



2016

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Nicole Maki Weller
Indiana University Kokomo

Jennie Jacobs Kronenfeld
Indiana University Kokomo

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Recommended Citation

Weller, Nicole Maki and Kronenfeld, Jennie Jacobs (2016) "Infertility Utilization and Women's Self-Rated Health," *Journal of the Indiana Academy of the Social Sciences*: Vol. 19 : Iss. 1 , Article 13.
Retrieved from: <https://digitalcommons.butler.edu/jiass/vol19/iss1/13>

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*Infertility Utilization and Women's Self-Rated Health**

NICOLE MAKI WELLER
Indiana University Kokomo

JENNIE JACOBS KRONENFELD
Arizona State University

ABSTRACT

Among women of reproductive age in the United States, at least 15 percent will report ever using infertility services. Using data from the 2006–2010 National Survey of Family Growth, this study considers the relationship between use of infertility services and a woman's self-rated health. This study employs a logistic regression to predict the probability of reporting a certain level of self-rated health when a woman reports seeking medical assistance for infertility. An additional measure considers the interaction between a woman ever using infertility services and the attitude toward having children on the probability of a lower level of self-rated health. Results indicate that ever using infertility services does increase the risk of women reporting worse self-rated health outcomes compared to women who have never used infertility services. The analysis of the interaction between the attitudes toward having children and ever using infertility services suggest that women who believe the reward of having children is worth the cost and who have ever used infertility services are also more likely to report worse self-rated health outcomes compared to women who have not used infertility services. This study provides further insight into the unique relationship between the infertility experience and overall health outcomes for women.

KEY WORDS Infertility; Women's Health; Self-Rated Health

Recent reports from the 2006–2010 continuous data file by the National Survey of Family Growth indicate that 7.3 million women aged 15–44 have ever used infertility services (Chandra, Copen, and Hervey Stephen 2014). Women and their partners who elect to utilize infertility services are presented with a high-cost/high-reward endeavor in

* Correspondence concerning this paper should be addressed to Nicole Maki Weller, Indiana University Kokomo, Department of Sociology, History, Political Science, 2300 S. Washington St., Kokomo, IN 46904.

which the high reward of utilizing infertility treatments is a successful pregnancy ending in a live birth. The high cost of utilizing infertility services, however, is observed in both direct costs, such as financial commitments to cover the infertility treatments, and indirect costs, such as medical consultations and procedures; maintaining a daily schedule of ovulation, intercourse, and infertility drugs; and time spent scheduling and attending clinical and laboratory visits.

An additional hardship often associated with the infertility experience is the onset of mental distress (White and McQuillan 2006). Previous studies have found that the infertility experience is associated with increased rates of emotional distress, physical fatigue, and conflict within the couple's sexual relationship (Abma and Martinez 2006; Cousineau and Domar 2007). Further studies have found that women report feeling inadequate in their ability to meet the socio-reproductive norms that are expected of women in society (Chuang et al. 2010; Thornton and Young-Demarco 2001). Likewise, feelings of resentment develop when women begin to self-blame for delaying childbirth for an education or career, or when they interact with family and friends who have not dealt with any infertility issues (Chuang et al. 2010; Thornton and Young-Demarco 2001). Finally, women experiencing infertility report feeling isolated from other women and even from their partners because of their infertility status (Abma and Martinez 2006). Women report feeling that their own fertility and reproductive health have become medicalized, and they express concern that, despite all efforts, becoming pregnant and having their own biological children may never happen (Chuang et al. 2010; Vahratian 2008). Under these circumstances, women coping with infertility begin to present high levels of anxiety and depression that are comparable to those of women who have recently been diagnosed with cancer or who have recently suffered a heart attack (Cousineau and Domar 2007; McQuillan et al. 2003; White and McQuillan 2006).

Based on existing literature linking the infertility experience to high levels of mental distress, particularly for women, the need to further explore the potential influence of infertility on overall physical health outcomes is warranted (Darwiche et al. 2014). It has been established that continued exposure to stress-inducing life events can negatively affect general health outcomes (Sobotova et al. 2011; White and McQuillan 2006). Studies have found that individuals exposed to continuous stress, from either their social or physical environment, are more likely to report psychological distress and to likewise have higher rates of chronic conditions such as heart disease, high blood pressure, or even obesity (McQuillan et al. 2003; Sobotova et al. 2011). This paper presents a unique approach to understanding the relationship between the infertility experiences on overall physical health, by exploring the various levels of self-rated health reported among women who have ever used infertility services. This paper focuses on self-rated health specifically instead of using mental health outcomes, in part because of data limitations addressed later in the methodology, and in part because of the profound accuracy of self-rated health measures in relating actual health outcomes. Furthermore, it is important to consider this relationship, as the general well-being of women is a predictor of current and future public health trends within a given society.

SELF-RATED HEALTH

Self-rated health (SRH) has been established as an accurate predictor of health for individuals across sociodemographic, social, and behavioral characteristics (Floderus et al. 2008; Kawachi, Kennedy, and Glass 1999; McQuillan et al. 2003). Two major components that support the predictive power of SRH are the long-term consistency of SRH responses with actual health outcomes, and, second only to age, SRH's accuracy in predicting early mortality (Burström and Fredlund 2001; Floderus et al. 2008). What makes SRH measures so accurate in predicting health outcomes is a combination of an individual understanding of one's own physiology and an inherent understanding of the implications of one's individual health behaviors (Burström and Fredlund 2001). Individuals are keenly aware of subtle changes in biological and physiological changes within their own bodies, which leads to accurate predictions of health (Burström and Fredlund 2001). Some researchers argue that this individual perception of biological and physiological changes is more precise than an objective diagnosis by a medical provider (Burström and Fredlund 2001; Floderus et al. 2008). In addition, individuals are aware of the implications of their health behaviors, positive or negative, on their actual health. For example, individuals who smoke, drink, or have limited exercise are more likely to report their health as poor because of these lifestyle choices (Burström and Fredlund 2001). The authors argue that this multifaceted measure of SRH, which is sensitive to sociodemographic differences, individual perceptions of biological and physiological health, and a strong consideration for lifestyle and health behaviors, will provide an accurate measure of health outcomes for women who have ever used infertility services (Mechakra-Tahiri, Zunzunegui, and Seguin 2007). By testing the relationship of women ever using infertility services with SRH, we are able to expand upon previous studies that have linked infertility to mental distress by demonstrating the long-reaching effects that the infertility experience imposes upon women.

HYPOTHESIS

Building on the existing literature regarding the mental distress associated with the infertility experience and the accuracy of SRH measures in predicting health outcomes, this study proposes that the infertility experience extends beyond mental distress for women and can be observed in a woman's overall physical health, as demonstrated in her reported SRH. The primary hypothesis for this study is that women who have ever used infertility services for help to get pregnant or to carry a pregnancy to term will report a poorer SRH compared to women who have never used infertility services. The secondary hypothesis focuses on women who have indicated that the reward of having children is worth any cost and then compares the SRH among these women to that in women who have ever used infertility services and women who have never used infertility services. The overarching hypothesis is that ever using infertility services produces undesirable health outcomes for women, as indicated by poorer measures of self-rated health.

METHODS

Source Population

Data for this study were derived from retrospective accounts of a first visit for infertility services in the female respondent survey of the 2006–2010 National Survey of Family Growth (NSFG) continuous data files. Based on previous research that suggests women overwhelmingly initiate and seek out preliminary medical treatment for infertility issues when compared to their male counterparts, only data from the female respondents' data files were analyzed (Greil and McQuillan 2004). Of the 12,279 female respondents in the 2006–2010 female data file, 10,605 had ever had sex with a male (NSFG variable: HADSEX) and were subsequently asked about their infertility-seeking behaviors and self-rated health. The total sample size for this study is 10,605 female respondents aged 18–44. Cases were removed from the original survey sample if respondents were less than 18 years old or had never had sexual intercourse with a man.

Outcome Variables

The outcome being measured in this study is the SRH of women who have ever used infertility services compared to the SRH of women who have never used infertility services. Of the study sample, 12 percent had utilized infertility services for help to get pregnant or carry a pregnancy to term. All female respondents were asked to rank their general health on an index scale including *poor health*, *fair health*, *good health*, *very good health*, and *excellent health* (NSFG variable: GENHEALT). Overall responses to the NSFG question of SRH indicated that 26 percent of the respondents reported excellent health, 40 percent reported very good health, and 7 percent reported fair health. Using this general health variable as an indicator for SRH, the SRH outcome was recoded so that lower values of general health reflect poor SRH responses and higher values of general health reflect excellent SRH responses. When interpreting outcomes from the logistic regression, the outcome measure of SRH can be understood as reporting a specific level of SRH, where lower levels of SRH equal undesirable health outcomes.

The NSFG does not include specific questions regarding mental health in its survey questionnaires. To overcome this limitation, this study applied the SRH measure as a proxy for overall health and as a measure that had not been previously considered when examining the relationship between the infertility experience and a woman's overall health outcomes; however, the extensive survey history of the NSFG provided population-level demographics with regard to reproductive, pregnancy, and infertility trends that have not been provided by any other data source. Because of the history and validity of the NSFG to provide the most widely accepted statistics regarding reproductive health, the NSFG was an ideal data source for this study.

Exposure Variables

A history of ever using infertility services was the primary predictor hypothesized to influence a woman's SRH. At the time of the 2006–2010 NSFG interview, all female

respondents who were 18 years or older or who had ever had sexual intercourse with a male were asked if they had ever sought medical help to get pregnant or to carry a pregnancy to term (NSFG variable: INFEVER). For this study, respondents who reported ever using infertility services were coded as 1, indicating that they have sought infertility treatment or services; otherwise, they were coded as 0 if they have never utilized infertility services.

The second analysis for this research examined if a woman's level of agreement with the statement that the rewards of being a parent outweighs the cost and effort involved in parenting (NSFG variable: CHREWARD) would influence her self-reported health. All female respondents were asked to indicate their level of agreement that the rewards of parenting outweigh the costs and effort of parenting using a Likert scale with responses of *strongly agree*, *agree*, *disagree*, and *strongly disagree*. Sixty (60) percent of the sample strongly agreed with the statement that the reward of having children is worth the cost. The variable was recoded so that a one-unit increase indicated a higher level of agreement with the reward of having children being worth the cost.

Control Variables

To accommodate for the restrictions of using time-varying variables, the study analyzed current sociodemographic characteristics that consider if the respondent had at least a high school degree, had ever worked full- or part time, had ever been married, and had ever been pregnant. Only respondents who were 18 years or older were asked questions about infertility. Because of the time-varying analysis of this study, we were able to include a measure only of whether the respondents had ever worked full time, had ever worked part time, or had never worked. Respondents could be measured in only one category.

Data limitations of the NSFG include limited information regarding historical health-care coverage. To overcome this, we included a measure about health-care coverage at the time the respondent sought infertility assistance. Health-care coverage was measured as whether the female respondent or her partner had private health-care coverage at the time they received infertility services. This was coded as 1 if either the female respondent or her partner had private coverage or as 0 if neither the female respondent or her partner had private health-care coverage at the time they utilized infertility services.

In this sample, the majority of women who had ever used infertility services were married, so we controlled for whether the respondent had ever been married. Finally, recognizing that a majority of women who have ever used infertility services will eventually become pregnant, we controlled for parity status. Race/ethnicity was measured in four categories, which included non-Hispanic white, non-Hispanic black, Hispanic, and non-Hispanic other race. These classifications come directly from the imputation measures of the NSFG. Table 1 provides the descriptive statistics for the variables utilized in this study.

Table 1. Means and Standard Deviations for $n = 10,605$ Female Respondents

	Mean	Std. Dev.
Self-Rated Health		
Excellent	0.26	0.670
Very Good	0.40	0.470
Good	0.25	0.320
Fair	0.07	0.050
Poor	0.02	0.180
Ever Used Infertility Services	0.120	0.310
Cost of Having Child Worth Reward		
Strongly Agree	0.56	0.310
Agree	0.32	0.140
Disagree	0.05	0.010
Strongly Disagree	0.07	0.030
Age at Time of Interview	28.6	8.480
Race & Ethnicity		
Non-Hispanic White	0.56	0.490
Non-Hispanic Black	0.17	0.370
Hispanic	0.22	0.410
Other, Non-Hispanic	0.06	0.230
Education		
≥ High School Degree	0.460	0.490
≥ 4 Years of College/College Graduate	0.420	0.340
> 4 Years of Postcollege/Graduate Training	0.120	0.310
Ever Worked Full/Part Time	0.890	0.320
Ever Married	0.470	0.490

Source: National Survey of Family Growth, 2006–2010 Continuous Data File.

RESULTS

An initial cross-tabulation analysis was employed to examine any observed racial/ethnic differences in the rates of self-reported infertility, of accessing infertility services, and of

access to health-care resources that would help alleviate some of the costs associated with infertility services. These findings are presented in Table 2.

Table 2. Race/Ethnicity Cross-Tabulated with Use of Infertility Services, Self-Rated Health, and Attitude toward Children

	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Other
Ever Utilized Infertility Services	61%	14%	19%	6%
Average Reported Self-Rated Health ^a	2.12	2.20	2.27	2.11
Average Attitude toward Children ^b	1.45	1.55	1.50	1.54

Notes: ^a Self-Rated Health Scale: 1 = Excellent, 2 = Very Good, 3 = Good, 4 = Fair, 5 = Poor.

^b Rewards of Parenthood Worth the Cost Scale: 1 = Strongly Agree, 2 = Agree, 3 = Disagree, 4 = Strongly Disagree.

Source: National Survey of Family Growth, 2006–2010 Continuous Data File.

In the analyzed sample of 10,605 female respondents from the 2006–2010 NSFG survey, 56 percent were non-Hispanic white, 17 percent were non-Hispanic black, 22 percent were Hispanic, and 6 percent were non-Hispanic other race/ethnicity. Overwhelmingly, non-Hispanic white women were more likely to report ever having used infertility services (61 percent), followed by Hispanic women (19 percent) and non-Hispanic black women (14 percent). Little variation was found in regard to reports of SRH, with the average report among all racial/ethnic groups being very good health. In addition, there was little variation among all racial/ethnic groups in the level of agreement with the statement that the reward of having children is worth the cost. On average, each racial/ethnic group strongly agreed with the statement that the reward of having children is worth the cost.

To measure the effect of ever using infertility services on the SRH of women, we employed a logistic regression using Statistical Analysis Systems (SAS) version 9.4. Logistic regression is used to predict the probability of reporting a certain level of self-rated health for the selected sample.

$$\log \frac{p(x)}{1-p(x)} = \beta_0 + x \cdot \beta$$

In this formula, *p* is the probability of a respondent reporting a certain level of self-rated health when she has ever used infertility services (the primary predictor) or the

respondent's level of agreement with the statement that the reward of having children is worth the cost (the secondary predictor).

The PROC LOGISTIC command in SAS is accompanied by a DESCENDING command, which provides the inverse value order of the outcome categories. Interpreting the outcome as the odds of having a level of SRH or lower (in which each level lower is indicative of worse health) is imperative to understanding the effect of the main predictors and controls for this analysis. Table 3 provides the odds ratios and significance statistics for the proceeding models.

Table 3. Models Showing Effects of Having Used Infertility Services on Level of Self-Rated Health

	Model 1	Model 2	Model 3
Ever Used Infertility Services		1.381**	1.394**
Reward of Children Worth the Cost			1.123**
Age at Time of Interview	1.029***	1.029***	1.028***
Race & Ethnicity^a			
Non-Hispanic Black	1.017	1.017	1.004
Hispanic	1.200*	1.196*	1.187*
Other, Non-Hispanic	1.135	1.131	1.119
Education^b			
≥ 4 Years of College/College Graduate	0.605***	0.606***	0.611***
> 4 Years of College/Graduate Training	0.395***	0.395***	0.399***
Ever Worked Full/Part Time	0.896	0.893	0.905
Ever Married	0.808**	0.798**	0.808**

Notes: ^a Ref. Non-Hispanic White.

^b Ref. a high school degree.

Coefficients are odds ratios *p < .05 **p < .01 ***p < .001

Source: National Survey of Family Growth, 2006–2010 Continuous Data File.

Model 1 of Table 3 presents the odds ratios of a respondent being in a lower level of self-rated health when only the control measures were examined. In Model 2, the effect of a respondent ever using infertility services on SRH was added to the analyses.

Model 3 is the full model, which tests the relationship between a respondent ever using infertility services and SRH, as well as the relationship of the secondary predictor, the respondent's attitude toward the reward of children, on SRH. The findings can be interpreted as the odds of a respondent reporting a certain level of SRH, such that lower levels of SRH are equal to reports of worse health. The SRH scale begins with responses of excellent health and predicts the odds of a respondent being in one level or lower of SRH, with the SRH scale including *excellent*, *very good*, *good*, *fair*, and *poor*.

Beginning with Model 2 of Table 3, which measures the effects of ever using infertility services on the female respondents' SRH, and controlling for all other variables, the results show that women who had ever utilized infertility services were 38 percent ($p < .01$) more likely to report lower levels of SRH compared to women who had never utilized infertility services. Findings from this study suggest that among women experiencing infertility, there is both an increased risk for mental distress, as previous studies have found, and an additional risk such that women's general health outcomes are negatively affected by the infertility experience. Additionally, Hispanic women who had ever utilized infertility services were 19 percent more like to report lower levels of SRH when compared to non-Hispanic white women. Reasoning for these outcomes may be attributed to variations in the significance and importance of motherhood and parenting in Hispanic cultures that would negatively affect a Hispanic woman's perception of her overall health outcomes (Bell 2009).

Model 3 of Table 3 presents the results of the interaction between ever using infertility services and SRH when consideration of the cost and reward of having children is included. Similar to the results presented in Model 2, women who had ever utilized infertility services were 39 percent ($p < .01$) more likely to report lower levels of SRH compared to women who had never utilized infertility services. For comparison, in Model 2, in which the measure regarding attitude toward children was not included, the odds ratio was 38 percent. For women who agreed with the statement that the rewards of being a parent outweigh the costs, the odds ratio of having a lower level of SRH increased. Put another way, for each level of agreement that the reward of parenthood is worth the cost, a woman was 12 percent more likely to report a lower level of SRH ($p < .01$). These results suggest that a woman's general health outcomes are negatively influenced when she has ever used infertility services, and with every level of agreement that she has regarding the importance of parenting.

Across all models and with all variables presented in Table 3, we found that having at least four years of college education reduced the odds of a low level of SRH by approximately 40 percent and that having postgraduate education reduced the odds by approximately 60 percent, when compared to the reference group of women with only a high school degree. This finding may be explained by the fact that women with more education may have access to more resources to assist in their infertility treatments, providing feelings of empowerment and control over their reproductive health.

Similarly, having worked either full- or part time and ever having been married also reduced the odds of respondents reporting low levels of SRH even when the female respondent had ever utilized infertility services.

An interesting outcome was found when the results examining parity status were considered. Having already been pregnant and a previous history of using infertility services increased the odds of reporting a level of SRH or lower by 21 percent ($p < .05$). This finding may suggest that among women experiencing secondary infertility, subsequent infertility experiences increase the negative impacts on their health as a result of personal frustration about not being able to get pregnant a subsequent time, or perhaps lack of social and emotional support that women experiencing secondary infertility generally report (Collins 1986; Greil and McQuillan 2004).

CONCLUSION

The purpose of this study was to examine the potential relationship between a woman ever having used infertility services and the woman's SRH—specifically whether the infertility experience and ever using infertility services influenced poorer SRH outcomes ultimately suggested worse overall health for women? The unique contribution of this study is the inclusion of a measure for SRH. Whereas previous studies have extensively considered the impact of infertility on a woman's mental distress, this study explores a new link between infertility and health with a specific focus on SRH. Given the profound accuracy of an SRH measure in predicting health outcomes, the findings from this study indicate that the infertility experience not only negatively influences a woman's mental distress but also may have a larger impact on her overall health. Finally, maternal health is an important indicator of overall social health, and when women are experiencing negative health outcomes, this can produce a trickle-down effect for her family and any existing children, as well as for society as a whole. The worse rates of SRH, as they are related to the infertility experience, indicate that the medical and mental health professions need to provide more in-depth examination and care to women who have used or may ever need to use infertility services. Likewise, given the delayed transition and older ages at first pregnancy for women (as a result of prolonging educational attainment, careers, delayed transition to marriage, and so on), it is possible that larger percentages of women may experience an infertility issue, increasing the risk that their overall health will be negatively affected.

To our knowledge, no other study has considered the link between the infertility experience and undesirable SRH outcomes; therefore, this study provides a greater understanding of how the infertility experience for women can have lasting effects on all aspects of their health. In spite of this unique contribution, limitations with this study remain. For example, this study considers the relationship between ever using infertility services and SRH health for women only. Previous studies have indicated that the infertility experience is often shared between partners; therefore, exploring the self-rated health of only women ignores any potential outcome for the self-rated health of men. At this time, the NSFG does not collect data at a couple level; therefore, any analysis that considers the relationship between infertility and SRH for men and women would need to be conducted independent of the couple effect. Future studies could consider the potential couple effect and include an analysis of SRH outcomes for men and women individually as well as at the couple level. Results from these studies may provide more insight into

emotional support present among couples that could influence SRH outcomes. An additional limitation of the data used for this study is the cross-sectional nature of the survey collection. This is not a longitudinal study; therefore, the long-term effects on a woman's SRH of using infertility services are unknown, and future analyses of this topic would need to take into consideration using longitudinal study designs for a more thorough understanding.

Even though this study considers the effect of infertility on the SRH of women only, and not men, the gendered role of women in society as nurturers and mothers, and the overwhelming reproductive medical procedures that are focused on women, further justify our decision to include only women. The findings from this study suggest that, as expected, women who have ever had to use infertility services and who report that the reward of children is worth the cost of having them are more likely to report worse levels of SRH. Given that SRH outcomes provide close to accurate measures of actual health, the findings from this study would suggest that women who have ever used infertility services are at increased risk for undesirable health outcomes, controlling for all other measures. The impact of infertility on mental health has been well established as a negative stressor, and now this study also suggests that infertility can also have a negative impact on overall health outcomes.

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