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Incidence of surrogacy in the USA and Israel and implications on women's health: a quantitative comparison

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Abstract

Purpose Gestational surrogacy (GS) has been researched in multiple qualitative studies. In contrast, quantitative aspects of the practice are conspicuously understudied. The present article assesses and compares the incidence of GS in the USA and Israel, two industrialized countries that have maintained active commercial surrogacy practice, for over two decades.

Method The article is a secondary analysis of GS figures published by the Israeli Parliament's Centre for Research and Information (2018) and by the USA's Centers for Disease Control (2016) and related professional publications. Each dataset is analyzed in reference to the respective country, so as to devise local incidence scores that are then juxtaposed in inter-country comparison.

Results The incidence of GS rises steeply in both countries. Though US surrogates are contracted by local and international, heterosexual and gay, and partnered and single intended parents, the relative incidence of GS is lower in the USA than in Israel, where only local heterosexual couples could contract a gestational surrogate. An exceptionally high rate of multiple births was observed in both settings, suggesting some overlooking of professional recommendations for elective single-embryo transfer.

Conclusion GS incidence appears to resemble the ratio between the countries' respective fertility rates. The paper underscores two main risks facing gestational surrogates: the risk of not conceiving and not being paid and the risk of carrying a multiple pregnancy, which is extremely prevalent in GS pregnancies, and sustaining the short- and long-term health complications that are more prevalent in such pregnancies.

Keywords Gestational surrogacy · quantitative assessment · multiple births · incidence · USA · Israel

Introduction

Over the past two decades, gestational surrogacy (GS) has proliferated through growing social circles. Men and women from industrialized and developing countries, partnered and singles, heterosexual, homosexual, and others engage in commercial surrogacy as gestational surrogates, intended parents (IPs), travel agents, brokers, and clinicians. Still, very little is known about the scope of the practice and its incidence. In this article, we aim to provide a preliminary quantitative assessment of the scope of the practice, as it takes place in the USA and Israel.

Social scientists have looked at a broad range of aspects related to GS, primarily from qualitative perspectives. Some researchers have explored legal and ethical aspects [1–3]; the concept of reproductive justice as it is and as it should be enacted in various domains of surrogacy [4]; legislation-guided movements of people from one surrogacy hub to another in search of reproductive assistance abroad [3, 5, 6], as well as care, commodification, and stratification in the context of cross-border reproductive travel [7, 8]. Gestational surrogacy has been discussed also as a vantage point for the exploration of broader phenomena like the commodification, fragmentation, and globalization of reproduction [9, 10–12] in the age of late capitalism [13]. Racialized aspects of the global order [14–16] and changes in prevailing notions of kinship [17], alongside various sorts of border crossing [18–20], have also been discussed in the context of GS. In LGBTQ studies,

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GS has been analyzed as a meeting point of queer reproductions, stratified reproductions, and reproductive justice [21]. On a different scale, researchers have taken surrogacy as a prism for the study of the situated significance of normal pregnancy in the societies in which it is being practiced [22, 23].

Studies at a micro-social level have looked at surrogates' actual and symbolic journeys, the contracts, and gift exchanges surrounding GS [24], including the significance of payment [24, 25] and the centrality of the notions "gift of life" and "labor of love"[25, 26]. Scholars probed surrogates' negotiation of their roles [25] and their embodied and lived experiences [13, 27]. Others looked into the significance of genetics for the surrogates [7] and IPs [28] and at the general implications of surrogates' pregnancies on people around them [25, 29].

The resulting families have also been explored. Susan Golombok and her colleagues' long-term research in the UK offers ample insight on the lives of IPs [30], including gay fathers [31], and their families as they evolve along the years [32–35]. Overall, the families have been found to demonstrate "greater psychological well-being and adaptation to parenthood … than … the comparison group of natural conception parents"[32]. Some feminist scholars expressed highly critical views of GS as exploitative and tried to advance a ban on commercial surrogacy [36–38].

In edited collections [1, 20], review articles [39], books, and journal papers, social scientists, using primarily qualitative methods, have explored various geographical settings in which GS was practiced, spanning from Thailand and Laos [5], India [4, 11, 16, 19, 40–42], and Turkey [43] to the UK [35, 44], the USA [21, 45–49], Germany, Switzerland [50], and Israel [22, 27, 51–54].

In the medical literature, studies of surrogacy are scarce. A major study of 333 GS cycles in Canada [55] pointed at obstetric complications and called for strict application of elective single-embryo transfer (eSET) and for long-term follow-up. The high incidence of multiple births in GS cycles was specifically addressed in a study that underscored ethical and clinical concerns regarding this observed exception [56]. A meta-analysis of GS [57] concluded that GS risks for all parties involved are comparable with standard IVF and oocyte donation, i.e., riskier than natural conception, noting that "[m]ost studies reporting on surrogacy have serious methodological limitations" and stressing that the area is understudied and that "[l]ong-term follow-up studies on surrogacy children and families will be needed in the future"[57].

In this paper, we hope to add to existing qualitative understandings, a quantitative perspective on commercial surrogacy in two settings, Israel and the USA. The decision to compare these particular countries, despite their evidently different magnitude, was guided by several considerations: First, both countries have maintained commercial surrogacy practices for over 20 years. Second, in both countries, surrogacy has been a highly active field, especially in recent years, as detailed in the following sections. Third, both countries are among the few industrialized countries that allow commercial surrogacy. At the same time, GS practice varies considerably between the countries. In Israel, the state regulates GS by a single state committee that licenses surrogates, IPs, and contracts, whereas in the USA, GS is regulated at the state level, with regulations varying in content and degree of monitoring. Adherence to professional guidelines (e.g., issued by the American College of Obstetricians and Gynecologists (ACOG), the American Society for Reproductive Medicine (ASRM), or the Society for Assisted Reproductive Technology (SART)) is completely voluntary. Another difference applies to the scope of the clientele. In Israel, GS has been available only to heterosexual Israeli couples and as of 2018, also to single women; the US is a world hub of surrogacy, serving IPs of all citizenships, personal statuses, and sexual orientations. Both countries are similar, though, in having considerable flow of local citizens travelling abroad for cross-border surrogacy.

Our analysis seeks to situate the relative magnitude of each country's domestic GS practice within its context and then probe possible implications on local women's health and well-being.

Background: the research fields

Israel is a family-centered society. Though comparable to industrialized countries in terms of life expectancy, women's education, and labor market participation, more Israelis marry, they do so at an earlier age, have roughly twice as many children, and divorce less frequently than their European and North American counterparts [58]. One aspect of this family-centered profile is an unparalleled state funding of fertility treatments including in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) that are provided nearly free of charge, to every Israeli woman, without screening, until the age of 45 and the birth of two live children with her current partner, if applicable. In the sphere of surrogacy, in 1996, Israel became the world's first country to regulate GS by means of dedicated primary law (for a full description of the Israeli law and the role of religion in its formation, see [59, 60]). Since then, a state committee screens applicants seeking to become either gestational surrogates or IPs. Contracts are also monitored, and payment to gestational surrogates is capped. The intended mother's egg retrieval, if applicable, and the artificial insemination are publicly funded, like other IVF treatments [61], but the gestational surrogate's fee, amounting to 140,000–150,000 NIS ($39,000–42,000) [51], and some related expenses are covered by the IPs. Eligibility to domestic surrogacy was restricted to heterosexual couples, until 2018, when single women were also granted access.

Arab citizens of Israel are entitled to GS, subject to similar restrictions. Gay men are not eligible for domestic surrogacy and many travel abroad for cross-border ova donation and GS. In recent years, a growing number of Israeli heterosexual couples also prefer to conduct GS abroad, primarily, due to the faster pace of the process and the distance from the surrogate, which some IPs consider an advantage [62]. Countries of destination vary according to changes in legislation, currently concentrating in Georgia, Albania, and the USA [63].

In the *USA*, the legal status of surrogacy varies greatly from one state to another. Some states (e.g., California, Connecticut, Massachusetts, Texas) apply friendly regulations and treat GS contracts as enforceable, whereas others (e.g., New York, Michigan, Utah) restrict the practice and under some circumstances may criminalize GS contracts [64]. The cost of surrogacy in the USA is much higher than in Israel, including expenditure for IVF ($20,000) [61], agency fees ($20,000), health insurance ($15,000–$30,000), GS's fee and expenses ($30,000–$50,000), and legal and counseling fees ($20,000), amounting to a total of $80,000–$150,000 [65]. Contingencies like invasive procedures, multiple pregnancy, or Cesarean section push the cost further up [24]. The high expenditure underlay the reference to GS in the USA as the "baby business" [66]. In 2014, 87% of ART clinics allowed GS. Gestational surrogates were involved in 1.93% of ART cycles conducted in the USA and comprised 3% of all transfers ([67], p. 5). American men and women also travel abroad for surrogacy, mostly in order to find more affordable contracts. Like their Israeli counterparts, American IPs have faced increasingly restrictive policies in numerous countries that have closed the practice to foreign or gay IPs. For many of these potential IPs, the USA has probably become the more accessible site for GS. At the same time, the USA is an international hub of commercial surrogacy, serving a wide range of international IPs. This international standing has become more salient in the past decade [48], possibly due to the growing restrictions on foreign and gay surrogacy in South Asian countries.

Methods

The present article is a secondary analysis of US and Israeli GS data. For Israel, we are using Ministry of Health figures published in October 2018 by the *Knesseth* – Israeli Parliament's – Centre for Research and Information [62]. The document provides comprehensive figures regarding GS initiated by Israelis, both domestically and abroad. The data on domestic surrogacy is based on birth reports and monitors deliveries and live-born infants. The number of cross-border surrogacy (CBS) deliveries is approximated by applications for DNA testing, a state prerequisite for the admission of CBS infants into Israel. As such, it does not specify the number of infants born from GS cycles abroad.

For the USA, the Department of Health and Human Services Centers for Disease Control and Prevention (CDC) has been collecting data since 1995, based on the 1992 law that obliges every fertility clinic to report to the CDC key data and overall performance. Since 2001, the survey includes a couple of questions regarding the use of a gestational carrier [64]. The CDC's annual report on ART in the USA includes very little data on GS. For the present analysis, we used the 2016 CDC report, which described figures for the year 2014 [67]. In order to enrich our GS data, we also consulted two articles on GS in the USA that published data from the CDC National ART Surveillance System (NASS) [48, 49] "which captures information on > 97% of all ART procedures performed in the USA" [49]. To gain further assurance regarding Perkins et al.'s published data, we compared the CDC report's graph that presents "Numbers and Percentages of Transfers Using Gestational Carriers, 2005–2014" [67], Figure 46, with that published by Perkins et al. [48] and found that for the overlapping years, the graphs were identical. The CDC data counts only GS cycles in which at least one embryo was transferred. Probably the most significant absent in the US dataset is that of CBS. US citizens who travel abroad for the procedure are not included in the dataset in any way. For a discussion of CDC's GS data, see [24]. Much as we searched, we did not find any estimate of the scope of CBS carried out by US resident IPs.

Two additional limitations run across both countries data. First, the data does not specify the number of gestational surrogates or IPs involved in the procedures but rather count only cycles, deliveries, and infants. We, therefore, cannot know the exact number of people who were engaged in the practice. Additionally, the reports do not mention traditional surrogacy cycles, which is outlawed in Israel but which apparently does occur in the USA, if in small numbers [24]. For the present analysis, we, therefore, base our calculations on the number of deliveries and infants. We present basic figures on CBS in Israel in order to indicate the steep increase in the scope of the practice, and the number of GS cycles in the USA primarily to assess pregnancy rates. We thus acknowledge that the data analyzed below may be somewhat incomplete, but at the same time, it appears to provide a close approximation, offering a valuable indication of the incidence of surrogacy in the USA and Israel.

The *comparison* looks at the 5 years for which we have figures for both countries: 2010–2014. It is based on several incidence scores, all devised for the present study, that measure surrogacy figures vis-à-vis relevant populations. We start with the whole country population. Given the difference in age distribution of the general population in the two countries, which represents Israel's higher fertility rates, we added adult population scores, which weigh the number of GS deliveries

Table 1 GS deliveries and infants born to Israelis in Israel and abroad (2010–2014)

Year	Domestic surrogacy			Cross-border surrogacy performed by Israeli IP CBS deliveries
	GS deliveries in Israel	GS infants born in Israel	Infant/ delivery	
2010	46	56	1.22	49
2011	49	68	1.39	93
2012	41	49	1.20	128
2013	58	72	1.24	169
2014	65	76	1.17	232
Total	259	321		671
	All deliveries (*N*): 930			
Annual average	52[a, b]	64	1.24	134[b]
	All deliveries (An. Av.): 186			
Av. Ann. growth	7.15%			36.48%

Source: Tables 1, 2, and 3 [62]

[a] Rounded figures are used for clarity

[b] A two-tailed paired *t* test for equal means has been performed with the total of GS and CBS deliveries finding that the null for equal means (Ho: $\mu 1 = \mu 2$) is rejected at a *p* value of 0.05 (*p* value 0.0426)

and infants vis-à-vis each country's adult population. As our focus in this study is on the local women who serve as gestational surrogates, and as we have no data regarding US residents' CBS, we concentrate solely on domestic GS in both settings. Since GS is a relatively small-scale phenomenon, our scores are calculated per million population, rather than the customary figure per thousand.

Results

Israel

Between the years 1998 and 2017, 823 infants were born in Israel following 666 domestic GS births. Starting from 11 applications submitted to the National Surrogacy Committee in the year 1996, when the Embryo Carrying Agreements Law was ratified, the annual average has quintupled from an average of 21 applications in the first 6 years (1996–2001) to 107 in the six last years (2012–2017). The number of infants born following GS has also increased accordingly, from an annual average of 9.5 in 1998–2001 to 73 in the years 2012–2017 (authors' calculations from Figure 1 [62]). The average number of GS deliveries for the scrutinized period (2010–2014), was 52 a year (Table 1 [62]), with an average of 64 infants being born, representing an average baby/delivery ratio of 1.24 (authors' calculations from Tables 2 and 3 [62]).

In recent years, as Table 1 shows, the bulk of GS deliveries that Israelis have initiated take place abroad. A paired *t* test confirmed that the difference between the number of domestic GS deliveries and that which followed Israelis' CBS is statistically significant. The high proportion of multiple births in GS cycles is also evident in the table.

In order to produce a relative estimate of these figures, we weighed them against the entire local Israeli population. As elucidated above, our focus is solely on domestic GS. Table 2 presents the emerging picture.

Aiming for comparative analysis, we now turn to calculate respective US figures that will be later on juxtaposed vs. the Israeli scores.

The USA

Between the years 1999 and 2013, 30,927 GS cycles were carried out in the USA, resulting in the birth of 18,400 infants in 13,380 deliveries, i.e., 1.38 infants per delivery. This means that over half GS infants in the USA (53.4%) were born in multiple births [70]. Both the absolute number and the percentage of GS cycles out of all ART cycles rose significantly during this period, from 1% ($n = 727$) in 1999 [70] to 3% ($n = 4030$) in 2014 [67] (Figure 46). Between the years 2004 and 2008, the number of infants born annually via GS in the USA almost doubled, rising from 738 to nearly 1400 [46]. In the scrutinized years, 2010–2014, 16,148 GS cycles were performed in the USA, resulting in the birth of 10,009 live infants [49]. Given 30.7% ($n = 2341$) multiple live births in this period [49], the number of deliveries amounts to 7645[1], i.e., 47.34% of all GS cycles. Of these cycles, 17.68% ($N =$

[1] Number of deliveries calculation: 2,341:0.307 = 7645
DeliveriesInfants
Singletons7645 − 2341 = 5313 ➔ 5313
Twins + 2341 × 2 ➔4682+
Total 9995+ ➔ possibly 14 triplets: 9995 + 14 = 10,009).

Table 2 Israeli GS delivery and infant scores (2010–2014)

IL score	Score description	Score value
Domestic GS delivery score	An. Av. domestic IL GS deliveries / M IL Pop.	52 / 7.9[a] = 6.58
Domestic GS infants score	An. Av. GS infants born in Il / M IL Pop.	64 / 7.9 = 8.1
Domestic GS delivery adult score	An. Av. domestic IL GS deliveries / M IL adult Pop.	52 / 5.3[b] = 9.81
Domestic GS infants adult score	An. Av. GS infants born in IL / M IL adult Pop.	64 / 5.3 = 12.08

Authors' calculations

[a] [68]. The exact figure for July 2012, the middle point, is 7,916,600

[b] [69]. The exact figure for age 18 and over and July 2012, the middle point, is 5,316,298

2852) were taken up by foreign (non-US) IPs [48], leaving 13,296 GS cycles initiated by US resident IPs. These figures are summarized in Table 3.

Before turning to the score calculation, we should remind, once again, that the following calculations apply only to domestic GS cycles, to the exclusion of CBS cycles initiated by US citizens. Whereas the percentage of non-US resident IPs that are included in the data is known and can be analyzed, the scope of CBS cycles conducted by US residents is unknown. Table 4 presents the proportion of GS deliveries and infants vis-à-vis the general American population and the American adult population.

The US figures disclose an even higher rate of multiple births than that found in Israel. This rate has indeed somewhat decreased in recent years but has remained at a relatively high level of 30.7% of all live births resulting from GS. We now move on to compare the two datasets in order to elucidate the relative incidence of local GS practice vs. the respective local population.

Comparative assessment: gestational surrogacy in Israel and the USA

What is the meaning of these figures in their nationwide contexts? What are the implications for local women who engage in GS in the USA and Israel? Since the Israeli data does not monitor GS cycles but only deliveries and newborn infants, we base our comparison on these variables. We approach our comparison by looking at the rate of GS multiple births in each country during the scrutinized years: 2010–2014. In Israel's domestic surrogacy, multiple births comprised up to 24% [(321–259) / 259] of GS deliveries (assuming that multiple births consist only of twins), whereas in the USA, the respective figure was 30.7%[2].

The table's first row demonstrates that during the scrutinized period, GS deliveries comprised 0.39‰ of all US deliveries, whereas in Israel, such deliveries comprised only 0.32‰ of local deliveries. This may suggest that Israelis opt for surrogacy less frequently than their American counterparts. However, the gap vanishes if we set aside non-American IPs. If we look at US resident IPs, as compared to Israeli IPs (row 2), the inter-country proportion of GS deliveries as part of all domestic deliveries is 0.997, i.e., practically identical. Basic statistical analysis (95% CIs) confirms the similarity. Aspiring for a finer understanding, we delved deeper into the figures. From the surrogate women's perspective, the local use of GS, when assessed vis-à-vis all local deliveries, is indeed greater in the USA than in Israel. From the IP perspective, however, we need to bear in mind that Israeli IPs of domestic surrogacy were only local heterosexual couples,[3] whereas in the USA, persons of all sexual orientations and marital statuses were allowed to contract a gestational surrogate. The resulting similarity in incidence of domestic GS in the two countries, despite serving substantially different scopes of clientele, may, therefore, suggest, very cautiously, that if we had full data on domestic as well as cross-border surrogacy in both countries, Israelis might have emerged as heavier users of GS.

A supplementary approach to evaluate the relative load of GS on women in each country is to weigh GS deliveries and infants, vis-à-vis the respective local populations. As mentioned, because our data specifies only deliveries and infants, we cannot ascertain the precise number of women and IPs involved in GS. And yet, rows 3–6 of Table 5 reveal a consistently higher incidence of GS deliveries and infants in Israel, suggesting that the proportion of women and IPs engaged in GS in Israel is most likely greater than in the USA. The same is true for the resulting infants: In proportion to each local population, more GS infants are being born in Israel than in the USA (6.38 / 8.1 = 1.27). However, as the percentage of multiple deliveries is higher in the US than in Israel, the discrepancy further increases when we turn to look at the delivery scores proportions, which stands on 1.35. When we refine our assessment by looking at the respective adult populations, in order to account for the inter-country difference in fertility rate, the gap further widens, to roughly 2:3 (1.54). These figures mean that in the years 2010–2014, a load of surrogacy in proportion to the local adult population was 54% higher among Israeli women as compared to US women. Bearing in mind that we do not have numbers of gestational surrogates

[2] The multiple birth percentage declined in the course of the years from 36% [48] in 1999–2013 to 30.7% [49] in 2010–2014.

[3] Single women gained access to domestic surrogacy only in 2018 and were therefore ineligible during the scrutinized period.

Table 3 US GCC figures (2010–2014)

Year 2010–2014	Total		US resident IP		Foreign (non-US) resident IP	
	N	An. average	*N*	An. average	*N*	Ann. average
GCC	16,148[a]	3226	13,296[b]	2659	2852[c]	570
Deliveries	7645	1529	6292	1258	1353	271
Infants	10,009[d]	2002	8237	1647	1772	354

Source: [67]

[a] [67] Figure 46 (main source). Also, [48] Figure 1, and [49] Table 1 column 2

[b] 16,148 − 2852

[c] [49]. Table 1 column 7

[d] [49]. Table 1 column 4

but only of deliveries, we cautiously estimate that, when looking at each country's adult population, for every 2 American women who engaged in GS, there were roughly 3 Israeli women engaged likewise. When we adopt an IP perspective and set aside non-US resident IPs, the gap evidently further widens, pushing the inter-country discrepancies to 1.54–1.87 (rows 7–10). 95% CIs for rows 4–10 confirm the difference are statistically significant. Only row 3 difference is marginally insignificant.

Local birth rates and fertility rates, indicating a proportion of 1.62 to 1.71 between the US and Israel (rows 11–13) may play a key role in explaining the observed gaps in GS incidence.

Discussion and conclusion

The quantitative analysis presented above, of the incidence of GS in the USA and Israel, shows substantial expansion of the practice in both settings, with more deliveries and more infants being born following GS. Comparatively speaking, though GS deliveries comprised a slightly higher percentage of US deliveries in 2010–2014 than the respective percentage in Israel, the incidence of GS per local adult population was roughly 50% higher in Israel than in the USA. Israeli adult women thus have a substantially higher likelihood of being engaged in GS than American adult women. Considered from an IP perspective, this gap is all the more instructive, as it rises to 1.87 when we compare each country's GS deliveries initiated by local IPs in proportion to the local adult population. In other words, there were nearly twice as many GS deliveries to Israeli IPs per adult Israeli than to US resident IPs per adult US resident. The gap is especially instructive given narrower range of potential IPs in Israel (i.e., local heterosexual couples vs. IPs of all family statuses, sexual orientations, and nationalities in the USA).

One explanation for this gap is most likely, the difference in the cost, which is more than twice higher in the USA than in Israel and may require an extreme financial effort for many IPs [51, 65]. But this is probably not the only reason. We suggest that the incidence gap also echoes the gap in fertility rates between the two countries. Though different subpopulations within each country are known to have different fertility rates, the overall figure still provides an instructive general indication. We, therefore, suggest that the higher incidence of GS in Israel may also resonate the country's higher fertility rates, which exceed those of the USA by 60–70% (Table 5, rows 11–13). When considered against local fertility rates, it may appear that in both countries, IPs are as keen to found families as their local counterparts who are not in need of GS. On a second look, however, the gap widens, because, as mentioned, Israeli GS serve a much smaller category of IPs. The higher relative incidence of GS in Israel

Table 4 US GS delivery and infant scores (2010–2014)

US score (total: US and non-US resident IP)	Score description	Score value
Domestic GS delivery score	An. Av. total domestic US GS deliveries / M US Pop.	1529 / 314[a] = 4.87
Domestic GS infants score	An. Av. total GS infants born in the US / M US Pop.	2002 / 314 = 6.38
Domestic GS delivery adult score	An. Av. total domestic US GS deliveries / M US adult Pop.	1529 / 240[b] = 6.37
Domestic GS infants adult score	An. Av. total GS infants born in the US / M US adult Pop.	2002 / 240 = 8.34

Authors' calculations

[a] [71] The exact figure for 2012 is 313,914,040

[b] [71] The exact figure for age 18 and over and 2012 is 240,203,630

Table 5 GS in the USA vs. Israel: comparative deliveries and infant scores

		Israel	USA	Israel / USA
	Proportion of surrogacy			
1.	Percentage of all IP GS deliveries / all domestic deliveries	52 / 163,725[a] = 0.32‰	1529 / 3,952,841[b] = 0.39‰	0.82 [0.63, 1.05][c]
2.	Percentage of local IP GS deliveries (US resident IP / all domestic deliveries)	52 / 163,725[d] = 0.317606‰	1258 / 3,952,841[e] = 0.318252‰	0.997 [0.77, 1.28]
	Score (score description)			
	All domestic GS: US and non-US resident IP			
3.	Domestic GS infants score (An. Av. GS infants born / M Pop.)	64 / 7.9 = 8.1	2002 / 314 = 6.38	1.27 [0.99, 1.63]
4.	Domestic GS delivery score (An. Av. domestic GS deliveries / M Pop.)	52 / 7.9 = 6.58	1529 / 314 = 4.87	1.35 [1.04, 1.73]
5.	Domestic GS infants adult score (An. Av. GS infants born / M adult Pop.)	64 / 5.3 = 12.08	2002 / 240 = 8.34	1.45 [1.12, 1.85]
6.	Domestic GS delivery adult score (An. Av. domestic GS deliveries / M adult Pop.)	52 / 5.3 = 9.81	1529 / 240 = 6.37	1.54 [1.18, 1.97]
	Score (score description)			
	US residents IP vs. Israeli IP			
7.	Domestic Am. IP GS infants score (An. Av. GS infants born to US resident IP / M Pop.)	64 / 7.9 = 8.1	1647 / 314 = 5.25	1.54 [1.20, 1.98]
8.	Domestic Am. IP GS delivery score (An. Av. domestic GS deliveries to US resident IP / M Pop.)	52 / 7.9 = 6.58	1258 / 314 = 4.00	1.64 [1.26, 2.11]
9.	Domestic Am. IP GS infants adult score (An. Av. GS infants born to US resident IP / M adult Pop.)	64 / 5.3 = 12.08	1647 / 240 = 6.86	1.76 [1.37, 2.25]
10.	Domestic Am. IP GS delivery adult score (An. Av. domestic GS deliveries to US resident IP / M adult Pop.)	52 / 5.3 = 9.81	1258 / 240 = 5.24	1.87 [1.44, 2.4]
	Fertility rates			
11.	Birth rate (births per 1000 population)	21.6[f] per 1000 population	12.6[g] per 1000 population	1.714
12.	General fertility rate (number of live births per 1000 women of reproductive age)	91.4[h] per 1000 women of reproductive age	53.6[i] per 1000 women of reproductive age	1.705
13.	Total fertility rate (total number of children born or likely to be born to a woman in her life time if she were subject to the prevailing rate of age-specific fertility in the population)	3050[j] per 1000 women	1880.5[k]per 1000 women	1.621

Extrapolated from Tables 1–4 above and cited sources

[a] 2012 figures: 170,940 (live birth) + 585 (still births) − 7800 (multiple births) = 163,725 https://www.cbs.gov.il/he/publications/DocLib/2018/3.%20ShnatonVitalStatistics/st03_01.pdf and [72]

[b] In [73]

[c] 95% CI for the quotient of two means. Standard deviation (SD) for Israel, from Table 1; SD for USA from [67] (main source) and also from [48] and partially extrapolated from the same sources

[d] 2012 figures: 170,940 (live birth) + 585 (still births) − 7800 (multiple births) = 163,725 https://www.cbs.gov.il/he/publications/DocLib/2018/3.%20ShnatonVitalStatistics/st03_01.pdf and [72]

[e] In [73]

[f] Table 10 [74]

[g] Table 10 [74]

[h] Table 10 [74]

[i] Table 10 [74]

[j] Table 4 [75]

[k] Table 4 [75]

coheres with the lower costs as well as with qualitative studies that have shown GS to be culturally embedded in their broader contexts (e.g., [24, 27]). Having said that, we need to bear in mind that the present analysis is based on small numbers: 259 deliveries in Israel and 6292 in the USA.

What can we learn about and from the comparison about GS practice in these two arenas? What are its implications on women's health? We start by drawing attention to the women left outside the present analysis. As mentioned, our analysis refers only to those GS who have had a live birth. As the Israeli report does not mention the number of cycles, we could compare only deliveries and live births. An Israeli state officer informally estimated that the delivery rate of GS is roughly 25–35%, as common than in Israel's IVF practice. The US GS

figures represent 47.34% delivery per GS cycles [49]. However, even the US reports exclude those gestational surrogates who have not reached the embryo transfer phase. These inclusion criteria leave out numerous women who have undergone screening procedures, collecting legal forms, issuing medical records, undergoing medical and psychological assessments, and eventually having been approved for the task; have been matched to specific IPs; and have undergone clinical preparation for embryo transfer, including repeated clinic visits and intake of medications, most likely, in several cycles of unsuccessful treatment. These women were paid but a minimal compensation that at best covered their own GS-related expenses [24, 25]. The US delivery/cycle figures and the Israeli estimates are crucial reminders that the number of women engaged in GS is substantially higher than depicted above by the number of deliveries. In fact, they suggest that possibly most women who engage in surrogacy do not conceive, do not receive the main payment, and often go unreported.

Women who do conceive and have a live birth are likely to face other concerns. As shown above, the percentage of multiple births is exceptionally high in GS pregnancies. In Israel, in the year 2012, halfway through the scrutinized period, 4.4% of all infants were twins; 4.6% of the infants were born in multiple births [72]. In comparison, of 321 domestic GS infants born in Israel in the scrutinized period, roughly 124 (62 × 2) infants were born in multiple births, amounting to 39%[4] of GS infants in that period. In the USA, the rate of multiple births is still higher. At the same time, in the general US 2012 delivery reports, twin births amount to a lower percent, merely 3.3% of all births nationwide, with higher-order births accounting for another 0.12% [73]. Among US gestational surrogates, as noted above, multiple live births accounted for 30.7% of all live births in the scrutinized period [49]. Even when compared to women undergoing fertility treatments, gestational surrogates have a higher incidence of multiple pregnancies [70]: 41–25% in GS cycles vs. 34–21% in non-GS ART cycles [56]. Having said that, rates of multiple births have been steadily declining in the USA in all forms of ART cycles, including GS. Still, beyond the variability, the differences between the general population and GS cycles are self-evident and momentous.

In terms of women's health, the elevated percentage of multiple pregnancies means that gestational surrogates face greater health risks than most other pregnant women. According to ACOG, women who carry multiple pregnancies have increased the risk for various conditions, like *preeclampsia*, *gestational diabetes*, preterm birth, Cesarean birth, as well as *postpartum depression* [76]. Additional heightened risks include gestational hypertension, anemia, miscarriage, and postpartum hemorrhage [77]. Some of these conditions may have long-term effects, like increased risk for diabetes mellitus, chronic hypertension, cardiovascular diseases, coronary heart disease, and stroke [78]. Söderström-Anttila et al.'s review revealed that despite their average younger age, gestational surrogates are at a similar risk for pregnancy-related complications as other IVF patients [57].

To the best of our knowledge, gestational surrogates are normally not covered nor compensated for such long-term health consequences. They are also not insured in case their working ability is damaged. The health of the GS infants can also be affected by multiple births, through increased likelihood of preterm birth, reduced birth weight, increased risk of congenital disabilities, and psychological sequelae [57]. Due to these risks, both the ASRM and the CDC have been advocating elective single-embryo transfer (eSET) practice. Scholars in the field have also drawn attention to the "precarious position of gestational surrogates" [56] and called to apply eSET recommendation especially strictly in GS, wherein the party at risk is not always capable of making the decisions and is not the one benefitting from the arrangement [49, 55], and to collect "long-term follow-up data on GCs [gestational carriers] and IPs" [55] (see also [56, 57, 79]). The practice of GS thus appears to be a singular sub-arena in which professional recommendations are not being applied. Future studies will be required in order to ascertain whether the incidence of GS multiple deliveries keeps declining and at what pace.

The high incidence of multiple pregnancies may be of special import in the USA. In Israel, as noted, not only is the incidence of multiple deliveries lower but also surrogates are also carefully screened. They are therefore practically guaranteed, as much as clinically possible, to be healthy women aged 22 to 40, who have no more than four children, who are not overweight or smokers, and have had no more than one Cesarean section in the past. These are women who have not "taken antidepressants or undergone gastric bypass"[59]. They are also guaranteed to have health insurance for their whole lives, like all Israeli citizens. In the less regulated USA, gestational surrogates' baseline does not necessarily fit this profile. Moreover, Internet-mediated independent "Indy" GS arrangements have been reported as increasing, alongside traditional surrogacy and repeated pregnancies by the same woman [24]. All of these arrangements are either outlawed or closely scrutinized before approval (repeated pregnancies) in Israel.

The increased risk that US gestational surrogates may face is exacerbated by the health insurance structure that may leave some gestational surrogates uninsured and, as such, especially vulnerable. A recent suggestion to mandate medical insurance for gestational surrogates that would extend for a few weeks after the delivery [56] may help cope with short-term risks though not with potential long-term sequelae of multiple pregnancies. Indeed, bed rest and complications may inflict great financial losses on

[4] (321 − 259) × 2/321 = 0.39; for the sake of clarity, we assumed that all multiple births were twins.

surrogates even in the short term, leaving some surrogates poorer rather than wealthier in the wake of the GS pregnancy [24, 25].

To sum up, more and more women and men in the USA and Israel are opting for GS in order to found families; more and more American and Israeli women engage in GS. These women expose themselves to two substantial risks. The first is the risk of not delivering a live infant, which results in a great effort to become a surrogate without receiving the main monetary compensation and emotional recognition. The other risk, which faces those gestational surrogates who do deliver, is that of multiple pregnancy and birth, with their increased risk to immediate- and long-term health complications.

This reality needs to be borne in mind when considering surrogacy-related issues that affect the scope of the practice and the well-being of the participating women. It should also be recalled vis-à-vis media presentations that often focus on the pain of IPs and the happy endings of successful GS births. Whereas the desire to have a family, as well as the bliss of GS births and the personal closeness that evolve between some gestational surrogates and IPs should be well acknowledged and certainly must not be underestimated, it is equally crucial, when making policy, financial, and clinical decisions, to bring forth the tremendous investment of time, money, emotion, and bodily resources on the part of women who engage in GS. Whereas it is vital that many GS cycles end successfully and that the resulting families prosper, it is as important to minimize the risks to the women who carry the pregnancies and to ensure their safety and well-being.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The study is a secondary analysis of existing data and did not involve any human participants.

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