States was achieved in 1985, and rates of surrogacy have been on the rise since this time (Patel et al., 2018). Delayed childbearing age, increased infertility, and the rise of same-sex and transgender couples have created a demand for, and focus on, reproductive technologies that are still relatively nascent—including gestational surrogacy. These conditions have created a burgeoning industry. One source reports that the global surrogacy market revenues were \$112.80 million in 2015 (Allied Market Research, 2020). Already passing \$4 billion in 2020, forecasters predict that surrogacy market revenues will cross \$27.5 billion by 2025 (Global Market Insights, 2021 and Hegde, 2019). Although surrogacy has been commercially successful, there has been a paucity of research regarding the medical and psychological risks and complications both for women and children. There is also little research investigating the risk factors for women becoming surrogates and surrogacy's impact on children born to surrogate mothers.

SURROGACY AROUND THE GLOBE: LEGAL DIFFERENCES

Pregnancy and fertility, already deeply personal experiences, become complicated in surrogacy beneath the context in which the surrogate mothers and the intended parents find themselves. Cultural attitudes, laws, and restrictions surrounding surrogacy vary by state, in the U.S., and by country, around 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 yield different rights for the surrogate mother, the child(ren) she births, and the intended parents. Although proponents of the surrogacy industry prefer the term “gestational carrier,” rather than “surrogate mother,” we reject the naming of women as wombs (Raymond, 1993/2019; Klein, 2008). We find that it dehumanizes women, reducing them to a marketed bodily function (Corea, 1985/1986; Rowland, 1992; Bindel, 2016; Pringle & Klein, 2022).

Around the world, some countries have banned international surrogacy, while allowing it between citizens within their own borders. Others have restricted it to heterosexual couples with an underlying fertility issue, or only allow altruistic surrogacy (i.e., surrogacy without compensation), such as in Greece, Thailand, and Portugal (Aznar & Martínez Peris, 2019). India recently imposed strict regulations on

¹ For the accounts of surrogate mothers from the U.S. and globally, see *Broken Bonds: Surrogate Mothers Speak Out* (2019). For recent critiques of surrogacy, see *Towards the Abolition of Surrogate Motherhood* (2021), a collection including various contributors in conjunction with the International Coalition for the Abolition of Surrogate Motherhood.

surrogacy in part due to the exploitation of Indian women by foreign internationals (Saran & Padubidri, 2020). 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 et al. (2014) concluded that surrogate pregnancies should be considered a high-risk emotional experience, because surrogate mothers may face negative experiences. It was a compelling finding, but this study was limited by a sample size of only eight. Another study of 184 Canadian surrogates found that women had both positive and negative experiences with surrogacy. 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 (Assisted Human Reproduction Act, 2004; Yee et al., 2020). These circumstances, however, are 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 become surrogates in the U.S. is crucial for us to obtain.

HEALTH OUTCOMES

Data concerning physical and mental health outcomes related to gestational surrogacy are limited. In their study, Duffy et al. (2005) documented significant obstetrical complications of ten gestational surrogate mothers. Almost a decade later, Merritt et al. (2014) sought to determine the impact of assisted reproductive technologies (ART) on pregnancy-related outcomes, including surrogate pregnancies. Their research found a fourfold increase in stillbirths, a fourfold increase in cesarean sections for mothers who used ART and a nearly fourfold increase in preterm birth (Merritt et al., 2014). Another study by Woo et al. (2017) looked at pregnancy outcomes of gestational surrogate pregnancies alone. It examined the records of 124 surrogates and found a significant difference in physical outcomes between their own spontaneous pregnancies and their gestational surrogate pregnancies (Woo et al., 2017). In surrogate pregnancies, the incidence of cesarean section was higher, with higher twin pregnancy rates, and a lower mean gestational age at delivery. The authors 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. (Woo et al., 2017, p. 997)

The evidence of physical harms to women who undergo a surrogate pregnancy underscores the need for the present research.

EMOTIONAL AND SOCIAL RAMIFICATIONS

Surrogacy is often valorized as “the right to have children of one’s own” and a way for surrogate women to experience self-fulfillment. However, the psychological distress from surrogacy has been described as significant (Raymond, 1990; Edelmann et al., 1994; Ekman, 2013; Macer, 2014; Klein, 2017). A study in Iran documented significant emotional stress among surrogate mothers (Tehran et al., 2014). Indian gestational surrogate mothers experienced higher levels of depression across pregnancy and several months following birth. They further displayed lower emotional connection with the unborn babies (Lamba et al., 2018). Surrogacy in India, unlike in the U.S., is frequently kept a secret by the surrogate and her family, as it is considered immoral (Pande, 2010). Surrogate mothers can face social humiliation and criticism from

family members and the wider community and may be shunned by persons in these networks (Karandikar et al., 2014).

On the other hand, a study in the United Kingdom (Jadva et al., 2003; 2015) reported that 20 gestational surrogate mothers in the U. K., did not experience psychological problems as a result of the surrogacy experience. 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 (Jadva et al., 2015). Unlike the rejection women in India face, attitudes in Western countries, like the U.S and the U.K., seem to afford women perceivably more “freedom” in acceptance of surrogacy as “progressive” (Vorzimmer & Randall, 2013).

FINANCIAL CONSIDERATIONS

The decision to act as a gestational surrogate is also ethically complicated by women’s financial circumstances, which can function as coercion in cases of poverty or emergency financial need. In 1994, Blyth published an article based on interviews with 19 British women about their surrogacy experiences. He found that, like women in the U.S., both altruism and financial need are motivating factors in becoming a surrogate mother (Blyth, 1994). However, most of the women he interviewed claimed that money *should not* be the prime motivating factor. More recently, Saravanan (2018) reported that “[s]urrogacy [in India] was a bazaar where everything about women’s reproductive capacity and the children born was priced,” including the sex, (dis)ability, number, and weight of the child(ren) born (pp. 5-6). Surrogate mothers that Saravanan interviewed were facing extreme poverty. Because of risks to women’s health and the concern of exploitation, India has moved to prohibit commercial surrogacy.

Of the research that has been done to date, none has explored, through interviews, the experiences of a large sample of women who have participated in gestational surrogacy in the U.S., a top destination for third-party reproduction (Lewin, 2014; Houghton, n.d.). 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 women and children involved and on society more broadly.

METHODS

The present study sought to evaluate and explore pregnancy experiences of American women by directly interviewing women who had experienced both gestational surrogate pregnancies as well as their own spontaneous pregnancies. A structured survey was designed that contained both quantitative and qualitative questions about each of their pregnancy experiences. Following this structured survey in-depth interviews were performed with a sample of 96 women from the U.S., which is currently a primary destination for commissioning parents to obtain children from surrogacy.

SURVEY QUESTIONNAIRE

The survey used in this present study contained the following sections: demographic characteristics, pregnancy history, learning about surrogacy and physical health history. We designed a questionnaire that contained both quantitative and qualitative questions about pregnancy experiences to investigate the medical and psychological sequelae of gestational surrogacy. The structured survey was then uploaded to Qualtrics (July 2020).

INSTITUTIONAL REVIEW BOARD AND INFORMED CONSENT

Institutional Review Board approval was granted by Pearl Pathways Institutional Review Board (IRB) (#20-CBCN-101). The review included all survey questionnaires, informed consent documents, and recruitment advertisements.

RECRUITMENT OF INTERVIEWEES

Advertisements were placed on social media—such as Facebook and Instagram—to recruit women who met inclusion criteria. Respondents to the advertisement were first screened using the inclusion criteria which required women to: (1) be 21 years old or older; (2) have acted as a gestational surrogate at least once; (3) be able to give verbal informed consent for the study; (4) not be employed by a fertility clinic; (5) reside in the U.S.; and (6) have the ability to speak English. Those women who met inclusion criteria were interviewed online by way of a secure online video platform.

An information sheet was given to potential 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 anonymity in their responses and could skip any questions they did not want to answer. No personal identifying information was collected in the survey. Interviews were not audio or video recorded. Participants were provided an honorarium of a \$50 gift card in appreciation for their time.

STATISTICAL ANALYSIS

Data were examined using R version 4.2.0 and analyzed using ordinary linear and logistic regressions, t-tests, chi-squared tests, and other methods as described below (R Core Team, 2022). Basic demographic data, pregnancy outcomes, delivery type, pregnancy complications, chronic health conditions, compensation, and feelings of respect were evaluated with counts, frequency and descriptive statistics.

Each pregnancy experience and reproductive history for each woman was unique and data for pregnancy outcomes, such as gestational age was complex. Each woman could have multiple pregnancies within each pregnancy type (surrogate or spontaneous) resulting in different gestational ages. For example, one woman might have one surrogate pregnancy and one spontaneous pregnancy, both delivered at term. Other women might have had six total pregnancies delivered at various gestational ages, mixing surrogate and spontaneous pregnancies. Due to this variation, certain analysis required hierarchical regression to control for individual women. The specific details of all analysis are explained where they are used below.

Briefly, to analyze gestational age at delivery we took two approaches. First, we conducted a simplified chi-square test for the differences in frequency of term length between spontaneous and surrogate pregnancies. However, this is at best an approximation, due to the different types and numbers of pregnancies. To account for this, we simplified the data by defining “Early Delivery” as either Early Term or Preterm, and “Other Delivery” as any other term length (Term, Late-Term, Post-Term). We then ran a hierarchical logistic regression model with a random intercept for each woman, controlling for each pregnancy’s maternal age and gravidity.

To analyze high-risk pregnancies, a hierarchical logistic regression was also computed allowing a random intercept for each woman and controlling for pregnancy type, maternal age, and gravidity.

Participants were asked about any complications or adverse effects that they might have experienced during their pregnancies. Participants were not asked about complications or adverse effects specific to each individual pregnancy, but only overall. Again, because women can have any number of pregnancies of either type, we present the mean (or frequency) adverse event rate across women, for each pregnancy type. Separate logistic regression models were used to compute the odds of a surrogate pregnancy having a greater chance of each adverse event, and the results are presented below. Hypothesis testing often has the unfortunate problem of being unable to deal with data when 0 counts are present, as we have here because one of the babies was not born alive; therefore, we extended the logistic regression, casting it in its predictive posterior form (as previously described). We were then able to compute the probability of each adverse event given one new pregnancy of both types. A simple adverse effect score was next created by summing the number of complications each woman experienced (of all kinds) for each pregnancy type, and dividing by the number of pregnancies of each type each women had. A paired t-test was used to check the difference between these scores.

A logistic regression model, like those above, was also used to analyze C-section rates between surrogate and spontaneous pregnancies.

FINDINGS

DEMOGRAPHIC DATA

A total of 96 women were interviewed, one of the largest sample sizes interviewing gestational surrogate mothers in the U.S. Participants ranged in age, at the time of the interview, from 24 to 50 with a median age of 34 (see Table 1.1). Among the interviewees, 90 women reported English as their first or primary language and 85 women identified as white (see Table 1.2). Other women described themselves as Latina or Hispanic (seven), biracial or multiracial (three), and Black or African American (one). Of the 96 women, 69 were employed at the time of the interview and the median annual family income reported was \$85,000 (minimum income of \$13,000 and maximum income \$225,000—quite a large range). In addition, 74 of the 97 women had some post-secondary school education: 17 had an associate degree, 42 had a bachelor's degree, 14 had a master's degree, and 22 were high school graduates. Only one woman did not complete high school. No women had completed doctoral degrees. Of the 87 women who had a husband or a partner, 50% of the partners had a high school education or associate degree.

It is important to note that employment status, education level and household income datapoints reflect a participant's current status (after her pregnancies) and not her status at the time of each of her pregnancies. Women could have used the payment from their surrogate pregnancy or pregnancies for advancing their own or their partners education. However, in our study sample, even after completing a surrogate pregnancy with payment, most women did not achieve a graduate degree. Despite payment for surrogate pregnancy or pregnancies, over seventy percent of women were employed at the time of the interview and still contributing to the household income.

Table 1.1

Demographic Data of Participants

Baseline Characteristic	Median	Mean	SD	Minimum	Maximum
Age	34	34.6	5.65	24	58
Annual Family Income	85,000	87,600	42,100	13,000	225,000
Surrogacy Payment	37,000	37,700	12,700	0	80,000
Total Pregnancies	4	3.9	1.6	2	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 ^a	5

Note. The medians, means, standard deviations and minimum and maximums of the participants.

a. One participant had both a surrogate and spontaneous pregnancies. However, her surrogate pregnancy did not result in a live birth and was therefore not counted as a child born. She was still included in this study because she did have both spontaneous pregnancies as well as a surrogate pregnancy.

Even though a gestational surrogate child will not inherit any traits from the surrogate mother, women who respond to commercial surrogate advertisements can be selected and compensated depending on race, age, previous pregnancy success, financial stability, or other traits, especially in the U.S. In this study we see that overwhelmingly, those who participate as surrogate mothers identify as white, are married, and were compensated for their surrogate pregnancy. Surrogacy agencies advertise that a good candidate for surrogate pregnancies are women that are between 21 and 40 years old and have had children of their own. Each of our participants would have been considered a “good candidate” for surrogacy by agency standards.

IVF EXPERIENCE AND PREGNANCY OUTCOMES

In vitro fertilization (IVF) is required to achieve a gestational pregnancy. Some participants reported having multiple IVF cycles, due to failed cycles, to achieve one surrogate pregnancy. One woman explained:

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 seven 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&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.

Although each woman in our study went on to have a surrogate pregnancy after her IVF attempt or attempts, we wonder how many women give up after a number of unsuccessful IVF attempts. In our study, we did not ask how many IVF rounds were attempted before a successful pregnancy. Further research is warranted and would be beneficial since IVF clinics do not accurately track success or failure rates.

Table 1.2

Demographic Data of Participants

	Variable	Number of Women	Percent
Primary Language	English	92	95.8
	Creole & French	1	1
	Spanish	3	3.1
Race/ Ethnicity	White	85	88.7
	Black or African American	1	1
	Biracial or Multiracial	3	3.1
	Hispanic or Latina	7	7.3
Husband or Partner	Yes	89	92.7
	No	7	7.3
Employed	Yes	69	72
	No	27	28
Husband or Partner Employed	Yes	87	89.7
	No	2	2.1
Education	Did not graduate High School	1	1
	GED/ High School	22	22.7
	Associate Degree	17	17.5
	Bachelor's Degree	28	29.9
	Master's Degree	8	8.2
	Doctoral Degree	0	0
Husband or Partner's Education	GED or High School Graduate	31	31
	Associate Degree	18	18.6
	Bachelor's Degree	29	29.9
	Master's Degree	8	8.2
	Doctoral Degree	2	2.1

Note. Counts and frequency of basic demographics of participants. Not all participants answered all questions.

We 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 n=51,

53% of the women). Other reported side-effects included headache (n=42, 44%), allergic reactions (n=16, 17%), infection (n=2, 2%), and “other” unlisted side effects, such as weight gain (n=15, 16%). Two participants commented on their weight gain at the end of the survey:

I did experience weight gain with the fertility drugs. It was about five to eight 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 third surrogacy.

Some women (n=39, 41%) reported more than one side effect and others experienced no side effects (n=28, 29%) from the IVF process.

Each woman in our study did have a successful IVF procedure resulting in a surrogate pregnancy. The average number of total pregnancies per woman, including known abortions and miscarriages, was 4 (minimum of 2 and maximum of 12), and each respondent had a range from 1 to 5 surrogate pregnancies. There were 141 surrogate pregnancies and 236 non-surrogate pregnancies among the 96 women interviewed. Not every pregnancy ended in a live birth, which is why on Table 1.1 readers will see 0 for minimum surrogate children born. One surrogate pregnancy did not result in a live birth of a baby. There were 157 surrogate children and 215 non-surrogate children born from the study population demographic.

We calculated gestational age at delivery for surrogate and spontaneous or non-surrogate births, broken into 5 categories: Preterm (less than 37 weeks), Early Term (from 37 to 38.6 weeks), Term (39 to 40.6 weeks), Late Term (41 to 41.6 weeks), and Post Term (greater than 42 weeks). The counts and frequencies are presented in Table 2. Maternal age and gravidity at the time of pregnancy can affect the length of gestation as well as increase the risk of complications for both the mother and baby, therefore, maternal age and gravidity were included in the analysis.

We took two approaches in analyzing the gestational age at delivery (Table 2). First, we conducted a simplified chi-square test for the differences in frequency of term length between spontaneous and surrogate pregnancies. This showed a statistically significant relationship between gestational age at delivery and pregnancy type ($p < .001$; see Table 2). This is at best an approximation, however, because of the different types and numbers of pregnancies, as mentioned above in the methods. To account for this, we first simplified the problem by defining “Early Delivery” as either Early Term or Preterm, and “Other Delivery” as any other term length (Term, Late-Term, Post-Term). We then ran a hierarchical logistic regression model with a random intercept for each woman, controlling for each pregnancy’s maternal age and gravidity. In this model, surrogate pregnancies were associated with early delivery, with an odds ratio of 5.1 (95% CI; 2.2, 11.7; p -value $< .0001$), indicating surrogate pregnancies had a much higher changes than non-surrogate or spontaneous pregnancies of early delivery.

Table 2

Gestational Age at Delivery for Surrogacy and Spontaneous Pregnancies

Gestational Age	Surrogacy		Spontaneous Non-Surrogacy		Total
	n	%	n	%	n
Preterm (<37 weeks)	22	17	3	1.4	25
Early Term (37-38.6 weeks)	32	24	36	17	68
Term (39-40.6 weeks)	73	56	137	65	210
Late Term (41-41.6 weeks)	3	2.3	21	9.9	24
Post Term (>42 weeks)	0	0	15	7.1	15
Total	130	-	212	-	342

Note. The number and frequencies of each of five different term lengths are given for both surrogate and non-surrogate births. A chi-square test assessing the difference in frequencies of term lengths between surrogate and non-surrogate births gave a p-value < .001. A hierarchical logistic regression on either Pre or Early Term or any other term, allowing for differences within women, gave an OR of 4.8 for earlier births for surrogate pregnancies.

Participants were asked for each pregnancy if they were told they had a high-risk pregnancy by their physician. Again, a hierarchical logistic regression was computed on whether pregnancies were high risk, allowing a random intercept for each woman and controlling for pregnancy type, maternal age, and gravidity. This 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 11.4, (95% CI; 3.5, 36.6; p-value = .00004). That is, the rate of high-risk pregnancy is higher in surrogate pregnancies when compared with non-surrogate pregnancies, regardless of maternal age or gravidity.

Realizing the limits of hypothesis testing, we next computed a visual representation of the maternal age—and gravidity—controlled high-risk model in its predictive form.

Figure 1 shows a graphical form of the model of high-risk pregnancy as a function of pregnancy type, maternal age, and gravidity in its predictive form (Briggs (2016). for a description of predictive forms of models. Each point on the graph represents the modeled probability of a high-risk pregnancy, given a specific pregnancy type, specific maternal age, and specific gravidity. Because the number of combinations of pregnancy type with maternal age and gravidity is very large, we chose values which are likely representative of our population.

Since gravidity was a feature of the model, specific values were be picked for each point in the figure, as well as specific values for maternal age and pregnancy type. Once these were in hand, we computed the probability of a high-risk pregnancy given these values. That is, each point is the modeled probability of having a high-risk pregnancy given the specific values shown on the graph.

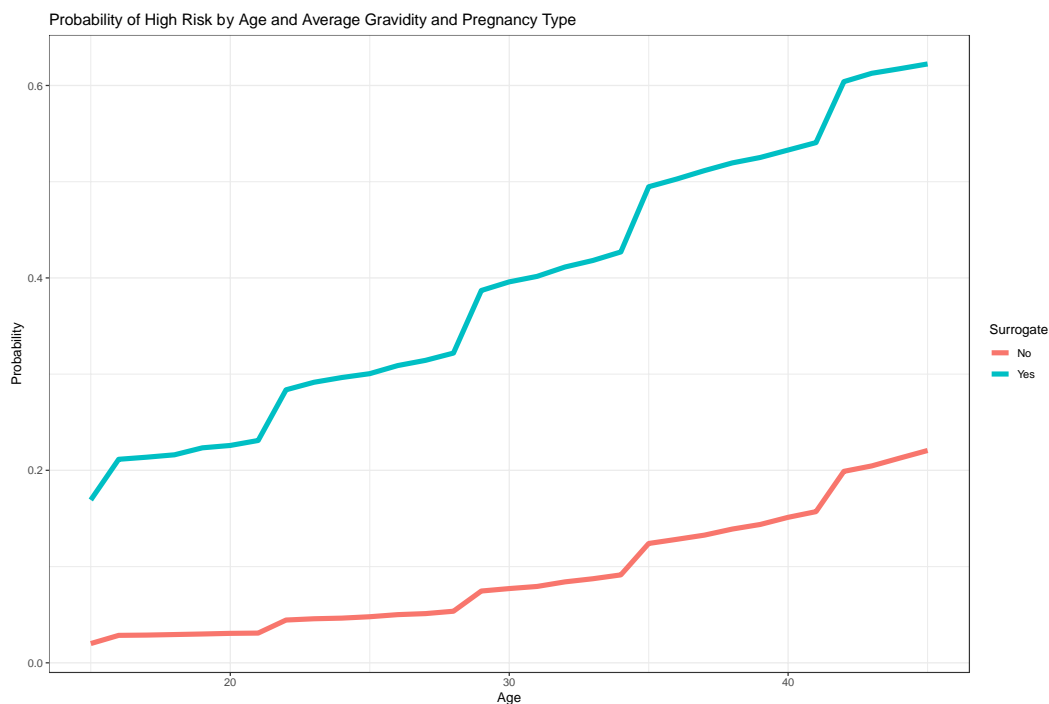
As an aid to choosing values of gravidity, we noted that a rough linear relationship of maternal age and gravidity was usual in the data: that is, as maternal age increased, gravidity also increased on average, as expected. The values we used in the figure were based on this relationship. We used maternal ages between 15-21 with a gravidity of 1, 22-29 with a gravidity of 2, 30-35 a gravidity of 3, 36-41 a gravidity of 4, and 42+ a gravidity of 5. For example, at the point of the figure for Age = 30, we use a gravidity of 3. These values are in no way crucial and were chosen merely to illustrate the predictive model.

The bottom line is that it is clear that as maternal age and gravidity increase, the probability of a high-risk pregnancy also increases, and that this probability is always larger and rises faster for surrogacy pregnancies.

Participants were also asked about any complications or adverse effects that they might have experienced during their pregnancies. These are summarized in Table 3, tabulated across all pregnancies for surrogate pregnancies and non-surrogate pregnancies. Participants were not asked about complications or adverse effects specific to each individual pregnancy, but only overall.

Complications or adverse effects were defined as the following: 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, and 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.

Figure 1
High Risk Pregnancy Probabilities for Surrogate and Non-Surrogate Pregnancies



Note. The model of high-risk pregnancies was investigated in its predictive posterior form so that direct probabilities of high-risk pregnancies could be computed. Specific values of maternal age and gravidity were picked, and the probabilities calculated. The maternal age values are on the x-axis, and these are tied to specific values of gravidity as explained in the text. For example, maternal ages of 30 were paired with gravidities of 3, as suggested by our observations. For example, the probability of a high-risk pregnancy was about 0.3 for a surrogate pregnancy and about 0.05 for a spontaneous pregnancy for 30-year-old women with gravidities of 3.

The counts across all pregnancies, of both types, are given in Table 3. Because women can have any number of pregnancies of either type, we also present the mean (or frequency) adverse event rate across women, for each pregnancy type. Separate logistic regression models were used to compute the odds of a surrogate pregnancy having a greater chance of each adverse event, and the results presented. Hypothesis testing often has the unfortunate problem of being unable to deal with data when 0 counts are present, as we have here. Therefore, we extended the logistic regression, casting it in its predictive posterior form (as described above). We were then able to compute the probability of each adverse event given one new pregnancy of both types. These are more informative numbers to use in decisions in many cases. They also have an easy interpretation: they are just the probability of the adverse event (given the information available in the data).

Table 3

Complications or Adverse Events During Surrogate and Non-Surrogate Pregnancies

Complications/ Adverse Effect	Surrogate Pregnancy		Non-Surrogate Pregnancy		Odds Complication Surrogate	P-Value
	n/FREQ	Prob	n/FREQ	Prob	Odds (95%CI)	P-value
High Blood Pressure (HBP)	21/0.17	0.26	6/0.025	0.05	5.9 (2.4, 16)	.0001
Life Threatening HBP with Preeclampsia or Eclampsia	9/0.072	0.12	0/0	0.004	NA	.99
Gestational Diabetes	8/0.065	0.11	5/0.02	0.04	2.6 (0.86, 8.9)	.095
Hemorrhage	19/0.15	0.24	6/0.027	0.05	5.3 (2.2, 14.8)	.0005
Infection (related to pregnancy)	3/0.026	0.048	2/0.021	0.02	2.5 (0.41, 19.4)	.32
Pre-term Labor	17/0.14	0.22	7/0.025	0.061	4.1 (1.72, 10.8)	.0014
Hyperemesis Gravidarum	13/0.11	0.17	10/0.058	0.085	2.2 (0.93, 5.2)	.076
Anemia	18/0.14	0.23	21/0.11	0.17	1.4 (0.73, 2.8)	.30
Ectopic Pregnancy	3/0.016	0.047	2/0.009	0.02	2.5 (0.41, 19.4)	.32
Placenta Previa	7/0.054	0.010	2/0.008	0.02	5.9 (1.4, 40)	.029
Placental Abruption	2/0.014	0.032	0/0	0.005	NA	.996
Ovarian Cysts	5/0.055	0.079	9/0.042	0.074	0.94 (0.28, 2.8)	.89
Miscarriage	12/0.067	0.16	12/0.043	0.098	1.69(0.73, 3.89)	.22
Postpartum Depression	21/0.17	0.27	14/0.074	0.12	2.5 (1.26, 5.24)	.007
Post-Partum HBP	15/0.13	0.20	2/0.007	0.018	12.6 (3.5, 81.0)	.0009

Note. Total numbers and rate per pregnancy for each adverse event and pregnancy type (2nd and 3rd columns), followed by the odds of a surrogate birth having an adverse event compared to a spontaneous birth (sixth column) where this could be computed, a p-value of the odds ratio being greater than 1 (seventh column), and the predictive probabilities of each adverse event, casting the model (which gave the odds ratio) into its posterior predictive form.

Overall, surrogate pregnancies were more likely to result in complications or adverse effects than non-surrogate pregnancies. A simple adverse effect score was next created by summing the number of complications each woman experienced (of all kinds) for each pregnancy type, and dividing by the number of pregnancies of each type each women had. Across all births, non-surrogate pregnancies had a mean score of 0.48 adverse event per pregnancy (minimum of 0 and maximum of 3), and surrogate pregnancies had a mean score of 1.3 (minimum of 0 and maximum of 7). A paired t-test was used to check the difference, since women could have births of both types. This gave a mean difference of 0.75 (95% CI; 0.47-1.02) more adverse events for surrogate pregnancies over non-surrogate pregnancies ($p < .0001$).

Looking at specific complications between surrogate pregnancies and spontaneous pregnancies, there is a statistically significant difference in five of the conditions: high blood pressure ($p = .0001$), hemorrhage ($p = .0005$), pre-term labor ($p = .0014$), post-partum depression ($p = .007$), and post-partum high blood pressure ($p = .0009$). Importantly, high blood pressure during pregnancy or post-partum puts a woman at great risk for pre-term delivery (during pregnancy), seizure, heart-attack, stroke, and death. Hemorrhage has previously been defined as a blood loss of 500ml during a vaginal birth and 1000ml during a c-section. It is currently defined by The American College of Obstetrics and Gynecology as blood loss of greater or equal to 1000ml, despite methods of delivery. A hemorrhage may warrant a blood transfusion, but not always. Surrogate mothers are more likely to experience pre-term labor. This is not surprising since our data also shows that surrogate pregnancies are more likely to deliver pre-term, as previously discussed. The impact of a surrogate pregnancy on post-partum depression is also important. These women are returning home from delivery with empty arms, full breasts, and significant hormonal shifts that accompany the post-partum period.

Deliveries via cesarean section (C-section) during surrogate and non-surrogate pregnancies were also assessed. Women reported total C-sections and vaginal deliveries (see Table 4). The total counts of each, the average rate across all women (the mean of each woman's C-section rate) are given. The mean of C-section rates in non-surrogate pregnancies was only 12.1% while that of C-sections in surrogate pregnancies was 35.3%. A logistic regression model like those above was used to analyze C-section rates. Woman with a surrogate pregnancy had *three* times higher odds of delivering via C-section rather than vaginally (OR 3.0; CI 1.82-5.2, p -value $< .0001$).

A total of 38 women reported having at least one surrogate C-section; of these, 14 (36.8%) reported at least one of the C-sections was emergent, and 24 (63.2%) reported all C-sections were planned. A total of 16 women reported having at least one non-surrogate C-section; of these, 6 (37.5%) reported at least one of the C-sections was emergent and 10 (62.5%) reported all C-sections were planned. There was no significant difference in these rates (Z-test, p -value ~ 1).

Table 4
Cesarean Sections and Vaginal Deliveries by Pregnancy Type

Pregnancy Type	Vaginal Deliveries	Total C-sections	Women with Planned C-section	Women with at least one emergent C-section
	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>
Surrogate Pregnancy	86 (64.7)	47 (35.3)	24 (63.2)	14 (36.8)
Non-Surrogate Pregnancy	188 (87.9)	26 (12.1)	10 (62.5)	6 (37.5)

Note. Women were more likely to deliver via C-section during surrogate pregnancies when compared to deliveries from their non-surrogate pregnancy (per-woman pregnancy logistic regression $p < .0001$).

Although surrogate pregnancies occur at an older maternal age than spontaneous pregnancies, our data shows that surrogate pregnancies are still more likely to be considered high-risk, have complications, and result in a c-section delivery.

One woman shared her high-risk, complicated surrogate pregnancy experience:

I was 40 when I was [a] 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 that could take care of me. [The] 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 [they] 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.

Overall, our study suggests that despite maternal age or gravidity, surrogate pregnancies are more likely to be high-risk, have complications, and result in c-sections, either planned or otherwise. The U.S. already ranks poorly in maternal morbidity and mortality when compared to other wealthy nations. As a hub for surrogacy tourism, these pregnancies seem to add to the poor condition of maternal health in the U.S.

CHRONIC HEALTH PROBLEMS

Women were asked “since your surrogacy experience(s), has a doctor diagnosed you with any illness?” Of course, this question does not specify that the illness is necessarily related to the surrogacy but can help us better understand chronic health issues following a surrogate pregnancy. Among the participants, 18 women stated that their doctors had diagnosed them with a new illness or medical condition after their surrogate pregnancies. New condition(s) noticed following surrogacy 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 (prolapse)

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, prehypertension

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.

It is known that women of color have higher rates of chronic health problems in the U.S. [National Center for Health Statistics (NCHS), 2020; U.S. Department of Health and Human Services, Office of Minority Health, (n.d.); National Center for Health Statistics (NCHS), 2019; Centers for Disease Control and Prevention (CDC), 2019]. Not knowing demographics of our population prior to designing the survey, we included a question to investigate chronic health conditions of surrogate mothers.

At the conclusion of our study, the sample size of women identifying as women of color was small (n=11). All women were asked, "Chronic problems come and go, but never really disappear. Did you have any of the following chronic conditions before becoming a surrogate?" Then we repeated the same question but changed to "Did you have any of the following chronic conditions after becoming a surrogate?" The counts, percentage of women suffering pre- and post-surrogacy, and percent change is presented in Table 5. All chronic problems increased after surrogacy.

Table 5
Chronic Health Conditions Reported Pre- and Post-Surrogate Pregnancies

Chronic Health Condition	Pre- Surrogacy		Post- Surrogacy		Percent Increase	<i>p</i> -value (paired t-test)
	<i>n</i>	%	<i>n</i>	%	%	<i>p</i> -value
Headaches or migraines	12	12.5	22	22.9	10.4	.003
Stomachache	7	7.3	10	10.4	3.1	.26
Bloating	5	5.2	17	17.7	12.5	.001
Nausea	2	2.1	9	9.4	7.3	.007
Pain in breasts	1	1	4	4.2	3.1	.08
Dizziness	0	0	4	4.2	4.2	.045

Note. The number of women reporting chronic health problems pre- and post-surrogacy, as well as the percent increase. The change in the mean number of each condition from pre- to post-surrogacy was examined with a paired t-test.

The difference in the number of chronic health issues from pre- to post-surrogacy was also different on the basis of race. Women from racial and ethnic minority groups had an average of 1.1 more chronic health issues (95% CI; 0.54-1.6), with p-value 0.00017.

As noted in Table 1.2, the sample size of women from racial and ethnic minority groups for the present study was 11: seven were Hispanic or Latina, three were biracial or multiracial, and one was Black or African American. Although we see an increase in chronic health problems after surrogate pregnancies and our sample size is small, it is important to note that chronic health conditions can get worse with age. Our analysis shows that at a minimum, further studies need to look deeper into the effects of surrogacy on chronic health problems and conditions.

SURROGACY EXPERIENCE: COMPENSATION AND RESPECT

Women learned about surrogacy in a variety of ways (Table 6), although most had heard about it through a friend (29.2%). Others had heard about it through family (7.3%), advertisements through newspapers, magazines, or online sources (12.6%), media sources such as books (1%), television or movies (17.7%), social media (8.3%), news (5.2%), or none of the aforementioned (18.8%). When asked if a family member had ever been a surrogate, only 4/96 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 woman, who disagreed with the majority commented at the end of the survey. She was the only participant to comment in the free text on accuracy of the advertisements:

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 \$37,000 and an average payment of \$37,700 (see Table 1.1). 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 pregnancy-related expenses. One woman told us:

Pregnancy made a preexisting 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.

Women who were compensated for their surrogate pregnancy or pregnancies were asked how they used the money they received. They were able to select one or more options from a list. Overwhelmingly, women reported using the payment they received to get out of debt or pay bills (see Table 7), regardless of employment status. The next three most reported uses of payment were split amongst savings, buying, or saving for a house, and educational expenses. Very few admitted to using the funds for vacation. Some women commented:

This has helped us tremendously financially. We just recently purchased a house. I need major neck surgery, [during] 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 card, 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 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.

Table 6
How Participants Learned About Surrogacy

Source	Full Sample	
	<i>n</i>	%
Friend	28	29.2
Family Member	7	7.3
Advertisements	12	12.6
Books	1	1
Television or Movies	17	17.7
Social Media	8	8.3
News	5	5.2
None of the above	18	18.8

Table 7
Reported Use of Payment for Surrogate Pregnancy

Use of Payment	Full Sample	
	<i>n</i>	%
Pay Bills/ Get Out of Debt	54	38
General Savings	29	20
Buy or Save for a House	22	15.5
Educational Expenses	22	15.5
Vacation	15	11

Note. Woman could select one or multiple uses for the payment they received from a surrogate pregnancy or pregnancies. This table is a tally of counts for each use.

Women were asked to what extent payment of money affected their decision to become a surrogate (utilizing a scale of 0-100 where 0 indicated it had no effect 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 a median of 40. Interestingly, though, when asked “How much do you think women who serve as surrogates are influenced by the financial benefit?” women reported a range of 20-100, with an average of 63 and a median of 60. Women are more inclined to think others, but not themselves, are financially motivated to be surrogates. Further analysis here would be beneficial. Even though women in this study claimed that they were less likely to

be financially motivated to be surrogate mothers, they overwhelmingly admitted to using the payment they received to pay bills or get out of debt .

When the amount of money paid for the surrogacy was greater than the yearly income, participants were *more likely* to be influenced by money in their decision to act as surrogates, answering on average 22 points higher on the influence question (95% CI; 4.1-40; p-value = .018).

As mentioned previously in our report, participants were asked about their current household income rather than income at the time of each pregnancy. Authors are aware of this limitation and admit this was a design flaw of the current study. However, valuable information can still be obtained using a participants current household income. Using the six 2020 federal tax brackets and the household income levels reported in the survey, we decided to organize and evaluate the responses by taxable income reported by each participant (see Table 8). Tier 1 corresponds to the lowest taxable income and tier 7 corresponds to the highest taxable income. Most women (n=88) reported a taxable income that falls within tier 2 and tier 3. Our data show that no women were in the top three tax tiers. The decision to act as a gestational surrogate is ethically complicated by women’s financial circumstances, which can function as coercion in cases of poverty or financial need. A great deal more could be done to study the financial incentive on the decision to become a surrogate mother.

Table 8
Tax Tiers of Participants, 2020

Tax Tier 1	Tax Tier 2	Tax Tier 3	Tax Tier 4	Tax Tier 5	Tax Tier 6	Tax Tier 7
< \$9,875 single	\$9,875, - \$40,125 single	\$40,125 - \$85,525 single	\$85,525- \$163,300 single	\$163,301- \$207,350 single	\$207,351- \$518,400 single	>\$518,401 single
< \$19,750 married	\$19,750- \$80,250 married	\$80,250- \$171,050 married	\$171,050- \$326,600 married	\$326-601 - \$414,700 married	\$414,701- \$622, 050	>\$622,051 married
2 women	41 women	46 women	6 women	0 women	0 women	0 women

Note: From 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 81.6% on average respected during their surrogate pregnancies, a difference which was statistically significant (t-test, p-value = 0.00002). 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 surprising. However, one woman explained this difference:

When you are pregnant with your own, everyone wants to help you, but, with my surrogacies, my in-laws didn’t want to help me at all—and my co-workers were 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, on average, reported feeling respected 88.1% by the

intended parent(s), 85.5% by the agency, and 90.3% by healthcare staff. Some women gave insights into their experiences of respect or lack of respect by medical personnel:

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 [felt] very disrespected (0%).

Overall, most women heard about surrogacy through a friend or through advertisements. Social media applications such as Facebook or Instagram allows for women to share their surrogacy 'journeys' with others in their spheres of influence or social circles. Further, these social media websites are utilized by the fertility industry to target possible eligible women with advertisements. Interestingly, women were less likely to admit that money was the motivating factor for entering into a surrogate arrangement, but held the belief that other women who enter into these arrangements are motivated by the money it offered. Regardless of perceived motivation, women in this study were more likely to use the payment they received to get out of debt or pay bills and none of the participants were in the upper tiers of taxable income. It is obvious that more research exploring financial perceptions and coercion is warranted and should have been conducted prior to opening a market on the wombs of women.

DISCUSSION

This study compared spontaneous pregnancies with surrogate pregnancies by interviewing 96 women in the U.S. about their pregnancy experiences, seeking to explore some of the claims made by Woo and others through directly interviewing women with gestational surrogacy experiences.

According to the University of California, San Francisco (n.d.), between 6-8% of all pregnancies have high-risk complications. Research has confirmed that surrogate pregnancies are high-risk. In our survey, women were asked if each individual pregnancy, looking at both spontaneous pregnancies and surrogate pregnancies, was considered high-risk by their doctors.

We found that surrogate pregnancies are more often labeled as high-risk pregnancies independent of maternal age or gravidity. This research supports the findings of Woo et al. (2017) in that surrogate pregnancies had a higher rate of delivery via C-section. Women were *more likely* to deliver at an earlier gestational age compared to their genetically related or spontaneous pregnancies. Not only did the present study show high rates of C-sections in surrogate pregnancies (35.3%) compared with non-surrogate pregnancies (12.1%) but also it revealed that the rate of new post-surrogacy chronic health issues for women of color was significantly higher than for white women. One woman expressed the following sentiment at the end of her interview, suggesting that she was not aware of the potential health risks involved in surrogacy:

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.

Cesarean sections were developed to prevent or treat life-threatening maternal or fetal complications (Belizán et al., 2007). In the 1980s, the international healthcare

community considered the ideal rate for C-sections to be between 10-15% [World Health Organization (WHO) & Human Reproductive Programme (HRP), 2015]. Since then, however, C-sections have become increasingly more common around the world. One explanation for the increasing rate in C-sections could be the increase in assisted reproductive technologies, like surrogacy, resulting in more high-risk pregnancies that require the procedure. Women with high-risk pregnancies, like those in this study, are at an increased risk for delivering via C-section. The elevated C-section rate found in this study could also be due to mere convenience. For example, in international surrogacy arrangements, a C-section is scheduled so that the intended parents can attend the birth of the child. One woman in our study said:

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.

Medically unnecessary C-sections can expose the mother and child to consequences that are not fully understood (Belizán et al., 1999; Althabe et al., 2006). Regardless of the reason, we 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, we add, without harming women and children (Merritt et al., 2014).

Not only were surrogate pregnancies *more likely* to be considered high-risk when compared to non-surrogate pregnancies but also our data showed that the rate of high-risk pregnancy is higher with surrogacy for each age and assumed gravidity level. This evidence rebuts the argument that the rates of risk for a surrogate are higher simply because she has had more pregnancies or is older in her surrogate pregnancy than she was in her non-surrogate pregnancy.

Compensation was an incentive 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 in this study (93.7%) were in the bottom half of the 2020 federal income tax brackets. While these data are imperfect, as they represent a woman's financial status during the year of the interview and not during the year of surrogacy, they highlight an important point: Many women who chose to participate in surrogacy were incentivized by some form of financial need. Women reported the strength of the financial incentive was inversely proportional to their financial status. This relation is ethically problematic, because those with less financial resources or education may be willing to take more risks and might be targeted by those seeking to exploit them. Commercial surrogacy disproportionately impacts poorer women, placing them at increased risk of adverse health outcomes during and after their surrogate pregnancies.

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 undercompensated 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 have underscored the importance of breastfeeding on maternal health, infant health and development, and the maternal-infant bond (Gillman et al., 2001; Kramer & Kakuma, 2004; Quigley et al., 2007; Eidelman et al., 2012). Comments by these surrogate mothers indicate that we need further research in order to evaluate the relationship between surrogate children and breastfeeding.

Finally, 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. A woman who suffered numerous complications during her surrogate pregnancies said:

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 the delivery of my 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.

Likewise, one woman, one whose complications we have seen above among the more severe circumstances, reported her near-death experience and yet, still, she expressed regret that she could not participate in a surrogate pregnancy again. She said:

I delivered, they knocked me out, and [they] took the baby. And I had transfusions during and after. The IPs [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. I'd do it again if I could and was planning to do it again for these IPs.

We found 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 potentially others not yet examined, on the children born from surrogacy arrangements. There is an urgent need for such research because legislation enabling or regulating commercial surrogacy has been passed in various states in the U.S. (Lahl, 2016).

LIMITATIONS

The survey was conducted during a global pandemic, which could have influenced reported employment, income, and other variables. One woman commented that some of her responses, like her “fear for the future and feeling isolated,” are, in her words, “because of COVID.”

An online patient-reported survey possibly could otherwise lack representation for 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 in being surveyed. One possible way to address this bias in the future would be a retrospective study of all women within an agency’s database—including those without online access.

Time was also a limitation, as with many surveys. There were many questions that we would have liked to include, but we did not do so out of respect for the interviewees’ time. Each survey took between one and two hours, depending on the number of pregnancies and complications needing explanation. Among potential questions, one was about the employment choices of surrogate mothers. For example, military wives are often participants in third-party reproduction (Ziff, 2017). For both surrogates and intended parents, this type of demographic data will be important for future studies to explore. We also did not inquire into how frequently women were surrogates for heterosexual couples, for international couples, for partnered gay men, and for single people of either sex.

Another limitation is that, as noted, the majority of women in the present study were white (85 of 97). By contrast, there were 11 participants from racial and ethnic minority groups: seven Hispanic or Latina women, three biracial or multiracial women, and one Black or African American woman. Research by Kaing et al. (2017) has indicated that, of 104 surrogate records reviewed, women otherwise identified as white constituted 52.8% and Hispanic or Latina women constituted 38.2%, with Asian women at 3.4%. Black or African American women do not appear represented in the reviewed 104 records. More studies, however, must account for the experiences of women of color in surrogacy, especially those who are economically disadvantaged. Coinciding with the literature on health disparities impacting women of color, further studies might confirm even more frequently negative outcomes for these women. Research on these cases would give us a greater understanding of not only economic disparities but also racial disparities present in surrogacy.

Our study also did not link women’s educational levels at the time of their decisions to become surrogates. It would be important to know if the ability to get out of debt afforded them the opportunity to seek higher education qualifications, which may or may not have affected their decisions. It is well known that egg donors use the income they receive from selling their eggs for educational expenses (Stieg, 2021,

Talmadge, 2013). Further research should evaluate the impact of commercial surrogacy on obtaining education.

Participation in this study required that women had physically recovered from their most recent surrogate pregnancies. All but one interviewee had completed their surrogate pregnancies at least six weeks prior to the interview (96 of 97). Future studies, however, could require a longer period of time following the interviewees' surrogate pregnancies, in order to better understand the long-term health complications for women in surrogacy.

CONCLUSION

I suggest to every woman who thinks about becoming a surrogate: please consider another way, whether it's for the money, or the delusional idea of self-fulfillment, or whatever. You're not just hurting yourself, you're hurting the baby you carry inside you as well. (Michelle, 2019, p. 116)

This study examined a large sample of American women (97) who participated in gestational surrogate pregnancies and compared these pregnancies and their spontaneous pregnancies. Gestational surrogate pregnancies were significantly *more likely* to be high-risk, deliver earlier, and require a cesarean section for delivery, than spontaneous pregnancies. We also found significant adverse consequences to both the mental and physical health and wellbeing of women following a surrogate pregnancy. This study suggests that women who participated in gestational surrogacy were more likely to experience the listed adverse events, and more likely to be of lower socioeconomic status (SES) and educational levels, most likely citing that financial need—at least, in part—drove their decisions to become surrogates.

Research has shown that Americans of a lower SES are more likely to suffer from chronic health conditions, far much more so than their wealthier counterparts. Due to sex bias, women have disproportionately suffered medical malpractice compared to men, which seems to be doubly so for economically disadvantaged women—even more so for those from racial and ethnic minority groups (Corea 1977/1985; Ehrenreich & English, 1978/2005; Dworkin, 1983; Dusenbery, 2018/2019). The present 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, putting them at heightened risk for adverse health outcomes. Many women participate in gestational surrogacy due to financial need, as opposed to it being simple altruism, a critical point Raymond (1990; 1993/2019), Klein (2008; 2017), and Ekman (2013), among others, have discussed in their critiques. Therefore, it is of the utmost importance that further studies focus on these trends so that surrogacy does not become a means of exaggerating and exploiting preexisting health disparities among women. This paper and future research concerning these issues can meaningfully impact public health policy and biomedical ethics both in the American context and globally.

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