

# Biospecimen Donation by Subjects from Appalachian Kentucky for Cancer Research

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## Abstract

**Background:** The NCI has documented a high incidence of cancer in the Appalachian regions of 13 states including Kentucky. Since 2003, patients have donated tissue to the Markey Cancer Center Biospecimen Core Program (BCP) for research aimed at reducing cancer in Kentucky, and in particular Appalachia. **Objective:** The objective of these analyses is to determine the proportion of subjects participating from Appalachian counties of Kentucky.

**Methods:** Data was available for 669 adults. Demographics and patterns of residence were determined for rural versus urban or Appalachian versus non-Appalachian counties. Rural/urban classification followed the 2003 Rural/Urban Continuum Code (<http://www.ers.usda.gov/Data/RuralUrbanContinuumCodes>). Appalachian and non-Appalachian counties and age-adjusted cancer incidence were classified by the KCR (<http://cancer-rates.info/ky/>). A county's age-adjusted cancer incidence rate was used to stratify participants into four cancer incidence groups: i) 218-494, ii) 495-514, iii) 515-536, and iv) 537-641 invasive cancers/100,000. Descriptive statistics were calculated and compared by Chi-Square test or Chi-Square test of equal proportions (p<0.05 considered to be statistically significant).

**Results:** Men (60.18±12.16 years) and women (59.05±12.35 years) who donated biospecimens were of similar age and predominantly Caucasian (95.2%) followed by African-American (3.6%). Participants were significantly more likely to be from rural (93.91%) than urban-Appalachian counties (6.09%). Significantly more Appalachian men (60.72%) donated biospecimens than women (39.28%), whereas men and women participated equally from non-Appalachian counties (51.77% and 48.23% respectively). Participants who donated biospecimens represented 71 of 120 KY counties; however, the majority resided in Fayette County (13.8%) - the location of the BCP. Overall, the number of participants in each cancer incidence group increased across counties with low to high age-adjusted incidence rates (Group i, 5.55%; Group ii, 22.88%; Group iii, 32.08%; Group iv, 39.51%).

**Conclusions:** Residents of Appalachian counties donated biospecimens to the BCP proportionately with cancer incidence rates, and are well represented in the BCP tissue repository.

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## Objective

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## Methods

### 2003 Rural-Urban Continuum Codes

The 2003 Rural-urban Continuum Codes form a classification scheme that distinguishes metropolitan counties by size and non-metropolitan counties by degree of urbanization and proximity to metro areas. The standard Office of Management and Budget (OMB) metro and non-metro categories have been subdivided into **three metro (Urban)** and **six non-metro (Rural)** categories, resulting in a 9-part county codification. This scheme was originally developed in 1974. The codes were updated in 1983 and 1993, and slightly revised in 1988. The 1988 revision was first published in 1990. This scheme allows researchers to break county data into finer residential groups, beyond metro and non-metro, particularly for the analysis of trends in non-metro areas that are related to population density and metro influence.

2003 Rural-Urban Continuum Code	Urban 0-3	Rural 4-9	Description for 2003 codes
1	Urban		County in metro area with 1 million population or more
2	Urban		County in metro area of 250,000 to 1 million population
3	Urban		County in metro area of fewer than 250,000 population
4	Rural		Nonmetro county with urban population of 20,000 or more, adjacent to a metro area
5	Rural		Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area
6	Rural		Nonmetro county with urban population of 2,500 to 19,999, adjacent to a metro area
7	Rural		Nonmetro county with urban population of 2,500 to 19,999, not adjacent to a metro area
8	Rural		Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area
9	Rural		Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro area

### Statistics

- Chi-square tests for equality and homogeneity of proportions
- p < 0.05 is statistically significant

### Age-Adjusted Invasive Cancer Incidence

#### Age-Adjusted Invasive Cancer Incidence Rates in Kentucky All Sites, 2003-2007 By County

Age-Adjusted to the 2000 U.S. Standard Million Population

Kentucky Rate: 516.22

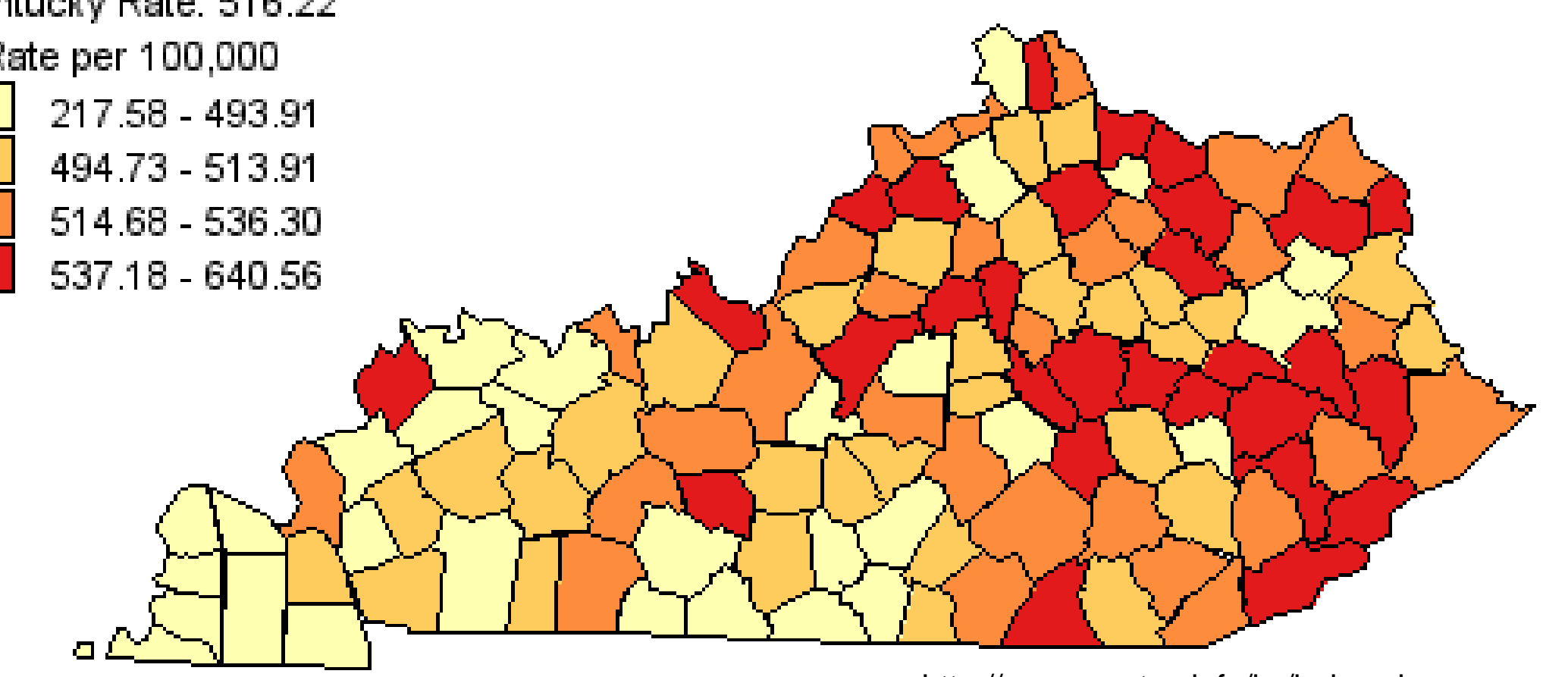
Rate per 100,000

217.58 - 493.91

494.73 - 513.91

514.68 - 536.30

537.18 - 640.56



<http://cancer-rates.info/ky/index.php>

## Results

Table 1: Distribution of Race and Gender across Rural and Urban areas of Kentucky show that Participants of both Genders were predominantly White followed by African-Americans

Race	Gender													
	Female				Male				Total					
	Rural n	Urban n	Total n	%	Rural n	Urban n	Total n	%	Rural n	Urban n	Total n	%		
African American	3	1.5%	9	10.8%	12	4.2%	2	0.7%	10	11.4%	12	3.1%	24	3.6%
Indian	0	0.0%	1	1.2%	1	0.4%	0	0.0%	0	0.0%	0	0.0%	1	0.1%
Asian	0	0.0%	2	2.4%	2	0.7%	0	0.0%	0	0.0%	0	0.0%	2	0.3%
Hispanic	1	0.5%	2	2.4%	3	1.1%	1	0.3%	0	0.0%	1	0.3%	4	0.6%
Unknown	1	0.5%	0	0.0%	1	0.4%	0	0.0%	0	0.0%	0	0.0%	1	0.1%
White	195	97.5%	69	83.1%	264	93.3%	295	99.0%	78	88.6%	373	96.6%	637	95.2%
Total	200	100.0%	83	100.0%	283	100.0%	298	100.0%	88	100.0%	386	100.0%	669	100.0%

Table 2: No significant difference between average Age of Men and Women

	Mean (Years)	Std Dev
Men	60.18	12.16
Women	59.05	12.35

Table 3: Age Adjusted Invasive Cancer Incidence Rates in KY (2003 – 2007) show that Number of Participants Increase with Cancer Incidence Rates

County Invasive Cancer Rate/100,000 US Std Million Population in Year 2000	County Cancer Rate Code	Number of Participants	Percent	Chi-Square Test of Equal Proportions
537-641	Group iv	228	39.5%	p < 0.0001
515-536	Group iii	185	32.1%	
495-514	Group ii	132	22.9%	
218-494	Group i	32	5.6%	

Table 4: Significantly Higher Numbers of Participants reside in Rural Appalachia (Chi-Square Statistic p<0.0001)

Frequency Percent Row Pct Column Pct	Appalachia		
	Yes	No	Total
From Rural Counties	416 (62.18) 83.53 93.91	82 12.26 16.47 36.28	498 74.44
From Urban Counties	27 4.04 15.79 6.09	144 21.52 84.21 63.72	171 25.56
Total	443 66.22	226 33.78	669 100.00

Total: 70 counties. Rural Appalachian counties: 40. Urban Appalachian counties: 3. Rural Non-Appalachian counties: 12. Urban Non-Appalachian counties: 15.

Age adjusted County Cancer Incidence Rate Rate/100,000 Age-Adjusted to the 2000 US Standard Million Population

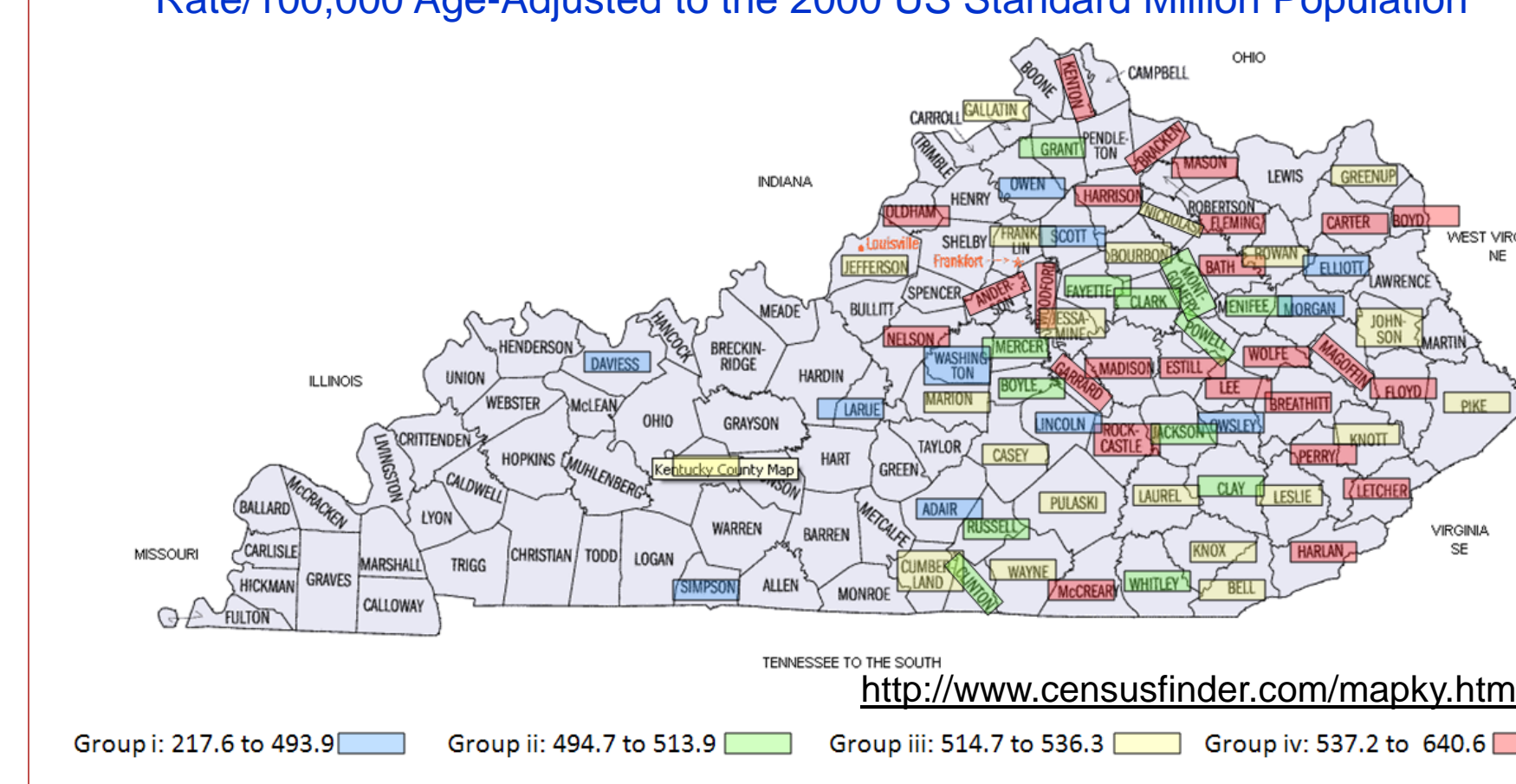


Table 5: Significantly Higher Proportion of both Men and Women Participated from Appalachian than non-Appalachian KY

Gender	Appalachia n (%)	Non-Appalachia n (%)	Total n	Chi-Square Test of Proportions
Men	269 (69.7%)	117 (30.3%)	386	p < 0.0001
Women	174 (61.5%)	109 (38.5%)	283	p < 0.0001

Table 6: From Appalachia, significantly higher number of Men participated than Women, while participation was equivalent from non-Appalachia (Chi-Square Statistic p=0.027)

Gender Frequency Percent Row Pct Column Pct	Appalachia		
	Yes	No	Total
Women	174 26.01 61.48 39.28	109 16.29 38.52 48.23	283 42.30
Men	269 40.21 69.69 60.72	117 17.49 30.31 51.77	386 57.70
Total	443 66.22	226 33.78	669 100.00

## Conclusions

Residents of Appalachian counties of Kentucky donated biospecimens to the BCP proportionately with cancer incidence rates, and are well represented in the BCP tissue repository.

## References

- The 2003 Rural/Urban Continuum Code (<http://www.ers.usda.gov/Data/RuralUrbanContinuumCodes>)
- The Kentucky Cancer Registry (<http://kcr.uky.edu>)
- Map showing counties of Kentucky (<http://www.censusfinder.com/mapky.htm>)
- Statistical Methods for Rates and Proportions (3rd Edition), by Joseph L. Fleiss, Bruce Levin, Myunghee Cho Paik and Joseph Fleiss. ISBN-10: 0471526290