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Rural and Urban Differences in Vegetable and Fruit Consumption Among Older Cancer Survivors in the Deep South: An Exploratory Cross-Sectional Study

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Abstract

Background—Cancer survivors, especially those who are older, experience increased comorbidity and risk for secondary cancers. A varied dietary pattern rich in vegetables and fruits (V&F) is recommended to improve health. However, V&F intake can differ by rural vs urban status.

Objective—Our objective was to assess the differences in V&F consumption among older cancer survivors residing in urban- and rural-designated areas, and to explore whether differences exist according to sex, race, and cancer type.

Design—This was a cross-sectional secondary analysis.

Participants/setting—Screening data from the Harvest for Health trial were obtained from October 2016 to November 2019 on 731 Medicare-eligible cancer survivors across Alabama.

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AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. H. Kaur conceived of the presented idea and carried out the experiment with support from W. Demark-Wahnefried, J. Fernandez, and J. Locher. J. Fernandez verified the analytical methods, and all of the authors supervised the findings of the work. The first draft of the manuscript was written by H. Kaur with support from W. Demark-Wahnefried, J. Fernandez, and J. Locher. All authors commented on previous versions of the manuscript. Supervision was provided by W. Demark-Wahnefried. All authors reviewed and approved the final manuscript.

Supplementary materials:
Tables 3 and 5 are available at www.jandonline.org

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

Main outcome measures—V&F consumption was measured by 2 items from the National Cancer Institute's dietary screener *Eating at America's Table*. Rural and urban residence was coded at the ZIP-code level using the US Department of Agriculture's Rural-Urban Commuting Area coding schema using 5 different classifications (A through E). Sex, race, and cancer type were dichotomized as male or female, non-Hispanic White or non-Hispanic Black, and gastrointestinal or other cancers, respectively.

Statistical analyses—Kruskal-Wallis rank sum and post-hoc tests were performed to detect differences in V&F consumption ($\alpha < .05$).

Results—The study sample was largely female (66.2%) and non-Hispanic White (78.1%); mean age was 70 years and reported average V&F intake was 1.47 cups/d. V&F consumption of cancer survivors living in isolated, small, rural towns was roughly one-half that consumed by survivors living elsewhere; thus, statistically significant rural–urban differences were found in models that accounted specifically for this subgroup, that is, Rural-Urban Commuting Area categorizations A and E. V&F consumption also was significantly lower in non-Hispanic Black (1.32 ± 0.98 cups/d) than non-Hispanic White survivors (1.51 ± 1.10 cups/d) ($P = .0456$); however, no statistically significant differences were detected by sex and cancer type.

Conclusions—Analyses that address the variability within rural-designated areas are important in future studies. Moreover, a greater understanding is needed of factors that adversely affect V&F consumption of those most vulnerable, that is, older, non-Hispanic Black cancer survivors, as well as those living in isolated, small, rural towns to best target future interventions.

Trial registration—ClinicalTrials.gov: NCT02985411.

Keywords

Cancer survivors; Aged; Rural health; Fruits; Vegetables

Among cancer survivors, lifestyle behaviors, including diet, have been implicated in health outcomes, such as cardiovascular disease, type 2 diabetes, and secondary cancers.[1] Vegetables and fruits (V&F) are rich sources of vitamins, minerals, phytochemicals, fiber, and antioxidants that are associated with reduced risk for certain cancers[2,3] and longer disease-free survival.[2,4] The 2020 American Cancer Society Dietary Guidelines recommend a total of 4 to 5 cups/d of V&F and consider V&F an essential component of the dietary pattern to promote overall health among cancer surviviors.[2] However, adherence to these guidelines is poor, and even worse in specific sub-populations, including non-Hispanic Black (NHB), male, rural Americans; moreover, poor intakes are also reported for cancer survivors.[5–9]

There are roughly 17 million cancer survivors in the United States, and more than 10 million are 65 years or older.[10,11] Cancer survivors often experience cancer recurrence, reduced quality of life, and are at a higher risk for cardiovascular disease, diabetes, second cancers, and functional decline.[12–15] These medical conditions are more common in elderly cancer survivors, and are exacerbated by the accelerated aging associated with cancer and treatment.[16] Poor lifestyle behaviors are associated with an increased risk of cancer recurrence, second malignancies, and other chronic diseases.[17,18] Older cancer survivors

with gastrointestinal (GI) cancers might experience intolerance toward high-fiber foods due to cancer and oncologic treatments.[19,20] In addition, older cancer survivors living in rural areas, particularly those who are NHB, may be at greater cancer risk due to a confluence of factors, such as shorter survival, fewer financial resources, and poorer quality of life.[21–26]

Cancer mortality and incidence rates are decreasing nationwide, but this trend is not observed in rural areas. where the cancer burden remains high.[26] Cancer-related health outcomes are even worse in the Deep South—a 5-state region that includes Alabama, Georgia, Louisiana, Mississippi, and South Carolina.[27] This area is largely rural and is composed of a large proportion of individuals who identify as NHB.[28,29] The Southern dietary pattern, common in rural NHB households is characterized by lower amounts of V&F.[30] Due to health disparities and reduced health equity in rural areas in the Deep South, survivors in these areas have a higher risk of recurrence.[31] Rural survivors also report greater cancer sequelae, such as psychological distress and higher rates of health-related unemployment, compared with urban counterparts.[32] These health-related differences, combined with higher rates of poverty and lack of access to healthier foods, accentuate the differences among rural-dwelling survivors compared with those in urban settings.[31–33]

Improved understanding of differences in dietary intake between rural and urban older cancer survivors is needed to target interventions to improve survival and reduce cancer recurrence and development of new primary cancers. Therefore, the purpose of this study was to assess differences in V&F consumption among older cancer survivors residing in urban- and rural-designated areas, and explore whether differences also exist by race, sex, and cancer type. The underlying hypothesis is that older cancer survivors residing in rural-designated areas will report lower V&F intake compared with urban survivors. Furthermore, NHB, male, and survivors with GI cancers will report lower consumption of V&F compared with survivors of other cancers and those who are non-Hispanic White (NHW) and female.

METHODS

Study Design and Participants

This secondary analysis uses screening data obtained between October 2016 and November 2019 from an ongoing study, Harvest for Health, a National Cancer Institute (NCI)-supported randomized controlled trial designed to assess the impact of a home-based vegetable gardening intervention on health behaviors among older cancer survivors across Alabama. Methods of the Harvest for Health pilot trial have been published previously and the trial is registered through the National Institutes of Health (ClinicalTrials.gov: NCT02985411).[34] Harvest for Health collaborates with the Alabama Statewide Cancer Registry, the University of Alabama at Birmingham Registry, I2B2 registries within University of Alabama at Birmingham, and previously established physician referral networks to identify and recruit cancer survivors across Alabama. Survivors who were Medicare-eligible and diagnosed with a cancer that has a 5-year survival rate of ≥60% (ie, bladder; breast [female only due to rare prevalence of male breast cancer; localized and regional, stage 0 to IIIa]; cervix [localized, stage I/II]; colorectal [localized, stage I/II]; corpus, uterus, and endometrial [localized, stage I/II]; gastric cardia [localized, stage 0 to 1A]; Hodgkin lymphoma [nonmetastatic]; non-Hodgkin lymphoma [nonmetastatic];

kidney and renal pelvis [localized, stage I/II]; larynx [localized, stage 0 to II]; leukemia; melanoma [localized and regional, stage 0 to II]; multiple myeloma [early stage]; oral cavity and pharynx [localized and regional, stage 0 to III]; ovary [localized and regional, stage I to IIa]; prostate [localized and regional, stage I to III]; soft-tissue sarcoma [localized and regional, stage I to III]; squamous and basal cell carcinoma [localized and regional, stage 0 to II]; testis; and thyroid cancer [localized and regional, stage I to III]) were selected for contact. Recruitment for Harvest for Health was conducted through a mailed solicitation, and participants were contacted and screened by telephone. Screening data from 731 cancer survivors were used for this investigation. The University of Alabama at Birmingham Institutional Review Board approved this study (IRB #160328009) and all participants provided verbal consent.

Measures

Data on address and ZIP code, primary cancer site, race, age, and sex were provided directly from cancer registries for roughly 78% of cancer survivors; for self-referred cases, which constituted approximately 22% of the sample, these data were ascertained using a verification form that was faxed to the survivor's oncologist after study staff obtained permission from the survivor, as well as their signed HIPAA (Health Insurance Portability and Accountability Act) release. The medical record served as the source document for demographic and clinical information. All participants in this analysis reported V&F consumption as assessed by 2 items adapted from the NCI's dietary screener *Eating at America's Table* (EATS), an instrument that was validated previously using more in-depth dietary recalls.[35] During the screening process, the following 2 questions were asked: "On average, how many cups of RAW green leafy vegetables (lettuce, green salad) do you eat per day (anchors: <1 cup; 1 to 1¾ cups; 2 to 2¾ cups; 3 to 3¾ cups; 4 to 4¾ cups; or ≥5 cups/day)?" and "On average, how many cups of OTHER fruits and vegetables do you eat per day (do not include lettuce, potatoes, fruit juices, dried beans) (anchors: < ½ cup; ½ to ¾ cups; 1 to 1¼ cups; 1½ to 1¾ cups; 2 to 2¼ cups; or ≥2½ cups or more)?" To quantify average daily consumption of V&F, this study used the lowest amount in each response category (for responses of <1 cup or <½ cup, a value of 0 was used) for each item, and then summed them together to create a single value for V&F intake. Primary cancer site was used to identify cancer type and was dichotomized as GI cancers and other cancers. GI cancers included cancer sites at the buccal mucosa, cecum, colorectum, duodenum, epiglottis, esophagus, glottis, ileum, liver, oral cavity and pharynx, palatine tonsils, rectum, retroperitoneum, small intestine, stomach, subglottis, throat, and tongue. Race was defined as NHB and NHW; other racial and ethnic groups were not explored due to negligible counts (eg, Hispanic, Asian, and other racial and ethnic minority groups totaled <1%). Sex was dichotomized as male vs female due to absence of reporting of other sex-specific categories. Rural or urban residence was identified through the use of Rural-Urban Commuting Area (RUCA) codes, version 2.0, a Census tract–based classification scheme that uses the Bureau of Census *urbanized area* and *urban cluster* definitions and work commuting data to classify ZIP codes within the United States.[36,37]

Rural and Urban Coding and Stratification

To investigate the relationship between V&F consumption and rural-urban residence, stratification was defined in 5 different ways using the US Department of Agriculture's RUCA codes.[37] Definitions and classifications of primary and secondary RUCA codes were specified at ZIP-code level.[37] The RUCA, version 2.0, package was used in concert with R software (version R, version 4.0.4; The R Project for Statistical Commuting) to assign RUCA based on the US Department of Agriculture and the University of Washington's Rural Health Research Center suggested coding schemes.[38] Data were transferred to an SAS dataset (version 9.4, SAS Institute), and RUCA number-designations were coded by "urban," "rural," "large rural city/town," "small rural town," and "isolated small rural town" to correspond to RUCA residency categories to facilitate the exploration of different methods of operationalizing geographic residence.[39] Five different categorizations (A through E) of urban- and rural-designated areas were constructed, based on the US Department of Agriculture and the University of Washington's Rural Health Research Center suggested coding schemes.[36]

Statistical Analysis

All statistical analyses were performed in SAS.[39] Normality of V&F intake was assessed descriptively (mean) and using the Kolmogorov–Smirnov test. The Brown and Forsythe test was used to determine the homogeneity in variance assumption, determined by the value of Prob > F < .05. V&F consumption was measured as a non-normally distributed continuous dependent variable between independent categorical variables (urban, rural, large rural city/town, small rural town, and isolated small rural town). The Kruskal-Wallis rank sum test was used to determine differences in V&F consumption according to residential categorizations A through E, respectively, and dichotomized variables of race (NHB vs NHW), sex (male vs female), and cancer type (GI cancers vs other cancers). Post-hoc tests were used to identify differences between groups for each rural and urban categorization. To estimate the power within the sample, a power calculation was performed for 731 cancer survivors using the mean values of 1.485, 1.395, 1.541, and 0.75, based on categorization A, under the assumption of a common standard deviation of 0.904. These inputs provided a power of 0.74 with an α value of .05.

RESULTS

Sample characteristics are presented in Table 1. Mean age of survivors was approximately 70 years, and their average daily V&F intake was 1.5 cups. Most of the sample was female, NHW, and survivors of non-GI cancers. Table 2 presents the results of V&F consumption by urban- vs rural-designated areas using residency categorizations. Significant differences in V&F consumption were observed for categorizations A and E. Post-hoc analysis revealed that significant differences in V&F consumption were seen in models A and E, which took isolated small rural towns into account, as shown in Table 3 (available at www.jandonline.org). However, no significant differences in V&F consumption between urban-and rural-designated areas were seen for categorizations B through D. Table 4 presents data on V&F consumption by race, sex, and cancer type. Compared with NHW survivors, NHB reported significantly lower V&F consumption; no significant differences

were detected for subgroups defined by sex and cancer type. Additional analyses within residency groups also were unable to detect differences by sex, age, or cancer type, but found that survivors residing in isolated small rural towns were significantly more likely to be NHW than NHB (Table 5; available at www.jandonline.org).

DISCUSSION

This report is one of the few to describe V&F intake among older cancer survivors in the Deep South—one of the most vulnerable and underrepresented populations.[10,40] Findings show average daily intakes of roughly 1.5 cups, compared with the 4 to 5 cups endorsed by the American Cancer Society.[2] The results of this study partially support the hypothesis that cancer survivors residing in rural areas have lower V&F intakes than those in urban areas. Results suggest that survivors residing in isolated, small, rural towns report a daily intake of V&Fs that is roughly one-half that of survivors living elsewhere. This report is unique because of its in-depth analysis using a variety of RUCA classifications to operationalize rural status.

There is limited research regarding dietary intake differences by geographic residency that uses different RUCA categorizations to explore urban and rural residency. Although it is acknowledged that the definitions of *rural* and *urban* change over time and vary depending on defined use for measuring urbanization in American geographic subunits, most studies use RUCA categories A and C.[41–44] This study explored more rarely used categorizations, that is, categories B, D, and E, which emphasize contributions of small rural towns and isolated small rural towns, as well as travel patterns. This study, as well as previous research by Hall and colleagues,[44] suggests that these more rarely used categorizations may offer more sensitivity in uncovering rural disparities.

These data corroborate previous studies examining V&F intake among rural residents. A study by Dean and Sharkey,[45] which examined the relationship between household and retail food environment on V&F intake among rural and urban adult residents (n = 2,260) in central Texas, found that adults in rural counties consumed fewer V&F (approximately 2.5 cups/d) compared with residents in urban counties (approximately 2.7 cups/d) ($P <$ .001). This study specifically focused on healthy middle-aged adults, a population that is different from older cancer survivors. More similarities may be noted between the current study and participants enrolled in the RENEW (Reach-out to Enhance Wellness) randomized controlled trial, which was designed to improve diet quality and physical functioning in older cancer survivors.[43] Here, a lower intake of V&F was observed among 160 rural cancer survivors at baseline (approximately 2.3 cups/d) compared with 327 urban cancer survivors (approximately 2.8 cups/d) ($P \leq .05$).[43] Although the intervention significantly improved V&F consumption among both subgroups, rural survivors reported significantly lower improvements in daily V&F intake (approximately 1.1 cups) than urban survivors (approximately 1.2 cups) ($P \leq .05$).[43] In addition, these previous studies used either RUCA codes or the US Census Bureau metropolitan and non-metropolitan characteristics at the county level to categorize residency into dichotomous groups. Furthermore, none of these studies investigated V&F intake within isolated small rural towns.

Differences observed across these studies could be explained by the increased distance and reduced access to grocery stores, high cost of healthy foods, and a lack of transportation that might hinder V&F intake within rural areas, and affect older adults living on fixed incomes.[45–49] Moreover, prevalence of poverty is greater in the Deep South, with rural areas exhibiting higher poverty rates than urban areas, which also might hinder V&F intake due to high cost.[31] Emerging evidence on rurality and diet in the Deep South has also revealed the importance of racial and ethnic influences. For instance, previous studies have reported that the prevalence of poorer diets is higher among rural NHB vs NHW populations.[30,50] However, in this study, the lower V&F intake detected among older cancer survivors residing in isolated small rural towns cannot be explained by racial minority, as survivors in this residency group were significantly more likely to be NHW than NHB. Future studies should investigate the influence of cultural factors and those that account for access.

There are several other factors that distinguish rural from urban populations, including income and education.[25,26,51] These factors could explain discrepancies in dietary intake among older cancer survivors residing in rural areas. Although this study was not able to capture these data, there was the ability to explore differences in V&F consumption by race, sex, and cancer type. In this study, NHB survivors reported a daily intake of V&F of 1.3 cups, which was significantly lower than 1.5 cups among NHW survivors. These findings are consistent with those of Bovell-Benjamin and colleagues[52] who reported that African American individuals (n = 114) residing in rural areas consumed fewer fruits and nonstarchy vegetables compared with NHW counterparts. In contrast, a study of 635 older, rural adults in the southern United States found that African American individuals had a higher intake of fruits compared with NHW participants,[53] a finding that is consistent with other studies.[42]

Unlike other studies within the general population, this study was unable to detect a significantly higher V&F intake among female participants compared with male participants.[54,55] The inability to detect statistically significant differences between the sexes could be explained by the lower number of men within the study, and hence a lack of power.

Because individuals diagnosed with GI cancers have the potential for GI complications related to oncologic treatments,[19,20] the current study also explored whether survivors diagnosed with GI cancers had differences in V&F intakes. However, no statistically significant differences were detected. Current literature on V&F consumption among survivors with GI cancers report that although certain V&F might be helpful in managing specific GI complications, other V&F can exacerbate symptoms. For example, recent research of Sun and colleagues[56] on 575 survivors with long-term rectal cancer found that V&F were considered helpful for bowel symptoms, whereas their earlier work among 856 ostomy and anastomosis surgical patients found lower intakes of vegetables such as corn, onions, and lettuce.[57] Therefore, although overall differences in V&F intake may not exist among survivors of GI cancers compared with other cancers, intake of specific V&F may still differ.

Overall, the study demonstrates that older cancer survivors, independent of race, sex, and cancer type, do not meet the recommended amounts of V&F. Consumption among older

cancer survivors falls far below the recommendation of 4 to 5 cups of V&F per day,[2] and may impact cancer recurrence and health-related quality of life.[58]

This study was strengthened by the large sample of older cancer survivors that were geographically distributed across Alabama. However, there were limitations. A primary short-coming was the use of a 2-item screener to define V&F consumption. Although the NCI EATS screener is validated, it categorizes serving sizes and may be less sensitive in detecting group differences than instruments that collect continuous data.[35] Furthermore, to increase the efficiency of screening, the V&F items were further adapted from the original NCI EATS instrument and were not evaluated for validity after adaptation. These findings may be influenced by respondent bias that is inherent with expressed interest to participate in a vegetable gardening intervention. Other limitations were the unbalanced sample distribution of rural and urban survivors and underrepresentation of men and racial and ethnic minorities that may have resulted in small cell sizes and introduces the potential for unstable data. Finally, there are likely to be confounding variables that were not assessed and must be included in future research efforts.

CONCLUSIONS

Older cancer survivors consume intakes of V&F that fall far below recommended levels, with consumption roughly 1.5 cups/d regardless of sex, race, and cancer type. Although global comparisons between rural and urban survivors suggest comparable V&F intakes, “deeper dives” into the data indicate that survivors living in isolated, small, rural towns report V&F intakes that are significantly lower. Such data reinforce a pivotal need to develop effective behavioral interventions that provide practical strategies to improve V&F consumption among older cancer survivors in the South, and to target those at highest risk—residents of isolated, small, rural towns and NHB survivors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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RESEARCH SNAPSHOT

Research Question:

Does vegetable and fruit consumption differ among older cancer survivors residing in urban- and rural-designated areas?

Key Findings:

In this cross-sectional study that included self-reported data from 731 older cancer survivors screened for the Harvest for Health trial, significant differences in vegetable and fruit consumption were observed for models that took isolated small rural towns into account (ie, Rural-Urban Commuting Area categorizations A and E). Older cancer survivors living in isolated small rural towns had roughly one-half the vegetable and fruit consumption of those living in other rural and urban areas.

Table 1.

Cancer-type and demographic sample characteristics of 731 cancer survivors who were screened for the Harvest for Health trial across Alabama from October 2016 to November 2019 and provided vegetable and fruit intake information for this cross-sectional analysis

Variable	Data
Age, y, mean ± SD[a] (range)	70.0 ± 6.4 (55–96)
Vegetable and fruit, cups/d, mean ± SD (range)	1.47 ± 1.08 (0–7.5)
Sex, n (%)	
Female	484 (66.2)
Male	247 (33.8)
Race, n (%)	
Non-Hispanic Black	160 (21.9)
Non-Hispanic White	571 (78.1)
Cancer type, n (%)	
Gastrointestinal cancers[b]	86 (11.8)
Other cancers	645 (88.2)

[a]SD = standard deviation.

[b]Includes cancer sites at the buccal mucosa, cecum, colorectum, duodenum, epiglottis, esophagus, glottis, ileum, liver, oral cavity or pharynx, palatine tonsils, rectum, retroperitoneum, small intestine, stomach, subglottis, throat, and tongue.

Table 2.

Vegetable and fruit consumption of 731 older cancer survivors screened for the Harvest for Health trial across Alabama between October 2016 to November 2019 by rural-urban status[a] using various classifications[b]

Categorization	Residency, n (%)	Cups of V&F,[c] mean[c] ± SD[d]	χ^2	*P* value
A[e]			8.3124	.0400
	Urban, 618 (84.5)	1.49 ± 1.09		
	Large rural city/town, 62 (8.5)	1.40 ± 0.93		
	Small rural town, 37 (5.1)	1.54 ± 1.12		
	Isolated rural town, 14 (1.9)	0.75 ± 0.47		
B[f]			1.4253	.4903
	Urban, 618 (84.5)	1.49 ± 1.09		
	Large rural city/town, 62 (8.5)	1.40 ± 0.93		
	Small and isolated rural town, 51 (7.0)	1.32 ± 1.04		
C[g]			0.9063	.3411
	Urban, 618 (84.5)	1.49 ± 1.09		
	Rural, 113 (15.5)	1.36 ± 0.98		
D[h]			1.8089	.1786
	Urban, 610 (83.5)	1.49 ± 1.09		
	Rural, 121 (16.6)	1.34 ± 0.98		
E[i]			8.8775	.0310
	Urban, 610 (83.5)	1.49 ± 1.09		
	Large rural city/town, 70 (9.6)	1.35 ± 0.93		
	Small rural town, 37 (5.1)	1.54 ± 1.12		
	Isolated rural town, 14 (1.9)	0.75 ± 0.47		

[a] University of Washington's Rural Health Research Center's classifications of the US Department of Agriculture's Rural and Urban Commuting Area (RUCA) codes.

[b] Table represents the results of the Kruskal–Wallis rank sum test to determine differences in V&F consumption according to residential categorizations A through E.

[c] V&F = vegetable and fruit.

[d] SD = standard deviation.

[e] Categorization A consists of the following 4 groups: urban (RUCA 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1), large rural city/town (RUCA 4.0, 4.2, 5.0, 5.2, 6.0, and 6.1), small rural town (RUCA 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, and 9.2), and isolated small rural town (RUCA 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6).

[f] Categorization B consists of the following 3 groups: urban (RUCA 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1), large rural city/town (RUCA 4.0, 4.2, 5.0, 5.2, 6.0, and 6.1), small and isolated small rural town (7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6).

[g] Categorization C consist of the following 2 groups: urban (RUCA 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1) and rural (RUCA 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6).

[h] Categorization D consists of the following 2 groups: urban (RUCA 1.0, 1.1, 2.0, 2.1, 4.1, 5.1, 7.1, 8.1, and 10.1) and rural (3.0, 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6).

[i] Categorization E consists of the following 4 groups: urban (RUCA 1.0, 1.1, 2.0, 2.1, 4.1, 5.1, 7.1, 8.1, and 10.1), large rural city/town (RUCA 3.0, 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.2, 8.2, and 10.2), small rural town (RUCA 7.0, 7.3, 7.4, 8.0, 8.3, 8.4, 9.0, 9.1, 9.2, and 10.3), and isolated small rural town (RUCA 10.0, 10.4, 10.5, and 10.6).

Table 4.

Comparison of vegetable and fruit consumption by race, sex, and cancer type among 731 older cancer survivors screened for the Harvest for Health trial across Alabama from October 2016 to November 2019[a]

Characteristic	n (%)	Cups of V&F,[b] mean ± SD[c]	χ^2	*P* value
Race			3.9958	.0456
Non-Hispanic Black	160 (21.9)	1.32 ± 0.98		
Non-Hispanic White	571 (78.1)	1.51 ± 1.10		
Sex			0.9972	3180
Male	247 (33.8)	1.41 ± 1.06		
Female	484 (66.2)	1.50 ± 1.08		
Cancer type			1.3844	.2394
Gastrointestinal cancers[d]	86 (11.8)	1.58 ± 1.05		
Other cancers	645 (88.2)	1.45 ± 1.08		

[a] Table represents the results of the KruskaleWallis rank sum test to determine differences in V&F consumption according to race, sex, and cancer type.

[b] V&F = vegetable and fruit.

[c] SD = standard deviation.

[d] Includes cancer sites at the buccal mucosa, cecum, colorectum, duodenum, epiglottis, esophagus, glottis, ileum, liver, oral cavity/pharynx, palatine tonsils, rectum, retroperitoneum, small intestine, stomach, subglottis, throat, and tongue.