

---

# **First Pregnancy Abortion or Natural Pregnancy Loss: A Cohort Study of Mental Health Services Utilization**

James Studnicki,\* Tessa Longbons Cox,\* John W. Fisher,\*  
Christina A. Cirucci,\* David C. Reardon,\*\* Ingrid Skop,\*  
Christopher Craver,\* Maka Tsulukidze,\*\*\* Zbigniew Ras\*\*\*\*

**ABSTRACT: Introduction:** While both induced abortion and natural pregnancy loss have been associated with subsequent mental health problems, population-based studies directly comparing these two pregnancy outcomes are rare. We sought to compare mental health morbidity after an induced abortion or natural loss.

**Methods:** Continuously eligible Medicaid beneficiaries age 16 in 1999 were assigned to two cohorts based upon the first pregnancy outcome: abortion (n = 1,331) or natural loss (n = 605). Outcomes were mental health outpatient visits, inpatient hospital admissions and hospital days of stay per patient per year. Average exposure periods before and after the first pregnancy outcome for each cohort were used to adjust the mental health service rates.

---

\* Charlotte Lozier Institute, 2776 S. Arlington Mill Drive, PO Box 803, Arlington, VA 22206, USA; jstudnicki@lozierinstitute.org (J.S.), tlongbons@lozierinstitute.org (T.L.), fastboatsailor@gmail.com (J.W.F.), chris@aaplog.org (C.A.C.), iskop@lozierinstitute.org (I.S.), ccraiver62@outlook.com (C.C.), Correspondence: tcx@lozierinstitute.org; (202) 223-8073

\*\* Elliot Institute, 1333 College Pkwy, Gulf Breeze, FL 32563, USA; dreardon@lozierinstitute.org

\*\*\* Department of Health Sciences, Florida Gulf Coast University, 10501 FGCU Blvd, Fort Myers, FL, USA, 33965; mtsulukidze@fgcu.edu

\*\*\*\* Computer Science Department, University of North Carolina at Charlotte, 9201 University City Blvd, Charlotte, NC, 28223, USA; ras@uncc.edu

**Results:** Prior to the first pregnancy outcome, all three utilization rates were significantly higher for the natural loss cohort compared to the abortion cohort. For the abortion cohort, the per-patient per-year increase from the pre- to post-pregnancy periods was significant for all three rates: 2.04 times for outpatient visits ( $p < 0.0001$ ), 3.04 times for inpatient admissions ( $p = 0.0003$ ), and 3.01 times for hospital days of stay ( $p = 0.0112$ ). None of the pre-to-post rate increases were significant for the natural loss cohort.

**Conclusion:** Higher pre-pregnancy use rates for women who experience a natural pregnancy loss indicate that increased mental health services use following abortion cannot be solely attributed to pre-existing mental illness. Only the abortion cohort, but not the natural loss cohort, experienced significant increases in mental health services use following the first pregnancy outcome.

**Keywords:** abortion, miscarriage, mental health

---

## Introduction

Intentional pregnancy loss by means of induced abortion has been consistently linked to an increased risk of subsequent mental health morbidity.<sup>1</sup> While literature reviews from a previous decade concluded that there was inadequate evidence that abortion was the direct and sole cause of mental illnesses,<sup>2,3</sup> subsequent studies and more recent reviews have demonstrated that induced abortion is at least a contributing cause to the triggering or worsening of mental health issues, including symptoms of depression, suicide and suicidal ideation, bipolar disorder, anorexia, substance abuse and others.<sup>1,4-12</sup>

Similarly, other studies have revealed a link between natural pregnancy loss (e.g., miscarriage) and mental health morbidity. A recent Portuguese study indicated that a substantial proportion of women showed persistent symptoms of mental health morbidity (grief, anxiety, depression, PTSD) for three or more years after an early pregnancy loss.<sup>13</sup> Similarly, a recent study of US veterans with a history of miscarriage or stillbirth indicated that they were more likely to have a diagnosis of anxiety, depression, PTSD, have experienced sexual trauma (harassment or rape), and received healthcare services during their pregnancy than did women without a history of pregnancy loss.<sup>14</sup>

Investigators combining both induced abortion and natural loss as forms of pregnancy loss have found increasing risks of post-pregnancy mental

health issues with either type of pregnancy loss<sup>12,15,16</sup> but studies directly comparing these two pregnancy outcomes are rare. A Norwegian single hospital study surveyed women 10 days, six months, two years and five years after pregnancy termination by either abortion (n=80) or miscarriage (n=40) using questionnaires to determine perceived quality of life, depression, anxiety and their feelings about terminating the pregnancy.<sup>17</sup> Women with abortions had greater feelings of guilt and shame than women with miscarriages at two and five years after the termination. The 120 participants were 47% of the 255 who were asked to participate. Of the participants, 91% completed the study. The authors noted that limitations in their study were a lack of control for both former psychiatric health status and knowledge of prior and subsequent pregnancy outcomes. Especially problematic are studies based on non-random samples of women solicited at abortion clinics. These non-replicable studies are characterized by extremely low participation rates, high attrition rates, selective reporting and a systematic exclusion of the women at greatest risk of psychological sequelae.<sup>18</sup>

A critical methodological concern in this domain is the determination of the mental health status of the women in the periods prior to their exposure to a pregnancy loss. Previous research has claimed that post-abortion rates of first-time psychiatric contact and first non-fatal suicide attempts are not significantly different than pre-abortion rates.<sup>19,20</sup> These findings are taken to suggest that women who have an abortion may be mentally or emotionally troubled before the abortion, and that problems subsequent to the abortion are not the result of the abortion itself. This dilemma suggests that the pre- and post-pregnancy outcome periods must be long enough to allow for the detection of psychological problems and disorders which may gradually evolve over a reproductive history extending over multiple pregnancy outcomes. In a previous longitudinal cohort study, we followed Medicaid-eligible women who were or turned 16 in 1999 for 17 years, recording each subsequent pregnancy outcome and grouping them into cohorts based on the first pregnancy (live birth, abortion, or miscarriage).<sup>21</sup> Since prior research had indicated that women with repeat abortions are at an increased risk for adverse psychological outcomes and death from all causes, we determined that further post hoc testing of these cohorts would enable us to address the long-term mental health consequences of having an abortion as the terminus of the first pregnancy.<sup>22,23</sup> Further, the characteristics of the dataset and research design would enable the study to utilize objective paid claims events avoiding the problems inherent in survey research; utilize a range of outpatient and inpatient treatment events that provide a comprehensive, composite view of mental health morbidity rather than a narrowly defined single adverse event; provide precise measurement of the duration of the exposure to mental health problems before and af-

ter the first pregnancy outcome; and provide an analysis of the mental health consequences of vastly different reproductive lifetime experiences which are associated with abortion, miscarriage, or birth as the first pregnancy outcome. In a recent analysis comparing the birth cohort with the abortion cohort, we found that having a first-pregnancy abortion was associated with a significantly greater risk of experiencing a mental health treatment event following the first pregnancy outcome.<sup>24</sup> In this present analysis, we take a similar approach to measure differences in mental health treatment utilization between the abortion and natural pregnancy loss cohorts.

## Methods

Data were obtained from the Medicaid Analytic eXtract (MAX) files licensed through the Centers for Medicare and Medicaid Services (CMS) Chronic Condition Data Warehouse (CCW), which contain patient-level data for healthcare services provided to Medicaid enrollees. As described in a previous study, the total analytic dataset comprises Medicaid-enrolled women 13 years of age and older with a minimum of one pregnancy from the 17 states that used state funds to cover induced abortions beyond those eligible for coverage by federal Medicaid.<sup>21</sup> To ensure that no pregnancies would be missed due to gaps in reporting, for this specific study, our study population was drawn from the seven states which consistently submitted full Medicaid claims data for the entire 17-year study period (1999-2015): Connecticut, New Jersey, New Mexico, New York, Oregon, Vermont, and West Virginia. Similarly, to ensure that no pregnancies were missed as a result of eligibility gaps, each woman included in the study population was eligible for Medicaid for at least one month in all years of the study period. Cohorts were developed from all women who were or turned 16 years old in 1999 based upon their first pregnancy outcome. In a similarly defined population of women 15 years old in 1999, less than 0.47% had a pregnancy, providing high confidence that women were assigned to study cohorts based on their first pregnancy outcomes. This analysis focused on the two cohorts experiencing either a first-pregnancy abortion or natural loss.

All unique pregnancy outcomes were identified for each Medicaid enrollee using International Classification of Diseases, Ninth Revision (ICD9) and Tenth Revision (ICD10) codes: natural pregnancy loss (a category that includes miscarriage, stillbirth, ectopic pregnancy, and other pregnancies not ending in induced abortion or live birth) (ICD9 V27.1, V27.4, V27.7, 630, 631, 633, 634 and ICD10 O00, O01, O02, O03) and induced abortion (ICD9 635.xx, ICD10 O04, CPT4: 59840, 59841, 59850, 59851, 59852, 59855, 59856, 59857, and HCPCS: S0199, S2260, S2265, S2266, S2267, X7724, X7726, S0190, S0191). Multiple diagnostic or treatment codes occurring within 30 days of an induced abortion or natural loss were collapsed into a single outcome using the first date associated with that series of Medicaid claims. When twins or higher-order pregnancies

resulted in a combination of live birth and natural pregnancy loss, they were excluded from the analysis. Current Procedural Terminology, Fourth Edition (CPT4) and Healthcare Common Procedure Coding System (HCPCS) codes were also used to confirm pregnancy outcomes.

We used a comprehensive list of 3-digit ICD9 (ICD9 290-319) and ICD10 (ICD10 F01-F48, F50-F98) codes to identify outpatient visits and inpatient hospitalizations resulting from a range of mental, behavioral, psychiatric or psychological problems, diseases, and disorders.

The analytic strategy was composed of five phases:

- 1) Each eligible enrollee was assigned to one of two cohorts based upon her first pregnancy outcome: abortion or natural loss.
- 2) Using each woman's age at her first pregnancy outcome, we determined the average length of the periods of exposure both before (pre) and after (post) the first outcome for each cohort.
- 3) We identified all mental health-related events that occurred before and after the first pregnancy outcome for both cohorts. The outcome variables are three event categories: a) outpatient visits; b) inpatient hospital admissions; and c) inpatient hospital days of stay.
- 4) Cohort-specific rates (per patient, per year) were calculated for each of the three outcome variables.
- 5) All cohort rate information was calculated using individual, event level utilization indicator counts for each woman in each of the pre and post time periods. For comparisons of the abortion and natural loss cohorts within each time period for each utilization indicator rate, we used a two-sample t-test for independent samples. For comparisons within each of the cohorts of the mean difference between the pre and post period rates we used a paired sample t-test for dependent analyses.

Summary analytic tables were created using (SAS/STAT) software, version (10) of the SAS system for (Unix), copyright (2019) SAS Institute, Inc. The study has been exempted from Institutional Review Board (IRB) review pursuant to the U.S. Department of Health and Human Services Policy for Protection of Human Research Subjects at C.F.R. 46.101(b). See IRB ID: 7269, [www.sterlingirb.com](http://www.sterlingirb.com).

## Results

As shown in Table 1, 475 (35.7%) of the women in the abortion cohort experienced 14,066 outpatient mental health visits, and 42 (3.1%) experienced 77 mental health inpatient admissions and 707 days of hospital stay in the period before the first pregnancy outcome (which was 77.10 months or 6.43 years in duration on average). In the period after the first pregnancy outcome, which was 126.90 months or 10.57 years on average, 785 (59.0%) abortion cohort women experienced 46,103 outpatient visits and 105 (7.9%) experienced 334 inpatient admissions and 3,425 days of hospital stay.

Of 605 women in the natural loss cohort, 303 (50.1%) experienced 14,221 outpatient mental health visits and 39 (6.4%) experienced 142 inpatient admissions and 1,475 days of hospital stay in the 86.08 months or 7.17 years average exposure before the first pregnancy outcome. In the period following the first pregnancy outcome, with an average exposure duration of 117.92 months or 9.83 years, 399 (65.9%) women from the natural loss cohort experienced 19,775 mental health outpatient visits and 48 (7.9%) experienced 107 hospital inpatient admissions and 869 days of hospital stay.

In the period before the first pregnancy outcome, all three of the mental health services utilization rates were statistically significantly higher for the natural loss cohort than for the abortion cohort. The natural loss cohort mean outpatient visit/patient/year rate was 3.1693; the mean abortion cohort rate was 1.5934;  $t = 4.55$ ,  $p < 0.0001$ . Inpatient admissions/patient/year rates were: natural loss  $M = 0.0216$ ; abortion  $M = 0.0076$ ;  $t = 3.57$ ,  $p = 0.0004$ . Inpatient days of hospital stay/patient/year were: natural loss  $M = 0.2002$ ; abortion  $M = 0.0724$ ;  $t = 2.68$ ,  $p = 0.0074$ . The natural loss cohort rate difference is 1.99 times the abortion cohort for outpatient visits, 2.84 times for inpatient admissions and 2.76 times for days of stay.

In the period after the first pregnancy outcome, the natural loss and abortion cohorts have nearly identical rates for all three mental health utilization indicators. The natural loss cohort rate outpatient visits/patient/year is still slightly higher than the abortion cohort (natural loss  $M = 3.5942$ , abortion  $M = 3.2559$ ) and the inpatient admissions rate (natural loss  $M = 0.0227$ , abortion  $M = 0.0231$ ) and hospital days rate (natural loss  $M = 0.2079$ , abortion  $M = 0.2176$ ) are now marginally lower for the natural loss cohort. However, none of the post-pregnancy between group outcome rate differences are significantly different (Table 2).

The differences in mental health utilization before and after the first pregnancy outcome were all statistically significant for the abortion cohort. For the rate of outpatient visits/patient/year, the abortion cohort mean difference (MD), or the post-period mean minus the pre-period mean, is 1.6624,  $t = 5.16$ ,  $p < .0001$ , and represents a doubling of the rate (2.04 times). The inpatient hospital admissions/patient/year rate MD is 0.0154,  $t = 3.16$ ,  $p = 0.0003$ , and represents a 3.04 times pre to post increase. The inpatient hospital days/patient/year rate MD is 0.1452,  $t = 2.54$ ,  $p = 0.0112$ , and represents a 3.01 times pre to post increase. For the natural loss cohort, none of the pre to post rate increases are significant. The post rate represents 1.13 times the pre rate for outpatient visits; and 1.05 and 1.04 times the pre rates for inpatient admissions and days of stay, respectively, per patient per year (Table 3, Figures 1, 2, 3).

**Table 1. Data Summary, by Cohort, Pre and Post First Pregnancy Outcome**

Variable	Abortion (n=1331)		Natural Loss (n=605)	
	Pre	Post	Pre	Post
Outpatients	475	785	303	399
Inpatients	42	105	39	48
Months/years exposure	77.10/6.43	126.90/10.57	86.08/7.17	117.92/9.83
Age first outcome				
No pre use		21.4 yrs		21.8
Pre use		23.1 yrs		23.7
Outpatient visits	14066	46103	14221	19755
Inpatient admissions	77	334	142	107
Inpatient days	707	3425	1475	869
OP visit rates*	1.5934	3.2559	3.1693	3.5942
IP admission rates	0.0076	0.0231	0.0216	0.0227
IP days rates	0.0724	0.2176	0.2002	0.2079

\*event per patient per year

## Discussion

Although there is an extensive literature which independently links both natural losses and induced abortion to an elevated risk of mental health disorders, very little attention has been given to directly comparing the mental health consequences of natural losses and induced abortions. The present study reveals that rates of subsequent utilization of mental health services significantly increase after a first pregnancy ending in abortion compared to a first pregnancy ending in a natural loss. In the periods before and after the first pregnancy outcome, women with first pregnancy abortions doubled their rate of mental health outpatient visits and tripled their rate of inpatient hospital psychiatric admissions and days of hospital stay. By contrast, women with first pregnancy natural losses had no statistically significant increase in either outpatient or inpatient mental health services utilization from the pre to the post periods.

**Table 2. Between Cohorts Independent Sample T-Tests**

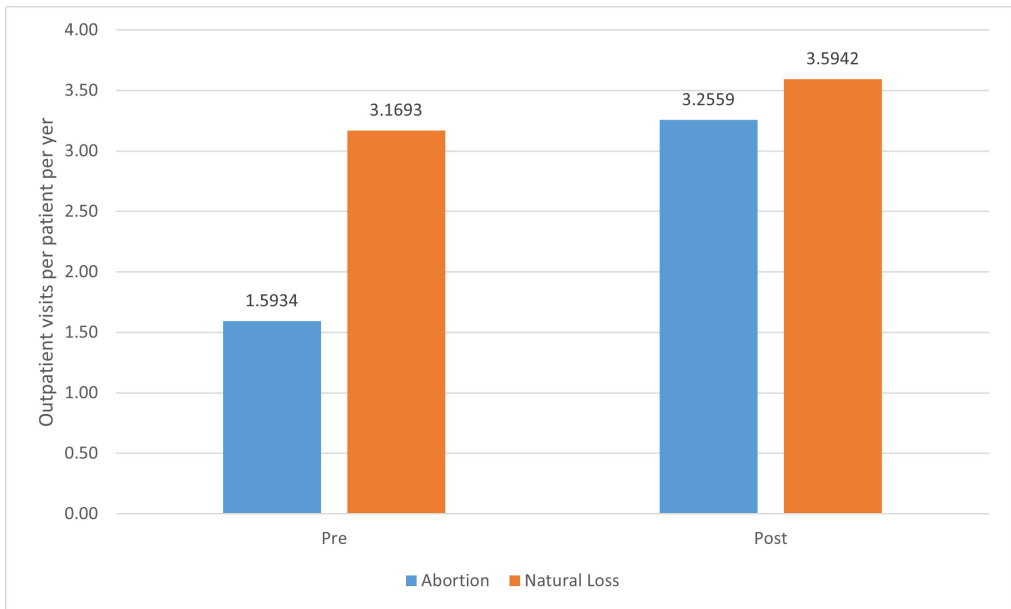
	OP Visit Rate Pre					
	N	Mean	Std	SE	T value	Pr>(t)
Abortion	1331	1.5934	6.0354	0.0570	4.55	<.0001
Natural Loss	605	3.1693	8.9027	0.0350		
	OP Visit Rate Post					
Abortion	1331	3.2559	11.5400	0.3164	0.62	0.5342 (NS)
Natural Loss	605	3.5942	10.0590	0.4090		
	IP Admission Rate Pre					
Abortion	1331	0.0076	0.0580	0.0016	3.57	0.0004
Natural Loss	605	0.0216	0.1135	0.0046		
	IP Admission Rate Post					
Abortion	1331	0.0231	0.1603	0.0044	0.1545	0.962 (NS)
Natural Loss	605	0.0227	0.1185	0.0048		
	IP Days Rate Pre					
Abortion	1331	0.0724	0.6703	0.0184	2.68	0.0074
Natural Loss	605	0.2002	1.4267	0.0800		
	IP Days Rate Post					
Abortion	1331	0.2176	2.0641	0.0266	0.1	0.919 (NS)
Natural Loss	605	0.2079	1.6336	0.0664		

Abortion is associated with complicated grief, substance use disorders, affective disorders, eating disorders and self-destructive behaviors.<sup>1,9,10,25,26</sup> While both natural losses and unwanted abortions may trigger a grief process, social and interpersonal issues may make it more difficult to complete the grief process after an unwanted abortion.<sup>1,27,28</sup> Any resulting complicated, disenfranchised, or impacted grief may contribute to affective and behavioral disorders, especially when there are pre-existing issues.<sup>1,28</sup> There is substantial evidence that the negative psychological effects associated with abortion are greatest among those women who feel pressured to have abortions contrary to their own personal values and preferences.<sup>8,29-31</sup> The fact that a first abortion



**Table 3. Within Cohorts, Pre to Post, Paired (Dependent) Samples T-Tests**

	Mean difference	Std	SE	T value	Pr>(t)
Abortion (n=1331)					
OP Visits	1.6624	11.76	0.3225	5.16	<0.0001
IP Admissions	0.0154	0.1557	0.0043	3.16	0.0003
IP Days	0.1452	2.0847	0.0571	2.54	0.0112
Natural Loss (n=605)					
OP Visits	0.4249	10.7017	0.4351	0.98	0.3291 (NS)
IP Admissions	0.0011	0.1065	0.0043	0.26	0.7925 (NS)
IP Days	0.0077	1.1571	0.0470	0.16	0.8693 (NS)



**Figure 1. Outpatient visits per patient per year—event level means**

increases the risk of multiple abortions,<sup>32,33</sup> each of which may increase the risk of mental health issues, may be greater than the similar risks associated with multiple natural losses. This elevated risk of multiple abortions when a first pregnancy ends in abortion,<sup>33</sup> may predispose women to a cascade of mental health problems.

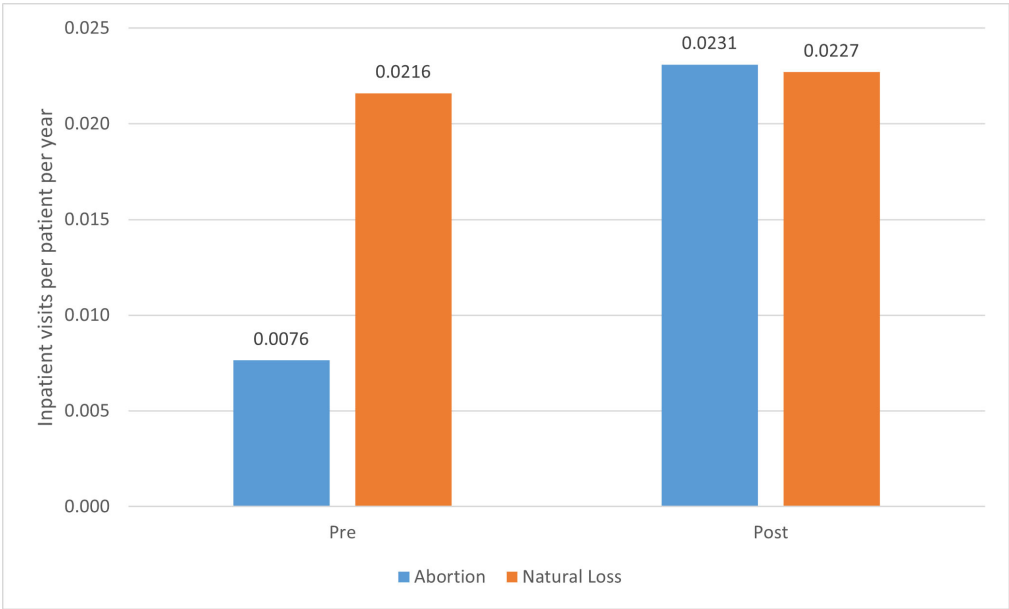


Figure 2. Inpatient visits per patient per year—event level mean

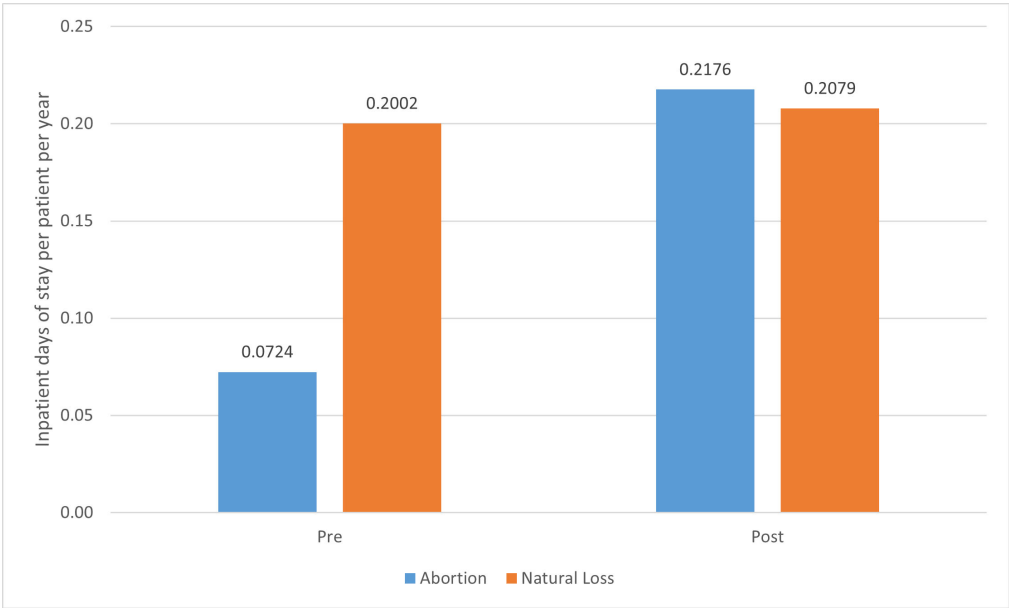


Figure 3. Inpatient days of stay per patient per year—event level means

Contributing to this relatively flat rate of pre- to post-first pregnancy mental health utilization for women with first pregnancy natural losses is their significantly higher pre-pregnancy mental health morbidity compared to women with first pregnancy abortions. Prior to the first pregnancy, women who will have natural pregnancy losses had twice the outpatient use and two and one-half times the inpatient admissions and days of stay than women who subsequently had first pregnancy abortions. While there is some overlap in treatment protocols for complications of induced abortion and spontaneous miscarriage, our findings underscore the disparate impact of these two pregnancy outcomes on patients' mental health both before and after the first pregnancy outcome. Healthcare providers should be aware of the diverse needs of Medicaid recipients experiencing abortion versus natural pregnancy loss and be prepared to offer appropriate mental healthcare. Patients presenting with symptoms of pregnancy loss should be screened for the type of loss.

Advanced maternal age and chromosomal abnormalities (aneuploidy) have been long associated with an increased risk of miscarriage.<sup>34,35</sup> Most of the available research, however, has looked at the question of whether a miscarriage is a causal factor predisposing a woman to some psychiatric disorder in the post-pregnancy period. Recent research assessed whether psychiatric disorders in the prior period were associated with an increased risk of miscarriage.<sup>36</sup> Using all the registered pregnancies in Norway between 2010-2016, the researchers determined that a wide range of psychiatric disorders in the pre-pregnancy period were associated with an increased risk of miscarriage: bipolar disorders, personality disorders, anxiety, depression, somatoform disorders and eating disorders. The findings of our research are consistent with these results. Our findings are also consistent with analyses from the National Longitudinal Study of Adolescent to Adult Health which revealed that induced abortion is an independent risk factor for mental health disorders even after controlling for over 20 confounding variables, including prior mental health.<sup>8,9</sup>

Our study has limitations. The study population is composed of Medicaid-eligible women and, as a result, these findings are not generalizable to a population of different sociodemographic composition. Services received outside the Medicaid program, regardless of Medicaid eligibility, will not appear in this data. While the use of a comprehensive aggregated index of mental health problems across a 17-year observation period is a strength of our study design, it does not allow conclusions regarding a first pregnancy natural loss or abortion and any specific mental health illness, disorder, or problem. Similarly, the cohort as the unit of analysis may mask any number of associations that could be specific to some subpopulation of the cohort; e.g., post-pregnancy outcome utilization for women with and without histories of specific mental illness. Our study focused on the quantity of mental health events but did not

evaluate the severity of events nor the specific diagnoses. These could be areas of future research. Our study utilized three coding systems applied to the Medicaid claims paid: the International Classification of Diseases (ICD) ninth and tenth revisions; the Current Procedural Terminology, Fourth Edition (CPT4); the Healthcare Common Procedure Coding System (HCPCS). There are limitations with the use of coding systems applied to research rather than administrative purposes: diagnoses not relevant to payment tend to be underreported; there is often variability in coding practices across hospitals and geographic regions; coding may be inaccurate due to upcoding, reflecting the “code creep” resulting from approaches to maximize payment; and the simple inability of any coding system to capture the clinical detail that may be available in the notes of the total medical record.<sup>37</sup>

## Conclusion

Our study has important clinical significance. In the period following the outcome of a first pregnancy, abortion is associated with significantly greater increases in utilization rates for both outpatient and inpatient mental health services than is a natural pregnancy loss. The relatively low rates of mental health services utilization prior to a first-pregnancy abortion indicate that this increase cannot be solely attributed to pre-existing mental illness. Health care providers should be aware of and attentive to the increase in mental health utilization that may occur after induced abortion. Clinicians typically understand that a woman who has undergone a miscarriage will experience grief and a sense of loss, but may easily overlook the issues that women face following abortion. Women with first pregnancy abortions, on average, have more than three times as many subsequent abortions during the reproductive period than women with first pregnancy natural losses.<sup>21</sup> Therefore, the influence of multiple or repeat abortions contributes to this difference and also supports the conclusion that induced abortion is an independent risk factor for mental health disorders. Increased attentiveness to this risk by health care providers may enable patients to have earlier access to mental health services and increased access to available resources. High levels of mental health morbidity prior to the first pregnancy outcome for women who subsequently miscarry suggests that mental health problems may be a risk factor for unwanted pregnancy loss.

**Funding:** This work was funded by the Charlotte Lozier Institute

**Author Contributions:** Conceptualization: J.S. and J.W.F.; Data Curation: J.S. and J.W.F.; Formal Analysis: J.S., J.W.F., and C.C.; Funding Acquisition: J.S.; Investigation: J.S., J.W.F., D.R., and T.L.C.; Methodology: J.S., J.W.F., D.R., and T.L.C.; Project Administration: J.S.; Resources: C.C. and J.W.F.; Software: C.C. and J.W.F.; Supervision: J.S.; Validation: All authors; Visualization: J.W.F.; Writing - Original Draft: J.S.; Writing - Review & Editing: All authors

**Institutional Review Board:** The study has been exempted from Institutional Review Board (IRB) review pursuant to the U.S. Department of Health and Human Services Policy for Protection of Human Research Subjects at C.F.R. 46.101(b). See IRB ID: 7269, [www.sterlingirb.com](http://www.sterlingirb.com).

**Data Availability:** Restrictions apply to the availability of these data. Data was obtained from Centers for Medicare and Medicaid Services subject to a signed data use agreement (DUA). Due to the data use policy of the Centers for Medicaid and Medicare Services, supporting data is not available from the authors.

**Conflicts of Interest:** The authors did not report any potential conflicts of interest.

## References

- <sup>1</sup> Reardon DC. The abortion and mental health controversy: A comprehensive literature review of common ground agreements, disagreements, actionable recommendations, and research opportunities. *SAGE Open Med.* 2018;6. doi:10.1177/2050312118807624
- <sup>2</sup> Major B, Appelbaum M, Beckman L, Dutton MA, Russo NF, West C. *Report of the APA Task Force on Mental Health and Abortion.* American Psychological Association; 2008.
- <sup>3</sup> National Collaborating Centre for Mental Health. *Induced Abortion and Mental Health: A Systematic Review of the Mental Health Outcomes of Induced Abortion, Including Their Prevalence and Associated Factors.* Academy of Medical Royal Colleges; 2011.
- <sup>4</sup> Jacob L, Kostev K, Gerhard C, Kalder M. Relationship between induced abortion and the incidence of depression, anxiety disorder, adjustment disorder, and somatoform disorder in Germany. *J Psychiatr Res.* 2019;114. doi:10.1016/j.jpsychires.2019.04.022
- <sup>5</sup> Gissler M, Karalis E, Ulander VM. Decreased suicide rate after induced abortion, after the Current Care Guidelines in Finland 1987 - 2012. *Scand J Public Health.* 2015;43(1). doi:10.1177/1403494814560844
- <sup>6</sup> McCarthy FP, Moss-Morris R, Khashan AS, et al. Previous pregnancy loss has an adverse impact on distress and behaviour in subsequent pregnancy. *BJOG.* 2015;122(13). doi:10.1111/1471-0528.13233
- <sup>7</sup> Wie JH, Nam SK, Ko HS, Shin JC, Park IY, Lee Y. The association between abortion experience and postmenopausal suicidal ideation and mental health: Results from the 5th Korean National Health and Nutrition Examination Survey (KNHANES V). *Taiwan J Obstet Gynecol.* 2019;58(1). doi:10.1016/j.tjog.2018.11.028
- <sup>8</sup> Sullins DP. Affective and substance abuse disorders following abortion by pregnancy intention in the united states: A longitudinal cohort study. *Medicina (Lithuania).* 2019;55(11). doi:10.3390/medicina55110741
- <sup>9</sup> Sullins DP. Abortion, substance abuse and mental health in early adulthood: Thirteen-year longitudinal evidence from the United States. *SAGE Open Med.* 2016;4. doi:10.1177/2050312116665997
- <sup>10</sup> Fergusson DM, John Horwood L, Boden JM. Does abortion reduce the mental health risks of unwanted or unintended pregnancy? A re-appraisal of the evidence. *Australian and New Zealand Journal of Psychiatry.* 2013;47(9). doi:10.1177/0004867413484597
- <sup>11</sup> Coleman PK. Abortion and mental health: Quantitative synthesis and analysis of research published 1995-2009. *British Journal of Psychiatry.* 2011;199(3). doi:10.1192/bjp.bp.110.077230
- <sup>12</sup> Jacob L, Gerhard C, Kostev K, Kalder M. Association between induced abortion, spontaneous abortion, and infertility respectively and the risk of psychiatric disorders in 57,770

women followed in gynecological practices in Germany. *J Affect Disord.* 2019;251. doi:10.1016/j.jad.2019.03.060

<sup>13</sup> Mendes DCG, Fonseca A, Cameirão MS. The psychological impact of Early Pregnancy Loss in Portugal: incidence and the effect on psychological morbidity. *Front Public Health.* 2023;11. doi:10.3389/fpubh.2023.1188060

<sup>14</sup> Shapiro MO, Kroll-Desrosiers A, Mattocks KM. Understanding the Mental Health Impact of Previous Pregnancy Loss Among Currently Pregnant Veterans. *Women's Health Issues.* Published online 2023. doi:10.1016/j.whi.2023.03.006

<sup>15</sup> Reardon DC, Craver C. Effects of pregnancy loss on subsequent postpartum mental health: A prospective longitudinal cohort study. *Int J Environ Res Public Health.* 2021;18(4). doi:10.3390/ijerph18042179

<sup>16</sup> Farren J, Mitchell-Jones N, Verbakel JY, Timmerman D, Jalmbrant M, Bourne T. The psychological impact of early pregnancy loss. *Hum Reprod Update.* 2018;24(6). doi:10.1093/humupd/dmy025

<sup>17</sup> Broen AN, Moum T, Bødtker AS, Ekeberg Ø. The course of mental health after miscarriage and induced abortion: A longitudinal, five-year follow-up study. *BMC Med.* 2005;3. doi:10.1186/1741-7015-3-18

<sup>18</sup> Reardon DC. The Embrace of the Proabortion Turnaway Study: Wishful Thinking? or Willful Deceptions? *Linacre Quarterly.* 2018;85(3). doi:10.1177/0024363918782156

<sup>19</sup> Munk-Olsen T, Laursen TM, Pedersen CB, Lidegaard Ø, Mortensen PB. Induced First-Trimester Abortion and Risk of Mental Disorder. *New England Journal of Medicine.* 2011;364(4). doi:10.1056/nejmoa0905882

<sup>20</sup> Steinberg JR, Laursen TM, Adler NE, Gasse C, Agerbo E, Munk-Olsen T. The association between first abortion and first-time non-fatal suicide attempt: a longitudinal cohort study of Danish population registries. *Lancet Psychiatry.* 2019;6(12). doi:10.1016/S2215-0366(19)30400-6

<sup>21</sup> Studnicki J, Longbons T, Reardon DC, et al. The Enduring Association of a First Pregnancy Abortion with Subsequent Pregnancy Outcomes: A Longitudinal Cohort Study. *Health Serv Res Manag Epidemiol.* 2022;9. doi:10.1177/23333928221130942

<sup>22</sup> Gissler M, Berg C, Bouvier-Colle MH, Buekens P. Pregnancy-associated mortality after birth, spontaneous abortion, or induced abortion in Finland, 1987-2000. *Am J Obstet Gynecol.* 2004;190(2). doi:10.1016/j.jajog.2003.08.044

<sup>23</sup> Reardon DC, Thorp JM. Pregnancy associated death in record linkage studies relative to delivery, termination of pregnancy, and natural losses: A systematic review with a narrative synthesis and meta-analysis. *SAGE Open Med.* 2017;5. doi:10.1177/2050312117740490

<sup>24</sup> Studnicki J, Longbons T, Fisher J, et al. A Cohort Study of Mental Health Services Utilization Following a First Pregnancy Abortion or Birth. *Int J Womens Health.* 2023;Volume 15. doi:10.2147/ijwh.s410798

<sup>25</sup> Kersting A, Kroker K, Steinhard J, et al. Complicated grief after traumatic loss: a 14-month follow up study. *Eur Arch Psychiatry Clin Neurosci.* 2007;257(8):437-443. doi:10.1007/s00406-007-0743-1

<sup>26</sup> McAll RK, McAll FM. Ritual mourning in anorexia nervosa. *Lancet.* 1980;2(8190):368. doi:10.1016/s0140-6736(80)90365-7

<sup>27</sup> Giannandrea SA, Cerulli C, Anson E, Chaudron LH. Increased risk for postpartum psychiatric disorders among women with past pregnancy loss. *J Womens Health (Larchmt).* 2013;22(9):760-768. doi:10.1089/jwh.2012.4011

<sup>28</sup> Burke T, Reardon DC. *Forbidden Grief: The Unspoken Pain of Abortion.* Acorn Books; 2007.

<sup>29</sup> Reardon DC, Longbons T. Effects of pressure to abort on women's emotional responses and mental health. *Cureus.* 2023;15(1):e34456. doi:10.7759/cureus.34456

<sup>30</sup> Reardon DC, Rafferty KA, Longbons T. The Effects of Abortion Decision Rightness and Decision Type on Women's Satisfaction and Mental Health. *Cureus*. 2023;15(5):e38882. doi:10.7759/cureus.38882

<sup>31</sup> Rue VM, Coleman PK, Rue JJ, Reardon DC. Induced abortion and traumatic stress: a preliminary comparison of American and Russian women. *Med Sci Monit*. 2004;10(10):SR5-SR16.

<sup>32</sup> Reardon DC, Craver C. Intervals and outcomes of first and second pregnancies in low-income women: a record-linkage longitudinal prospective cohort study. *Med Sci Monit*. 2021;27:e931596. doi:10.12659/MSM.931596

<sup>33</sup> Studnicki J, Fisher JW, Reardon DC, Craver C, Longbons T, Harrison DJ. Pregnancy Outcome Patterns of Medicaid-Eligible Women, 1999-2014: A National Prospective Longitudinal Study. *Health Serv Res Manag Epidemiol*. 2020;7:2333392820941348. Published 2020 Jul 31. doi:10.1177/2333392820941348

<sup>34</sup> Garrido-Gimenez C, Alijotas-Reig J. Recurrent miscarriage: Causes, evaluation and management. *Postgrad Med J*. 2015;91(1073). doi:10.1136/postgradmedj-2014-132672

<sup>35</sup> Magnus MC, Wilcox AJ, Morken NH, Weinberg CR, Håberg SE. Role of maternal age and pregnancy history in risk of miscarriage: Prospective register based study. *BMJ (Online)*. 2019;364. doi:10.1136/bmj.l869

<sup>36</sup> Magnus MC, Havdahl A, Morken NH, Wensaas KA, Wilcox AJ, Håberg SE. Risk of miscarriage in women with psychiatric disorders. *British Journal of Psychiatry*. 2021;219(3). doi:10.1192/bjp.2020.259

<sup>37</sup> Ferver K, Burton B, Jesilow P. The use of claims data in healthcare research. *Open Public Health J*. 2009;2:11-24. <https://openpublichealthjournal.com/contents/volumes/V2/TOPHJ-2-11/TOPHJ-2-11.pdf>

## Author bios

**James Studnicki** is currently Vice President and Director of Data Analytics at the Charlotte Lozier Institute in Arlington, Virginia. Over a span of four decades, he held academic appointments at the Johns Hopkins University School of Hygiene and Public Health, the University of South Florida College of Public Health, and the University of North Carolina, Charlotte, where for ten years he served as the Irwin Belk Endowed Chair in Health Services Research. Dr. Studnicki holds Doctor of Science (ScD) and Master of Public Health (MPH) degrees from Johns Hopkins and a Master of Business Administration (MBA) from the George Washington University.

**Tessa Longbons Cox** is a senior research associate with the Charlotte Lozier Institute. Her research focuses on abortion statistics at the state and national levels and the changing landscape of abortion policy, provision, and access in the United States. She received her B.A. from Thomas Edison State University.

**John W. Fisher** is currently an Associate Scholar of the Charlotte Lozier Institute. Following a 22-year career as a nuclear submarine officer, he served as the Director of Life Support and engineering at the Florida Aquarium, Chief Financial Officer of Technology Transfer Services, and 10 years as an Assistant Professor at the University of North Carolina at Charlotte College of Health and Human Services. Dr. Fisher holds a PhD in Information Systems and De-

cision Sciences from the University of South Florida, a JD from Massachusetts School of Law, and master's degrees from the Massachusetts Institute of Technology (Ocean Engineering), University of Notre Dame (Administration), Indiana University (Business Administration), and the United States Naval War College (National Security Policy). He is currently a member of the bar in New Hampshire and Massachusetts.

**Christina A. Cirucci**, MD received her Bachelor of Science in Mechanical Engineering from Virginia Tech in Blacksburg, VA and her MD from Thomas Jefferson University, Philadelphia, PA. She completed her residency in obstetrics and gynecology at the Medical College of Virginia in Richmond, VA. Dr. Cirucci is an Associate Scholar of Charlotte Lozier Institute. She is a diplomate of the American Board of Obstetrics and Gynecology and a life Fellow of the American College of Obstetricians and Gynecologists. She is a member of the Christian Medical and Dental Associations, the North American Menopause Society, the Pennsylvania Medical Society, and the Allegheny County Medical Society. She is a board member of the American Association of Pro-Life Obstetricians and Gynecologists. She worked in private practice for twenty years in Pittsburgh, PA.

**David C. Reardon** is the director of Elliot Institute, a biomedical ethicist, and a lead author on numerous studies and books examining the risk factors and effects of pregnancy loss on women and families. He is also an Associate Scholar of the Charlotte Lozier Institute.

**Ingrid Skop**, M.D., F.A.C.O.G. is Vice President and Director of Medical Affairs for the Charlotte Lozier Institute. Prior to joining CLI, she served for over 25 years in private practice as an obstetrician-gynecologist in San Antonio. Dr. Skop received her Bachelor of Science in physiology from Oklahoma State University and her medical doctorate from Washington University School of Medicine. She completed her residency in obstetrics and gynecology at the University of Texas Health Science Center at San Antonio. Dr. Skop is a Fellow of the American College of Obstetricians and Gynecologists and is a lifetime member of the American Association of Pro-Life Obstetricians and Gynecologists.

**Christopher Craver** is an independent health services researcher affiliated with the Charlotte Lozier Institute focused on the use of secondary healthcare data sources in population based scientific research. He is widely published in many healthcare topics including cancer treatment, rare disease populations, and the efficacy of surgical services.

**Maka Tsulukidze**, MD, PhD, MPH is an Assistant Professor at the Florida Gulf Coast University, Marieb College of Health & Human Services and an Associate Scholar of the Charlotte Lozier Institute. Before joining FGCU, Dr. Tsulukidze was a Postdoctoral Fellow at the Dartmouth Center for Health Care Delivery Science. She has earned a Ph.D. degree from the University of North



Carolina at Charlotte and MD from Tbilisi Medical Academy. Previously Dr. Tsulukidze was a UNICEF National Consultant to the Parliament of Georgia, Short-Term Consultant at PAHO/WHO and Senior Expert at the Parliament of Georgia, Committee on Health and Social Issues. She has also worked as a Deputy Chair/Project Manager for the Task Force for Prevention of Micronutrient Malnutrition and Food Fortification Initiatives established under the Parliament of Georgia, Committee on Health and Social Issues.

**Zbigniew Ras** is a Professor of Computer Science and KDD Laboratory Director at the University of North Carolina, Charlotte. He also holds professorship position at the Polish-Japanese Academy of Information Technology in Warsaw, Poland. His PhD degree is from the University of Warsaw and the Habilitation Degree from the Polish Academy of Sciences. In 2012, President of Poland appointed him as full professor. His areas of expertise include Knowledge Discovery and Data Mining, Recommender Systems, Health Informatics, Business Analytics, Granular Computing, Music Information Retrieval, and Art. He is the Editor-in-Chief of the *Journal of Intelligent Information Systems* (Springer) and a member of several Editorial Boards at other journals. He is the author of 350+ publications and the editor/author of 62 books published mainly by Springer and North Holland. He received many awards including Harshini V. de Silva Graduate Mentor Award and Alcoa Foundation Outstanding Faculty Award, both at UNC Charlotte. Also, he was the finalist of the Bank of America Award for excellence in teaching. Dr. Ras received competitive grants and contracts from NSF, DOD/ARO, ONR, SAS, The Daniel Group, ORNL, DOE, IBM, State Committee for Scientific Research (in Poland), and AM-VIS (in Czech Republic). He graduated 23 PhD students, including 4 in Poland.