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Article

Pregnancy Outcomes Following Participation in the *Healthy Women Healthy Futures* Doula Program in New York City

Diana Romero *, Meredith G. Manze [2] and Mukta Mohnani

Department of Community Health and Social Sciences (CHASS), CUNY Graduate School of Public Health and Health Policy, New York, NY, USA; meredith.manze@sph.cuny.edu (M.G.M.); mukta.mohnani02@login.cuny.edu (M.M.)

* Coresspondence: diana.romero@sph.cuny.edu; Tel.: +1-201-264-4602

Abstract: *Background*: Historically, in the United States and globally, women have supported other women before, during, and after childbirth. Birth doulas are considered an important component to eliminating racial disparities in maternal morbidity and mortality. To address disparities in birth outcomes, *Healthy Women Healthy Futures* (HWHF) provides free birth and postpartum doula services to low-income women and communities of color in New York City. *Methods*: Secondary analysis of program data (n=364) collected between 2020 and 2021 was conducted. Univariate and multivariable analyses focused on: method of delivery, preterm birth, low-birthweight birth, breastfeeding, maternal-infant skin contact. The key exposure variable was total doula hours. *Results*: Clients who received prenatal doula support had low rates of preterm birth (8.8%) and low birthweight (7.1%), and high rates of vaginal delivery (69.1%), breastfeeding in the hospital (90.9%), and maternal-infant skin contact (78.2%). Multivariable analysis did not identify an association between number of doula hours and any of the five outcomes examined. *Conclusion*: While descriptive results point to positive birth outcomes, these effects did not persist in multivariable analyses. Data quality concerns from this intervention likely hindered the ability to detect a program impact, emphasizing the importance of funding to support data collection and management activities.

Keywords: Doulas; pregnancy outcome; health disparities; maternal health; women of color

1. Introduction

Historically, in the United States and globally, women have supported other women before, during, and after childbirth. This support could come from friends, family members, or knowledgeable members of the community. Nevertheless, with scientific and technological advances during the twentieth century, pregnancy and childbirth became highly medicalized, in many cases leading to the dehumanization of women's birth experiences [1–3]. Over the last few decades, there has been increasing attention to continuous support during pregnancy leading to the return of women-to-women support in the form of doula services [2,3].

A doula is a non-medically trained birth worker or companion who provides emotional, physical, and educational support to women throughout their pregnancy and birthing experience [3]. Although people of any gender can train to work as doulas, the large majority identify as women [4]. Even in cases where women require medical intervention, those in labor have benefitted from doulas' assistance and support before and during labor and delivery, resulting in more positive medical experiences 2. Doulas provide equitable and high-quality maternity care and are therefore considered one of the crucial components among strategies to eliminate racial disparities in maternal morbidity and mortality [5].

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Several studies have demonstrated that continuous birthing support by doulas during pregnancy is associated with positive birth outcomes and experiences [6–12]. Although the clinical settings and populations served vary greatly, the majority of the studies have shown a reduction in cesarean deliveries, the need for pain medication [6–8,13], and operative vaginal deliveries [6], and an increase in early breastfeeding initiation [6,10] as well as improved maternal satisfaction and perceived birth experience [14].

In the United States, persistent racial and ethnic disparities exists in maternal morbidity and mortality; women of color are disproportionately more affected than White women [15]. Many federal and state-level measures have been introduced to provide doula services to low-income women, particularly Black women [5]. To address disparities in birth outcomes, *Healthy Women Healthy Futures* (HWHF) provides free birth and postpartum doula services to pregnant women in low income and communities of color in New York City [16].

Healthy Women Healthy Futures (HWHF) is a non-profit organization founded in 2014, whose stated mission is to improve health of pregnant women and infants in New York City (NYC). They aim to mitigate the detrimental effects of structural violence among NYC pregnant and postpartum women of color and their infants. HWHF is administered through a partnership among two community-based organizations (CBOs) and one Federally Qualified Health Center (FQHC) [17,18]. HWHF identifies, trains, and assists community women to become doulas who generally live among and share background characteristics with their clients (e.g., race/ethnicity, age, language, socioeconomic status, immigrant ancestry, or experience) so they have a close understanding of the communities they serve. HWHF-trained doulas provide educational, emotional, and physical support to pregnant women of color and those from low-income communities across NYC. Specifically, HWHF doulas act as liaisons between their clients and the healthcare and social service systems they engage with to ensure that they have access to the healthcare and social services they require, such as communicating with case managers and social workers. They also empower clients to advocate for themselves and make their own health care decisions. Doulas can translate technical medical information for their clients and direct them to hospitals, midwives, and other services.

HWHF provides both birth and postpartum doula services. A *birth* doula helps expectant mothers from the prenatal period through the final weeks of pregnancy, supporting mothers during labor and birth. They work with the woman's obstetrician or midwife to provide continuous care, such as educating them about healthy behaviors during the prenatal period; providing emotional and physical support; and advocating for them during labor and birth at hospitals and other birthing centers. HWHF birth doulas provide up to five visits during the late prenatal period, labor and delivery support, and up to two postpartum visits. A *postpartum doula* is trained to help mothers transition into parenthood and provide information about newborn care and development, such as infant feeding and parent-infant bonding. There were 100-110 HWHF doulas during the 2020-2021 program period. All doulas must complete birth and/or postpartum doula training. While doulas typically meet with clients in their homes and attend the birth, during the study period doulas had to engage in virtual visits with program clients due to the COVID-19 pandemic.

HWHF's doula program had not evaluated their services since its inception. The objective of this study was to test a set of demographic and doula program-related factors that might be associated with differences in a group of birth-related outcomes among pregnant clients who received HWHF doula support during the 2020 to 2021 program period in NYC. Such data can be used for the program's quality improvement.

2. Materials and Methods

2.1. Data Source

Secondary analysis of HWHF data was conducted using client records collected between July 2020 and June 2021 from three organizations participating in the HWHF program. These data include HWHF clients who received prenatal and/or postpartum doula support. The program data analyzed in this study included client demographics, health characteristics, and labor and delivery data, which were entered on paper forms by doulas. Due to missing data, we were unable to include certain

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variables and could only use data from two sites for the analysis. Data were assembled for a total of 457 HWHF clients during the study period; 93 participants were excluded due to missing data from one site, for a final analytic sample of 364.

2.2. Study Sample

Potential clients learned about HWHF doula services through advertisements, direct outreach by lead agency staff and doulas, and referral sources in the community (e.g., medical and social service providers in hospitals, clinics, CBOs). Current and former HWHF clients also recommended the program to family and friends. The two inclusion criteria to participate in the HWHF program were New York City residence and eligibility for, or receipt of, public assistance. This included but was not limited to Supplemental Security Income (SSI), Social Security Disability Insurance (SSDI), childcare vouchers, Section 8 housing, public housing, WIC, food stamps (SNAP), cash assistance (TANF), or other social benefits (e.g., unemployment insurance). All clients completed an informed consent process prior to enrolling in the HWHF program.

2.3. Data Management

Each of the three HWHF organizations handled their own program data (i.e., they established their respective data collection protocols with their doula staff). Two had paper-based files for the 2020-2021 project period; all paper files were reviewed and quantitative data for a predetermined list of variables were recorded into an Excel spreadsheet. The third organization had an electronic medical records system. Due to missing data for key analytic variables, we were only able to conduct the regression analyses with data from two of the three sites

2.4. Measures

Based on the available program data, the outcome variables of interest that we could examine in this study were: 1) pre-term birth (Yes [≤ 37 weeks] vs. No [>37 weeks]); 2) low birthweight (Yes [<2500 grams] vs. No [≥2500 grams]); 3) method of delivery (vaginal vs. cesarean); 4) breastfeeding at the hospital (Yes/No); 5) skin contact between newborn and mother (Yes/No).

The exposure, or treatment, variable is the total number of doula hours, which was calculated by combining total prenatal and postnatal doula hours. The covariates included in the analyses (based on available program data) were maternal age, race/ethnicity (Black/African American, White American, Hispanic/Latina, Asian/multiracial/other), insurance (Medicaid vs. private insurance/child health plus/other), and doula-attended birth (Yes/No).

2.5. Statistical Analysis

First, we conducted descriptive analysis (frequencies/percentages, means/standard deviations) for the total sample (n=364) as well as the sub-sample that excluded women who only received postpartum doula care (n=304) to summarize the distribution of the following variables of interest: pre-term birth, low birthweight, method of delivery, breastfeeding at the hospital, skin contact, number of total doula hours, doula-attended birth, maternal age (mean years), gestational age (mean weeks), race/ethnicity, and insurance (Table 1). Then we performed unadjusted and adjusted logistic regression modeling for each of the five outcome variables, limiting the analysis to clients who received birth doula services. Given the nature of services provided by birth and postpartum doulas, respectively, these analyses excluded postpartum only clients (i.e., those who did not receive birth doula care resulting in sample size of n=304). The multivariable models were adjusted for covariates that included maternal age, race/ethnicity, health insurance, and doula attendance at birth. We conducted the analyses with SAS version 9.4 (SAS Institute Inc., Cary, NC) with differences at $p<0.05$ considered statistically significant.

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Table 1. Demographic and birth-related characteristics of clients in the Healthy Women Healthy Futures program (2020-2021).

Characteristics	Total Sample (N=364) n (%)	Sub-sample (excludes PP-only clients) (N=304) n (%)
Maternal Age (mean yrs, SD)	29.99 (6.1)	29.95 (6.1)
range	14–50	14–50
Race		
Black/African American	166 (48.1)	140 (47.6)
White American	24 (7.0)	21 (7.1)
Hispanic	129 (37.4)	111 (37.8)
Asian/multiracial/other	26 (7.5)	22 (7.5)
Gestational age (mean wks, SD)	33.1 (6.2)	33.1 (6.3)
range	8–40	8–40
Insurance		
Medicaid	297 (89.2)	254 (89.8)
Private insurance/Child Health Plus/other	36 (10.8)	29 (10.2)
Method of delivery		
Cesarean	112 (34.8)	85 (30.9)
Vaginal	210 (65.2)	190 (69.1)
Preterm birth		
Yes	29 (9.7)	24 (8.8)
No	270 (90.3)	250 (91.2)
Low birthweight		
Yes	27 (8.6)	19 (7.1)
No	288 (91.4)	250 (92.9)
Doula attended birth		
Yes	282 (79.2)	267 (89.9)
No	74 (20.8)	30 (10.1)
Baby breastfed		
Yes	285 (89.3)	251 (90.9)
No	34 (10.7)	25 (9.1)
Skin Contact		
Yes	246 (77.4)	215 (78.2)
No	72 (22.6)	60 (21.8)
Total doula hours (mean hrs, SD)	19.3 (13.1)	19.2 (12.6)
range	0 -74.5	1.5–74.5

2.6. Human Subjects Protection

The City University of New York (CUNY) Institutional Review Board (IRB) deemed this secondary analysis study exempt in that it did not meet the criteria for human subjects' research due to the use of de-identified data.

3. Results

3.1. Total Sample Description

The total sample included 364 HWHF clients who received doula support prenatally, postpartum or during both periods (Table 1). The mean maternal age was 30 years and the mean gestational age was 33.1 weeks. Approximately 48.1% of the clients were Black/African Americans,

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7% were White, 37.4% were Hispanic, and 7.5% were in the Asian, multiracial, or other categories. Regarding health insurance status, 89% received Medicaid and 11% either had private insurance, child health plus, or other insurance. Approximately 65% of the clients had vaginal delivery and 35% had cesarean delivery. The majority of clients did not have a preterm birth (90.3%) or a low-birthweight baby (91.4%). In terms of birth-related variables, 89.3% breastfed at the hospital, 77.4% had skin contact with the baby, and the doula attended the births for 79.2% of the clients. The mean total doula hours were 19.3 (SD=13.1). In Table 1 we also summarized the characteristics of the subsample (n=304) used for the multivariable analyses (i.e., excluded postpartum-only clients), which were similar to the total sample.

3.2. Subsample Description

Clients who received prenatal doula support (n=304) had low rates of preterm birth (8.8%) and low birthweight (7.1%), and high rates of vaginal delivery (69.1%), breastfeeding in the hospital (90.9%), and maternal-infant skin contact (78.2%) (Table 1).

3.3. Multivariable Findings

We have grouped the binary logistic regression analyses into three categories: method of delivery (vaginal vs. cesarean), newborn birth-related outcomes (low birthweight; preterm birth), and postpartum-related outcomes in the hospital (breastfeeding; skin contact). While both the unadjusted and adjusted logistic regression model results are reported in the data tables, we have summarized the key results from the adjusted models below.

Method of Delivery Outcome (Table 2)

Table 2. Unadjusted and adjusted logistic regression comparing the odds of vaginal delivery by total doula hours (n=304).

	Unadjusted Models			Adjusted Models		
	OR	95% CI	p-value	OR	95% CI	p-value
Total doula hours		N = 275			N =262	
	0.99	0.98–1.02	0.750	1.00	0.98–1.02	0.742
Age		N = 266				
	0.97	0.92–1.01	0.106	0.96	0.92–1.01	0.087
Race/Ethnicity		N = 270				
Black/African American	Ref	-	-	Ref	-	-
White American	8.48	1.10–65.70	**0.041**	7.54	0.96–59.20	**0.054**
Hispanic/Latina	0.98	0.57–1.71	0.955	0.87	0.48–1.58	0.655
Asian/multiracial/other	0.74	0.27–2.05	0.563	0.69	0.24–2.01	0.499
Doula attended Birth		N = 275				
No	Ref	-	-	Ref	-	-
Yes	1.54	0.61–3.92	0.364	2.06	0.72–5.84	0.176

Note: Ref = reference category; OR = odds ratio; CI = confidence interval.

In the adjusted logistic regression model predicting *mode of delivery*, there was a marginally significant (p=0.054) association, such that Whites appeared more likely (OR=7.54, CI: 0.96-59.2) to have a vaginal delivery compared to Black/African Americans. There were no significant associations with total doula hours or attendance at birth, nor client age.

Newborn birth-related outcomes (Table 3)

With regard to *low birthweight*, in the adjusted logistic regression model there was a marginally significant (p=0.052) association, such that Hispanic/Latinas appeared less likely (OR=0.26; CI: 0.07-1.01) to have a low birthweight baby compared to Black/African Americans. There were no significant

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associations with total doula hours, client age nor insurance status. In the adjusted logistic regression model for *preterm birth*, there were no significant associations with either the doula hours or the demographic variables.

Hospital postpartum-related outcomes (Table 4)

Table 3. Unadjusted and adjusted logistic regression comparing the odds of low birthweight and preterm birth by total doula hours (n=304).

	Low Birthweight						Preterm birth					
	Unadjusted Models			Adjusted model			Unadjusted Models			Adjusted model		
	OR	95%CI	p value	OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value
Total doula hours		N = 269			N = 242			N = 274			N = 247	
	0.99	0.96–1.03	0.772	0.99	0.95–1.03	0.512	0.98	0.95–1.02	0.400	0.98	0.94–1.02	0.308
Age		N = 262						N = 266				
	0.97	0.90–1.05	0.403	0.95	0.88–1.03	0.220	0.99	0.92–1.06	0.668	0.99	0.92–1.06	0.670
Race/Ethnicity		N = 265						N = 269				
Black/African American*	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
White American	0.57	0.07–4.69	0.602	0.47	0.06–3.97	0.487	0.46	0.06–3.75	0.472	0.39	0.05–3.22	0.382
Hispanic/Latina	0.31	0.08–1.14	0.077	0.26	0.07–1.01	**0.052**	0.53	0.20–1.44	0.215	0.47	0.17–1.32	0.152
Asian/multiracial/ Other	2.74	0.77–9.70	0.118	2.70	0.73–9.90	0.135	1.57	0.41–6.06	0.515	1.24	0.32–4.87	0.758
Insurance		N = 250						N = 256				
Medicaid	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Private insurance/ Child health plus/ Other	1.02	0.22–4.66	0.985	1.69	0.34–8.45	0.524	*			*		

Note: Ref = reference category; OR = odds ratio; CI = confidence interval; *Estimates for the ORs and CIs could not be produced due to zero observations in this category.

Table 4. Unadjusted and adjusted logistic regression comparing the odds of baby breastfeeding and skin contact by total doula hours (n=304).

	Baby Breastfeeding						Skin Contact					
	Unadjusted Models			Adjusted model			Unadjusted Models			Adjusted model		
	OR	95%CI	p value	OR	95% CI	p value	OR	95%CI	p value	OR	95% CI	p value
Total doula hours		N = 276			N = 263			N = 275			N = 262	
	1.03	0.99–1.07	0.141	1.02	0.98–1.07	0.285	1.01	0.98–1.03	0.588	1.01	0.98–1.03	0.560
Age		N = 267						N = 266				
	0.94	0.88–1.01	0.100	0.93	0.86–1.00	**0.050**	0.99	0.94–1.04	0.629	0.98	0.94–1.03	0.515
Race/Ethnicity		N = 271						N = 270				
Black/African	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-

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American*												
White American	*			*			2.49	0.54–11.4	0.240	2.56	0.55–11.94	0.233
Hispanic/Latina	0.40	0.16–0.99	**0.049**	0.43	0.16–1.11	0.081	1.17	0.62–2.21	0.623	1.18	0.60–2.32	0.622
Asian/multiracial/ other	0.53	0.10–2.74	0.451	0.57	0.10–3.07	0.508	0.59	0.20–1.70	0.325	0.53	0.18–1.60	0.262
Doula Attended Birth		N = 276						N = 275				
No	Ref	-	-	Ref	-	-	Ref	-	-	Ref	-	-
Yes	1.88	0.51–6.91	0.344	1.79	0.44–7.23	0.417	0.89	0.29–2.76	0.838	1.02	0.30–3.42	0.977

Note: Ref = reference category; OR = odds ratio; CI = confidence interval; *Estimates for the ORs and CIs could not be produced due to zero observations in this category.

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With regard to *breastfeeding in the hospital*, in the adjusted logistic regression model there was a marginally significant (p=0.05) association, such that older clients appeared to be less likely (OR=0.93, CI: 0.86-1.00) to breastfeed at the hospital. There were no significant associations with total doula hours, attendance at the birth, nor client race/ethnicity. In the adjusted logistic regression model for *skin contact,* there were no significant associations with either the doula hours or the demographic variables.

4. Discussion

Data from the *Healthy Women Health Futures* program indicated high rates of positive birth outcomes and low rates of negative birth outcomes in the overall sample, suggesting receipt of doula support irrespective of the number of hours may be beneficial. However, we did not find any significant association between doula hours and any of our outcomes after adjusting for covariates. We did detect marginal associations with some of the outcomes related to differences by race/ethnicity or client age. That said, these are associations with demographic characteristics irrespective of variables related to the doula intervention. Compared with pre-pandemic data for NY city and state, a higher proportion of clients in this study had positive outcomes (NYC DOHMH, 2015; NYC DOHMH, 2019; March of Dimes, 2022), despite our sample being at higher risk of more negative birth outcomes, as compared to all of those who gave birth in the city and state. Thus, despite the null findings between our key predictor variable (total number of doula hours) and the five outcomes, engagement with a doula, irrespective of the number of hours, in and of itself may have had a significant effect on these outcomes. This warrants further investigation, including qualitative data from clients on their experiences regarding the impact of the doula services.

At the outset of this data analysis project, we consulted with the partner organizations implementing the HWHF doula program to develop a plan for analysis of the data from 2020-2021. The proposed analytic plan specified the various outcome and predictor variables needed to analyze the groups of clients receiving prenatal and/or postpartum doula care. After a careful review of the more than 15 data entry (intake) forms used by the program, we identified the specific data that the programs needed to provide for the purposes of the analyses. In light of the different modes of data collection and management employed by the respective organizations, retrieval of the data, incorporation into a central database, data validation, and efforts to minimize the extent of missing data proved challenging. When no additional data could be retrieved the analytic plan was modified accordingly, such that fewer outcomes could be analyzed with a limited number of covariates and limited to two of the three sites. This is an important programmatic context in which to consider the findings reported in the results section and implications going forward for community-based programs such as HWHF.

We are concerned that the study findings may not provide an entirely accurate or complete representation of the impact of the HWHF program given the number of considerations surrounding the delivery of the program during the study time period, as well as data issues to consider. These concerns can be broadly grouped into three categories: external factors potentially affecting program delivery and birth outcomes; absence of client perspectives and experiences; and data limitations restricting the analysis.

External Factors

Probably the largest negative impact on the delivery of HWHF doula services between July 2020 and June 2021 was the COVID-19 pandemic. In early 2020 New York was considered an epicenter of the pandemic with the governor declaring a disaster emergency on March 7, 2020, in the State of New York [19,20]. Healthcare providers had to pivot away from in-person services to remote modes of contact through telemedicine (e.g., telephone, video appointments, text messages) [21,22]. This meant that HWHF doulas were limited in their ability to visit with clients in person and were subject to hospital restrictions on persons accompanying pregnant patients during labor and delivery, and postpartum [23,24]. A key aspect of doula services is the intimate in-person care that doulas provide [24]; thus, the inability to provide care in that manner during a portion of the study period suggests

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that the intervention could not be delivered as intended due to these extraordinary external circumstances.

We also know that preterm birth and low birthweight have been shown to be affected by host factors, such as obesity, hypertension, diabetes, heart disease, renal disease, lung disease, use of alcohol, cigarettes or drugs, taking medications for conditions including blood clots, seizures, etc, older maternal age, prior preterm birth, and socioeconomic factors such as low education, poverty, domestic violence [25–28]. As these data were not available, we could not account for all these factors in the analyses to identify a potential separate effect of doula services after controlling for other factors.

Client Perspectives and Experiences

The current study analyzed available quantitative data collected by HWHF doulas using the various program intake forms. However, this analysis did not include any data collected directly from clients regarding their experiences with an HWHF doula and their perspectives on the program's influence on their birth-related outcomes. We can only conjecture that such data would provide insights about the program's potential impact on the client's health-related behaviors not captured by the intake forms.

Data Limitations

As described above, the research team collaborated with staff from the three participating organizations to obtain program data for the analyses. While the organizations expended much effort to provide the necessary client data, the different data management systems presented challenges and the availability of data for specific variables was not complete. The missing data meant that important variables (for both covariates and outcomes) could not be included in the analyses, such as a deemed high-risk pregnancy, NICU admittance, breastfeeding (in postpartum visits), measures of maternal mental health, safe sleep measures (e.g., baby on back, sleeps alone, clear crib), and postpartum maternal follow-up scheduled, to name a few. Additionally, missing data restricted the analyses to two sites and the findings were limited in terms of not accounting for the full range of relevant variables. Furthermore, the relatively small sample size resulted in less statistical power to detect possible differences.

We recognize that the decision to exclude from the analysis clients identified as receiving only postpartum doula care may be overly conservative as there is the possibility that certain clients may have received such care from the postpartum doula *at the hospital,* thus, possibly impacting the outcomes of breastfeeding and mother-infant skin contact at the hospital. However, since it is also possible (and more likely in the context of the COVID-19 pandemic) that the postpartum doula care began once the mother and infant were discharged from the hospital, we felt exclusion of those clients from the analyses was the more appropriate approach.

5. Conclusions

From our engagement with the HWHF partner organizations in this project, it is clear that there exists a population group in NYC that is interested in receiving doula services and that the partner organizations expend considerable effort to deliver such services and manage the program, which exhibited relatively high rates of positive outcomes at the univariate level. We observed that the data management aspects of the program (e.g., numerous data collection forms, data collection and entry by doulas [who are primarily tasked to provide healthcare-related services], different/incompatible data management systems across organizations) are not conducive to analysis of program impact, in addition to lack of adequate resources to dedicate to data management. These observations are not meant to be critical but rather to acknowledge the difficulty faced by service providers to both implement a labor-intensive community-based intervention and manage a large volume of data and field-based staff (i.e., doulas) at the level needed to conduct have complete, valid data for rigorous analyses of program impact. Without addressing this issue, it is likely that subsequent attempts to

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detect program impact will encounter similar challenges regarding data quality and completeness resulting in lack of confidence in results pointing potentially to no effect. Thus, we strongly recommend that funders of public health-related programs to community-based service providers consider the additional resources (both economic and research-related) these organizations require to strengthen the data-related component of the services they provide so that rigorous program evaluation activities can be carried out. In this way, there will be greater confidence in the evidence regarding program impact, which will collectively benefit clients, the organizations devoting effort to provide such services, the donors providing funding, and the larger public health and scientific communities.

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Conflicts of Interest: The authors declare no conflict of interest.

References

1. Kukla, Rebecca and Wayne, Katherine. *The {Stanford} Encyclopedia of Philosophy*, Spring 2018.; Metaphysics Research Lab, Stanford University, 2018.
2. Bohren, M. A.; Hofmeyr, G. J.; Sakala, C.; Fukuzawa, R. K.; Cuthbert, A. Continuous Support for Women during Childbirth. *Cochrane Database of Systematic Reviews* **2017**, *2017* (8). https://doi.org/10.1002/14651858.CD003766.pub6.
3. Lantz, P. M.; Low, L. K.; Varkey, S.; Watson, R. L. Doulas as Childbirth Paraprofessionals: Results from a National Survey. *Women's Health Issues* **2005**, *15* (3), 109–116. https://doi.org/10.1016/j.whi.2005.01.002.
4. Dorwart, L. We Need More Male Doulas. February 14, 2018. https://www.vice.com/en/article/neqzp8/we-need-more-male-doulas.
5. Mottl-Santiago, J.; Herr, K.; Rodrigues, D.; Walker, C.; Walker, C.; Feinberg, E. The Birth Sisters Program: A Model of Hospital-Based Doula Support to Promote Health Equity. *Journal of Health Care for the Poor and Underserved* **2020**, *31* (1), 43–55. https://doi.org/10.1353/hpu.2020.0007.
6. Mottl-Santiago, J.; Walker, C.; Ewan, J.; Vragovic, O.; Winder, S.; Stubblefield, P. A Hospital-Based Doula Program and Childbirth Outcomes in an Urban, Multicultural Setting. *Matern Child Health J* **2008**, *12* (3), 372–377. https://doi.org/10.1007/s10995-007-0245-9.
7. Campbell, D. A.; Lake, M. F.; Falk, M.; Backstrand, J. R. A Randomized Control Trial of Continuous Support in Labor by a Lay Doula. *Journal of Obstetric, Gynecologic & Neonatal Nursing* **2006**, *35* (4), 456–464. https://doi.org/10.1111/j.1552-6909.2006.00067.x.
8. McGrath, S. K.; Kennell, J. H. A Randomized Controlled Trial of Continuous Labor Support for Middle-Class Couples: Effect on Cesarean Delivery Rates. *Birth* **2008**, *35* (2), 92–97. https://doi.org/10.1111/j.1523-536X.2008.00221.x.
9. Chapple, W.; Gilliland, A.; Li, D.; Shier, E.; Wright, E. An Economic Model of the Benefits of Professional Doula Labor Support in Wisconsin Births. *WMJ* **2013**, *112* (2), 58–64.
10. Acquaye, S. N.; Spatz, D. L. An Integrative Review: The Role of the Doula in Breastfeeding Initiation and Duration. *J Perinat Educ* **2021**, *30* (1), 29–47. https://doi.org/10.1891/J-PE-D-20-00037.
11. Kozhimannil, K. B.; Hardeman, R. R.; Attanasio, L. B.; Blauer-Peterson, C.; O'Brien, M. Doula Care, Birth Outcomes, and Costs Among Medicaid Beneficiaries. *Am J Public Health* **2013**, *103* (4), e113–e121. https://doi.org/10.2105/AJPH.2012.301201.
12. Nommsen-Rivers, L. A.; Mastergeorge, A. M.; Hansen, R. L.; Cullum, A. S.; Dewey, K. G. Doula Care, Early Breastfeeding Outcomes, and Breastfeeding Status at 6 Weeks Postpartum Among Low-Income Primiparae. *Journal of Obstetric, Gynecologic & Neonatal Nursing* **2009**, *38* (2), 157–173. https://doi.org/10.1111/j.1552-6909.2009.01005.x.

 doi:10.20944/preprints202408.0872.v1

13. Paterno, M. T.; Van Zandt, S. E.; Murphy, J.; Jordan, E. T. Evaluation of a Student-Nurse Doula Program: An Analysis of Doula Interventions and Their Impact on Labor Analgesia and Cesarean Birth. *Journal of Midwifery & Women's Health* **2012**, *57* (1), 28–34. https://doi.org/10.1111/j.1542-2011.2011.00091.x.
14. Lunda, P.; Minnie, C. S.; Benadé, P. Women's Experiences of Continuous Support during Childbirth: A Meta-Synthesis. *BMC Pregnancy Childbirth* **2018**, *18* (1), 167. https://doi.org/10.1186/s12884-018-1755-8.
15. Noursi, S.; Saluja, B.; Richey, L. Using the Ecological Systems Theory to Understand Black/White Disparities in Maternal Morbidity and Mortality in the United States. *J. Racial and Ethnic Health Disparities* **2021**, *8* (3), 661–669. https://doi.org/10.1007/s40615-020-00825-4.
16. NYC DOHMH. New York City Department of Health and Mental Hygiene: The State of Doula Care in NYC 2021, 2021. https://www1.nyc.gov/assets/doh/downloads/pdf/csi/doula-report-2021.pdf.
17. CoraGroup. Healthy Women Healthy Futures, 2018-2019: Evaluation Report; New York, NY, 2020; p 58.
18. CoraGroup. Healthy Women Healthy Futures: Data Systems Planning and Improvement Project, 2020; New York, NY, 2020; p 19.
19. Cuomo, A. *No. 202: Declaring a Disaster Emergency in the State of New York*; Executive Order 202; Albany, New York, 2020. https://www.governor.ny.gov/news/no-202-declaring-disaster-emergency-state-new-york.
20. McKinley, J. New York City Region Is Now an Epicenter of the Coronavirus Pandemic. *The New York Times*. March 22, 2020. https://www.nytimes.com/2020/03/22/nyregion/Coronavirus-new-York-epicenter.html (accessed 2021-05-13).
21. CDC. *Using Telehealth Services*. Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/hcp/telehealth.html (accessed 2021-05-13).
22. Henry, T. A. *COVID-19 makes telemedicine mainstream. Will it stay that way?*. American Medical Association. https://www.ama-assn.org/practice-management/digital/covid-19-makes-telemedicine-mainstream-will-it-stay-way (accessed 2021-05-13).
23. NYC DOHMH. COVID-19: Guide to Virtual Doula Support, 2021. https://www1.nyc.gov/assets/doh/downloads/pdf/imm/covid-19-virtual-doula-support.pdf.
24. Searcy, J. J.; Castañeda, A. N. On the Outside Looking In: A Global Doula Response to COVID-19. *Front. Sociol.* **2021**, *6*, 613978. https://doi.org/10.3389/fsoc.2021.613978.
25. Badshah, S.; Mason, L.; McKelvie, K.; Payne, R.; Lisboa, P. J. Risk Factors for Low Birthweight in the Public-Hospitals at Peshawar, NWFP-Pakistan. *BMC Public Health* **2008**, *8* (1), 197. https://doi.org/10.1186/1471-2458-8-197.
26. Chen, H.-Y.; Chuang, C.-H.; Yang, Y.-J.; Wu, T.-P. Exploring the Risk Factors of Preterm Birth Using Data Mining. *Expert Systems with Applications* **2011**, *38* (5), 5384–5387. https://doi.org/10.1016/j.eswa.2010.10.017.
27. Coutinho, P. R.; Cecatti, J. G.; Surita, F. G.; Souza, J. P. de; Morais, S. S. de. Factors Associated with Low Birth Weight in a Historical Series of Deliveries in Campinas, Brazil. *Rev. Assoc. Med. Bras.* **2009**, *55* (6), 692–699. https://doi.org/10.1590/S0104-42302009000600013.
28. Feresu, S. A.; Harlow, S. D.; Woelk, G. B. Risk Factors for Low Birthweight in Zimbabwean Women: A Secondary Data Analysis. *PLoS ONE* **2015**, *10* (6), e0129705. https://doi.org/10.1371/journal.pone.0129705.