Increase in Incidence of Colorectal Cancer Among Young Men and Women in the United States

Rebecca L. Siegel, Ahmedin Jemal, and Elizabeth M. Ward
Department of Surveillance and Health Policy Research, American Cancer Society, Atlanta, Georgia

Abstract

The recent, accelerated decline in colorectal cancer incidence rates has largely been attributed to an increase in screening rates among adults 50 years and older. We used data from 13 Surveillance, Epidemiology, and End Results cancer registries to report on colorectal cancer incidence trends from 1992 through 2005 among adults under age 50 years, for whom screening is not recommended for persons at average risk, by sex, race/ethnicity, age, stage at diagnosis, and anatomic subsite. Overall, incidence rates of colorectal cancer per 100,000 young individuals (ages 20-49 years) increased 1.5% per year in men and 1.6% per year in women from 1992 to 2005. Among non-Hispanic Whites, rates increased for both men and women in each 10-year age grouping (20-29, 30-39, and 40-49 years) and for every stage of diagnosis. The increase in incidence among non-Hispanic Whites was predominantly driven by rectal cancer, for which there was an average increase of 3.5% per year in men and 2.9% per year in women over the 13-year study interval. In contrast to the overall decreasing trend in colorectal cancer incidence in the United States, rates are increasing among men and women under age 50 years. Further studies are necessary to elucidate causes for this trend and identify potential prevention and early detection strategies.

Introduction

Overall incidence rates for colorectal cancer (CRC) in the United States have been generally declining since the mid-1980s (1, 2). In the most recent time period, the rate of decline has accelerated; since 1998, CRC incidence rates have decreased 2.8% per year in men and 2.2% per year in women (1). These rapid decreases have been largely attributed to an increase in CRC screening, particularly colonoscopy, among individuals ages 50 years and older (3, 4). Screening for CRC can reduce incidence by preventing cancer occurrence through the detection and removal of precancerous polyps (5, 6). Recent incidence trends among adults younger than 50 years, for whom CRC screening is not recommended for those at average risk, have not been analyzed, though a previous study limited to ages 20 to 39 years found an increase in incidence from 1973 to 1999 for all races combined (7). We report on trends in CRC incidence rates between 1992 and 2005 among young adults (ages 20 to 49 years) by sex, race/ethnicity, age, stage at diagnosis, and anatomic subsite.

Materials and Methods

We obtained invasive CRC cases diagnosed from 1992 through 2005 from the 13 oldest Surveillance, Epidemiology, and End Results (SEER) registries, which provide population-based incidence data for the 5 major racial/ethnic populations (8). The states, metropolitan areas, and other registries that comprise the SEER 13 database, which covers ~14% of the U.S. population, are Atlanta, Connecticut, Detroit, rural Georgia, Hawaii, Iowa, Los Angeles, New Mexico, San Francisco-Oakland, San Jose-Monterey, Seattle-Puget Sound, Utah, and the Alaska Native Tumor Registry. We calculated annual, age-adjusted incidence rates (using the 2000 U.S. standard population) of CRC per 100,000 individuals ages 20 to 49 y by sex and race/ethnicity using SEER*Stat software version 6.4.4 (8, 9).

Received 2/27/09; revised 3/30/09; accepted 4/2/09; published online 6/8/09.
Note: Supplementary data for this article are available at Cancer Epidemiology, Biomarkers & Prevention Online (http://cebp.aacrjournals.org/).
Requests for reprints: Rebecca Siegel, Surveillance and Health Policy Research, American Cancer Society, 250 Williams Street, North West, 6D123, Atlanta, GA 30303-1002. Phone: 404-329-7992; Fax: 404-327-6450. E-mail: rebecca.siegel@cancer.org
Copyright © 2009 American Association for Cancer Research. E-mail: cebp.aacrjournals.org Downloaded on June 24, 2017. © 2009 American Association for Cancer Research.
For comparison purposes, we also analyzed the annual percent change in CRC incidence rates among non-Hispanic Whites ages 50 y and older by stage and anatomic subsite.

Results

Overall incidence rates of CRC per 100,000 young adults (ages 20-49 y) increased 1.5% per year in men and 1.6% per year in women from 1992 to 2005. Specifically, incidence rates increased significantly among young non-Hispanic Whites, by 2.0% per year in men and 2.2% per year in women, and among Hispanic men, by 2.7% per year (Table 1; Supplementary Figure).

Among non-Hispanic Whites, incidence rates increased within each 10-year age grouping (20-29, 30-39, and 40-49) and for each stage of diagnosis in both men and women, though the increase in women for regional stage disease was not statistically significant (Table 1; Supplementary Figure).

Among non-Hispanic Whites, incidence rates increased in the youngest age group (20-29 years), by 5.2% per year in men and 5.6% per year in women. Analysis by anatomic subsite showed significant increases in cancers of the distal colon and rectum in both men and women. On average, rectal cancer incidence rates increased 3.5% per year in men and 2.9% per year in women over the 13-year study interval. Although the incidence of rectal cancer seems to have leveled off in women since 1999 to 2001, rates in men continued to increase through 2002 to 2005 (Fig. 1). In marked contrast, among non-Hispanic White men and women ages 50 years and older, CRC incidence rates decreased by a minimum of 1.8% annually for every stage of diagnosis and a minimum of 2.7% annually for each anatomic subsite in the most recent time period (Supplementary Table).

Discussion

Our study found that in sharp contrast to the overall declining rates of CRC in the United States, incidence rates were in the youngest age group (20-29 years), by 5.2% per year in men and 5.6% per year in women. Analysis by anatomic subsite showed significant increases in cancers of the distal colon and rectum in both men and women. On average, rectal cancer incidence rates increased 3.5% per year in men and 2.9% per year in women over the 13-year study interval. Although the incidence of rectal cancer seems to have leveled off in women since 1999 to 2001, rates in men continued to increase through 2002 to 2005 (Fig. 1). In marked contrast, among non-Hispanic White men and women ages 50 years and older, CRC incidence rates decreased by a minimum of 1.8% annually for every stage of diagnosis and a minimum of 2.7% annually for each anatomic subsite in the most recent time period (Supplementary Table).

Table 1. CRC incidence trends among young adults (20 to 49 y) by sex and race/ethnicity, 1992 to 2005

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>n</th>
<th>Line segment 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>APC*</td>
</tr>
<tr>
<td>All races combined</td>
<td>1992-2005</td>
<td>1.5†</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>Men</td>
<td>10,913</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>9,733</td>
</tr>
<tr>
<td>Hispanic</td>
<td>Men</td>
<td>6,748</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>5,626</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>Men</td>
<td>1,409</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>1,456</td>
</tr>
<tr>
<td>Asian American/Pacific Islander</td>
<td>Men</td>
<td>1,284</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>1,239</td>
</tr>
</tbody>
</table>

NOTE: Trends were analyzed by Joinpoint Regression Program, Version 3.0, with a maximum of three joinpoints (i.e., four line segments).

*APC based on incidence rates age-adjusted to the 2000 US standard population.

†The APC is significantly different from zero (P < 0.05).

(C19.9, C20.9; ref. 12). For comparison purposes, we also analyzed the annual percent change in CRC incidence rates among non-Hispanic Whites ages 50 y and older by stage and anatomic subsite.

Table 2. CRC incidence trends among young (20-49 y) non-Hispanic Whites by sex, age, stage at diagnosis, and anatomic subsite, 1992 to 2005

<table>
<thead>
<tr>
<th>n</th>
<th>Line segment 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
</tr>
<tr>
<td>Age Men</td>
<td>20-29</td>
</tr>
<tr>
<td></td>
<td>30-39</td>
</tr>
<tr>
<td></td>
<td>40-49</td>
</tr>
<tr>
<td>Women</td>
<td>20-29</td>
</tr>
<tr>
<td></td>
<td>30-39</td>
</tr>
<tr>
<td></td>
<td>40-49</td>
</tr>
<tr>
<td>Stage Men Local</td>
<td>2,345</td>
</tr>
<tr>
<td>Regional</td>
<td>2,626</td>
</tr>
<tr>
<td>Distant</td>
<td>1,554</td>
</tr>
<tr>
<td>Unstaged</td>
<td>223</td>
</tr>
<tr>
<td>Women Local</td>
<td>2,091</td>
</tr>
<tr>
<td>Regional</td>
<td>2,139</td>
</tr>
<tr>
<td>Distant</td>
<td>1,266</td>
</tr>
<tr>
<td>Unstaged</td>
<td>130</td>
</tr>
<tr>
<td>Subsite Men Proximal colon</td>
<td>2,054</td>
</tr>
<tr>
<td>Distal colon</td>
<td>1,609</td>
</tr>
<tr>
<td>Rectum</td>
<td>2,609</td>
</tr>
<tr>
<td>Women Proximal colon</td>
<td>1,548</td>
</tr>
<tr>
<td>Distal colon</td>
<td>1,619</td>
</tr>
<tr>
<td>Rectum</td>
<td>2,065</td>
</tr>
</tbody>
</table>

NOTE: Trends were analyzed by Joinpoint Regression Program, Version 3.0, with a maximum of three joinpoints (i.e., four line segments).

*APC based on incidence rates age-adjusted to the 2000 US standard population.

†The APC is significantly different from zero (P < 0.05).
Deaths among adults younger than age 50 years are increasing due to an increase in left-sided tumors, particularly in the rectum. These findings are generally consistent with two previous studies that analyzed CRC trends using SEER databases (3, 7). O’Connell et al. (7) reported an increase in incidence rates in ages 20 to 39 years for both colon and rectal cancers during 1973 to 1999; however, this analysis was limited by the exclusion of 40 to 49 year-olds, who represent 73% of CRC patients under age 50 years, and the inability to examine trends by race/ethnicity and to include the most recent 6 years of data, during which the accelerated decline in overall CRC incidence rates occurred. Cress et al. (3) documented an increase in incidence rates in ages 0 to 49 years in rectal cancer, but not colon cancer, in all races combined during 1992 to 2001.

Obesity is a major risk factor for CRC in men and, to a lesser extent, for colon cancer in women (13). However, there is accumulating evidence that obesity confers a stronger risk of CRC in premenopausal, compared with postmenopausal, women (14-16). In the past three decades, the prevalence of obesity has increased markedly among individuals of all ages and racial/ethnic groups in the United States (17-19), which may have contributed to the overall increase in CRC incidence rates among young adults. However, CRC incidence rates among non-Hispanic Whites substantially increased for left-sided tumors (distal and rectal) but not for right-sided tumors (proximal). It is unknown whether the mechanism through which adiposity induces tumor development and the latency period from exposure to disease occurrence differs by anatomic subsite. In tandem with obesity trends, type 2 diabetes, also an established risk factor for CRC (20), has increased dramatically in the United States (21, 22), and may have likewise contributed to the observed increase in CRC incidence in young adults.

Consumption of red and processed meat has been shown to increase risk of cancers of the distal colon and rectum (23), whereas milk and calcium consumption have shown a protective effect against these subsites (24). Between the late 1970s and the mid-1990s, fast-food consumption in the United States increased 5-fold among children (ages 2 to 17 y) and 3-fold among adults (ages 18 years and older) (25). A diet high in fast food is associated with both greater meat consumption (26) and reduced milk consumption (27). The average energy intake from hamburgers/cheeseburgers increased 30% from 1977-78 to 1994-96 (28); concurrently, the proportion of energy intake from milk decreased 42% among both adolescents (12-18 years) and young adults (19-29 years) (29). It is plausible that the emergence of unfavorable dietary patterns in children and young adults over the past three decades may have contributed to the increase in CRC among young adults observed in our study.

Other behavioral factors associated with an increased risk of CRC are alcohol intake (30) and smoking (31, 32). It is unlikely that trends in alcohol use explain the recent increase in CRC among young adults because there has been a decline in alcohol consumption in the United States since 1981, both overall and among high school students (33-35). Despite transient increases in smoking prevalence within some birth cohorts since 1964, tobacco exposure is unlikely to have played a role in the recent increase in CRC incidence in young adults because of the requisite length (minimum 30 years) of the induction period (32, 36).

The outcome of CRC treatment depends strongly on stage at diagnosis. Clinical practice guidelines suggest that patients with inflammatory bowel disease, polyposis syndromes, a known genetic predisposition, or a personal or family history of adenomatous polyps or CRC begin screening before age 50 years. Early recognition of CRC in patients under age 50 without these risk factors requires clinical awareness and aggressive pursuit of symptoms. A study of initial presentation of young onset CRC patients found that 86% were symptomatic at the time of diagnosis, with the most common symptoms of rectal bleeding (51%), abdominal pain (32%), and change in bowel habits (18%). The most common factors leading to diagnosis in asymptomatic patients were anemia (14%) and positive fecal occult blood test (7%) (37). Our findings of a recent increase in CRC among those under age 50 years suggests the importance of timely evaluation of the distal colorectum, at a minimum, in young adults.

**Figure 1.** CRC incidence trends among young non-Hispanic White adults (20-49 y) by age and anatomic subsite, 1992 to 2005.
adults who present with symptoms consistent with possible underlying cancer. The increasing incidence of CRC in young adults is in contrast with the rapidly declining incidence among older individuals. The disparate increase in left-sided CRC suggests that particular attention be given to studies to elucidate the behavioral and environmental risk factors responsible for this trend and potential prevention and early detection strategies.

Disclosure of Potential Conflicts of Interest
No potential conflicts of interest were disclosed.

Acknowledgments
The costs of publication of this article were defrayed in part by the payment of page charges. This article must therefore be hereby marked advertisement in accordance with 18 U.S.C. Section 1734 solely to indicate this fact.

References
Increase in Incidence of Colorectal Cancer Among Young Men and Women in the United States

Rebecca L. Siegel, Ahmedin Jemal and Elizabeth M. Ward


Updated version
Access the most recent version of this article at:
http://cebp.aacrjournals.org/content/18/6/1695

Supplementary Material
Access the most recent supplemental material at:
http://cebp.aacrjournals.org/content/suppl/2009/06/04/18.6.1695.DC1

Cited articles
This article cites 30 articles, 9 of which you can access for free at:
http://cebp.aacrjournals.org/content/18/6/1695.full.html#ref-list-1

Citing articles
This article has been cited by 25 HighWire-hosted articles. Access the articles at:
/content/18/6/1695.full.html#related-urls

E-mail alerts
Sign up to receive free email-alerts related to this article or journal.

Reprints and Subscriptions
To order reprints of this article or to subscribe to the journal, contact the AACR Publications Department at pubs@aacr.org.

Permissions
To request permission to re-use all or part of this article, contact the AACR Publications Department at permissions@aacr.org.