Fertility Treatment in Utah: A Pooled Analysis of 2009–2015 Utah Pregnancy Risk Assessment Monitoring System (PRAMS) Data

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Background

Infertility is a common chronic condition affecting 8% to 12% of couples in the United States and worldwide.[1-3] Infertility is unique because it is usually experienced by a couple and not an individual. Since the underlying causes of infertility are most commonly (in approximately 50% of cases) due to a combination of male and female factors, it is often necessary to treat both people. [1,4]

Infertility is defined as the inability of a couple to conceive after having regular sexual relations without using contraception for 12 months or more in a woman younger than 35 years and for at least 6 months in a woman aged 35 or older.[5] Primary infertility is defined as the "inability to achieve a spontaneous clinical pregnancy," whereas secondary infertility is defined as "the inability to achieve a spontaneous clinical pregnancy following a previous spontaneous pregnancy."[6] Infertility rates may be rising due to trends in delaying pregnancy, since advanced reproductive age increases the risk for infertility.[7] Women typically experience peak fecundability in their mid-20s, with a gradual but significant decline in fecundability beginning at age 32, followed by a more rapid decrease beginning at age 37.[8] Men begin to experience an increased probability of sterility beginning in their late 30s, with rates accelerating after age 40.[7]

Infertility treatment in Utah is of particular interest, because the state has a strong pronatalist culture and one of the highest birth rates in the US.[9-12] The main objectives of this data snapshot are (1) to provide updated estimates of the prevalence of fertility treatments among women in Utah experiencing a live birth and (2) to assess how treatments for infertility are associated with women's age and prior live births.[12]

Methods

To investigate fertility treatment in Utah, we used 2009-2015 data for women aged 20 to 40+ years from the Utah Pregnancy Risk Assessment Monitoring System (PRAMS) via the IBIS-PH interactive query system. PRAMS is an ongoing population-based surveillance system funded and conducted by the Centers for Disease Control and Prevention (CDC) in collaboration with state health departments, which samples mothers who have given birth to a live infant.[13] In Utah, PRAMS is maintained by the Utah Department of Health's Reproductive Health Program. Approximately 200 Utah mothers randomly selected from birth certificate data are sampled every month to participate in UT-PRAMS. UT-PRAMS uses a stratified sampling system based on maternal education and infant weight to capture smaller but higher at-risk populations.[14] Weighted response rates for 2009-2015 were between 67% and 81%, above CDC-required minimum response rates.

The outcome of interest was birth to couples that had received fertility treatment, defined as the index birth. Couples without a prior pregnancy who received fertility treatments were classified as experiencing primary infertility; women with 1-4 previous live births who received fertitily treatments were classified as experiencing secondary infertility.[6] This was assessed via the question, "Did you take any fertility drugs or receive any medical procedures from a doctor, nurse, or other health care worker to help you get pregnant with your new baby?" The response to this question was binary

(yes/no). Age was categorized into 5 groups: 20-24, 25-29, 30-34, 35-39, and 40+ years. Parity was dichotomized into those without a prior live birth (indicator of primary infertility) and those with 1-4 prior live births (indicator of secondary infertility). Mothers with 5 or more live births were excluded from the current study due to very small numbers and relatively larger standard errors. Weighted prevalence and 95% confidence intervals (CI) are reported. IBIS-PH interactive query system for UT-PRAMS data takes into account the weighted stratified sampling per CDC protocol.[15]

Results

A total of 10,396 women, with a yearly range from 1,367 to 1,666, participated in UT-PRAMS from 2009 to 2015. Most women (83.0%) were younger than 35 years, with 14.0% aged 35-39 and only 3.0% aged 40 and older. The overall proportion of infertility treatment among study participants was 10.6% (95% CI: 9.3, 11.1).

The prevalence of infertility treatment among women with live births is higher among older women (Figure 1). It ranges from less than 5.0% at 20-24 years to over 25.0% at age 40 years or older.

Table 1 illustrates the prevalence of infertility treatment among women in different age groups based on whether they had experienced a previous live birth or not, which may serve as an indicator for secondary or primary infertility, respectively. Rates of infertility treatment increase with age, especially among women who have never experienced a live birth previously and therefore may suffer from primary infertility. For women aged 20-24 years, there is minimal difference between women with a previous live birth compared to women without a previous live birth: 3.7% (95% CI 2.3, 6.1) and 5.2% (95% CI 3.7, 7.2), respectively.

Table 1. Weighted Prevalence of Infertility Treatment by Age and Parity, Utah PRAMS 2009-2015

Age Group	Number of Previous Live Births	Infertility Treatment (%)	95% Confidence Interval
Overall		**10.2**	**9.3, 11.1**
20-24 years			
	1-4	3.7	2.3, 6.1
	none	5.2	3.7, 7.2
25-29 years			
	1-4	5.9	4.8, 7.3
	none	16.4	13.3, 19.9
30-34 years			
	1-4	10.5	8.8, 12.6
	None	25.8	20.3, 32.3
35-39 years			
	1-4	15.3	11.6, 19.9
	none	24.6	15.1, 37.3
40+ years			
	1-4	18.9	9.0, 35.3
	none	65.6	33.7, 87.7

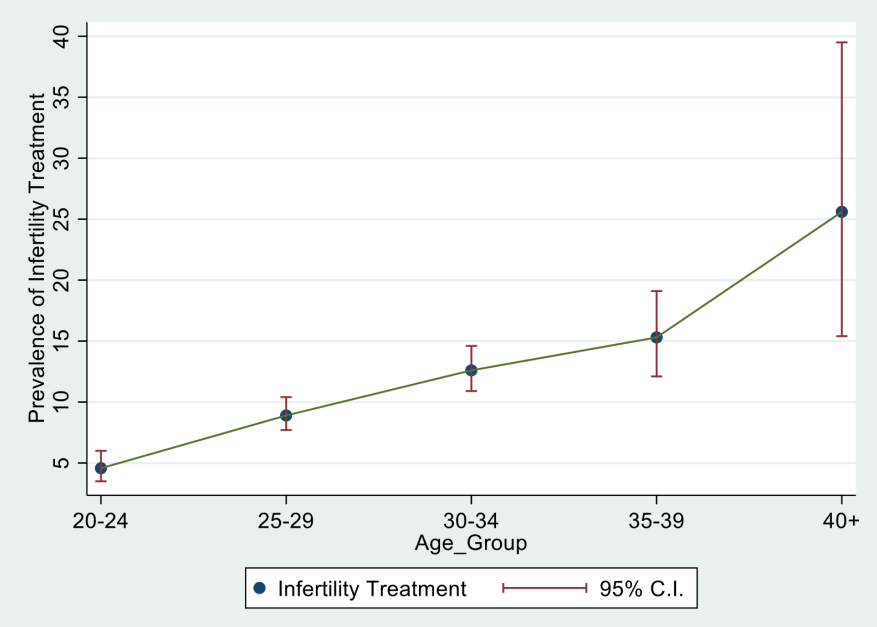

Figure 1. Weighted Prevalence of Infertility Treatment in Utah (PRAMS 2009-2015) by Age Group

In the 25-29 and the 30-34 year age groups, the percentage of participants without any previous live birth who received infertility treatments was 2.5 times higher than participants with previous live births. In women aged 35-39 years, the percentage of women without a prior live birth who received infertility treatment was about the same as for women aged 30-34 years, but there was a higher percentage of women with probable secondary infertility who received infertility treatment. Finally, for women aged 40 years and older, the prevalence of fertility treatment is 18.9% (95% CI 9.0, 35.3) for women with prior live birth, and 65.6% (95% CI 33.7, 87.7) for women without prior live birth, albeit with wide confidence intervals.

Discussion

This data snapshot of Utah during 2009-2015 revealed that about 10% of women who ultimately had a live birth sought treatment for infertility. Given that the PRAMS database samples only women who successfully experience a live birth, the actual percentage of women who sought treatment for infertility is likely much higher. Although not directly comparable, data from the National Survey for Family Growth (NSFG), conducted during 2002-2015, shows that the percentage of all married women aged 15-44 years who received infertility services was consistently around 12.0%. Additionally, in the NSFG studies, the percentage of women aged 15-44 years with primary infertility who have ever received any infertility service ranged from 6.5% to 7.1%, which was approximately the same proportion of women with secondary infertility.[14] In contrast, among Utah women aged 25 years or older, those who had not previously had a live birth were more than twice as likely to receive infertility treatments as compared to those with presumably secondary infertility: 16.4% to 65.6% versus 5.9% to18.9%, respectively.

Although we do not know the proportion of infertility treatment that did not result in live birth, it is well established that with other factors being equal, infertility treatment is more likely to be successful among couples with secondary infertility.[15] Further, in the prior UT-PRAMS study mentioned above, seeking early infertility treatment was more common among women with at least one prior live birth.[9] Therefore, if there is a bias in our ascertainment of fertility treatment, it would tend to inflate the prevalence of fertility treatment among those with secondary infertility. This strengthens our finding that women with primary infertility were much more likely to seek infertility treatment than women with secondary infertility (9%-15% absolute difference between ages 25–39, and over 45% in women aged 40-44 years). This may reflect the predominant religious culture in Utah that stresses the importance of having children.[9] The cultural emphasis might be a relatively stronger motivation for having the first versus subsequent children. This may be similar to some societies where children are highly valued for social, cultural, and economic reasons.[16] In such social settings, women experiencing infertility may experience emotional distress.[17, 18]

At the intersection of the 7 domains of health, infertility has a considerable bearing on almost all of them, and especially in the areas of physical, social, and emotional health. There is evidence that the psychological effects of infertility are similar to that of cancer and heart diseases.[18] Infertility or subfertility indicate the presence of other underlying physical illnesses in either women (e.g., ovulatory dysfunction, hormonal abnormalities) or men (e.g., oligospermia, infection).[19] Furthermore, infertility itself may be a risk factor for early mortality in both women and men.[20-21]

Since infertility is a relatively common chronic condition that can significantly impact a person's health and well-being, efforts for prevention and early identification are important. It may be beneficial for individuals to develop a greater awareness of their reproductive capacity, including how to determine whether they may be fertile or not. Women can learn to chart external signs or biomarkers that reflect internal hormonal changes that result in ovulation, which is essential for female fertility.[22] By using fertility awareness-based methods (FABMs), women can also monitor their health and work with physicians trained in restorative reproductive medical (RRM) approaches to identify and treat potential underlying causes of infertility.[23-25] Men may also benefit by learning about the factors that affect their fertility and the steps they can take to improve their reproductive health. Finally, clinicians should counsel patients about their reproductive life plans by discussing patients' goals. The reproductive life plan encourages women and men to reflect on their reproductive intentions in the context of their personal values and life goals.[26]

Limitations of our study of infertility treatment in Utah come from the use of the PRAMS database. First, the dataset only includes women who experienced a live birth. Because women without a live birth are not included in the PRAMS database, the actual percentage of Utah women seeking infertility treatment is higher, as fertility treatment does not guarantee live birth. Second, receiving fertility treatment does not necessarily always indicate that infertility was present. Studies with earlier UT-PRAMS datasets (2004-2008) found that 5.0% of women received infertility treatment even though they did not meet the formal definition for infertility, i.e., had been trying to conceive for less than 6-12 months.[10] For these 2 reasons, our findings of the prevalence of fertility treatment by age and parity cannot be directly translated into an estimate of the prevalence of primary or secondary infertility. Nevertheless, they do provide important insight into the patterns of the use of infertility treatment in Utah.

Acknowledgements

Pregnancy Risk Assessment Monitoring System (PRAMS) retrieved on March 11, 2021, from Utah Department of Health, Center for Health Data and Informatics, Indicator-Based System for Public Health. Website: http://ibis.health.utah.gov/

References

1. Vander Borght, M., & Wyns, C. (2018). Fertility and infertility: Definition and epidemiology. Clinical biochemistry, 62, 2–10. https://doi.org/10.1016/j.clinbiochem.2018.03.012

2. https://www.cdc.gov/nchs/fastats/infertility.htm

3. Chandra, A., Copen, C. E., & Stephen, E. H. (2013). Infertility and impaired fecundity in the United States, 1982-2010: data from the National Survey of Family Growth. National health statistics reports, (67), 1–19.

4. Chu, K. Y., Patel, P., & Ramasamy, R. (2019). Consideration of gender differences in infertility evaluation. Current opinion in urology, 29(3), 267–271. https://doi.org/10.1097/MOU.0000000000000590

5. Practice Committee of the American Society for Reproductive Medicine. Electronic address: asrm@asrm.org (2020). Definitions of infertility and recurrent pregnancy loss: a committee opinion. Fertility and sterility, 113(3), 533–535. https://doi.org/10.1016/j.fertnstert.2019.11.025

6. Ghaffari, F., & Arabipoor, A. (2018). The role of conception type in the definition of primary and secondary infertility. International journal of reproductive biomedicine, 16(5), 355–356.

7. Kessler LM, Craig BM, Plosker SM, Reed DR, Quinn GP. Infertility evaluation and treatment among women in the United States. Fertil Steril. 2013;100(4):1025-1032. doi:10.1016/j.fertnstert.2013.05.040 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3814221/pdf/nihms506522.pdf

8. Wilcox A. Fertility and Pregnancy: An Epidemiologic Perspective. Oxford University Press, USA, 2010.

9. Stanford JB, Smith KR. Marital fertility and income: moderating effects of the Church of Jesus Christ of Latter-day Saints religion in Utah. J Biosoc Sci 2013;45:239-48.

10. Sanders J, Simonsen S, Porucznik CA, Baksh L, Stanford JB. Use of fertility treatments in relation to the duration of pregnancy attempt among women who were trying to become pregnant and experienced a live birth. Matern Child Health J. 2014;18(1):258-267. doi:10.1007/s10995-013-1262-5

11. Stanford JB, Sanders JN, Simonsen SE, Hammoud A, Gibson M, Smith KR. Methods for a Retrospective Population-based and Clinic-based Subfertility Cohort Study: the Fertility Experiences Study. Paediatr Perinat Epidemiol 2016;30:397-407.

12. Stanford J, Simonsen S. Infertility in Utah, 2004-5. Utah's Health An Annual Review 2007;12 Suppl.:153-7.

13. Shulman HB, D'Angelo DV, Harrison L, Smith RA, Warner L. The Pregnancy Risk Assessment Monitoring System (PRAMS): Overview of Design and Methodology. Am J Public Health. 2018 Oct;108(10):1305-1313. doi: 10.2105/AJPH.2018.304563. Epub 2018 Aug 23. PMID: 30138070; PMCID: PMC6137777.

14. Schliep KC, Denhalter D, Gren LH, Panushka KA, Singh TP, Varner MW. Factors in the Hospital Experience Associated with Postpartum Breastfeeding Success. Breastfeed Med. 2019 Jun;14(5):334-341. doi: 10.1089/bfm.2018.0039. Epub 2019 Apr 3. PMID: 30942606; PMCID: PMC7648434.

15. Centers for Disease Control and Prevention, (2019): National Survey of Family Growth-Key Statistics. https://www.cdc.gov/nchs/nsfg/key_statistics/i.htm#impaired Assessed March 21, 2021.

16. Evers JL. Female subfertility. Lancet 2002;360:151-9.

17. Choy, J. T., & Eisenberg, M. L. (2018). Male infertility as a window to health. Fertility and sterility, 110(5), 810–814. https://doi.org/10.1016/j.fertnstert.2018.08.015

18. Hasanpoor-Azghdy SB, Simbar M, Vedadhir A. The Social Consequences of Infertility among Iranian Women: A Qualitative Study. Int J Fertil Steril. 2015 Jan-Mar;8(4):409-20. doi: 10.22074/ijfs.2015.4181. Epub 2015 Feb 7. PMID: 25780523; PMCID: PMC4355928

19. Fidler, A.T, and Bernstein, J. (1999): Infertility: From a Personal Public Health

20. Centers for Disease Control and Prevention, (2019): National Survey of Family Growth-Key Statistics. https://www.cdc.gov/nchs/nsfg/key_statistics/i_2015-2017.htm#infertility Assessed March 15, 2021.

21. Lindsay, T. J., & Vitrikas, K. R. (2015). Evaluation and treatment of infertility. American family physician, 91(5), 308–314.

22. Senapati S. (2018). Infertility: a marker of future health risk in women?. Fertility and sterility, 110(5), 783–789. https://doi.org/10.1016/j.fertnstert.2018.08.058

23. Manhart MD, Duane M, Lind A, Sinai I, Golden-Tevald J. Fertility awareness-based methods of family planning: a review of effectiveness for avoiding pregnancy using SORT. Osteopathic Fam Physician. 2013;5(1):2-8.

24. Stanford JB, Parnell TA, Boyle PC. Outcomes from treatment of infertility with natural procreative technology in an Irish general practice. J Am Board Fam Med 21(5):375-84, 2008;

25. Tham E, Schliep K, Stanford J. Natural procreative technology for infertility and recurrent miscarriage: outcomes in a Canadian family practice. Can Fam Physician 58:e267-74, 2012.

26. Boyle PC, de Groot T, Andralojc KM, Parnell TA. Healthy Singleton Pregnancies From Restorative Reproductive Medicine (RRM) After Failed IVF. Front Med (Lausanne). 2018;5:210. Published 2018 Jul 31. doi:10.3389/fmed.2018.00210

27. Files JA, Frey KA, David PS, Hunt KS, Noble BN, Mayer AP. Developing a reproductive life plan. J Midwifery Womens Health. 2011;56(5):468-474. doi:10.1111/j.1542-2011.2011.00048.x