

Whitney E. Zahnd, PhD<sup>1</sup>; Melinda M. Davis, PhD<sup>2</sup>; Jason S. Rotter, MHA<sup>3</sup>; Robin C. Vanderpool, DrPH<sup>4</sup>; Cynthia K. Perry, PhD, FNP-BC<sup>2</sup>; Jackilen Shannon, PhD, RD<sup>2</sup>; Linda Ko, PhD<sup>5</sup>; Stephanie B. Wheeler, PhD, MPH<sup>3</sup>; Cassie L. Odahowski, MPH<sup>1</sup>; Paige E. Farris, MSW<sup>2</sup>; Jan M. Eberth, PhD<sup>1</sup>

<sup>1</sup> University of South Carolina, <sup>2</sup> Oregon Health & Science University, <sup>3</sup> University of North Carolina-Chapel Hill; <sup>4</sup> University of Kentucky; <sup>5</sup> University of Washington

## BACKGROUND AND PURPOSE

- Previous studies have suggested that nearly one in three cancer survivors experience cancer-related financial problems that may lead to delaying or forgoing medical care. <sup>1,2</sup>
- Rural cancer patients may experience greater financial problems related to their cancer due to higher treatment-related travel costs, higher rates of no insurance/under-insurance, and less flexible work leave policies. <sup>3</sup>
- Rural cancer patients are more likely than their urban counterparts to forego medical care (e.g. surveillance, screening, prescription medication) following treatment due to financial concerns. <sup>4,5</sup>

### Purpose

To examine rural-urban differences in reported financial problems due to cancer using a nationally representative survey.

## METHODS

**Data Source:** 2012, 2014, and 2017 data from the National Cancer Institute's (NCI's) Health Information National Trends Survey (HINTS), a nationally representative, cross-sectional survey on cancer-relevant health behaviors, information seeking, etc.

**Outcome Variable:** A Likert scale question was asked of those reporting a previous or current cancer diagnosis: "Looking back, since the time you were first diagnosed with cancer, how much, if at all, has cancer and its treatment hurt your financial situation?" We collapsed responses to "not at all" vs. "a little, some, a lot" for our analysis.

**Rural Definition:** Rural-urban status was defined using 2003 Rural-Urban Continuum Codes (RUCCs).<sup>6</sup> RUCCs of 1-3 were considered urban; 4-9 were considered rural.

### Statistical Analysis:

- We calculated weighted percentages and Wald chi-square statistics to assess rural-urban differences in survivor-level (e.g. age) and cancer experience (e.g. time since last treatment) characteristics.
- We performed multivariable logistic regression to examine rural-urban differences in reported financial problems after accounting for survivor-level and cancer experience characteristics. We reported corresponding predicted probabilities.

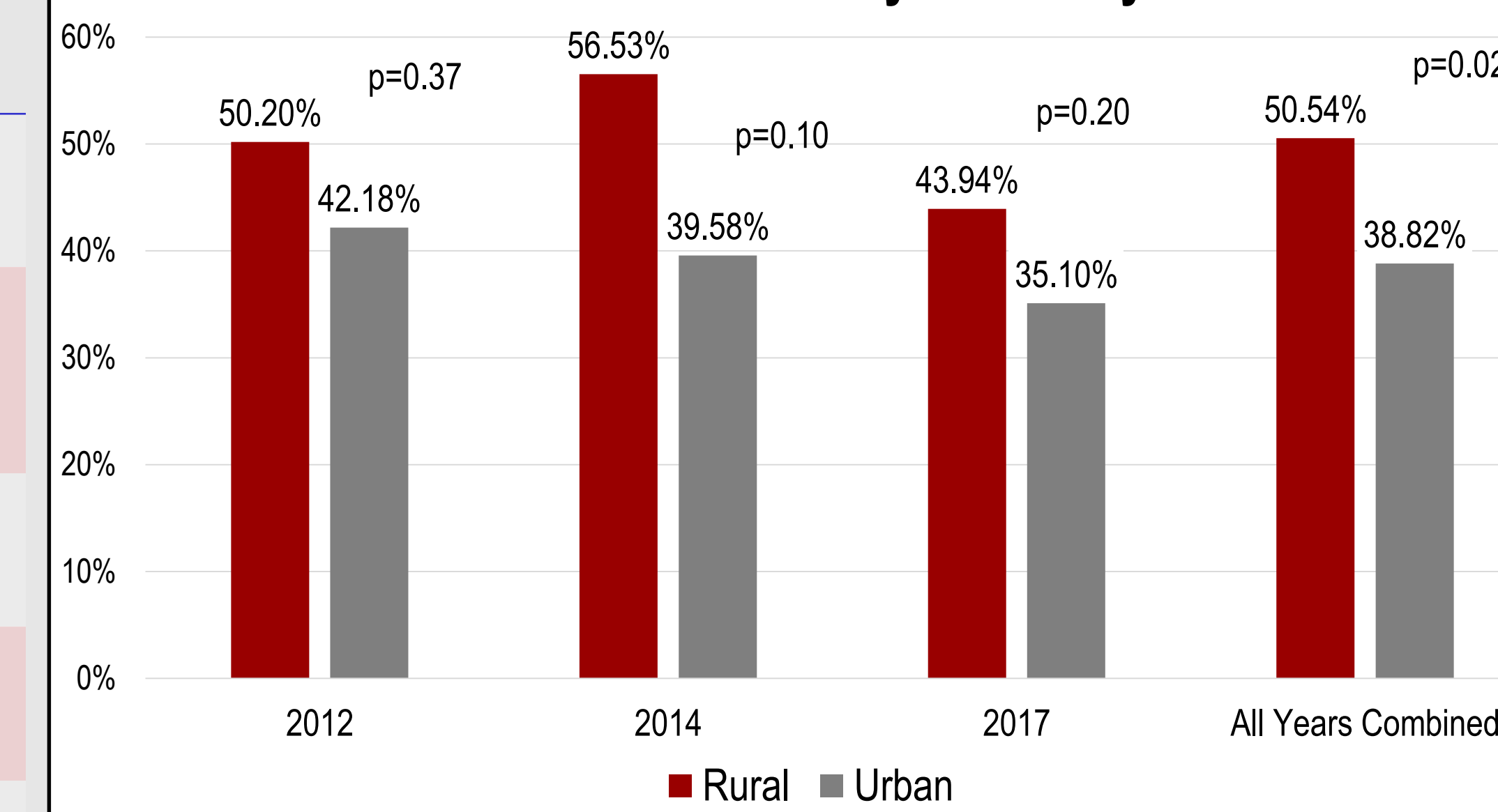
## RESULTS

**Table 1: Selected Survivor-Level and Cancer Experience Characteristics**

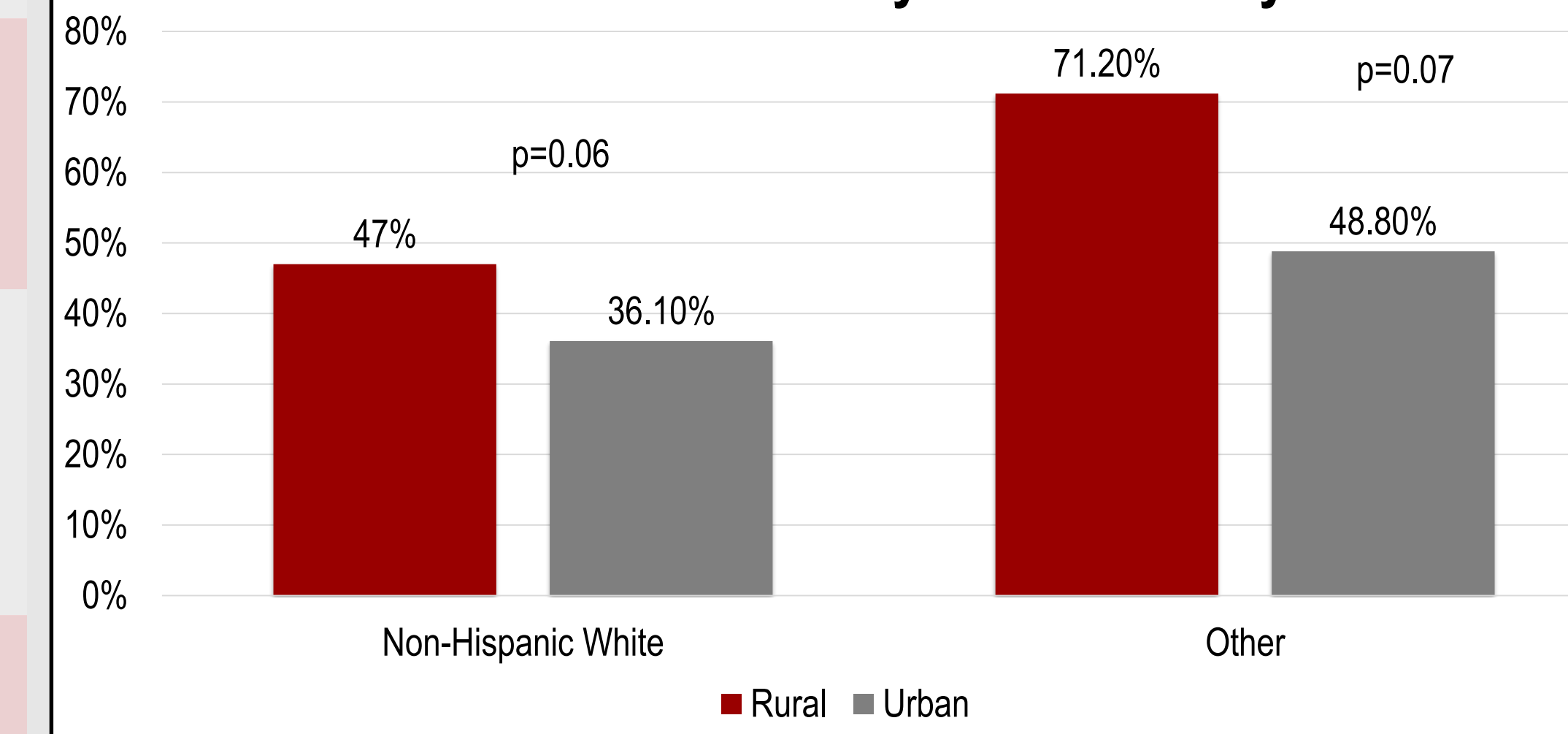
	Rural (n=223) Weighted %	Urban (n=1,136) Weighted %
<b>Gender</b>		
Male	41.8%	43.2%
Female	58.2%	56.8%
<b>Age Group</b>		
18-49	18.4%	16.3%
50-64	30.6%	35.0%
65+	51.0%	48.6%
<b>Marital Status</b>		
Married/Living as Married	73.9%	65.4%
Not Married	26.1%	34.6%
<b>Race/Ethnicity</b>		
Non-Hispanic White	85.3%	79.1%
Other	14.7%	20.9%
<b>Income</b>		
\$0-19,999	23.7%	15.3%
\$20-49,999	31.2%	26.1%
\$50-74,999	15.8%	20.9%
\$75,000+	29.3%	37.8%
<b>Census Region</b>		
Northeast	11.8%	18.8%
Midwest	28.3%	20.5%
South	46.7%	36.1%
West	13.1%	24.6%
<b>Occupational Status</b>		
Employed	23.5%	39.7%
Retired	51.4%	44.1%
Disabled	9.7%	6.0%
Other (unemployed/student/homemaker)	15.4%	10.3%
<b>Insurance Status</b>		
Yes	93.3%	95.8%
No	6.7%	4.2%
<b>Non-Cancer Co-morbidities*</b>		
0	12.6%	18.9%
1-2	43.7%	48.0%
3+	43.7%	33.1%
<b>Receipt of Surgery, Yes</b>	71.9%	77.2%
<b>Receipt of Chemotherapy, Yes</b>	21.5%	21.2%
<b>Receipt of Radiation, Yes</b>	25.6%	27.7%
<b>Time since last treatment</b>		
No treatment received	12.2%	8.2%
Current to <1 year	9.4%	15.5%
1-4 years	21.9%	23.4%
5+ years	56.4%	52.9%

*Wald p-values <0.05 are indicated in bold*

**Figure 1: Rural-Urban Differences in Reported Financial Problems by HINTS Cycle**



**Figure 2: Rural-Urban Differences in Reported Financial Problems by Race/Ethnicity**



### Key Findings

- Rural cancer survivors were more likely to report financial problems associated with their cancer compared to urban survivors (50.54% vs. 38.82%, p=0.02), but this was attenuated to non-statistical significance in adjusted analysis.
- Adjusted analysis showed that those with low income, who received chemotherapy and/or radiation, and those in current or recent treatment were more likely to report financial problems associated with their cancer diagnosis and treatment.

**Table 2: Factors Associated with Cancer Survivors Noting Financial Problems after Cancer Diagnosis and Treatment**

Factor	Adjusted Predicted Probability (95% CI)
<b>Rural-Urban Status</b>	
Rural	49.3 (30.6-67.9)
Urban	38.7 (23.1-56.2)
<b>Gender</b>	
Female	44.3 (27.2-62.2)
Male	35.2 (20.3-52.5)
<b>Age</b>	
18-49	54.7 (33.3-74.5)
50-64	44.2 (26.9-62.9)
65+	35.7 (21.2-52.7)
<b>Race/Ethnicity</b>	
Other	51.4 (31.7-70.7)
Non-Hispanic White	37.1 (22.1-54.3)
<b>Income</b>	
\$0-19,999	<b>55.2 (35.2-73.5)</b>
\$20-49,999	<b>43.7 (26.4-62.0)</b>
\$50-74,999	<b>36.9 (21.9-54.4)</b>
\$75,000+	<b>29.7 (16.6-46.5)</b>
<b>Census Region</b>	
Northeast	36.7 (21.2-54.7)
Midwest	45.5 (27.9-63.6)
South	42.2 (25.8-59.6)
West	35.8 (20.7-53.4)
<b>Occupational Status</b>	
Employed	43.0 (26.0-61.0)
Retired	35.5 (21.2-52.1)
Disabled	66.4 (43.8-84.0)
Other	38.8 (20.4-60.6)
<b>Insurance Status</b>	
No	49.6 (24.9-74.8)
Yes	39.9 (24.3-57.2)
<b>Receipt of Surgery</b>	
Yes	40.8 (25.2-57.6)
No	39.4 (21.6-59.5)
<b>Receipt of Chemotherapy</b>	
Yes	<b>64.6 (43.9-80.8)</b>
No	<b>34.0 (19.1-52.0)</b>
<b>Receipt of Radiation</b>	
Yes	<b>54.8 (35.9-72.1)</b>
No	<b>35.1 (20.0-52.9)</b>
<b>Time since last treatment</b>	
No treatment received	<b>34.3 (16.4-56.9)</b>
Current to <1 year	<b>51.7 (32.9-69.6)</b>
1-4 years	<b>43.2 (26.8-60.6)</b>
5+ years	<b>37.0 (22.2-54.0)</b>

*Wald p-values <0.05 are indicated in bold; Model also adjusted for co-morbidities and marital status*

## DISCUSSION

- More than half of rural cancer survivors reported financial problems associated with their cancer, which is notably higher than estimates from earlier population-based surveys. <sup>1,2</sup>
- Higher levels of reported financial problems related to cancer among rural survivors underscores the importance of improving provider-level and system-level processes to address these financial burdens.
- Treatment factors were associated with higher reported financial problems. With the increased use of expensive targeted therapies and immunotherapies, this finding should continue to be explored, particularly as rural cancer patients are more likely to forgo treatment due to costs.

## REFERENCES AND ACKNOWLEDGEMENTS

1. Kent EE, Forsythe LP, Yabroff KR, Weaver KE, de Moor JS, Rodriguez JL (2013) Are survivors who report cancer-related financial problems more likely to forgo or delay medical care? *Cancer* 119(20):3710-3717.
2. Yabroff KR, Dowling EC, Guy GP Jr, Banegas MP, Davidoff A, Han X et al (2016) Financial hardship associated with cancer in the United States: findings from a population-based sample of adult cancer survivors. *J Clin Oncol* 34(3):259-267.
3. Charlton M, Schlichting J, Chioreo C, Ward M, Vikas P (2015) Challenges of rural cancer care in the United States. *Oncology (Williston Park)* 29(9):633-640.
4. Palmer NR, Geiger AM, Lu L, Case LD, Weaver KE (2013) Impact of rural residence on forgoing healthcare after cancer because of cost. *Cancer Epidemiol Biomark Prev* 22(10):1668-1676.
5. McDougall JA, Banegas MP, Wiggins CL, Chiu VK, Rajput A, Kinney AY (2018) Rural disparities in treatment-related financial hardship and adherence to surveillance colonoscopy in diverse colorectal cancer survivors. *Cancer Epidemiol Biomark Prev* 27(11):1275-1282.
6. United States Department of Agriculture (2016). Rural Urban Continuum Codes. <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes>. Accessed 1 Aug 2018

**ACKNOWLEDGEMENTS:** This study was supported, in part, by the Cancer Prevention and Control Research Network, funded by the Centers for Disease Control and Prevention and the National Cancer Institute.

Contact Information: zahnd@mailbox.sc.edu