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# Disparities in fertility-sparing surgery in adolescent and young women with stage I ovarian dysgerminoma



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## ABSTRACT

**Background:** In many cancers, racial and socioeconomic disparities exist regarding the extent of surgery. For ovarian dysgerminoma, fertility-sparing (FS) surgery is recommended whenever possible. The aim of this study was to investigate rates of FS versus non-fertility-sparing (NFS) procedures for stage I ovarian dysgerminoma in adolescents and young adults (AYAs) by ethnicity/race and socioeconomic status.

**Materials and methods:** The National Cancer Data Base was queried for patients with ovarian dysgerminoma from 1998 to 2012. After selecting patients aged 15–39 y with stage I disease, a multivariate regression analysis was performed, and rates of FS and NFS procedures were compared, first according to ethnicity/race, and then by socioeconomic surrogate variables.

**Results:** Among the 687 AYAs with stage I ovarian dysgerminoma, there was no significant difference in rates of FS and NFS procedures based on ethnicity/race alone ( $P = 0.17$ ), but there was a significant difference in procedure type for all three socioeconomic surrogates. The uninsured had higher NFS rates (30%) than those with government (21%) or private (19%) insurance ( $P = 0.036$ ). Those in the poorest ZIP codes had almost twice the rate of NFS procedures (31%) compared with those in the most affluent ZIP codes (17%). For those in the least-educated regions, 24% underwent NFS procedures compared to 14% in the most-educated areas ( $P = 0.027$ ).

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Conclusions: AYAs with stage I ovarian dysgerminoma in lower socioeconomic groups were more likely to undergo NFS procedures than those in higher socioeconomic groups, but there was no difference in rates of FS versus NFS procedures by ethnicity/race. Approaches aimed at reducing socioeconomic disparities require further examination.

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## Introduction

Malignant ovarian germ cell tumors (MOGCTs) are a rare form of gonadal malignancy that occur across all age groups but are most prevalent in adolescents and young adults (AYAs). The most common subset of MOGCTs is dysgerminoma, accounting for about 35% of MOGCTs and 3%-5% of all primary ovarian malignancies across all age groups.<sup>1-3</sup> Ovarian dysgerminomas tend to present at an early stage, with approximately 50%-80% of patients presenting with stage I disease.<sup>2,4-7</sup>

In the past, it was believed that there was a high prevalence of bilateral disease and thereby a high risk of recurrence in the contralateral ovary, even with low-stage ovarian dysgerminoma.<sup>8</sup> In the 1950s, Pedowitz *et al.*<sup>9</sup> found that even among patients believed to have unilateral involvement, 36.2% had involvement of the other ovary shortly after unilateral salpingo-oophorectomy. These findings led to the recommendation for extensive surgery in the form of bilateral salpingo-oophorectomy and hysterectomy for ovarian dysgerminoma. In the 1960s, surgeons started to question this aggressive approach and discuss the possibility of performing more conservative procedures coupled with other treatment modalities.<sup>8</sup> Most studies within the past 35 y have found that less than 15% of ovarian dysgerminomas were bilateral at presentation,<sup>10-14</sup> leading to a change in the overall surgical approach, with increased emphasis on fertility-sparing (FS) procedures.<sup>12,15</sup> Vicus *et al.*<sup>6</sup> reported a case in 2010 in which a patient had bilateral ovarian dysgerminoma, underwent an FS procedure and chemotherapy, and was disease free at 5 y. Retaining childbearing potential is important in women with these tumors, as they most commonly present during or before their childbearing years. As such, the guidelines of the National Comprehensive Cancer Network of the United States now recommend FS surgery whenever possible for patients desiring to maintain fertility, even for those with advanced disease.<sup>16</sup>

Multiple studies in the adult literature have demonstrated that racial and socioeconomic disparities exist in the surgical treatment of other types of ovarian cancer and in access to FS procedures.<sup>17-19</sup> Reports addressing these disparities in ovarian dysgerminomas do not exist in the current literature. The purpose of this study was to assess rates of FS versus non-fertility-sparing (NFS) procedures for stage I ovarian dysgerminoma in the AYA population in the United States according to ethnicity/race and socioeconomic status. We focused on the AYA age group, given that these women are those whose childbearing potential is most relevant. In addition, stage I ovarian dysgerminoma is the most commonly encountered stage for this tumor and the stage for which FS procedures are most frequently possible.

## Methods

### Data source

The National Cancer Data Base (NCDB) is jointly maintained by the American Cancer Society and the American College of Surgeons Commission on Cancer. Database records are created by over 1500 accredited centers nationwide, using highly standardized methods and definitions, consistent with specifications mentioned by the North American Association of Central Cancer Registries. Records include patient characteristics, cancer properties, treatment modality specifics, and basic outcome information. Data definitions are readily available online (<https://www.facs.org/quality-programs/cancer/ncdb/puf>). Approximately 70% of all cancer cases in the United States are captured in the database,<sup>20,21</sup> with at least 71% of cases under 19 y of age being captured.<sup>22</sup> Since its inception, data from the NCDB have been consistently verified for validity and have been used in over 350 articles over the last 25 y.<sup>23</sup>

### Study cohort

Institutional review board exemption was obtained from the institutional review board of the University of Alabama, Birmingham. The AYA age group as defined from 15 to 39 y old was derived from the Children's Oncology Group guidelines.<sup>24</sup> All AYA women with primary diagnosis of dysgerminoma were examined from the NCDB data of 1998 to 2012. Dysgerminoma diagnosis was determined based on the histological (International Classification of Diseases-O3) code designation of 9060. Further stratification by stage at diagnosis was performed, with a special focus on those patients at stage 1. Tumor stage was determined by the NCDB analytic stage, which uses pathologic staging when known, otherwise clinical staging is used for the NCDB analytic stage. Multiple characteristic variables were examined, including ethnicity/race and socioeconomic status. Three socioeconomic surrogate variables were identified—insurance type, income, and education level. The median income and percent of people with no high school degree by ZIP code were classified into quartiles using the US Census data from 2012. The outcomes of interest were rates of FS and NFS procedures. NFS procedures were defined as any procedures including bilateral oophorectomy and/or hysterectomy. FS procedures were defined as those including unilateral or partial oophorectomy.

### Statistical analysis

For statistical analysis, SAS software, version 9.4 (SAS Institute, Cary, NC), was used. Variable distributions were presented using standard descriptive statistics. Among AYA

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