S7.: Changes in Development

To address changes in land-use and the built environment, changes in population demographics that may affect vulnerability to hazard events, and changes in state-owned or -operated buildings, infrastructure, and critical facilities, the Commonwealth of Kentucky Enhanced Hazard Mitigation Plan 2018 will rely upon the highly useful *Kentucky Annual Economic Report* (KAER) published by Center for Business and Economic Research (CBER) in the Gatton College of Business and Economics at the University of Kentucky (UK)[1].

A note about the graphics to be displayed for this section:

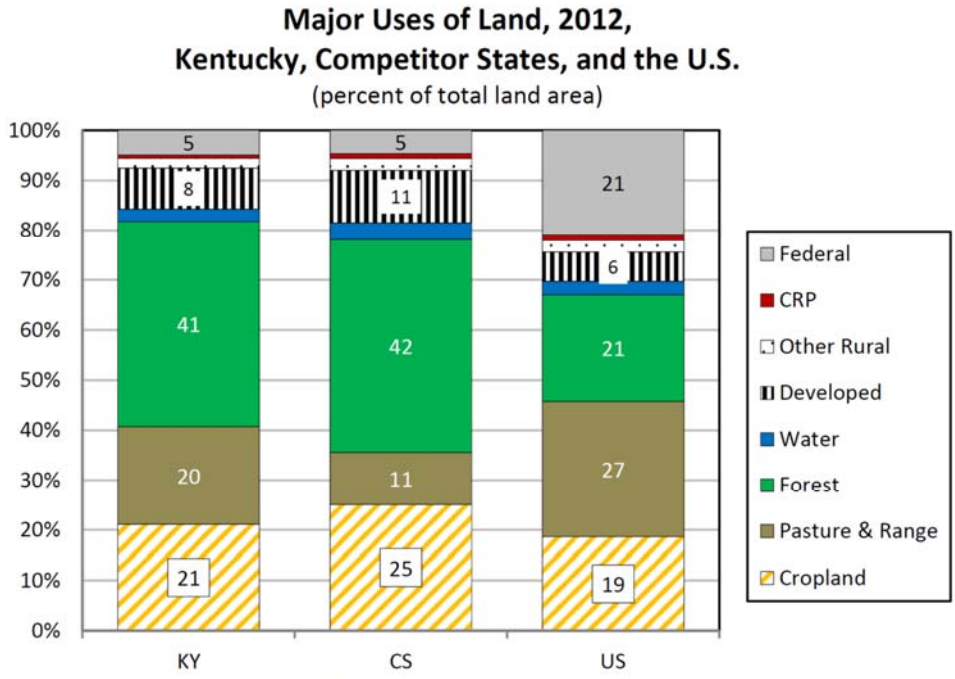
The CK-EHMP 2018 is using the 2018 KAER. Data used in the KAER is best-available data.

Because this section of the CK-EHMP is supposed to show *changes*, where a relevant data point does not show a change, this plan will use an older KAER. Specifically, this plan will use the 2014 KAER. The logic behind the use of the 2014 KAER is straightforward: Kentucky's 2013 enhanced hazard mitigation plan (CK-EHMP 2013) was approved at the end of October in 2013. Consequently, if discussing changes since the CK-EHMP 2013 was approved, it seems preferable to start the clock at 2014 instead of 2013.

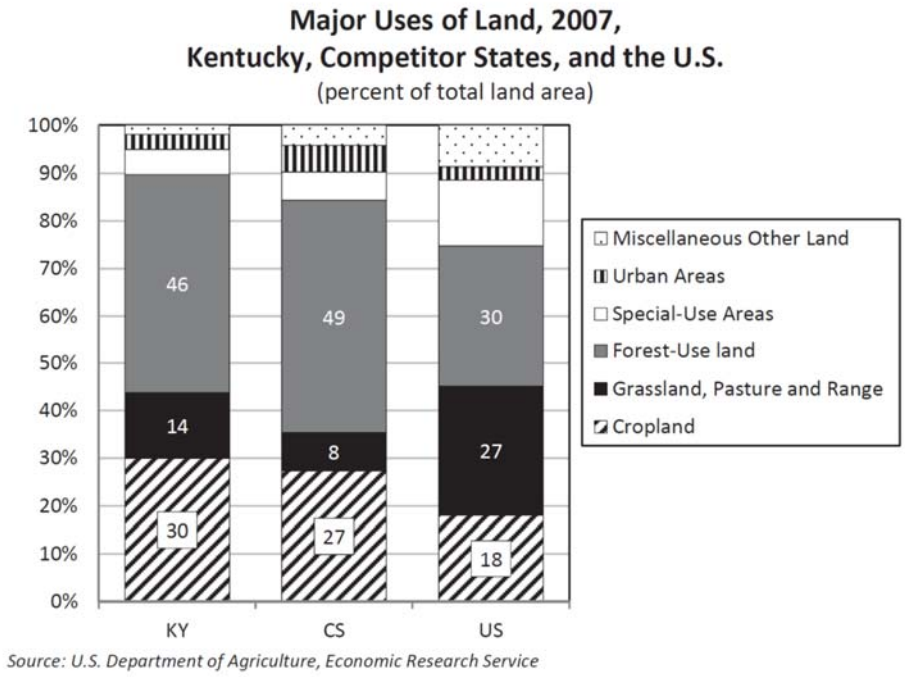
The use of both the 2014 and 2018 KAERs means that changes in development mostly will reflect changes from 2011 to 2015 or 2016.

[1] Childress, Michael T. (ed). 2018. *Kentucky Annual Economic Report 2018*. University of Kentucky, Gatton College of Business and Economics, Center for Business and Economic Research.
Contributors to the Report include: Christopher Bollinger, Adam Childress, Michael Childress, Xiaozhou Ding, Bethany Paris, Veronica Turner, and Jacob Williams.

Changes in Land-Use and the Built Environment



Source: U.S. Department of Agriculture, National Resources Inventory



Source: U.S. Department of Agriculture, Economic Research Service

The above two tables are from the 2018 and 2014 KAER, respectively. Regarding the data source and analysis used to make the graphics:

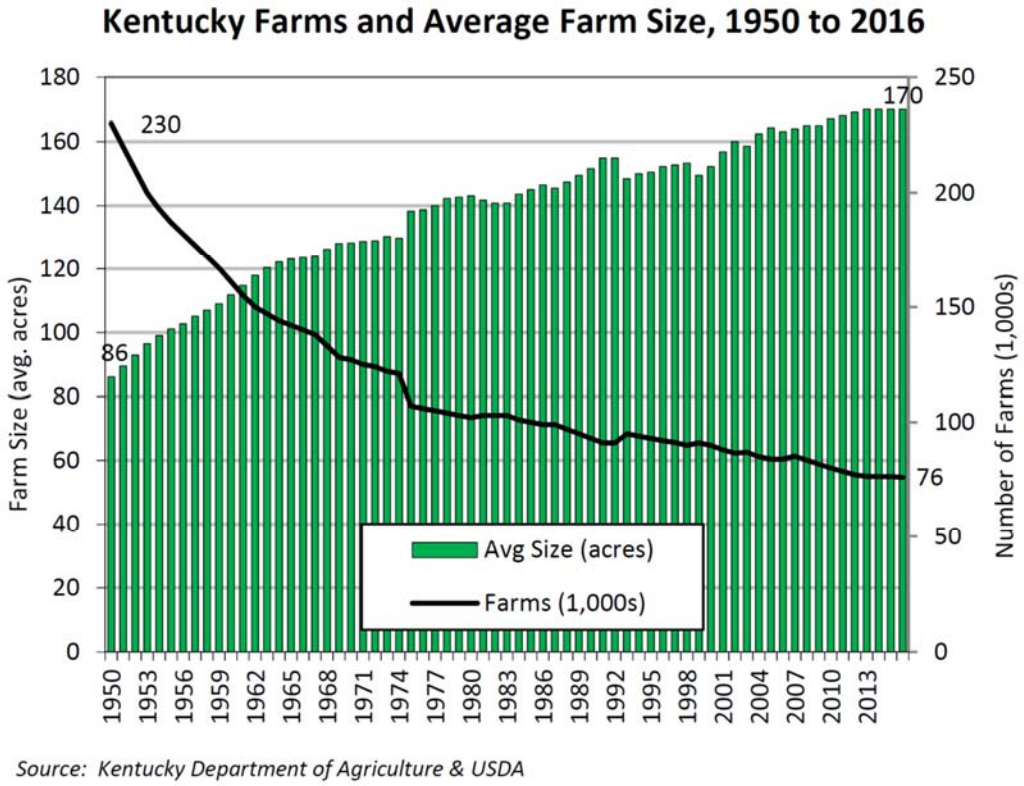
"The 2012 National Resources Inventory[2] (NRI) is the most recent in a series of natural resource inventories conducted by the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS)…

"The chart [above] shows that the vast majority of land in the U.S. falls into one of three categories: cropland, forest, or pasture/range. In Kentucky, these three categories account for 82 percent of the total land area; this is a higher percentage than the competitor states and the U.S. Forest accounts for the largest category in Kentucky, 41 percent. Approximately 8 percent of Kentucky is 'developed,' compared to 11 percent in the competitor states[3] and 6 percent in the U.S…[2018 KAER, p. 31]."

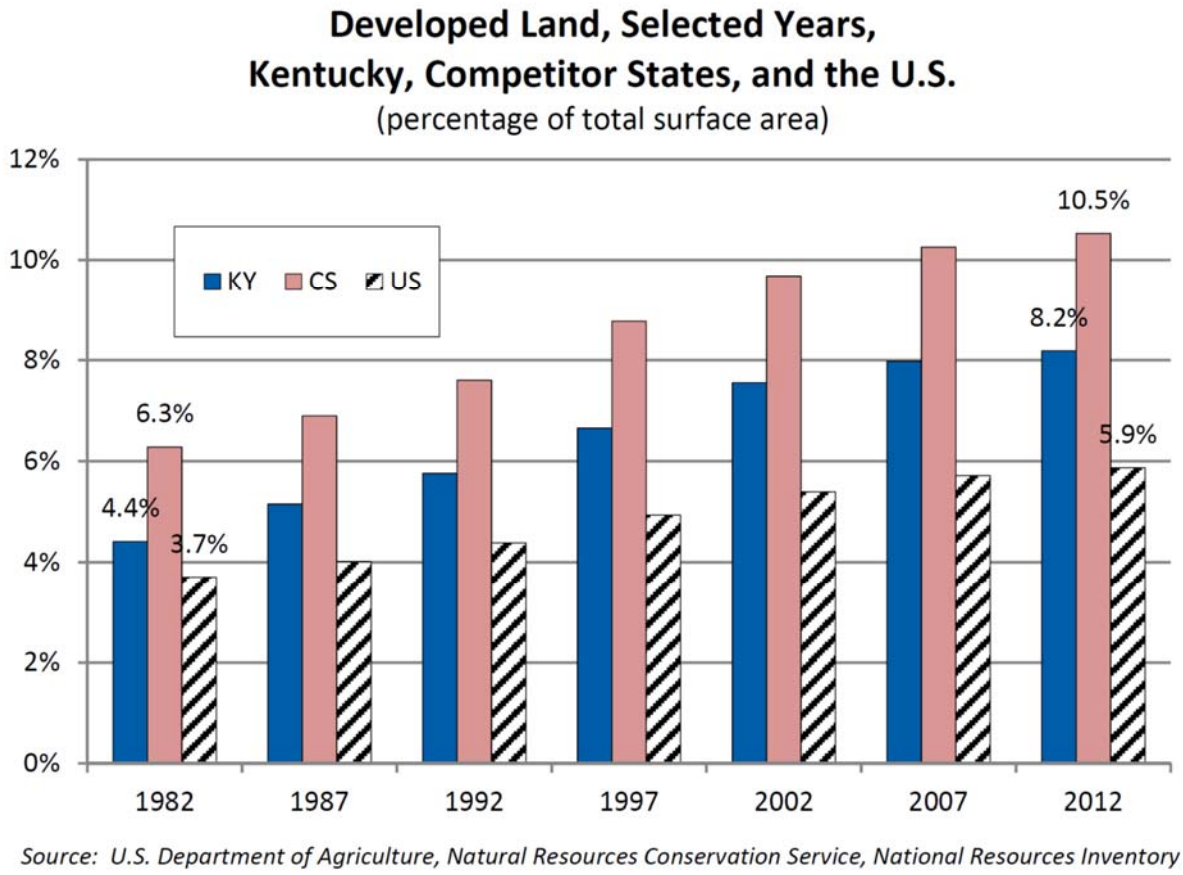
Compare the land-use with this same chart created in 2014 and when 2007 statistics represented best-available data: The three categories (cropland, forest, and pasture/range) accounted for 90 percent of the total land area in Kentucky. The 2014 KAER also notes that 46 percent of the land-use is forests [2014 KAER, p. 100]. (This is a slightly different statistic than that 41 percent of land-use is *United States* forest.)

[2] The NRCS data used here is update every five years. Government data also typically lags one year behind its official release. So, it is acceptable that the 2018 KAER uses data that was released in 2013 and that ended in 2012. This represents the best available data. However, for this plan document, it is expected that either the 2019 or 2020 KAER will have newer figures using NRCS data that likely will reflect 2017 collection. The Commonwealth of Kentucky Enhanced Hazard Mitigation Plan 2018 will update this section when more recent NRCS data is utilized by the Kentucky Annual Economic Report.

[3] "Competitor states" refers to the following states: Alabama, Georgia, Illinois, Indiana, Missouri, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia.



"The family farm has nearly become a quaint ghost of Kentucky's past. Over the last half century, two major trends have transformed the state's countryside: the consolidation of small, family-owned farms into larger enterprises; and the conversion of agricultural land to urban (or suburban) uses. As seen [above], roughly one-third as many farms exist today as there were in 1950, while the average size of Kentucky's farms has doubled. According to the 2012 Census of Agriculture, which is conducted every five years by the U.S. Department of Agriculture, Kentucky experienced the largest decrease in farmland among the states from 2007 to 2012. It is likely, however, that much of the decrease in farmland is due to farmland going idle rather than transformed through residential, industrial, or commercial development. Yet, during this period the number of farms decreased from 85,260 in 2007 to 77,064 in 2012. Most of the farms in Kentucky are owned by an individual or a family (90%), and 43 percent of Kentucky farmers spend at least 200 days a year off the farm working in other jobs [2018 KAER, p. 30]."

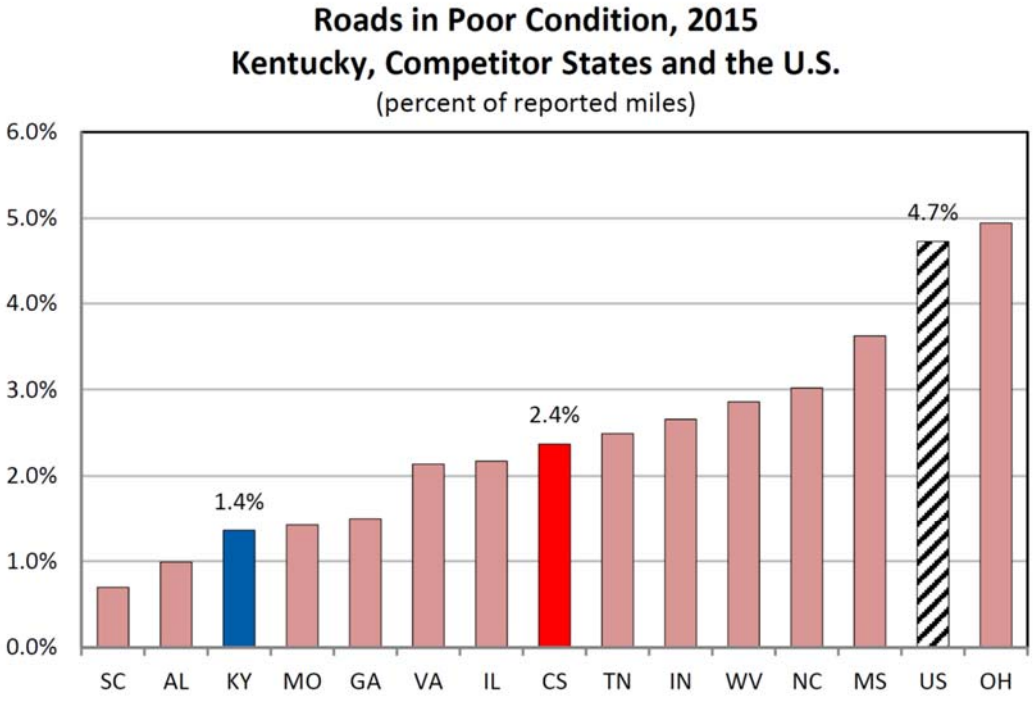


"Developed land includes a combination of land cover and use categories, such as large urban and built-up areas, small built-up areas, and rural transportation land…More developed land requires more roads, sewers, water systems, and other infrastructure needed to support a growing and/or shifting population. From 1982 to 2012, developed land as a percentage of total surface area nearly doubled in Kentucky, from 4.4 percent to 8.2 percent; this represents an increase of 86 percent in developed land in Kentucky, which is a higher rate than the competitor states[4] (68%) or the U.S. (59%). However, the rate of change was minimal from 2007 to 2012 – in Kentucky, the competitor states, and U.S. overall – probably reflecting the impact of the Great Recession. State and local government infrastructure expenditures increased in Kentucky, on a per capita basis, from 1995 to 2013 by 34 percent (using constant 2015 dollars), compared to 14 percent in the competitor states and 22 percent in the U.S. [2018 KAER, p. 186]."

[4] "Competitor states" refers to the following states: Alabama, Georgia, Illinois, Indiana, Missouri, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia.

For additional analysis of changes in land-use and the built environment, see also the flood risk assessment conducted by Kentucky's Division of Water where it shows both in its analysis and as part of its appendix changes in impervious surface.

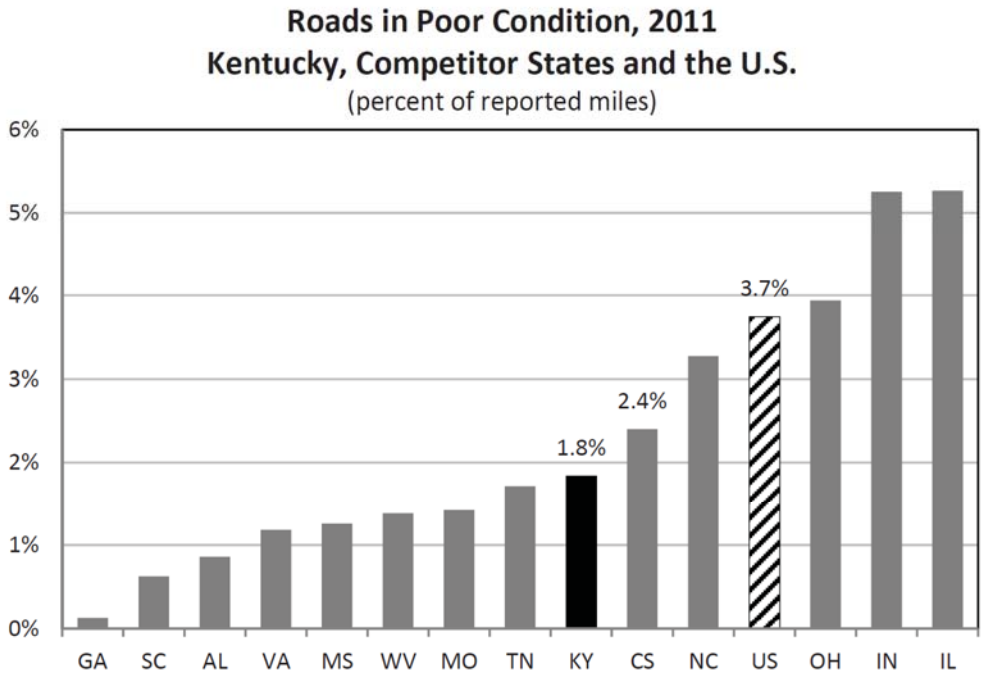
Changes in Infrastructure and Critical Facilities



Source: Author's calculations based on Table HM-64, Highway Statistics 2015, Federal Highway Administration.
CS is the weighted average of the competitor states.

[5]

[5] Author's calculation is the calculation from the contributor to 2018 KAER.



Source: Author's calculations based on Table HM-64, Highway Statistics 2011, Federal Highway Administration. CS is the weighted average of the competitor states.

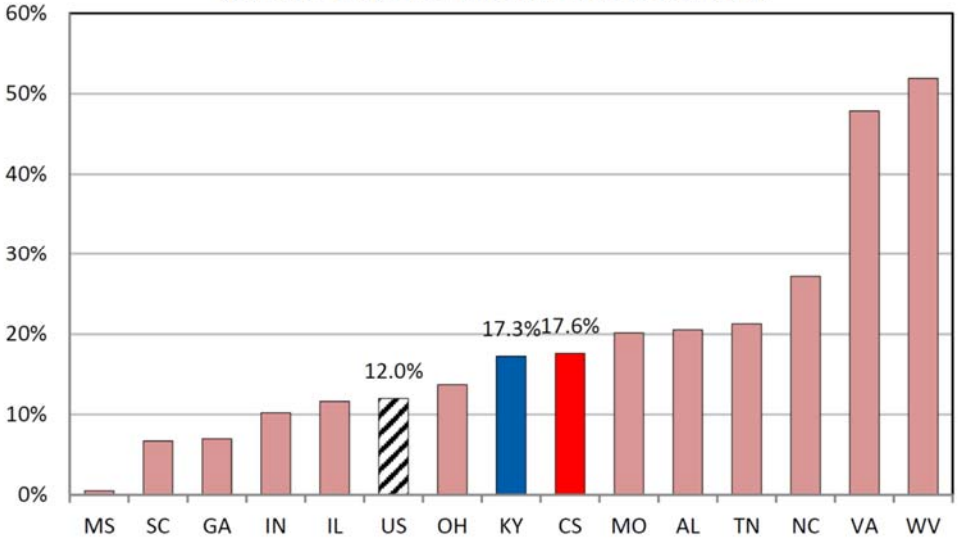
[6]

Road condition is obviously important infrastructure for emergency management and disaster preparedness. Poor road condition is something to prepare for in cases of hazard events and the mobilization that such events cause. Road condition also is a source of mitigation need and is critical infrastructure.

Kentucky's road condition fairs significantly better than the U.S. average and better than the average of all competitor states (i.e., the states compared in the graphs above). In 2011, only 1.8% of Kentucky's roads were in poor condition. This condition improved five years later: Only 1.4% of Kentucky's roads were in poor condition in 2015.

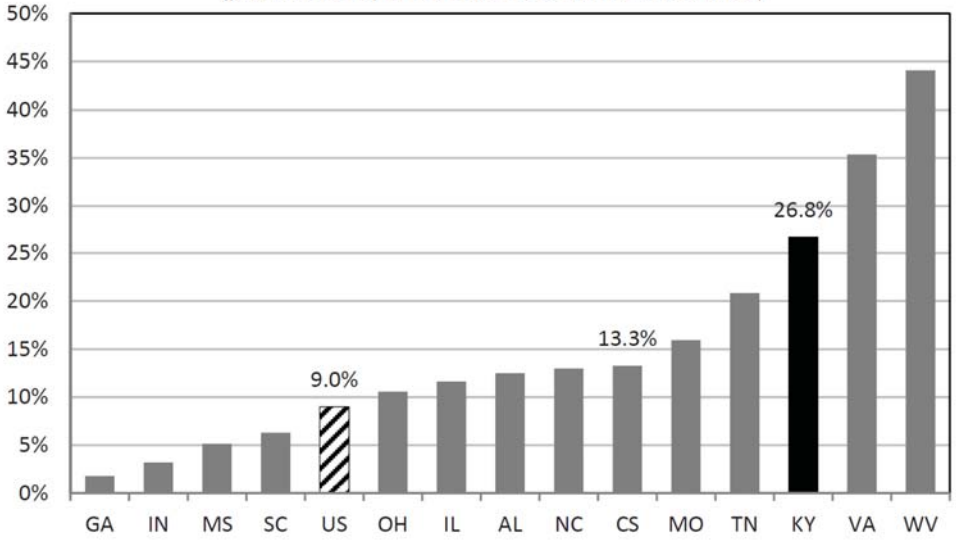
[6] Author's calculation is the calculation from the contributor to 2014 KAER.

Narrow Rural Roads, 2015
Kentucky, Competitor States and the U.S.
(percent of reported miles less than 12 feet wide)



Source: Author's calculations based on Table HM-53, Highway Statistics 2015, Federal Highway Administration.
CS is the weighted average of the competitor states.

Narrow Rural Roads, 2011
Kentucky, Competitor States and the U.S.
(percent of reported miles less than 12 feet wide)

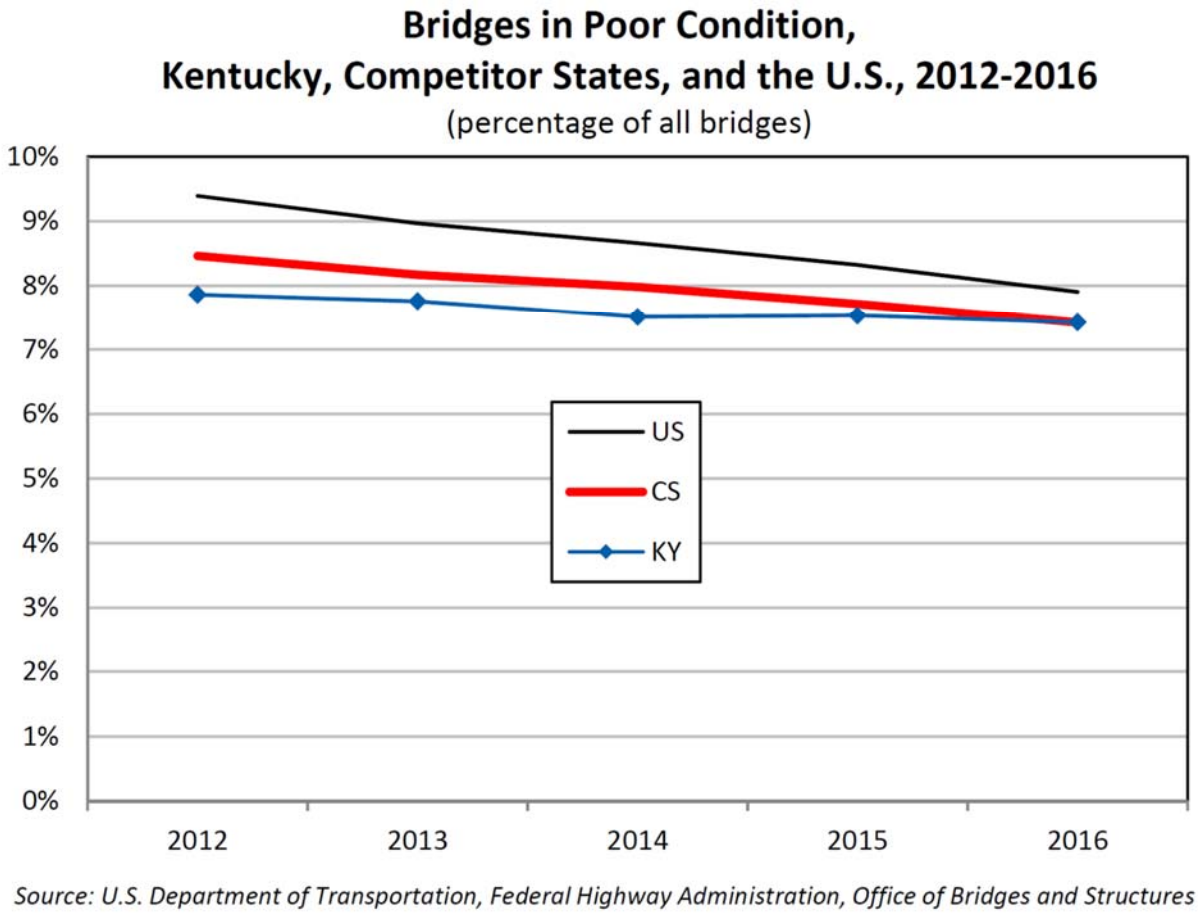


Source: Author's calculations based on Table HM-53, Highway Statistics 2011, Federal Highway Administration.
CS is the weighted average of the competitor states.

“[Narrow roads] is a measure of lane width for ‘other principal arterial’ roads, not interstates, other freeways, or expressways. A narrow lane is one that is less than 12 feet wide. Obviously, the more narrow the lane, the more difficult it is to move… [2018 KAER, p. 189]” people and supplies in the event of a hazard occurrence.

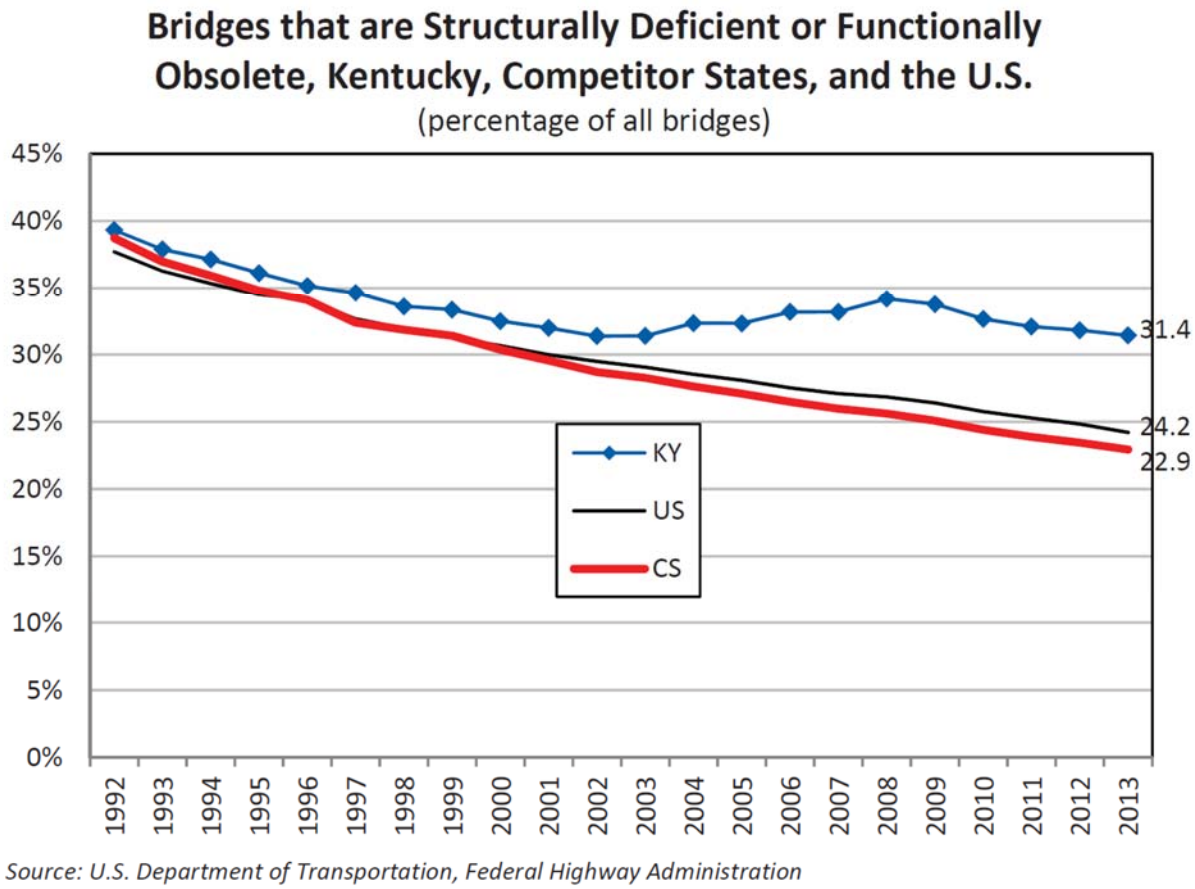
In 2018, and using best available data from the Federal Highway Administration (FHWA), the authors of 2018 KAER estimated that 17.3 percent of Kentucky’s “other principal arterial rural roads” are narrow, compared to 12 percent nationally and 17.6 percent for the competitor states.

In 2014 and using then best available data from the Federal Highway Administration, the authors of 2014 KAER estimated that 26.8% of Kentucky’s “other principal arterial rural roads” were narrow, compared with 9 percent national and 13.3 percent for the weighted average from competitor states.



Source: U.S. Department of Transportation, Federal Highway Administration, Office of Bridges and Structures

"The Federal Highway Administration (FHWA) categorizes the country's bridges using a 'Good-Fair-Poor' condition framework, outlined in the Pavement and Bridge Condition Performance Measures final rule, which was published in January of 2017. Of the 14,265 bridges in Kentucky, 7.4 percent of them are considered to be in poor condition, which is the same as the competitor states (7.4%), but slightly lower than the U.S. (7.9%). The real difference between Kentucky, the competitor states, and U.S. lies in the distribution of bridges in the other two categories – good and fair. The percentage of Kentucky bridges deemed to be in 'good' condition (38.4%) is much lower than the competitor states (48.0%) or the U.S. (47.4%); and, is much higher in the 'fair' category (54.2%) compared to the competitor states or the U.S., where both are at 44.6 percent. While 92.6 percent of Kentucky bridges are considered to be in 'good' or 'fair' condition in 2016, Kentucky had only the 24th highest percentage among all states. Texas is the highest with 98.8 percent and Rhode Island is the lowest with 75.1 percent [2018 KAER, p. 190]."

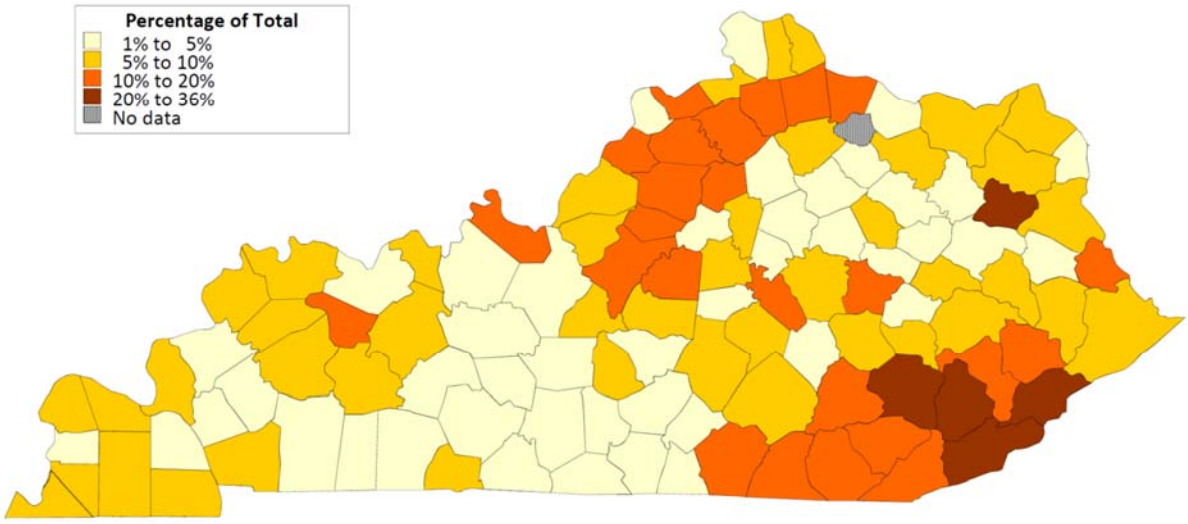


The above graph is from the 2015 Kentucky Annual Economic Report (KAER): Beginning with the 2016 submission, the KAER authors changed the above graph to a map showing Structurally Deficient Bridges in Kentucky by County. The most recent of this map (i.e., from 2018 KAER) is shown below.

Again, bridges are incredibly important infrastructure regarding hazard events. Bridges facilitate mobility of population during hazard events or whether populations are vulnerable and stranded. Mitigation projects frequently target bridges or regard bridges in their design and implementation.

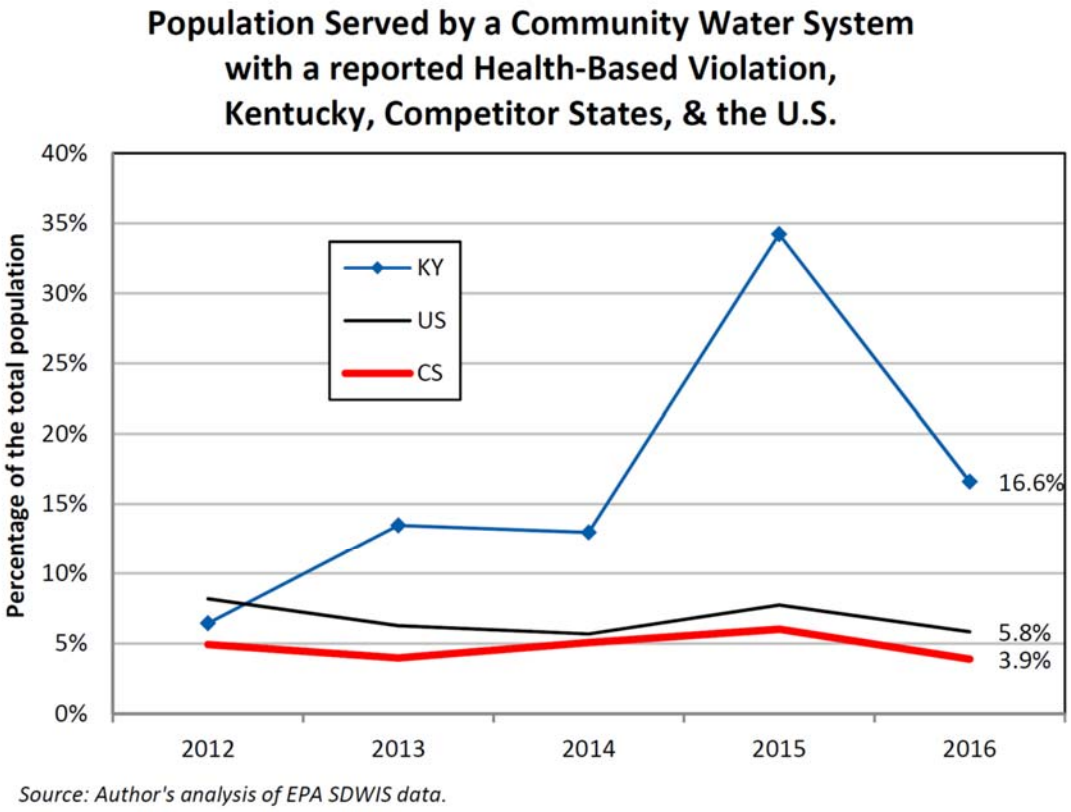
“There are just over 14,000 bridges in Kentucky, and nearly one-third of them (31.4%) are considered either structurally deficient or functionally obsolete – a higher percentage than the competitor states (22.9%) and the U.S. (24.2%). Of Kentucky’s 4,436 problem bridges, 1,234 are structurally deficient and 3,202 are functionally obsolete. Among all states in 2013, Kentucky had the twelfth highest percentage of deficient bridges [2015 KAER, p. 116].”

Structurally Deficient Bridges in Kentucky, 2016



Source: U.S. Department of Transportation, Federal Highway Administration, Office of Bridges and Structures

"This map shows that the highest concentration of structurally deficient bridges are located in the southeastern part of the state. Counties are divided into four groups: 1 to 5 percent of the bridges are structurally deficient (45 counties across the state); 5 to 10 percent (44); 10 to 20 percent (25); and 20 to 36 percent (5). Leslie County has the highest percentage in the state, with 35.7 percent of its bridges categorized as structurally deficient [2018 KAER, p. 191]."



Water quality is relevant infrastructure when speaking of drought or severe winter storms. Areas in Kentucky served by a community water system with reported health-based violations might be targets of future mitigation activity in preparation for drought or for the consequence of a hazard event being immobility

"The United States enjoys one of the safest and most reliable supplies of drinking water in the world. The Safe Drinking Water Act of 1974 sought to preserve the nation's water supply while maintaining high standards for quality. Most Americans get their water from a community water system (CWS), nearly 50,400 of which served approximately 306 million people nationally in 2016, according to the Environmental Protection Agency. Over the past few years, around 6 to 7 percent of the U.S. population received its water from a community water system that reported at least one health-based violation, while just under 5 percent of those living in one of Kentucky's competitor states did. In Kentucky, this percentage ranged between 6.4 percent in 2012 to nearly 35 percent in 2015 to 16.6 percent in 2016. Among the competitor states in 2016, Kentucky's 16.6 percent was the highest, followed by Ohio at 12.4 percent and West Virginia at 8.7 percent. A May 2017 report from the Natural Resources Defense Council, *Threats on Tap: Widespread Violations Highlight Need for Investment in Water Infrastructure and Protections,* shows that for the U.S. overall 'the EPA and states took formal enforcement action in 21.2 percent of the 12,137 health-based violations in 2015 (And) a little more than one out of every five cases (20.5 percent or 2,488 violations) returned to compliance by the end of the year [2018 KAER, p. 192]."

Changes in Population Demographics That May Affect Vulnerability

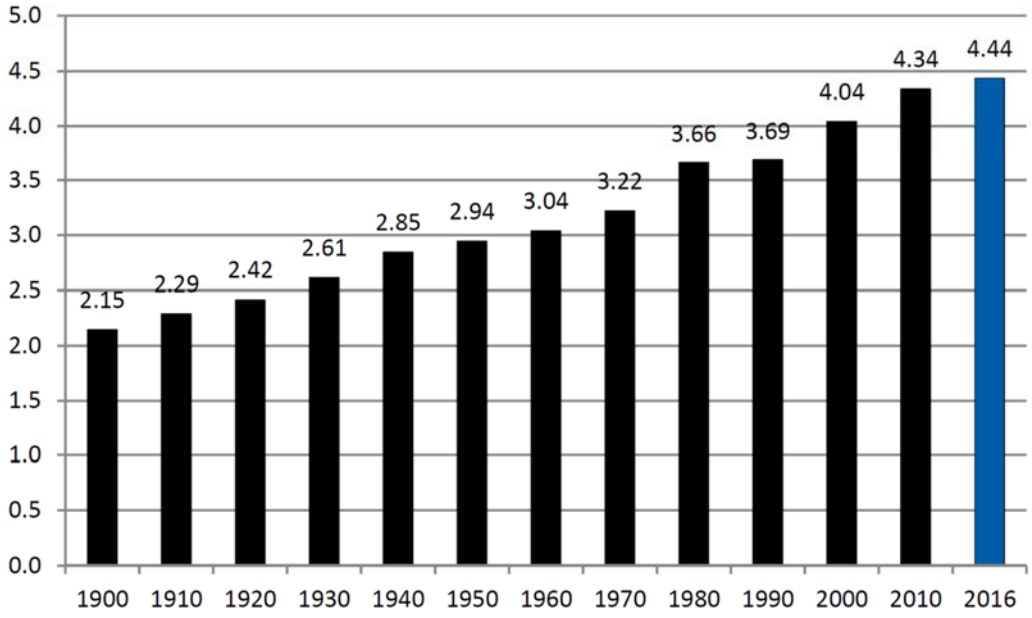
"Because Kentucky is generally more rural, has fewer minority citizens, and is somewhat older, the population has grown more slowly here compared to the U.S.…Between the peak of the last economic expansion, which was during the fourth quarter of 2007, and the 'present' (2016), Kentucky experienced slower population growth (4.2%) than the U.S. (7.3%) or the competitor state averages (5.5%). During this time period, there were marked regional differences within the state. Kentucky's Urban Triangle[7] experienced a 7.6 percent increase, and South Central Kentucky is not far behind at 5.2 percent. However, the population in Western Kentucky grew less than 1 percent and in Eastern Kentucky it declined 2.8 percent. And there are several counties with population levels lower in 2016 compared to 2007. In fact, 61 counties, largely in Eastern Kentucky, but several in Western Kentucky, lost population during this time. The five largest declines were in Lee (-16.2%), Fulton[8] (-9.9%), Harlan (-9.3%), Martin (-9.2%), and Leslie (-9.0%) Counties, with another 18 counties experiencing declines ranging from 4 to 8 percent, mainly in the traditional coal producing counties of both Western and Eastern Kentucky. On the other hand, population growth in much of Northern and Central Kentucky has been strong. The fastest growing counties were Scott (24.1%), Warren (16.9%), Shelby (15.1%), Boone (14.4%), and Jessamine (13.7%) [2018 KAER, pp. 216-217]."

[7] "Urban Triangle" refers to Lexington-Fayette Urban County Government (LFUCG), Louisville/Jefferson County Metropolitan Government, and the Northern Kentucky region bordering Cincinnati, Ohio.

[8] Fulton County is in Western Kentucky in the Jackson Purchase region.

Population Totals, Kentucky, 1900-2016

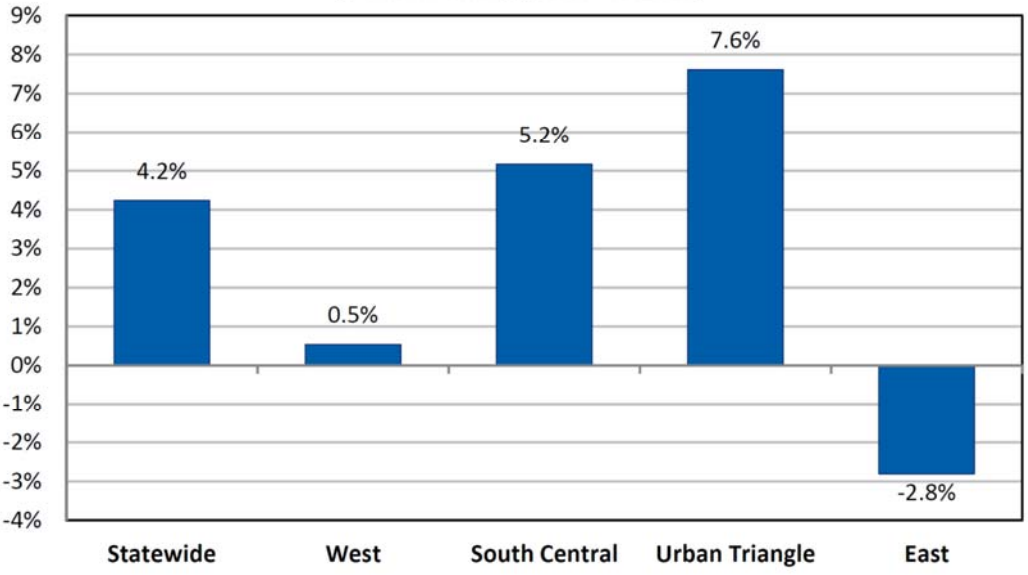
(millions)



Source: U.S. Census Bureau

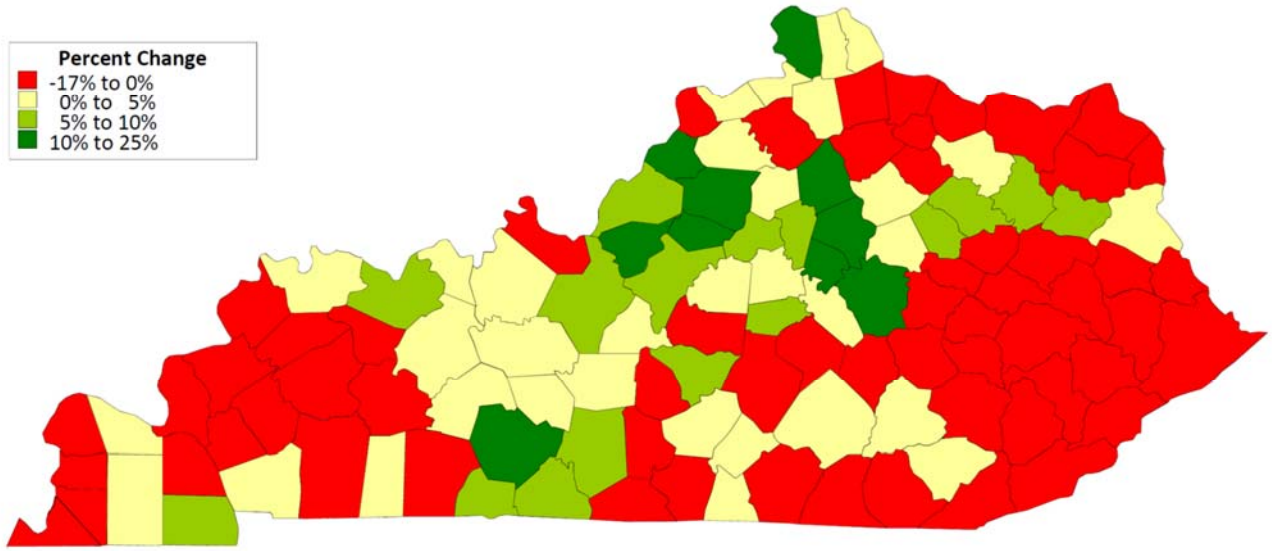
Population Change in Kentucky Regions, Peak of the Last Economic Expansion to the Present

(percent change, 2007 to 2016)



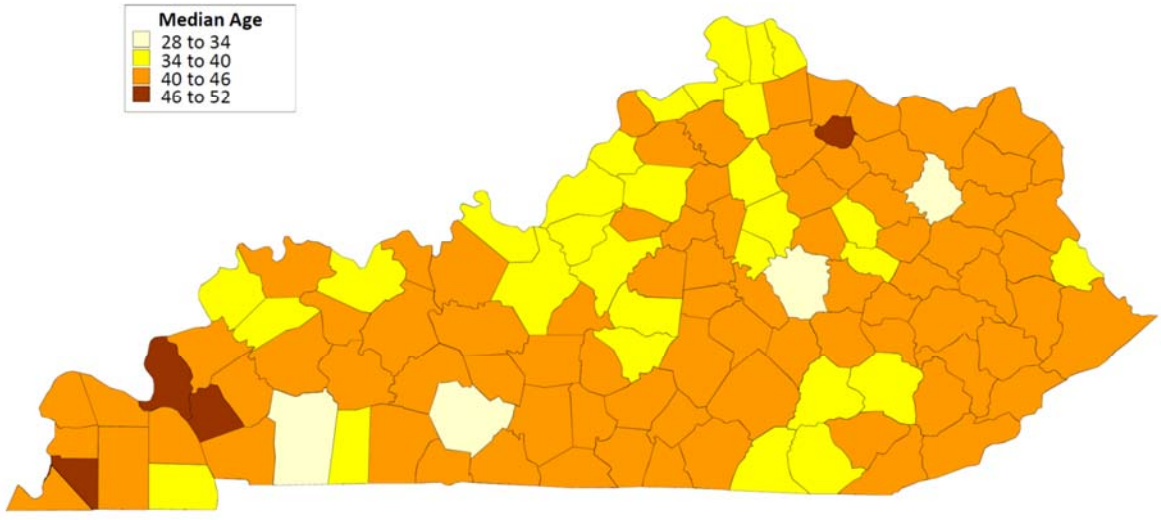
Source: Author's calculations using data from the U.S. Census Bureau. See glossary for map of Kentucky regions by county.

Kentucky County Population Change, 2007 to 2016

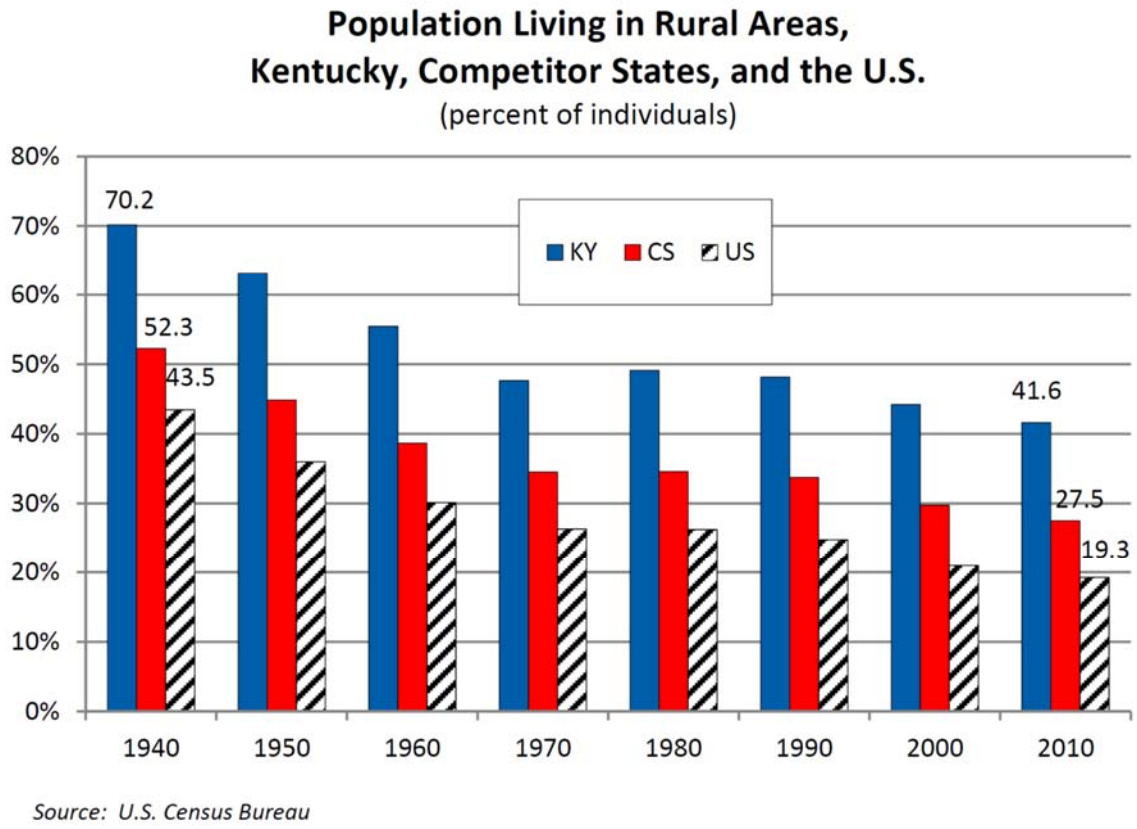


Source: U.S. Census Bureau

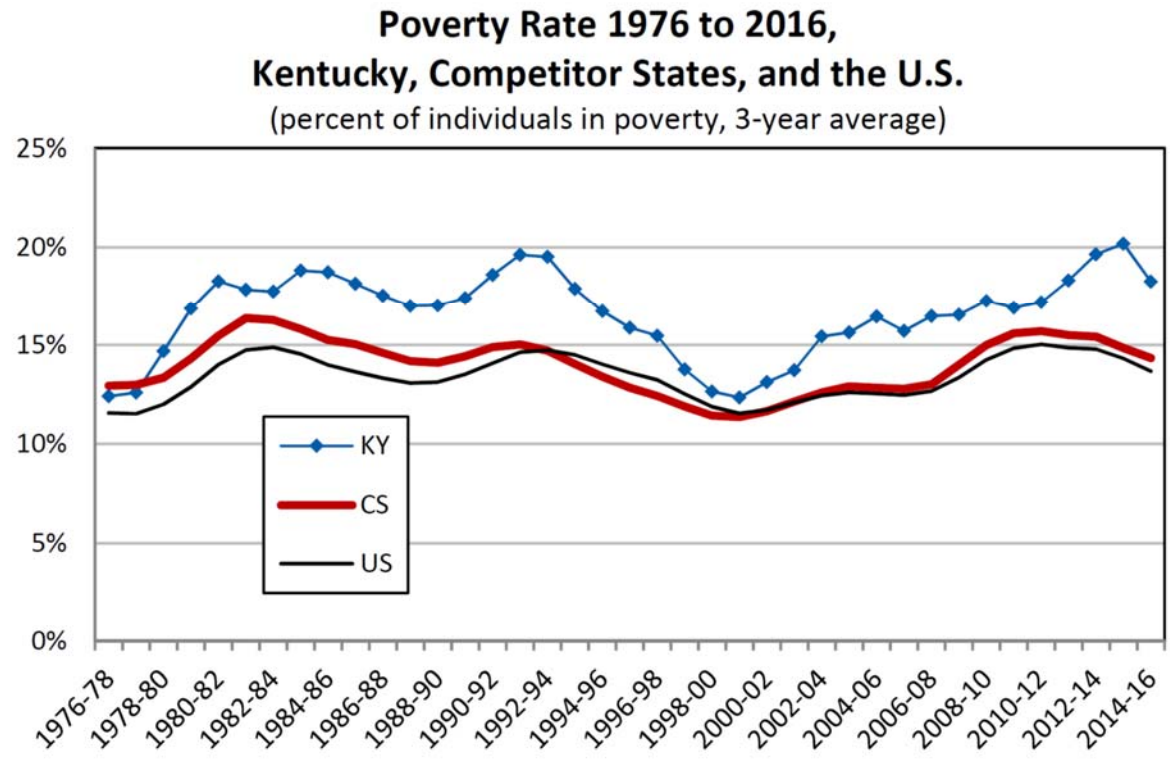
Median Age by County, 2012-2016



Source: U.S. Census Bureau, 2012-2016 5-Year American Community Survey



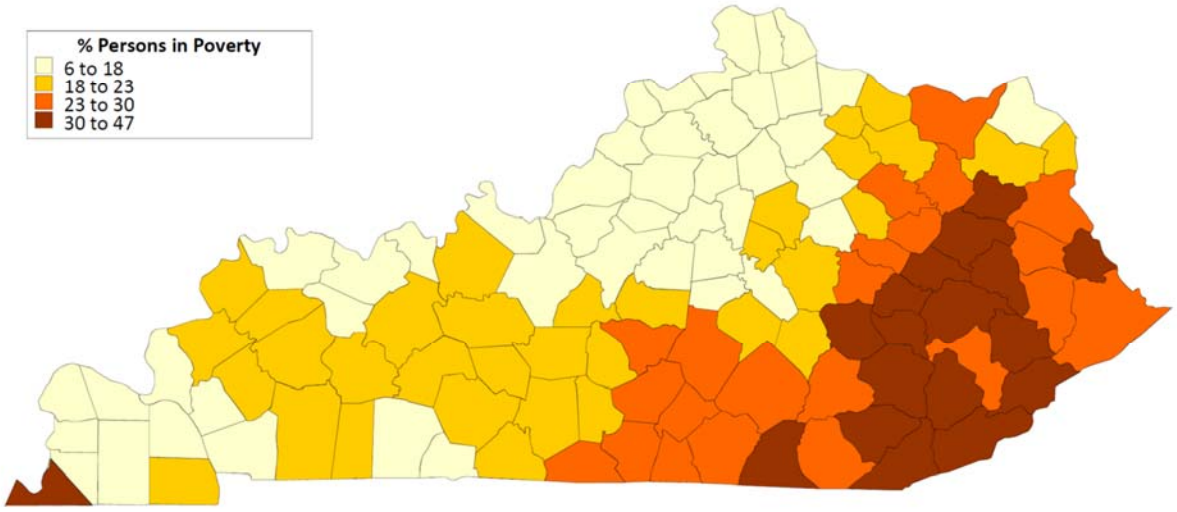
"While Kentucky has become increasingly urban over the years, a significant portion of Kentucky's population live in rural areas – especially compared to its competitor states and the U.S. In the 2010 Census, nearly 42 percent of Kentucky's population resided in rural areas (the balance of 58 percent live in urban areas), compared to about 28 percent in the competitor states and around 19 percent in the U.S. Rural communities can have many unique and appealing assets that provide a foundation for economic development activities. For example, natural amenities such as mountains, lakes, streams, forests, and wildlife can be used to leverage economic development and attract individuals hoping to find more idyllic surroundings. At the same time, there are many development challenges associated with building diverse economies and providing an adequate infrastructure in rural areas [2018 KAER, p. 228]."



Source: Author's analysis of IPUMS-CPS data, courtesy of Miriam King, Steven Ruggles, J. Trent Alexander, Sarah Flood, Katie Genadek, Matthew B. Schroeder, Brandon Trampe, and Rebecca Vick. Integrated Public Use Microdata Series, Current Population Survey: Version 3.0. [Machine-readable database]. Minneapolis: University of Minnesota, 2010.

"…[C]oncentrations of poverty have a significant negative effect on the fiscal health of cities and regions that, as a result, must shoulder higher spending. The U.S. poverty rate increased during the Great Recession and currently stands at around 14 percent. From about 1980 to the present, Kentucky's poverty rate has been consistently higher than both the U.S. and competitor states. The data in the chart show the 3-year moving average poverty rate estimated from the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS). According to the Census Bureau's 2016 American Community Survey 1-year estimate, another estimate of the poverty rate, Kentucky's poverty rate is 18.5 percent, which is higher than the competitor states (14.7%) and U.S. (14%) poverty estimates [2018 KAER, p. 96]."

Estimated County Poverty Rates, 2015



Source: U.S. Census Bureau, Small Area and Income Esimates (SAIPE)

"Kentucky's consistently poor counties are concentrated in Eastern Kentucky, but high poverty is found across the state. Poverty rates in Bell, Clay, Martin, McCreary, and Owsley Counties are over 40 percent – the highest in the state – while Bullitt, Boone, Oldham, and Spencer Counties have rates in the single digits. There can be, of course, concentrated pockets of poverty within counties with relatively low rates. At 24.7 percent, the 'mostly rural' counties generally have higher poverty rates than the 'slightly rural' (18.4%) and metro counties (15.3%) [2018 KAER, p. 97]."