2024 Safety Belt Usage Survey in Kentucky

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Kentucky Transportation Center
College of Engineering, University of Kentucky, Lexington, Kentucky

in cooperation with
Kentucky Transportation Cabinet
Commonwealth of Kentucky

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University of Kentucky

Research Report
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2024 Safety Belt Usage Survey in Kentucky

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Chapter 1 Introduction and Background

The use of safety belts is a proven means of reducing injuries to motor vehicle occupants involved in traffic crashes. Promoting and supporting safety belt usage is a top priority for transportation safety officials across the country. For years, there have been various methods used in efforts to increase safety belt usage. Past efforts have included public information campaigns, local and statewide legislation, and enforcement of legislation.

To evaluate the effectiveness of these efforts, statewide observational surveys are conducted. The first observational surveys in Kentucky were conducted in 1982 in tandem with a law that was passed by the 1982 Kentucky General Assembly that mandated a "restraint system" for children 40 inches or less in height. Annual surveys have been conducted ever since. In the first several years of the survey, seatbelt usage increased quickly, from four percent in 1982 to 42 percent in 1993. In 1994, Kentucky included mandatory seatbelt usage as a secondary enforcement law, meaning that law enforcement officials may penalize a vehicle occupant for not wearing a seatbelt if the driver is already being penalized for a separate infraction. In 2006, the seatbelt law became mandatory via primary enforcement, in which law enforcement officials may conduct traffic stops and write citations for lack of seatbelt usage without other infractions. Primary enforcement also coincided with a continuing increase in seatbelt usage. Examples of the increasing usage rates are 60 percent in 2000, 72 percent in 2007, and 86 percent in 2014. Usage rates have leveled off in more recent years, staying between 86 and 90 percent for the past decade. Still, collecting and understanding the safety belt data is a critical part of pursuing progress within the realm of transportation safety.

Historically, Kentucky's survey has included child safety seat presence, motorcycle helmet usage, and bicycle helmet usage as well as safety belt usage. Due to a variety of reasons, including relatively steady usage rates and difficulty collecting data, those aspects have since been removed from the study. Looking ahead, the state plans to reestablish the collection of child safety seat data every 4 years starting in 2025.

This study involved collecting and evaluating data from across the state to establish the safety belt usage rate in Kentucky for 2024. The effort supports the National Highway Traffic Safety Administration (NHTSA) seat belt safety initiatives. The survey began immediately after completion of the annual "Click It or Ticket" campaigns, lasted for ten weeks, and involved collecting data at 150 sites across 15 counties. Data from the individual sites were weighted and summarized into a statewide percentage. The resulting usage rate is presented in a variety of ways, considering attributes such as roadway functional classification, county, motor vehicle type, and amount of traffic. Kentucky's 2024 safety belt usage rate is valuable knowledge in itself but becomes more useful when compared to rates determined from previous surveys, which are included in the report. The 2024 survey and this report represent continued documentation of the effects associated with safety belt legislation, related education campaigns, and general public attitude.

Chapter 2 Survey Methodology

New survey sites were selected in 2023, as is required every five years. The survey design follows what has been done in recent years and is in accordance with NHTSA's Federal Register, Vol. 76, No. 63, Subpart B. The approach is considered a complex multistage sampling design. This chapter details the full process, from selecting counties to identifying data collection sites.

2.1 Selection of Counties and Number of Sites in Each County

- The number of highway fatalities was summarized for each of Kentucky's 120 counties for the five-year period of 2016 through 2020. Data were sourced from NHTSA's Fatality Analysis Reporting System (FARS), which provides yearly crash summaries. Occupant fatality totals were sorted, and those counties with fatality rates in the lowest 15th percentile were excluded from consideration. The result was a sample of 75 counties that were considered as eligible survey counties.

- While the number of data collection sites has varied in the past, all survey methodologies have resulted in a standard error of approximately one percent. Since 2013, the survey has comprised 150 sites in 15 counties. This is roughly 20 percent of the eligible counties.

- To ensure a geographically representative sample of counties across Kentucky, the selection methodology involved randomly selecting a county in each of the 12 Transportation Cabinet highway districts. The districts have similar numbers of counties and provide a good distribution across the state. Three of the districts include the state's major urban areas. Two counties were selected in each of these three urban districts, which resulted in the selection of a total of 15 counties.

- The only exception to the random selection procedure was the automatic selection of Jefferson and Fayette Counties, which are located in two of the urban districts. This was done because the number of vehicle miles traveled (VMT) in these counties (which contain Louisville and Lexington, respectively) is much higher than any other county. Any meaningful statewide sample must include these counties because they are the largest urban centers in Kentucky.

- The objective was to identify 150 data collection sites in the 15 selected counties. Based on results from past data collection, this number of sites would easily meet the 2.5 percentage point standard error criterion. Additional data would be collected if the standard error exceeded 2.5 percent.

- Past experience has shown that the number of vehicles observed varies dramatically by the site (depending on the average daily traffic [ADT] at the site). It is expected that there will be at least 50 observations made at every site. The total statewide sample size should be over 50,000.

- The number of sites selected in each county was based on county-level VMT data. In past survey designs, it was stated that the number of sites in each county was "roughly proportional" to its VMT and clusters were formed based on "intuitive cutoff points." For this survey design, further statistical rigor was introduced at this step: a k-means cluster analysis was performed on the county VMT values. This selects the optimal number of groupings. In this case, five clusters were identified. A cluster can include one or several counties.

- Using a linear Diophantine equation, each cluster was assigned a number of data collection sites. Solutions were constrained to multiples of three and ensured that the total number of sites in the state was 150.

- Counties with lower VMT had fewer assigned data collection sites than counties with higher VMT. The number of sites in a county varied from six to 24.

- Table 2.1 lists the counties selected. VMT values are given for each county. The five clusters of counties are delineated, and the number of sites in each county is noted.

Table 2.1 Selected Counties

County	Highway District	VMT (x1000)	VMT Cluster	Number of Sites
Pendleton	6	105774	1	6
Wolfe	10	107970	1	6
McCreary	8	159942	1	6
Harlan	11	198372	1	6
Larue	4	212646	1	6
Greenup	9	298290	1	6
Jessamine	7	388692	2	9
Floyd	12	402234	2	9
Marshall	1	500688	2	9
Franklin	5	525576	2	9
Barren	3	604266	2	9
Christian	2	1009062	3	12
Kenton	6	1431792	3	12
Fayette	7	2845284	4	21
Jefferson	5	6866526	5	24

- Figure 2.1 shows the location of the districts and counties across the state. These counties will be used from 2023 through 2027, in accordance with NHTSA requirements. This map includes the mini-survey locations as well (see Section 3.3 for more information.)

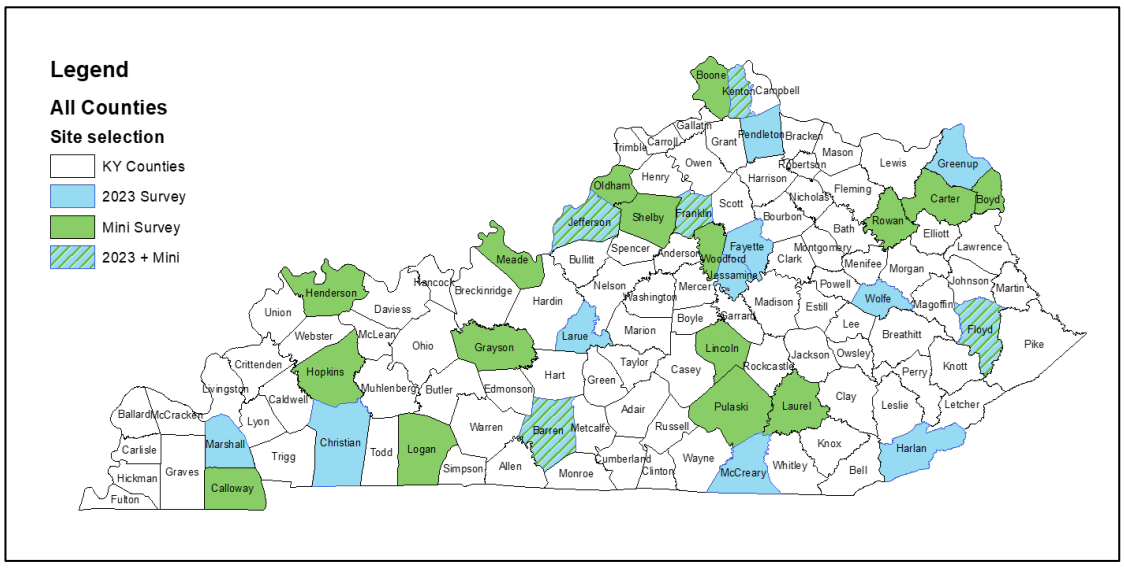


Figure 2.1 Map of Selected Counties in Kentucky

2.2 Assign Sites by Highway Type

- After the counties were selected and the number of data collection sites in each county determined, the next step was to assign the number of sites by highway type. Sites within a county were selected using a complex stratified random sampling, treating the counties as the stratum and road class as the stratification unit.

- The following three roadway types (road class stratum) were used:
    1. limited access; primary
    2. arterials; secondary
    3. local; tertiary

- Using the primary/secondary/tertiary classification system to stratify the roads within each county, the appropriate number of segments were selected within each group for the selected counties.

- Within a county, the candidate sites were subset into (at most) three functional classes: “primary”, “secondary”, and “tertiary.” Adjustments were made if a functional class did not have any roads in the county. In six of the 15 selected counties, there were no roads in the “limited access” category so no primary road segments were included.

- The number of sites was then divided up proportional to the total VMT for a roadway type relative to the overall county VMT. After rounding to the closest integer, if the sum of the number of sites did not equal the number of sites stated in the table, one site could be added or subtracted accordingly.

- R was employed for the county and site selection process. The R code is provided in Appendix G.

- Using the criteria as noted, Table 2.2 presents the number of sites by county and highway type. Of the 150 sites, there are 46 sites on limited-access roadways, 66 sites on arterials, and 38 sites on tertiary roads.

Table 2.2 Number of Sites in Each County by Road Class

Stratum: County	Total Number of Sites Allocated	County VMT (x1000)	Stratification Unit: Road Class	Population (DVMT)	Sample Count
Barren	9	604266	Primary	500346	3
			Secondary	433439	3
			Tertiary	357983	3
Christian	12	1009062	Primary	1319052	6
			Secondary	823310	4
			Tertiary	327696	2
Fayette	21	2845284	Primary	2941893	9
			Secondary	3052968	9
			Tertiary	809307	3
Floyd	9	402234	Primary	0	0
			Secondary	678149	6
			Tertiary	362911	3
Franklin	9	525576	Primary	577855	4
			Secondary	686795	4
			Tertiary	122045	1
Greenup	6	298290	Primary	0	0
			Secondary	538447	5
			Tertiary	171954	1
Harlan	6	198372	Primary	0	0
			Secondary	347930	4
			Tertiary	195996	2
Jefferson	24	6866526	Primary	9444963	13
			Secondary	6862556	9
			Tertiary	1422504	2
Jessamine	9	388692	Primary	0	0
			Secondary	683020	7
			Tertiary	188980	2
Kenton	12	1431792	Primary	2260467	7
			Secondary	907075	3
			Tertiary	550094	2
Larue	6	212646	Primary	161769	2
			Secondary	205444	3
			Tertiary	81110	1
Marshall	9	500688	Primary	648000	4
			Secondary	355044	3
			Tertiary	251450	2
McCreary	6	159942	Primary	0	0
			Secondary	182092	4
			Tertiary	114095	2
Pendleton	6	105774	Primary	0	0
			Secondary	144036	4
			Tertiary	82068	2
Wolfe	6	107970	Primary	116825	2
			Secondary	62979	2
			Tertiary	62209	2

2.3 Selection of Data Collection Sites

- After the counties and number of sites (by roadway type) in each county were selected, the next portion of the methodology involved: a) randomly selecting roadway segments in each roadway type and b) selecting specific sites within each segment.

- The road segment database employed KYTC's "All Roads" network file. The Kentucky All Roads file includes all public roads and is updated weekly. Within the dataset, some allowed exclusions were made, namely rural local roads, nonpublic roads, and the like. Using ArcGIS, the All Roads file was combined with Functional Classification data and Traffic Counts data. For each segment, Daily Vehicle Miles Traveled (DVMT) was used as the Measure of Size (MOS).

- Using the primary/secondary/tertiary classification system to stratify the roads within each county, the appropriate number of segments were selected within each group. Appendix B provides a map of site locations by highway type.

- The segment length (in terms of VMT) was factored into the selection process, with longer sections having a higher probability of selection than shorter sections.

- Within a functional class, sampling weights for the road segments were determined by dividing each road segment's DVMT by the total DVMT for that functional class within that county. Then, road segments were selected by sampling without replacement according to these sampling weights.

- The probability of selection (POS) was the probability of selecting a site from a functional class multiplied by the sampling weight used when drawing sites from within a county.

- Within the selected segment, observation points were identified. The segments were inspected either remotely, using online imagery, or through a site visit. Site selection ensured that observers could obtain data safely and effectively. Often, this meant positioning observer(s) at an intersection or overpass so they had an unobstructed view of traffic while not being too close to it.

- If applicable, the number of approaches (by direction of travel) and lanes on the approaches on the specified road were identified at each site. The approach and lane used to collect data were randomly selected.

- Appendix A (Table A1) contains a list of the 150 data collection sites. The county and road name or number are given along with a reference to locate the observation site. The highway where the data were to be collected is identified. Each site's VMT and the county VMT are given. The probability of selection for each site is provided.

- For each roadway type within a county, one additional segment was selected to serve as the "alternate." These alternates were utilized if no appropriate data collection observation point could be found within the original segment or if an identified observation site was unavailable for a substantial period of time (e.g., due to construction work). The list of available alternates is provided in Table A2 of Appendix A.

- In the 2023 survey, five alternates were used. To remain consistent, those five alternate sites were used again for this year's data collection and will continue to be used through 2027.

2.4 Data Collection Procedure

- Sites were clustered together for observation to maximize efficiency (and minimize time and travel costs). Sites in relatively close proximity to one another were designated data collection clusters. However, if there were multiple sites along the same road, care was taken to put them in different clusters to allow for a range in data observation days/times. Each cluster was assigned a random day for data collection. Within the cluster, data collectors could choose the order of sites to optimize their travel route that day.

- Data were collected for one hour at each site with either one or two data collectors (depending on the number of directions of travel included). One hour was required if data were gathered by one data collector in one direction of travel, whereas one half hour was needed if two data collectors observed separate directions of travel. There is a reasonable assumption that, for sites where one observer was used, the observed vehicles in one direction on a specific route in one hour will equal the number of vehicles on both directions on that route in a half hour. Sites requiring only one observer are divided roadways, low-volume roads, or T-intersections. On roads with higher traffic volumes, an equal distribution of traffic flow in each direction cannot be assumed; therefore, two observers were used, with one observing each direction. The use of a variable observation period (as described) does not affect the probability of selection.

- Data collection was scheduled to occur between June 3 and August 13. Data collection guidelines stated that data would be collected between 8:00 am and 6:00 pm on weekdays. The schedule included rush hour and non-rush hour observations. Start times were staggered to ensure the surveys captured a representative number of sites for each day of the week and time of day.

- Data were collected through direct observation. Appendix C contains the form used to collect and record data. Data were collected using paper forms. The form allows data collectors to record information such as the site number and the date and time of data collection. For drivers and front-seat passengers, the categories are:
    1. Safety belt used (shoulder belt is in front of shoulder),
    2. Safety belt not used (shoulder belt not in front of shoulder), and
    3. Unknown (cannot be determined if belt is used).

- The ratio of the total number of recorded unknown values of belt use to the total number of drivers and passengers observed must not exceed 10 percent. Additional data were collected if the nonresponse threshold was surpassed.

- The following vehicle types (both in-state and out-of-state vehicles) were included in the data collection:
    1. Passenger car (PC)
    2. Pickup (PU)
    3. Van
    4. Sport utility vehicle (SUV)

- Before starting data collection, data collectors received classroom training on data collection procedures. The classroom training included:
    1. An overview of the survey and project background
    2. Data clusters and scheduling observations
    3. How to collect data through direct observation and use of the data form
    4. Data input for analysis

After the classroom portion of the training, data collectors conducted trial surveys at locations representative of the three roadway types included in the survey. The project manager was present during these trial surveys to provide guidance. Trial survey results were evaluated to ensure the data collectors provided consistent and accurate data that aligned with data collected by other data collectors and the project manager.

- Drivers received no indication that data collectors were conducting a safety belt survey. At intersections, data were collected for vehicles either stopped or moving slowly enough to observe. At overpasses on limited access highways, an observation position was chosen to allow for an unobstructed view of the vehicle's front seat.

- For high-volume locations, randomized selection was achieved by recording data for the next vehicle in view after recording the previous data. At low-volume locations, data for the driver and outboard front-seat passenger were obtained for all vehicles so there was no need for a random selection.

- A quality control monitor conducted random visits to collect data at ten of the data collection sites. There were five data collectors and one quality control monitor. The objective was that data were compared for at least two sites for each data collector.

2.5 Usage Rate Calculations

The following paragraphs summarize the calculations used to estimate the statewide seat belt usage rate. Seat belt usage rates were calculated using formulas based on the proportion of the state's total vehicle miles traveled (VMT) represented by the site. The seat belt usage rate calculations followed a four-step process.

- First, estimated rates were calculated for each of the road strata within each county. Observed usage rates for all sites within each stratum-county combination were combined through simple averaging, as shown in Equation 1. (Since the sites' original probability of being included in the sample was proportional to their VMT, averaging their usage rates makes use of that sampling probability to reflect their different VMTs).

$$p_{i(j)k} = \sum_{l=1}^{n_{i(j)k}} p_{i(j)kl} \,/\, n_{i(j)k} \qquad \text{(Eq.1)}$$

where *i(j)* = county *i* within category *j* (category 1 = one randomly selected county, category 2 = the two districts in which one county was random and one county was forced, and category 3 = two randomly selected counties); *k* = road functional class stratum; *l* = site within stratum and county; $n_{i(j)k}$ = number of sites within the stratum-county combination; and $p_{i(j)kl}$ = the observed seat belt use rate at site *i(j)kl* = $B_{i(j)kl}/O_{i(j)kl}$ (where $B_{i(j)kl}$ = total number of belted occupants (drivers and outboard front-seat passengers) observed at the site and $O_{i(j)kl}$ = total number of occupants (excluding unknown usage) whose belt use was observed at the site).

- Second, a county-by-county seat belt use rate, $p_{i(j)}$, was obtained by combining county-stratum seat belt use rates across strata within counties. These were weighted by the class's relative contribution to total county VMT:

$$p_{i(j)} = \frac{\sum_k VMT_{i(j)k}\, p_{i(j)k}}{\sum_k VMT_{i(j)k}} \qquad \text{(Eq. 2)}$$

where $VMT_{i(j)k}$ = VMT of all roads in stratum *k* in county *i(j)*, and $p_{i(j)k}$ = seat belt use rate for stratum *k* in county *i(j)*.

- In the third step, category-weighted seat belt use rates were obtained by combining and weighting the rates from the sampled counties in each category by their VMT values and probabilities of being selected:

$$p_{i(j)} = \frac{\sum_i VMT_{i(j)} W_{i(j)} p_{i(j)}}{\sum_k VMT_{i(j)} W_{i(j)}} \quad \text{(Eq. 3)}$$

where $VMT_{i(j)}$ = total VMT for county *i* in category *j* and $W_{i(j)}$ = the inverse of the probability of the county's selection: where *j* is one of the three following categories:

<u>One county randomly selected from district (*j* = 1)</u>
Highway Districts 1,2,3,4,8,9,10,11, and 12

$$W_{i(1)} = \frac{\sum_{L=1}^{x_m} VMT_{L(1)}}{VMT_{i(1)}} \quad \text{(Eq. 4)}$$

where *m* = county *i*'s district, x_m = the number of counties in District *m*, *L* is the L[th] county in District *m*, $VMT_{L(1)}$ = the VMT in county *L*, $VMT_{i(1)}$ = the VMT in county *i*.

<u>One county randomly selected from district and one county certainly selected (*j* = 2)</u>
Highway Districts 5 and 7

$$W_{i(2)} = \frac{\sum_{L=1}^{y_m} VMT_{L(2)}}{VMT_{i(2)}} \quad \text{(Eq. 5)}$$

where *m* = county *i*'s district, y_m = the number of counties in district *m* excluding the certain county, *L* is the L[th] county in district *m*, $VMT_{L(2)}$ = the VMT in county *L*, $VMT_{i(2)}$ = the VMT in county *i*.

Or for certainty counties:

$$W_{i(2)} = 1$$

<u>Two counties randomly selected from district (*j* = 3)</u>
Highway District 6 only

$$W_{i(3)} = \frac{\sum_{L=1}^{11} VMT_{L(3)}}{2 \times VMT_{i(3)}} \quad \text{(Eq. 6)}$$

where *L* is the L[th] county in District 6, $VMT_{L(3)}$ = the VMT in county *L*, $VMT_{i(3)}$ = the VMT in county *i*.

Finally, the statewide belt use proportion was calculated by combining the category proportions weighted by their proportion of statewide VMT:

$$p = \frac{\sum_{j=1}^{3} VMT_j p_j}{\sum_{j=1}^{3} VMT_j} \qquad \text{(Eq. 7)}$$

The result is a combination of the individual site seat belt usage rates weighted to reflect each site's importance in the total state VMT.

Estimates for occupant subgroups, such as drivers or passengers and vehicle type (e.g., passenger car, pickup, etc.) were calculated using the same procedure.

2.6 Nonresponsive Judgement

- Based on data collection protocol and past experience, including the provision for using alternate observation sites, road segments with non-zero eligible volume and zero observations conducted should not occur. Nevertheless, if eligible vehicles passed an eligible site or an alternate eligible site during the observation time, but no usable data were collected for some reason, this site would be considered a non-responding site. The weight for a non-responding site was distributed over other sites in the same road type in the same primary sampling unit (PSU).

  Let:

  $$\pi_{gchi} = \pi_{gc}\pi_{hi|gc}$$

  be the road segment selection probability, and

  $$w_{gchi} = \frac{1}{\pi_{gchi}}$$

  be the road segment weight.

  The non-responding site nonresponse adjustment factor:

  $$f_{gch} = \frac{\sum_{all\ i} w_{gchi}}{\sum_{responding\ i} w_{gchi}}$$

  would be applied to all weights of non-missing road segments in the same road type of the same county, and the missing road segments would be dropped from the analysis file. However, if no vehicles passed the site during the selected observation time (60 minutes) this was treated as an empty block. Accordingly, the site would not be considered as a non-responding site and would not require nonresponse adjustment.

2.7 Imputation

No imputation was done on missing data.

2.8 Standard Error Calculation

- The standard error of the overall seat belt usage rate was calculated using the following procedure. Standard error of estimate values was estimated through a delete-1 jackknife approach, based on the general formula:

$$\hat{\sigma}_{\hat{p}} = [\frac{n-1}{n} \sum_{(i)=1}^{n} (\hat{p}_{(i)} - \hat{p})^2]^{1/2} \qquad \text{(Eq. 8)}$$

where $\hat{\sigma}_{\hat{p}}$ = standard deviation (standard error) of the estimated statewide seat belt use proportion $\hat{p}$ (equivalent to *p* in the notation of formulas 1-3; *n* = the number of sites (i.e., 150); and $\hat{p}_{(i)}$ = the estimated statewide belt use proportion with site *i* excluded from the calculation.

The relative error rate, i.e., $\hat{\sigma}_{\hat{p}} / \hat{p}$, was also calculated, as well as the approximate 95% confidence interval (i.e., $\hat{p} \pm 1.96\hat{\sigma}_{\hat{p}}$). These values were reported for the overall statewide seatbelt usage rate.

Chapter 3 Results

3.1 2024 Statewide Survey

- Table 3.1 summarizes safety belt usage rates for all front-seat occupants (drivers and passengers) for the three road classifications. The overall statewide usage rate in 2024, based on the data collected at 150 sites and derived through the described weighting procedure, was 87.80 percent.

- The true overall safety belt usage rate in Kentucky for 2024 was between 86.67 percent and 88.95 percent, with 95 percent confidence. This includes a standard error of 0.58 percent, which yields a margin of error of 1.14 percent.

- The sample size of all front-seat occupants was 75,538.

- The 2024 data reflect a 1.6 percent decrease in safety belt usage compared to 2023 (89.4 percent).

- The statewide usage rate for drivers was 87.7 percent while the rate for front-seat passenger was 88.3 percent. Compared to 2023, there was a greater decrease in seatbelt use among drivers than among passengers.

- Usage rates varied by road classification. The average usage rate was 91.9 percent on limited access (primary) roads, 87.2 percent on arterial (secondary) roads, and 81.7 percent on local (tertiary) roads.

Table 3.1 Usage Rates for Front-Seat Occupants (By Road Class)

	OCCUPANT TYPE		
ROAD CLASSIFICATION	Drivers	Passengers	All Occupants
Limited Access	91.8	92.8	91.9
Arterials	87.4	85.1	87.2
Locals	80.9	86.5	81.7
All Roads	87.7	88.3	87.8

- Appendices D and E provide summaries of the data collected by site. For each site, the usage rate and sample size are given for all front-seat occupants, drivers, and front-seat passengers. The relative error and confidence interval are given for the *all front seat occupants* category. The percent unknown is given for each site. Also included are the site type (original or alternate), date observed, and site sample weight (inverse of probability of selection).

- There was a wide range of usage rates among the survey sites. The three lowest usage rates were 24.0 percent and 53.3 percent on rural local roads in Floyd County, and 54.7 percent on a local road in Christian County. The three highest usage rates were 97.2 percent on a secondary road in Jessamine County, and 96.4 percent and 96.5 percent on interstates in Jefferson County. The range of usage rates seen among sites has been increasing for the past several years.

- There were 59 sites that had usage rates of 90 percent or more. Meanwhile, there were 23 sites that had usage rates less than 80 percent.

- The highest unknown rate at any site was 30.4 percent at a secondary road in Wolfe County. Of the 150 sites, 25 sites had unknown usage rates exceeding ten percent. The average unknown rate from all sites was 3.91 percent. According to data collectors, tinted windows and windshields are becoming increasingly common, contributing to a large unknown rate.

- A substantial difference in usage rate (for all front-seat occupants) was noted when vehicle type and road class were considered (see Table 3.2). The rate varied by vehicle type — from a low of 71.5 percent for pickup trucks on local roads to a high of 93.5 percent for SUVs on limited access roads.

- Examining usage rates according to road class revealed that rates ranged from 81.7 percent on local roads to 91.9 percent on limited access highways.

- Passenger cars, pickups, and SUVs followed the usual trend of exhibiting the lowest usage rates on local roads and the highest rates on limited access highways. Conversely, for vans, occupant usage rate was highest on local roads.

- For each road classification, the lowest usage rate was for pickups. Pickups were the only vehicle class for which usage rates did not reach 90 percent on any roads this year.

Table 3.2 Usage Rates for Front-Seat Occupants (By Road Class and Vehicle Type)

	VEHICLE TYPE				
ROAD CLASSIFICATION	Passenger Car	Pickup	Van	SUV	All Vehicles
Limited Access	91.6	87.6	92.4	93.5	91.9
Arterials	86.5	81.0	90.1	90.2	87.2
Locals	81.4	71.5	93.2	86.9	81.7
All Roads	87.5	81.6	91.3	90.7	87.8

- Table 3.3 summarizes usage rate by county. These varied from a high of 90.8 percent in Fayette County and Franklin County to a low of 70.7 percent in Floyd County.

- Usage rates exceeded 90 percent in three counties: Fayette, Franklin, and Kenton.

- Usage rates were less than 80 percent in three counties: Floyd, Harlan, and Wolfe.

Table 3.3 Usage Rates for Front-Seat Occupants (By County)

	OCCUPANT TYPE		
COUNTY	Drivers	Passengers	All Occupants
Barren	87.9	90.6	88.2
Christian	84.7	84.3	84.5
Fayette	90.5	91.9	90.8
Floyd	71.9	62.7	70.7
Franklin	90.6	92.6	90.8
Greenup	87.1	90.8	87.9
Harlan	77.5	73.9	76.7
Jefferson	89.9	89.6	89.8
Jessamine	87.8	93.1	88.3
Kenton	90.1	88.8	90.4
Larue	83.3	84.9	83.4
Marshall	87.9	92.2	88.7
McCreary	81.9	80.8	81.8
Pendleton	82.6	86.7	83.3
Wolfe	75.7	84.8	77.5
All Counties	87.7	88.3	87.8

- Usage rates by county and vehicle type are presented in Table 3.4. These rates ranged from a high of 94.1 percent for vans in Larue County to a low of 61.2 percent for pickup trucks in Floyd County.

- Historically, SUVs have the highest usage rate and pickup trucks have the lowest usage rate. This year, vans had a higher usage rate than SUVs (91.3 percent compared to 90.7 percent, respectively), while pickups remained the lowest (81.6 percent).

- The percentage of van occupants using seatbelts was especially high this year. Eleven of the surveyed counties had usage rates for vans that exceeded 90 percent. In 2023, nine counties recorded van usage rates above 90

percent, while in 2022 only six counties did, demonstrating increasing safety belt usage rates among van occupants.

- Usage rates for pickup trucks was less than 80 percent in nine counties, which mirrors last year's survey. Three counties had pickup usage rates below 70 percent — Floyd County (61.2 percent), Harlan County (65.2 percent), and Wolfe County (67.6 percent.) No other vehicle class had average usage rates less than 70 percent.

Table 3.4 Usage Rates for Front-Seat Occupants (By County and Vehicle Type)

	VEHICLE TYPE				
COUNTY	Passenger Car	Pickup	Van	SUV	All Vehicles
Barren	86.3	81.6	92.3	93.5	88.2
Christian	83.5	79.0	91.8	88.0	84.5
Fayette	90.7	85.4	90.2	93.0	90.8
Floyd	70.0	61.2	86.1	76.4	70.7
Franklin	90.9	87.6	93.2	91.9	90.8
Greenup	89.1	83.2	91.8	88.8	87.9
Harlan	83.7	65.2	92.7	78.7	76.7
Jefferson	88.9	84.6	92.2	92.2	89.8
Jessamine	89.6	77.6	92.6	91.9	88.3
Kenton	90.1	84.0	92.2	92.3	90.4
Larue	81.8	73.2	94.1	89.8	83.4
Marshall	89.3	82.5	90.1	91.5	88.7
McCreary	80.9	73.5	88.7	89.1	81.8
Pendleton	80.5	75.6	88.3	89.4	83.3
Wolfe	78.4	67.7	83.9	81.9	77.5
All	87.5	81.6	91.3	90.7	87.8

- The current survey counties will be used from 2023 through 2027. During this period, it will be useful to track the usage rates of individual counties. Table 3.5 compares overall usage rates in 2023 and 2024 for these counties. This table will continue to expand in the next few years, offering more insight into specific communities.

Table 3.5 Usage Rates by County (By Year)

	YEAR	
COUNTY	2023	2024
Barren	87.4	88.2
Christian	89.3	84.5
Fayette	93.5	90.8
Floyd	79.0	70.7
Franklin	93.5	90.8
Greenup	80.4	87.9
Harlan	80.4	76.7
Jefferson	90.5	89.8
Jessamine	88.8	88.3
Kenton	93.0	90.4
Larue	87.8	83.4
Marshall	90.5	88.7
McCreary	81.4	81.8
Pendleton	86.1	83.3
Wolfe	84.1	77.5
All Counties	89.4	87.8

3.2 Safety Belt Trends

While the data collection procedure has changed several times, and redesigns occur every five years to ensure a fair sample, it is still valuable to compare the 2024 usage rate to rates from past years. As shown in Table 3.5, statewide rates increased dramatically from four percent in 1982 to just under 90 percent by 2018. Generally, Kentucky's usage rate has hovered between 85 and 90 percent for the past decade.

Table 3.6 Trend in Statewide Safety Belt Usage Rates (Percent Wearing Seatbelts)

YEAR	All Front Seat Occupants	Drivers	Children
1982	**	4	15
1983	**	6	24
1984	**	7	30
1985	9	9	29
1986	13	13	30
1988	20	21	48
1989	25	26	49
1990	33	32	57
1991	39	39	57
1992	40	41	62
1993	42	42	61
1994	58	58	72
1995	54	54	66
1996	55	55	79
1997	54	54	82
1998	54	54	80
1999	59	59	89
2000	60	60	87
2001	62	62	89
2002	62	62	93
2003	66	65	95
2004	66	66	96
2005	67	67	94
2006	67	68	94
2007	72	72	98
2008	73	74	98
2009	80	80	99
2010	80	81	96
2011	82	83	97
2012	84	84	98
2013	85	85	**
2014	86	87	**
2015	87	87	**
2016	87	87	**
2017	87	87	**
2018	90	90	**
2019	90	90	**
2020	90	90	**
2021	90	90	**
2022	87	86	**
2023	89	89	**
2024	88	88	**

*Children under 4 years of age using either safety seat or safety belt. Children seated in front or rear seat. **Data not obtained.

- Figure 3.1 presents the preceding data as a line graph. As illustrated, the increase in usage rate has slowed and remains just under 90 percent.

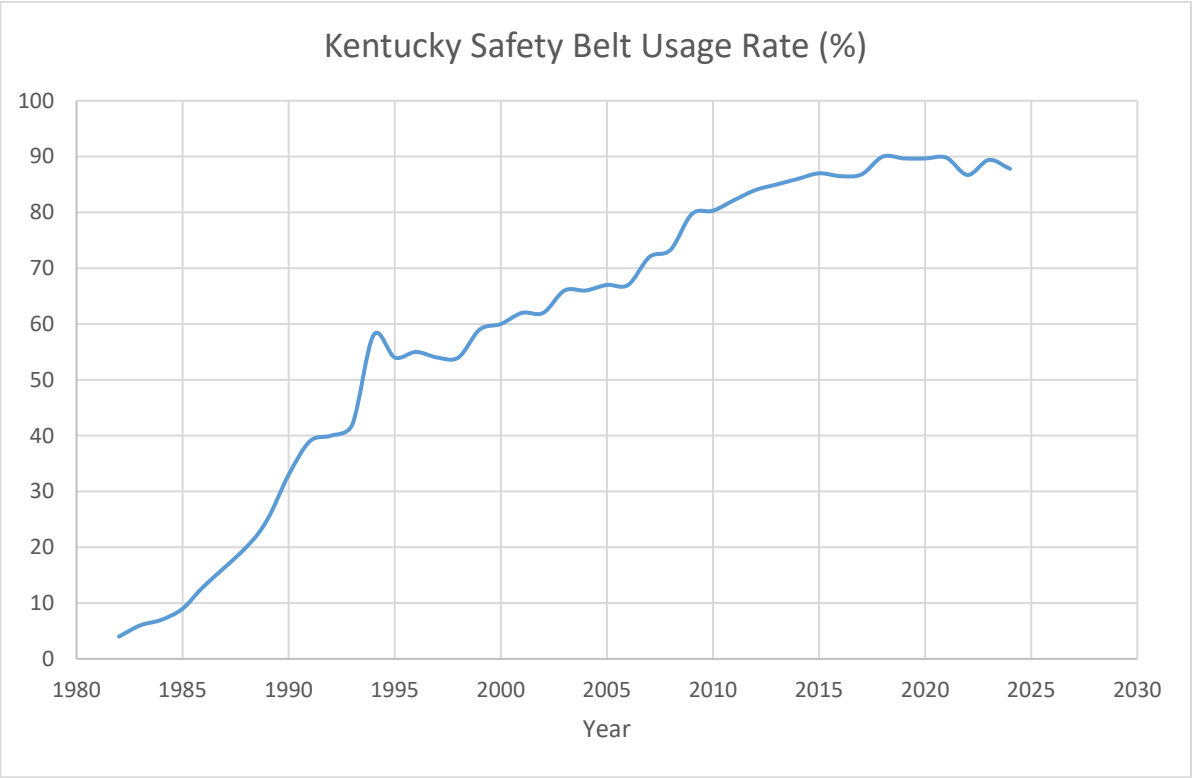


Figure 3.1 Trends in Seatbelt Usage from 1984-2024

3.3 Mini Survey

- Survey locations have often changed due to modifications in data collection procedure and survey redesigns. To provide a consistent baseline by which to evaluate data, mini-surveys have been performed in tandem with the main one. For the past several years, mini-surveys have collected data at 21 sites (selected from the 200 sites for the survey first used prior to the change in sites made in 2009). The 21 sites represented seven road functional classifications and three regions of the state.

- This mini-survey was conducted in 2024 to enable a comparison of identical sites over an extended number of years.

- The usage rate at the mini-survey locations in 2024 was 86.5 percent. This is a 3.1 percent decrease from 89.6 percent in 2023. This shows consistency with official statewide survey results, though there is a greater discrepancy in the mini-survey.

- Compared to last year's mini-survey, usage rates increased at three locations, stayed the same at two locations, and decreased at sixteen locations.

- Figure 3.2 shows the trends in safety belt usage rates from the regular survey and mini-survey since the latter began in 2009.

- Appendix F contains the results for the mini-survey sites for the last ten years since 2014.

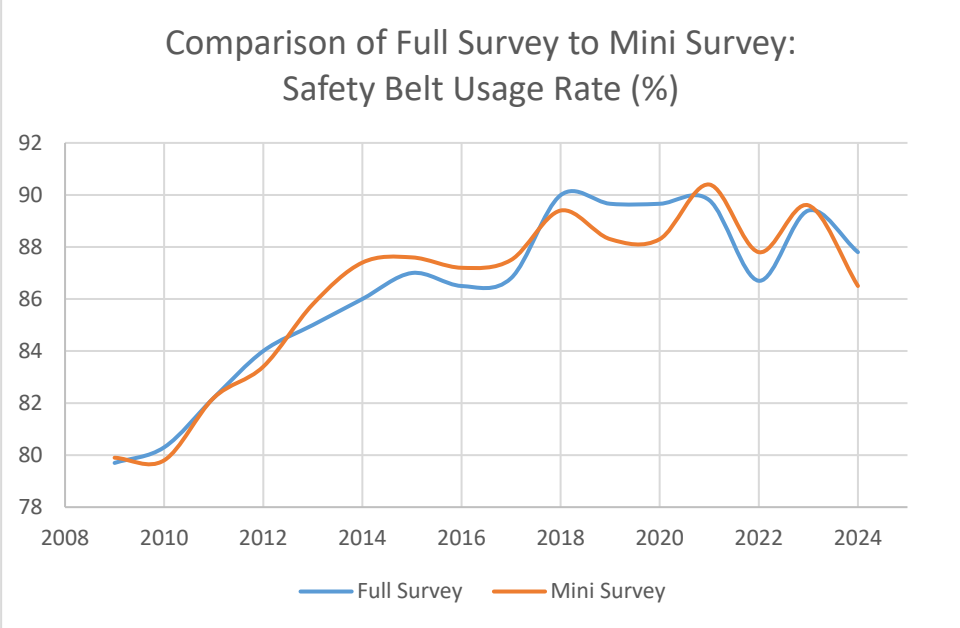


Figure 3.2 Safety Belt Usage Rates according to the Full Survey and the Mini-Survey

Chapter 4 Conclusions and Recommendations

- Kentucky's safety belt usage rate in 2024 (87.80 percent) was 1.6 percent lower than in 2023 (89.40 percent).
- The highest usage rate since the surveys began was 89.99 percent in 2018, but the surveys illustrate a gradual flattening of the curve or "regression toward the mean."
- A change in approach is needed if a continued rise in seatbelt usage is the state's objective. Such changes may be focused on stronger enforcement of safety belt laws and/or increased education in targeted areas.
- Safety belt usage varies by county and vehicle type. Focusing on this variability indicates locations where more emphasis would be beneficial.
- Data show that occupants of pickups have the lowest usage rates. The exemption for safety belt use for occupants of farm vehicles should be changed. Education campaigns focused on pickup drivers in rural areas should be considered.
- Modifying the driver point system so that a driver receives points when they are cited for failure to use a safety belt should be considered. This could aid enforcement.
- Consideration should be given to increasing the dollar amount drivers are fined when cited for failure to wear a safety belt.

Appendix A Data Collection Sites

Table A1 Data Collection Sites

Site	District	County	Road Class	Road Surveyed	Reference	Segment VMT	County Eligible VMT	Probability of Selection
1	3	Barren	primary	I-65	Mammoth Cave Rd	146471.787	500346.058	0.219555722
2	3	Barren	primary	CUMBERLAND PARKWAY	Beckton Rd	37374.273	500346.058	0.056022635
3	3	Barren	primary	CUMBERLAND PARKWAY	Veterans Outer Loop	18494.163	500346.058	0.027722058
4	3	Barren	secondary	HAPPY VALLEY RD	Paddock Way	783.246	433439.32	0.001355287
5	3	Barren	secondary	HAPPY VALLEY RD	Buena Vista Estates	749.558	433439.32	0.001296995
6	3	Barren	secondary	N JACKSON HWY	Horton Ridge Rd	5233.371	433439.32	0.009055543
7	3	Barren	tertiary	GLENVIEW DR	Adairland Ct	702.16	357982.584	0.001471077
8	3	Barren	tertiary	PARK CITY BON AYR RD	Mayhew Rd	643.08	357982.584	0.0013473
9	3	Barren	tertiary	LOUISVILLE RD	Mammoth Cave Ave	183.414	357982.584	0.000384266
10	2	Christian	primary	I-169	Grapevine Rd	31173.084	1319052.364	0.017724704
11	2	Christian	primary	I-24	Newstead Rd	59984.506	1319052.364	0.034106591
12	2	Christian	primary	I-24	Cox Mill Rd	119400.928	1319052.364	0.067890175
13	2	Christian	primary	I-24	Millers Mill Rd	80486.924	1319052.364	0.045764061
14	2	Christian	primary	I-24	Pembroke Oak Grove Rd	14909.175	1319052.364	0.008477208
15	2	Christian	primary	I-24	Carter Rd	113754.78	1319052.364	0.064679832
16	2	Christian	secondary	COUNTRY CLUB LN	Forbes Dr	150.84	823309.554	9.16059E-05
17	2	Christian	secondary	PEMBROKE RD	Duffy St	3401.2	823309.554	0.002065566
18	2	Christian	secondary	FORT CAMPBELL BLVD	Hopkinsville Towne Center	1443	823309.554	0.000876341
19	2	Christian	secondary	CADIZ RD	Green Hill Memorial Gardens	2412.816	823309.554	0.001465315
20	2	Christian	tertiary	GLASS AVE	North Elm St	490.25	327696.214	0.000374013
21	2	Christian	tertiary	CROFTON-FRUIT HILL RD	Macedonia Loop	256.452	327696.214	0.000195648
22	7	Fayette	primary	I-64	North Cleveland Rd	215612.45	2941892.627	0.659613486
23	7	Fayette	primary	I-64	Haley Rd	70969.248	2941892.627	0.217113033
24	7	Fayette	primary	I-75	Old Richmond Rd	61019.715	2941892.627	0.186674874
25	7	Fayette	primary	I-75	US-25	15295.784	2941892.627	0.046793705
26	7	Fayette	primary	I-75	Athens Walnut Hill Rd	307393.844	2941892.627	0.940396183
27	7	Fayette	primary	I-75	Todds Rd	205546.1	2941892.627	0.628817953
28	7	Fayette	primary	I-75	Bryan Station Rd	142037.632	2941892.627	0.434529349
29	7	Fayette	primary	I-75	Georgetown Rd	86351.232	2941892.627	0.264170446
30	7	Fayette	primary	W NEW CIRCLE RD	Old Frankfort Pike	85279.6	2941892.627	0.260892051

Site	District	County	Road Class	Road Surveyed	Reference	Segment VMT	County Eligible VMT	Probability of Selection
31	7	Fayette	secondary	MAN O WAR BLVD	Buckhorn Dr	5304	3052967.619	0.015635934
32	7	Fayette	secondary	E NEW CIRCLE RD	Winchester Rd	11615.892	3052967.619	0.034243084
33	7	Fayette	secondary	NICHOLASVILLE RD	Marketplace Dr	5121.2	3052967.619	0.015097048
34	7	Fayette	secondary	NICHOLASVILLE RD	Arcadia Park	3763.8	3052967.619	0.011095499
35	7	Fayette	secondary	NICHOLASVILLE RD	Cooper Dr/Waller Ave	1698.3	3052967.619	0.005006506
36	7	Fayette	secondary	PARIS PIKE	La Troienne Way	1970.072	3052967.619	0.005807676
37	7	Fayette	secondary	VERSAILLES RD	Old Versailles Rd	14364.218	3052967.619	0.042345016
38	7	Fayette	secondary	WINCHESTER RD	Executive Dr	2566.8	3052967.619	0.007566802
39	7	Fayette	secondary	W MAIN ST	Clyde St	3062.043	3052967.619	0.009026754
40	7	Fayette	tertiary	CHINOE RD	Alumni Dr	925.708	809306.895	0.003431484
41	7	Fayette	tertiary	OLD HIGBEE MILL RD	Clemens Dr	852.048	809306.895	0.003158436
42	7	Fayette	tertiary	RUSSELL CAVE RD	Iron Works Pike	1681.01	809306.895	0.006231295
43	12	Floyd	secondary	KY-80	Maple St	4209.427	678149.371	0.00931084
44	12	Floyd	secondary	KY-80	Reynolds Ln/River Bottom Rd	1929.068	678149.371	0.00426691
45	12	Floyd	secondary	KY-80	Old Hunter Branch Rd	1867.502	678149.371	0.004130732
46	12	Floyd	secondary	US-23	Harold Church of Christ	4414.12	678149.371	0.009763601
47	12	Floyd	secondary	US-23	Rose Dr	16196.07	678149.371	0.035824121
48	12	Floyd	secondary	US-23	University Dr	4763.55	678149.371	0.010536506
49	12	Floyd	tertiary	KY-306	Lighthouse Temple Church	375.816	362910.699	0.00077667
50	12	Floyd	tertiary	KY-404	Blue River Rd	435.812	362910.699	0.00090066
51	12	Floyd	tertiary	KY-550	Old Schoolhouse Rd	805.94	362910.699	0.001665575
52	5	Franklin	primary	I-64	Hickory Ridge Rd	14144.343	577854.878	0.019581862
53	5	Franklin	primary	I-64	US-127	127148.528	577854.878	0.176028318
54	5	Franklin	primary	I-64	Hanly Ln	104512.056	577854.878	0.144689693
55	5	Franklin	primary	I-64	Duckers Rd	93474.018	577854.878	0.129408295
56	5	Franklin	secondary	EAST WEST CONNECTOR RD	Collins Ln	4953.138	686794.973	0.005769568
57	5	Franklin	secondary	EAST WEST CONNECTOR RD	Galbraith Rd	13984.722	686794.973	0.016289836
58	5	Franklin	secondary	US-127 S	Leonardwood Dr/Westridge Dr	3587	686794.973	0.004178248
59	5	Franklin	secondary	GEORGETOWN RD	Woodlake Rd	2677.128	686794.973	0.003118401
60	5	Franklin	tertiary	EVERGREEN RD	Bridgeport Christian Church	1009.47	122045.0838	0.001654258
61	9	Greenup	secondary	KY-10	East Tygarts Rd	682.52	538446.9686	0.001584464

Site	District	County	Road Class	Road Surveyed	Reference	Segment VMT	County Eligible VMT	Probability of Selection
62	9	Greenup	secondary	US-23	Ashland Dr	5489.634	538446.9686	0.012744138
63	9	Greenup	secondary	US-23	Chinns Brg	5728.89	538446.9686	0.013299569
64	9	Greenup	secondary	US-23	Grays Branch Rd	4078.62	538446.9686	0.009468481
65	9	Greenup	secondary	US-23	Antique Loop	2431.542	538446.9686	0.005644804
66	9	Greenup	tertiary	COUNTRY CLUB DR	Princess Dr	830.705	171954.4796	0.00120774
67	11	Harlan	secondary	KY-160	Red Barn Mini Market	752.402	347930.145	0.001236955
68	11	Harlan	secondary	US-119 S	Carpet Mart	6854.25	347930.145	0.011268443
69	11	Harlan	secondary	US-119 N	KY-522/Ross Dr	1226.67	347930.145	0.002016655
70	11	Harlan	secondary	US-119 N	Lakey Branch Rd	2957.084	347930.145	0.00486147
71	11	Harlan	tertiary	KY-38	Dartmont Rd	1199.156	195996.001	0.001749825
72	11	Harlan	tertiary	KY-215	Hubbard Ln	188.305	195996.001	0.000274777
73	5	Jefferson	primary	I-64	Breckenridge Ln	89372.76	9444962.556	0.123012227
74	5	Jefferson	primary	I-64	Blankenbaker Parkway	23070.8	9444962.556	0.031754536
75	5	Jefferson	primary	I-64	S. English Station Rd	104576.4	9444962.556	0.143938443
76	5	Jefferson	primary	I-65	KY-1065	87704.66	9444962.556	0.120716263
77	5	Jefferson	primary	I-65	Arthur St/E Lee St	36701.826	9444962.556	0.050516213
78	5	Jefferson	primary	I-65	E Magnolia Ave entrance ramp	44520.53	9444962.556	0.061277838
79	5	Jefferson	primary	I-71	Lime Kiln Ln	92151.954	9444962.556	0.126837496
80	5	Jefferson	primary	I-264	Brownsboro Rd	36279.225	9444962.556	0.049934547
81	5	Jefferson	primary	I-265	Smyrna Parkway	98944.674	9444962.556	0.136186963
82	5	Jefferson	primary	I-265	Pennsylvania Run Rd	89360.04	9444962.556	0.122994719
83	5	Jefferson	primary	I-265	Wolf Pen Branch Rd	13497.165	9444962.556	0.018577432
84	5	Jefferson	primary	I-265	Old Henry Rd	20356.38	9444962.556	0.028018421
85	5	Jefferson	primary	I-265	Greyling Dr	103294.08	9444962.556	0.142173464
86	5	Jefferson	secondary	TAYLORSVILLE RD	Stone Lakes Dr	1599.99	6862555.918	0.00209833
87	5	Jefferson	secondary	TAYLORSVILLE RD	Jeffersontown Christian Church	5623.538	6862555.918	0.007375072
88	5	Jefferson	secondary	WESTPORT RD	Murphy Ln	5685.594	6862555.918	0.007456456
89	5	Jefferson	secondary	S HURSTBOURNE PKWY	Watterson Trail	6452.856	6862555.918	0.008462693
90	5	Jefferson	secondary	BRECKENRIDGE LN	Dutchmans Ln	8282.91	6862555.918	0.010862744
91	5	Jefferson	secondary	SHEPHERDSVILLE RD	Rangeland Rd	10714.756	6862555.918	0.014052025
92	5	Jefferson	secondary	DIXIE HWY	Crums Ln	7701.76	6862555.918	0.010100587

Site	District	County	Road Class	Road Surveyed	Reference	Segment VMT	County Eligible VMT	Probability of Selection
93	5	Jefferson	secondary	WINKLER AVE	S Third St	878.815	6862555.918	0.001152535
94	5	Jefferson	secondary	EASTERN PKWY	Ellsworth Ave	1926.48	6862555.918	0.002526511
95	5	Jefferson	tertiary	NELSON MILLER PKY	Park View Court	542.087	1422503.821	0.000762159
96	5	Jefferson	tertiary	GOLDSMITH LN	Belmont Rd	569.669	1422503.821	0.000800938
97	7	Jessamine	secondary	WILMORE RD	April Highway	4128.574	683019.502	0.004696648
98	7	Jessamine	secondary	US-27	S Main St	6604.328	683019.502	0.007513055
99	7	Jessamine	secondary	US-27	Etter Dr	7564.377	683019.502	0.008605202
100	7	Jessamine	secondary	US-27	Arts Rental Equipment	10407.106	683019.502	0.011839078
101	7	Jessamine	secondary	LEXINGTON RD	Kohls Dr/Commerce Dr	3826.6	683019.502	0.004353123
102	7	Jessamine	secondary	N MAIN ST	Village Parkway	5916.152	683019.502	0.006730189
103	7	Jessamine	secondary	HARRODSBURG RD	Almahurst Ln/Stonegate Dr	2272.14	683019.502	0.002584777
104	7	Jessamine	tertiary	LINDEN LN	S Third St	68.15	188979.9918	8.00577E-05
105	7	Jessamine	tertiary	ASHGROVE RD	Spurlock Ln	916.12	188979.9918	0.001076191
106	6	Kenton	primary	I-75	Eads Rd	167762.672	2260467.297	0.172997322
107	6	Kenton	primary	I-75	Buttermilk Pike	15403.248	2260467.297	0.015883871
108	6	Kenton	primary	I-75	Dixie Highway	104621.125	2260467.297	0.107885588
109	6	Kenton	primary	I-75	Kyles Ln	42320.425	2260467.297	0.043640937
110	6	Kenton	primary	I-275	KY-3076	109962.039	2260467.297	0.113393152
111	6	Kenton	primary	I-275	Taylor Mill Rd	53627.312	2260467.297	0.055300629
112	6	Kenton	primary	I-275	Turkey Foot Rd	24393.81	2260467.297	0.025154963
113	6	Kenton	secondary	MADISON PIKE	Roselawn Court	3313.284	907075.2461	0.003649059
114	6	Kenton	secondary	MADISON PIKE	McCullum Pike	6816.514	907075.2461	0.007507313
115	6	Kenton	secondary	TURKEYFOOT RD	Spring Valley Dr	3810.614	907075.2461	0.004196789
116	6	Kenton	tertiary	RIVER RD	Welcome to City of Bromley sign	12653.783	550093.8887	0.015319966
117	6	Kenton	tertiary	DIXIE HWY	Bracht-Piner Rd	702.96	550093.8887	0.000851075
118	4	Larue	primary	I-65	Uptown Talley Rd	34396.383	54956.846	0.062587986
120	4	Larue	secondary	NEW JACKSON HWY	Thomas Ln	224.546	205443.751	0.000327894
121	4	Larue	secondary	NEW JACKSON HWY	Charlie Ragland Rd	3274.194	205443.751	0.004781154
122	4	Larue	secondary	LINCOLN FARM RD	Earl Jones Rd	2035.405	205443.751	0.002972208
123	4	Larue	tertiary	SONORA RD	Siberia Rd	897.768	81109.594	0.001106858
124	1	Marshall	primary	I-24	Mt Moriah Rd	144189.76	648000	0.178012049

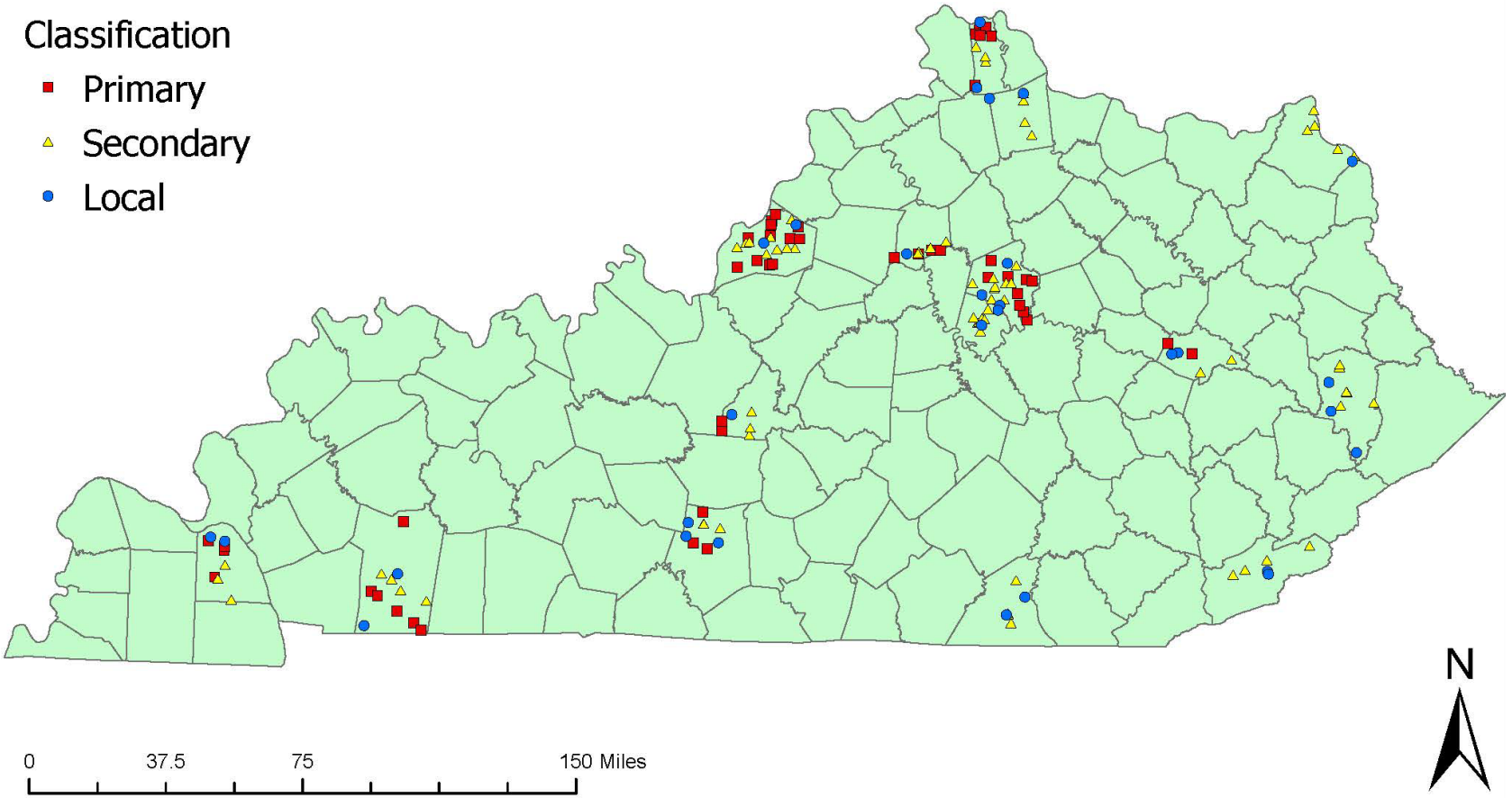
Site	District	County	Road Class	Road Surveyed	Reference	Segment VMT	County Eligible VMT	Probability of Selection
125	1	Marshall	primary	I-69	Jackson School Rd	26973.51851	648000	0.03330064
126	1	Marshall	primary	I-69	Palma Rd	32602.40653	648000	0.040249885
127	1	Marshall	primary	I-69	Lakeview Church Rd	16308.25701	648000	0.020133651
128	1	Marshall	secondary	US-641 S	Lee Brick & Block	3512.886	355043.943	0.005936537
129	1	Marshall	secondary	US-641 N	Marco St	1362.771	355043.943	0.00230299
130	1	Marshall	secondary	US-641 S	Mayfield Highway	3633.519	355043.943	0.006140399
131	1	Marshall	tertiary	OAK PARK BLVD	I-24	7771.610512	251449.6127	0.012362891
132	1	Marshall	tertiary	US-62	Holly Hills Ln/Eaves Ln	877.66	251449.6127	0.00139616
133	8	McCreary	secondary	CUMBERLAND FALLS RD	Pleasant Knob Church Rd	487.86	182092.435	0.001789698
134	8	McCreary	secondary	US-27	McCreary Reservoir	11533.104	182092.435	0.042308806
135	8	McCreary	secondary	US-27	Williamsburg St	2317.7	182092.435	0.008502405
136	8	McCreary	secondary	US-27	Cora Cooper Rd	2126.207	182092.435	0.007799919
137	8	McCreary	tertiary	KY-92	Pleasant Run Church Rd	491.732	114095.356	0.001439484
138	8	McCreary	tertiary	KY-1651	Old Bailey Rd	439.74	114095.356	0.001287284
139	6	Pendleton	secondary	US-27	Old 3L Highway	2869.44	144035.592	0.026535761
140	6	Pendleton	secondary	US-27	KY-330	194.856	144035.592	0.001801973
141	6	Pendleton	secondary	US-27	Charles Dr	2492.276	144035.592	0.023047856
142	6	Pendleton	secondary	US-27	Lock Rd	2102.386	144035.592	0.019442265
143	6	Pendleton	tertiary	KY-177	US-27	1451.99	82068.18308	0.011783194
144	6	Pendleton	tertiary	KY-491	Carters Chapel Rd	1392.752	82068.18308	0.011302466
145	10	Wolfe	primary	BTC MOUNTAIN PKWY	KY-15	8628.609	116824.579	0.029543814
146	10	Wolfe	primary	BTC MOUNTAIN PKWY	KY-746	12280.488	116824.579	0.042047617
147	10	Wolfe	secondary	KY-15	Hunting Fork Rd	5658.408	62978.809	0.035938488
148	10	Wolfe	secondary	KY-11	Bob Adams Rd	491.732	62978.809	0.001439484
149	10	Wolfe	tertiary	KY-715	Big Andy Ridge Rd	737.721	62209.36704	0.008075260
150	10	Wolfe	tertiary	KY-715	Tar Ridge Rd	1381.728	62209.36704	0.008884373

Table A2 Alternate Data Collection Sites

Site	County	Road Class	Observation Location
151	Barren	primary	I-65 @ N Toohey Ridge Road
152	Barren	secondary	Scottsville Road @ Liquor Lodge
153	Barren	tertiary	N Race St @ Clements Ave
154	Christian	primary	Pennyrile Pkwy @ Grapevine Road
155	Christian	secondary	Fort Campbell Blvd @ Legion Dr/Segler Dr
156	Christian	tertiary	Crofton-Fruit Hill Road @ Macedonia Loop
157	Fayette	primary	W New Circle Rd @ Georgetown Rd
158	Fayette	secondary	Cooper Dr @ University Dr
159	Fayette	tertiary	Chone Dr @ Alumni Dr
160	Floyd	secondary	US-23 @ service road just North of Stonewall Road
161	Floyd	tertiary	KY-122 @ 20026 KY-122
162	Franklin	primary	I-64 @ Duckers Road
163	Franklin	secondary	Lawerenceburg Rd @ Louisville Road
164	Franklin	tertiary	Cedar Road @ Hamilton Ln
165	Greenup	secondary	Industrial Parkway @ East Park Dr
166	Greenup	tertiary	KY-01 @ Hopewell Rd/Martin Rd
167	Harlan	secondary	US Highway 421 @ Chevrolet Camp Road
168	Harlan	tertiary	KY-215 @ Britton Creek Road
169	Jefferson	primary	I-65 @ Hindman Richardson connector
170	Jefferson	secondary	Bardstown Road @ Wrocklage Ave
171	Jefferson	tertiary	Cooper Chapel Road @ McNeely Lake Park North Entrance
172	Jessamine	secondary	Lexington Road @ Baker Ln/Groggins Ferry Road
173	Jessamine	tertiary	Union Mill Rd @ Service Road just past Johnson Road
174	Kenton	primary	I-275 @ Johns Hill Road
175	Kenton	secondary	Turkeyfoot Road @ Bethany Lutheran Church
176	Kenton	tertiary	Richardson Rd @ Fairway Park Apartments
177	Larue	secondary	Lincoln Parkway @ Commerce Parkway
178	Larue	tertiary	Sonora Road @ Tanner Road
179	Marshall	primary	I-24 @ KY-95
180	Marshall	secondary	US-641 S @ South Marshall Elementary School Road
181	Marshall	tertiary	Symdonia Highway @ New Harmony Road
182	McCreary	secondary	US-27 @ County Park Road
183	McCreary	tertiary	KY-92 @ Pleasant Run Church Rd
184	Pendleton	secondary	US-27 @ Wright Road/Menzie Bottoms Road
185	Pendleton	tertiary	KY-8 @ Ivor Road
186	Wolfe	primary	Bert T Combs Mountain Parkway @ Quillen Chapel Road
187	Wolfe	secondary	KY-11 @ Bob Adams Road
188	Wolfe	tertiary	KY-715 @ Big Andy Ridge Road

Appendix B Data Collection Site Map

Kentucky Seatbelt Data Collection Sites by Roadway Classification



Appendix C Data Collection Form

SAFETY BELT DATA COLLECTION FORM

Date: _____ Starting Time: _____ Ending Time: _____ Int #: _____

Location: _____ Sheet #: _____

Observer: _____ Comment: _____

DRIVER USAGE

Vehicle	Safety Belt	None	Unknown
PC			
PU			
VAN			
SUV			

FRONT-SEAT OCCUPANT USAGE (OVER 3 YEARS OF AGE)

Vehicle	Safety Belt	None	Unknown
PC			
PU			
VAN			
SUV			

Yes:

Total:

Percent usage:

Appendix D Summary of Data (by Site)

Table D1 Summary of Data

	ALL FRONT SEAT OCCUPANTS					CATEGORY			
						DRIVERS		FRONT SEAT PASSENGERS	
Site	Sample Size	Percent Usage	Relative Error (%)	Margin of Error*	Percent Unknown	Sample Size	Percent Usage	Sample Size	Percent Usage
1	1244	89.0	1.0	1.7	1.9	830	89.4	414	88.2
2	328	89.6	1.9	3.3	0.9	248	90.7	80	86.3
3	229	94.3	1.6	3.0	8.4	199	94.5	30	93.3
4	254	91.7	1.9	3.4	8.6	225	91.1	29	96.6
5	326	90.5	1.8	3.2	1.2	275	89.8	51	94.1
6	135	90.4	2.8	5.0	19.6	123	89.4	12	100.0
7	80	86.3	4.5	7.5	2.4	56	87.5	24	83.3
8	50	92.0	4.2	7.5	2.0	36	91.7	14	92.9
9	136	64.7	6.3	8.0	3.5	108	61.1	28	78.6
10	313	93.3	1.5	2.8	6.8	250	93.6	63	92.1
11	607	91.8	1.2	2.2	7.2	408	91.2	199	93.0
12	605	92.2	1.2	2.1	0.7	408	92.9	197	90.9
13	363	83.7	2.3	3.8	7.4	326	83.1	37	89.2
14	686	83.4	1.7	2.8	4.3	500	86.8	186	74.2
15	1110	96.1	0.6	1.1	0.0	705	94.8	405	98.5
16	362	80.4	2.6	4.1	0.5	307	79.5	55	85.5
17	88	81.8	5.0	8.1	0.0	70	81.4	18	83.3
18	406	84.0	2.2	3.6	9.4	330	86.4	76	73.7
19	320	87.2	2.1	3.7	14.7	256	86.3	64	90.6
20	116	75.0	5.4	7.9	2.5	99	75.8	17	70.6
21	53	54.7	12.5	13.4	0.0	48	54.2	5	60.0
22	669	83.9	1.7	2.8	8.6	557	84.0	112	83.0
23	844	89.6	1.2	2.1	7.8	661	89.0	183	91.8
24	752	96.1	0.7	1.4	0.0	575	96.0	177	96.6
25	1276	91.3	0.9	1.5	0.9	993	91.2	283	91.5
26	1472	92.3	0.8	1.4	2.9	1016	92.5	456	91.7
27	1238	91.8	0.8	1.5	1.5	915	90.5	323	95.7
28	1291	89.2	1.0	1.7	2.5	969	87.4	322	94.4
29	1025	96.0	0.6	1.2	0.6	714	95.7	311	96.8
30	841	95.5	0.8	1.4	0.5	681	95.6	160	95.0
31	731	89.9	1.2	2.2	2.9	654	89.9	77	89.6
32	667	81.1	1.9	3.0	5.0	585	82.1	82	74.4
33	1027	91.6	0.9	1.7	1.7	832	91.2	195	93.3
34	889	91.0	1.1	1.9	2.5	699	91.6	190	88.9
35	372	91.4	1.6	2.8	0.3	315	92.1	57	87.7
36	326	90.2	1.8	3.2	9.9	290	89.3	36	97.2
37	547	95.2	1.0	1.8	5.5	521	95.4	26	92.3
38	322	89.4	1.9	3.4	8.0	301	88.7	21	100.0
39	495	91.1	1.4	2.5	0.6	408	90.2	87	95.4
40	304	88.2	2.1	3.6	4.1	264	88.6	40	85.0
41	211	87.2	2.6	4.5	1.9	186	86.6	25	92.0
42	215	93.5	1.8	3.3	2.3	176	92.6	39	97.4

Site	ALL FRONT SEAT OCCUPANTS					CATEGORY			
						DRIVERS		FRONT SEAT PASSENGERS	
	Sample Size	Percent Usage	Relative Error (%)	Margin of Error*	Percent Unknown	Sample Size	Percent Usage	Sample Size	Percent Usage
43	331	74.0	3.3	4.7	0.9	266	75.2	65	69.2
44	245	84.9	2.7	4.5	13.7	201	87.6	44	72.7
45	251	84.9	2.7	4.4	13.4	205	83.4	46	91.3
46	487	86.9	1.8	3.0	5.3	408	89.0	79	75.9
47	435	83.4	2.1	3.5	17.5	352	88.6	83	61.4
48	314	86.6	2.2	3.8	14.0	256	83.6	58	100.0
49	50	24.0	25.2	11.8	3.8	45	26.7	5	0.0
50	65	63.1	9.5	11.7	1.5	61	63.9	4	50.0
51	60	53.3	12.1	12.6	11.8	54	53.7	6	50.0
52	1000	88.7	1.1	2.0	3.1	806	88.2	194	90.7
53	949	89.0	1.1	2.0	2.3	670	89.9	279	87.1
54	1135	93.0	0.8	1.5	0.2	826	92.6	309	94.2
55	1201	92.4	0.8	1.5	3.0	764	93.6	437	90.4
56	467	88.2	1.7	2.9	0.0	424	88.7	43	83.7
57	345	95.1	1.2	2.3	5.2	303	95.0	42	95.2
58	786	93.6	0.9	1.7	0.0	604	93.0	182	95.6
59	156	91.7	2.4	4.3	3.1	121	90.1	35	97.1
60	53	83.0	6.2	10.1	5.4	51	82.4	2	100.0
61	154	88.3	2.9	5.1	0.0	110	88.2	44	88.6
62	583	87.7	1.6	2.7	3.2	472	86.9	111	91.0
63	343	77.8	2.9	4.4	5.0	277	77.3	66	80.3
64	373	87.7	1.9	3.3	8.1	273	85.7	100	93.0
65	205	93.2	1.9	3.5	0.0	145	92.4	60	95.0
66	220	90.9	2.1	3.8	10.9	182	90.1	38	94.7
67	116	67.2	6.5	8.5	5.7	92	66.3	24	70.8
68	259	88.8	2.2	3.8	0.0	199	90.5	60	83.3
69	123	82.9	4.1	6.6	18.0	102	84.3	21	76.2
70	129	91.5	2.7	4.8	0.0	93	92.5	36	88.9
71	134	73.1	5.2	7.5	13.5	106	74.5	28	67.9
72	101	59.4	8.2	9.6	16.5	84	59.5	17	58.8
73	713	93.1	1.0	1.9	10.9	619	92.7	94	95.7
74	1589	96.4	0.5	0.9	0.0	951	96.2	638	96.7
75	2027	96.5	0.4	0.8	0.0	1246	96.5	781	96.5
76	858	92.7	1.0	1.7	3.4	759	92.1	99	97.0
77	790	92.2	1.0	1.9	0.0	754	92.0	36	94.4
78	683	92.7	1.1	2.0	0.0	618	92.7	65	92.3
79	1108	94.9	0.7	1.3	2.7	853	95.1	255	94.5
80	524	95.0	1.0	1.9	7.6	438	94.1	86	100.0
81	763	91.2	1.1	2.0	6.7	671	90.3	92	97.8
82	676	85.5	1.6	2.7	1.7	562	85.2	114	86.8
83	1123	94.0	0.8	1.4	0.0	761	95.7	362	90.6
84	735	94.4	0.9	1.7	4.5	588	93.5	147	98.0

Site	ALL FRONT SEAT OCCUPANTS					CATEGORY			
						DRIVERS		FRONT SEAT PASSENGERS	
	Sample Size	Percent Usage	Relative Error (%)	Margin of Error*	Percent Unknown	Sample Size	Percent Usage	Sample Size	Percent Usage
85	547	86.3	1.7	2.9	0.0	439	88.8	108	75.9
86	471	93.2	1.2	2.3	0.0	404	92.8	67	95.5
87	679	87.3	1.5	2.5	0.0	555	87.0	124	88.7
88	739	88.8	1.3	2.3	3.0	586	90.1	153	83.7
89	476	83.8	2.0	3.3	6.1	423	84.2	53	81.1
90	1108	92.7	0.8	1.5	4.5	819	93.4	289	90.7
91	379	78.6	2.7	4.1	1.8	310	80.6	69	69.6
92	222	82.0	3.1	5.1	15.9	209	80.9	13	100.0
93	324	79.9	2.8	4.4	1.2	298	81.9	26	57.7
94	287	90.2	1.9	3.4	4.3	274	90.9	13	76.9
95	146	89.7	2.8	4.9	0.0	129	88.4	17	100.0
96	127	85.0	3.7	6.2	10.6	109	83.5	18	94.4
97	433	97.2	0.8	1.5	0.0	320	96.6	113	99.1
98	421	84.1	2.1	3.5	7.3	388	83.8	33	87.9
99	719	91.4	1.1	2.1	0.0	532	91.5	187	90.9
100	512	88.9	1.6	2.7	8.6	458	88.0	54	96.3
101	649	88.3	1.4	2.5	3.9	562	87.7	87	92.0
102	516	82.6	2.0	3.3	2.3	465	82.2	51	86.3
103	448	90.0	1.6	2.8	0.0	333	91.3	115	86.1
104	79	86.1	4.5	7.6	13.2	69	84.1	10	100.0
105	64	85.9	5.1	8.5	12.3	58	84.5	6	100.0
106	1127	94.2	0.7	1.4	0.0	791	93.8	336	95.2
107	1137	91.1	0.9	1.7	1.6	922	90.2	215	94.9
108	1320	92.5	0.8	1.4	10.0	982	92.3	338	93.2
109	1184	89.8	1.0	1.7	0.0	1008	89.5	176	91.5
110	1032	90.3	1.0	1.8	5.8	820	89.8	212	92.5
111	1029	90.5	1.0	1.8	8.1	886	90.5	143	90.2
112	765	91.5	1.1	2.0	3.3	673	91.4	92	92.4
113	381	90.6	1.7	2.9	3.5	332	90.4	49	91.8
114	274	85.0	2.5	4.2	0.0	266	86.5	8	37.5
115	532	92.9	1.2	2.2	6.8	485	93.0	47	91.5
116	63	84.1	5.5	9.0	0.0	60	83.3	3	100.0
117	336	90.8	1.7	3.1	0.0	248	89.5	88	94.3
118	804	90.7	1.1	2.0	0.6	542	89.9	262	92.4
119	710	88.3	1.4	2.4	4.6	539	88.5	171	87.7
120	86	65.1	7.9	10.1	4.4	67	67.2	19	57.9
121	130	81.5	4.2	6.7	2.3	115	80.0	15	93.3
122	259	85.7	2.5	4.3	0.0	227	85.0	32	90.6
123	52	86.5	5.5	9.3	0.0	45	86.7	7	85.7
124	647	89.3	1.4	2.4	7.4	550	88.5	97	93.8
125	138	90.6	2.7	4.9	17.4	110	90.0	28	92.9
126	301	90.7	1.8	3.3	14.0	247	89.9	54	94.4
127	376	89.6	1.8	3.1	10.5	297	89.2	79	91.1

Site	ALL FRONT SEAT OCCUPANTS					CATEGORY			
						DRIVERS		FRONT SEAT PASSENGERS	
	Sample Size	Percent Usage	Relative Error (%)	Margin of Error*	Percent Unknown	Sample Size	Percent Usage	Sample Size	Percent Usage
128	255	89.8	2.1	3.7	2.7	207	89.4	48	91.7
129	462	86.4	1.8	3.1	1.1	353	88.4	109	79.8
130	232	84.9	2.8	4.6	19.4	179	83.2	53	90.6
131	326	90.2	1.8	3.2	6.9	261	89.3	65	93.8
132	222	85.1	2.8	4.7	7.5	178	81.5	44	100.0
133	54	88.9	4.8	8.4	6.9	37	89.2	17	88.2
134	230	79.6	3.3	5.2	0.0	200	80.5	30	73.3
135	316	88.3	2.0	3.5	1.9	273	89.0	43	83.7
136	391	79.3	2.6	4.0	1.0	327	77.7	64	87.5
137	83	67.5	7.6	10.1	0.0	66	66.7	17	70.6
138	157	89.2	2.8	4.9	3.7	139	89.9	18	83.3
139	99	78.8	5.2	8.1	6.6	82	76.8	17	88.2
140	241	85.9	2.6	4.4	6.2	201	84.1	40	95.0
141	156	85.3	3.3	5.6	8.8	134	85.1	22	86.4
142	214	89.3	2.4	4.1	2.7	179	88.8	35	91.4
143	118	71.2	5.9	8.2	2.5	92	69.6	26	76.9
144	99	89.9	3.4	5.9	0.0	74	91.9	25	84.0
145	267	77.2	3.3	5.0	6.3	211	75.4	56	83.9
146	167	78.4	4.1	6.2	13.9	129	76.7	38	84.2
147	143	81.8	3.9	6.3	7.1	126	80.2	17	94.1
148	135	75.6	4.9	7.2	30.4	113	72.6	22	90.9
149	51	70.6	9.0	12.5	12.1	42	71.4	9	66.7
150	150	80.7	4.0	6.3	21.1	111	77.5	39	89.7

*Percent (using .95 probability)

Appendix E Summary of Data (With Sample Weights)

Table E1 Summary of Data (With Sample Weights)

Site ID	Site Type	Date Observed	Site Sample Weight	Number of Drivers	Number of Front Passengers	Number of Occupants Belted	Number of Occupants Unbelted	Number of Occupants with Unknown Belt Use
1	Original	7/18/2024	4.555	853	415	1107	137	24
2	Original	7/29/2024	17.850	251	80	294	34	3
3	Original	7/8/2024	36.072	220	30	216	13	21
4	Original	7/8/2024	737.851	249	29	233	21	24
5	Original	6/11/2024	771.013	279	51	295	31	4
6	Original	7/8/2024	110.430	156	12	122	13	33
7	Original	6/11/2024	679.774	58	24	69	11	2
8	Original	6/11/2024	742.225	37	14	46	4	1
9	Original	7/18/2024	2602.365	111	30	88	48	5
10	Original	7/29/2024	56.418	273	63	292	21	23
11	Original	7/10/2024	29.320	445	209	557	50	47
12	Original	7/16/2024	14.730	412	197	558	47	4
13	Original	6/12/2024	21.851	355	37	304	59	29
14	Original	6/26/2024	117.963	531	186	572	114	31
15	Original	6/25/2024	15.461	705	405	1067	43	0
16	Original	7/16/2024	10916.329	309	55	291	71	2
17	Original	6/25/2024	484.129	70	18	72	16	0
18	Original	6/26/2024	1141.108	371	77	341	65	42
19	Original	7/10/2024	682.447	311	64	279	41	55
20	Original	6/17/2024	2673.707	102	17	87	29	3
21	Alternate	6/12/2024	5111.229	48	5	29	24	0
22	Original	6/7/2024	1.516	613	119	561	108	63
23	Original	8/8/2024	4.606	725	190	756	88	71
24	Original	6/10/2024	5.357	575	177	723	29	0
25	Original	7/19/2024	21.370	1002	286	1165	111	12
26	Original	8/8/2024	1.063	1048	468	1358	114	44
27	Original	7/19/2024	1.590	928	329	1137	101	19
28	Original	6/7/2024	2.301	994	330	1151	140	33
29	Original	7/9/2024	3.785	720	311	984	41	6
30	Original	7/9/2024	3.833	685	160	803	38	4

Site ID	Site Type	Date Observed	Site Sample Weight	Number of Drivers	Number of Front Passengers	Number of Occupants Belted	Number of Occupants Unbelted	Number of Occupants with Unknown Belt Use
31	Original	7/19/2024	63.955	675	78	657	74	22
32	Original	8/8/2024	29.203	620	82	541	126	35
33	Original	7/22/2024	66.238	850	195	941	86	18
34	Original	7/22/2024	90.127	721	191	809	80	23
35	Original	6/10/2024	199.740	316	57	340	32	1
36	Original	7/19/2024	172.186	326	36	294	32	36
37	Original	7/24/2024	23.616	553	26	521	26	32
38	Original	7/1/2024	132.156	319	31	288	34	28
39	Original	7/9/2024	110.782	411	87	451	44	3
40	Alternate	7/19/2024	291.419	276	41	268	36	13
41	Original	7/22/2024	316.612	190	25	184	27	4
42	Original	7/9/2024	160.480	181	39	201	14	5
43	Original	7/25/2024	107.402	269	65	245	86	3
44	Original	6/13/2024	234.362	240	44	208	37	39
45	Original	6/17/2024	242.088	244	46	213	38	39
46	Original	6/13/2024	102.421	435	79	423	64	27
47	Original	6/13/2024	27.914	432	95	363	72	92
48	Original	6/17/2024	94.908	307	58	272	42	51
49	Original	6/4/2024	1287.547	47	5	12	38	2
50	Original	7/3/2024	1110.297	62	4	41	24	1
51	Original	7/3/2024	600.393	62	6	32	28	8
52	Original	7/24/2024	51.068	838	194	887	113	32
53	Original	6/14/2024	5.681	692	279	845	104	22
54	Original	7/12/2024	6.911	828	309	1056	79	2
55	Original	6/14/2024	7.727	786	452	1110	91	37
56	Original	6/20/2024	173.323	424	43	412	55	0
57	Original	7/12/2024	61.388	322	42	328	17	19
58	Original	7/12/2024	239.335	604	182	736	50	0
59	Original	6/14/2024	320.677	126	35	143	13	5
60	Original	6/20/2024	604.501	54	2	44	9	3
61	Original	6/21/2024	631.128	110	44	136	18	0

Site ID	Site Type	Date Observed	Site Sample Weight	Number of Drivers	Number of Front Passengers	Number of Occupants Belted	Number of Occupants Unbelted	Number of Occupants with Unknown Belt Use
62	Original	6/4/2024	78.467	478	124	511	72	19
63	Original	6/4/2024	75.190	287	74	267	76	18
64	Original	6/21/2024	105.614	306	100	327	46	33
65	Original	6/21/2024	177.154	145	60	191	14	0
66	Original	6/4/2024	827.993	204	43	200	20	27
67	Original	7/2/2024	808.437	97	26	78	38	7
68	Original	6/27/2024	88.743	199	60	230	29	0
69	Original	7/2/2024	495.871	124	26	102	21	27
70	Original	6/27/2024	205.699	93	36	118	11	0
71	Original	7/23/2024	571.486	126	29	98	36	21
72	Original	7/23/2024	3639.312	104	17	60	41	20
73	Original	7/15/2024	8.129	706	94	664	49	87
74	Original	7/8/2024	31.492	951	638	1532	57	0
75	Original	7/8/2024	6.947	1246	781	1957	70	0
76	Original	7/15/2024	8.284	789	99	795	63	30
77	Original	7/22/2024	19.796	754	36	728	62	0
78	Original	7/22/2024	16.319	618	65	633	50	0
79	Original	7/2/2024	7.884	868	271	1052	56	31
80	Original	7/2/2024	20.026	464	103	498	26	43
81	Original	7/15/2024	7.343	725	93	696	67	55
82	Original	6/3/2024	8.130	574	114	578	98	12
83	Original	7/8/2024	53.829	761	362	1056	67	0
84	Original	7/2/2024	35.691	607	163	694	41	35
85	Original	6/21/2024	7.034	439	108	472	75	0
86	Original	6/21/2024	476.569	404	67	439	32	0
87	Original	7/19/2024	135.592	555	124	593	86	0
88	Original	7/2/2024	134.112	609	153	656	83	23
89	Original	6/6/2024	118.166	448	59	399	77	31
90	Original	7/2/2024	92.058	851	309	1027	81	52
91	Original	6/3/2024	71.164	315	71	298	81	7
92	Original	7/25/2024	99.004	251	13	182	40	42

Site ID	Site Type	Date Observed	Site Sample Weight	Number of Drivers	Number of Front Passengers	Number of Occupants Belted	Number of Occupants Unbelted	Number of Occupants with Unknown Belt Use
93	Original	6/11/2024	867.653	302	26	259	65	4
94	Original	7/25/2024	395.803	287	13	259	28	13
95	Original	7/19/2024	1312.062	129	17	131	15	0
96	Original	7/15/2024	1248.535	124	18	108	19	15
97	Original	6/24/2024	212.918	320	113	421	12	0
98	Original	6/10/2024	133.102	421	33	354	67	33
99	Original	6/24/2024	116.209	532	187	657	62	0
100	Original	6/10/2024	84.466	504	56	455	57	48
101	Original	6/10/2024	229.720	587	88	573	76	26
102	Original	6/10/2024	148.584	477	51	426	90	12
103	Original	6/24/2024	386.881	333	115	403	45	0
104	Original	7/11/2024	12490.994	81	10	68	11	12
105	Original	7/11/2024	929.203	67	6	55	9	9
106	Original	7/10/2024	5.780	791	336	1062	65	0
107	Original	6/3/2024	62.957	937	219	1036	101	19
108	Original	7/3/2024	9.269	1088	379	1221	99	147
109	Original	7/10/2024	22.914	1008	176	1063	121	0
110	Original	7/3/2024	8.819	878	217	932	100	63
111	Alternate	7/3/2024	18.083	970	150	931	98	91
112	Original	6/3/2024	39.754	697	94	700	65	26
113	Original	8/6/2024	274.043	343	52	345	36	14
114	Original	6/25/2024	133.203	266	8	233	41	0
115	Original	7/3/2024	238.277	523	48	494	38	39
116	Original	6/25/2024	65.274	60	3	53	10	0
117	Original	7/1/2024	1174.984	248	88	305	31	0
118	Original	6/7/2024	15.978	547	262	729	75	5
119	Original	6/27/2024	10.000	569	175	627	83	34
120	Original	6/27/2024	3049.765	71	19	56	30	4
121	Original	6/7/2024	209.155	118	15	106	24	3
122	Original	8/12/2024	336.450	227	32	222	37	0
123	Original	6/7/2024	903.458	45	7	45	7	0

Site ID	Site Type	Date Observed	Site Sample Weight	Number of Drivers	Number of Front Passengers	Number of Occupants Belted	Number of Occupants Unbelted	Number of Occupants with Unknown Belt Use
124	Original	7/17/2024	5.618	600	99	578	69	52
125	Original	7/10/2024	30.029	139	28	125	13	29
126	Original	7/10/2024	24.845	296	54	273	28	49
127	Original	7/17/2024	49.668	339	81	337	39	44
128	Original	7/23/2024	168.448	214	48	229	26	7
129	Original	7/23/2024	434.218	358	109	399	63	5
130	Original	7/17/2024	162.856	228	60	197	35	56
131	Original	6/12/2024	80.887	284	66	294	32	24
132	Original	6/12/2024	716.250	194	46	189	33	18
133	Original	7/30/2024	558.753	40	18	48	6	4
134	Original	6/26/2024	23.636	200	30	183	47	0
135	Original	7/11/2024	117.614	279	43	279	37	6
136	Original	6/26/2024	128.206	331	64	310	81	4
137	Alternate	6/13/2024	694.693	66	17	56	27	0
138	Original	7/11/2024	776.829	145	18	140	17	6
139	Original	6/24/2024	37.685	89	17	78	21	7
140	Original	6/24/2024	554.947	215	42	207	34	16
141	Original	6/14/2024	43.388	149	22	133	23	15
142	Original	6/24/2024	51.434	184	36	191	23	6
143	Original	6/14/2024	84.867	95	26	84	34	3
144	Original	7/1/2024	88.476	74	25	89	10	0
145	Original	6/20/2024	33.848	224	61	206	61	18
146	Original	8/12/2024	23.783	155	39	131	36	27
147	Original	6/20/2024	27.825	136	18	117	26	11
148	Alternate	7/9/2024	694.693	164	30	102	33	59
149	Alternate	6/20/2024	123.835	48	10	36	15	7
150	Original	7/9/2024	112.557	147	43	121	29	40
			Totals	**59797**	**15741**	**65150**	**7431**	**2957**

Appendix F Mini Survey Data

Table F1 Data from Mini Survey

County	Town	Intersection Description	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
Barren	Cave City	I-65 at Exit 53	89	91	90	88	96	91	96	95	95	90
Meade	Muldraugh	US 31W at KY 1638	88	89	88	88	91	88	90	86	90	88
Grayson	Leitchfield	KY 259 at US 62	85	85	79	85	85	87	85	82	85	79
Logan	Russellville	US 68 at US 79	83	82	86	83	83	87	88	77	81	82
Hopkins	Madisonville	Pennyrile Pkwy at Exit 44	91	91	95	91	93	91	94	87	90	90
Henderson	Henderson	Us 41A at 5th St.	85	88	80	88	90	90	90	87	89	86
Calloway	Murray	KY 1637 at 16th	85	88	88	85	90	89	91	91	92	86
Shelby	Simpsonville	I-64 at Exit 28	93	95	94	93	97	93	95	92	95	89
Woodford	Versailles	US 60 at US 62	93	89	93	88	94	90	87	91	92	96
Oldham	La Grange	KY 146 at KY 329B	90	92	92	94	91	91	94	92	90	91
Franklin	Frankfort	KY 2820 at US 127	87	79	73	84	74	83	86	86	90	88
Kenton	Crescent Springs	I-75 at Exit 186	92	92	93	93	95	89	94	94	96	90
Jefferson	Louisville	US 31W at KY 841	87	87	84	88	86	86	86	82	82	80
Boone	Walton	US 42 at US 25	87	88	91	88	88	89	94	92	91	91
Boyd	Ashland	I-64 at Exit 185	90	91	85	88	91	91	87	89	91	89
Lincoln	Stanford	US 27 at US 150	86	82	87	82	88	86	87	83	85	81
Carter	Grayson	US 60 at KY 7	81	81	80	83	84	87	88	85	89	84
Floyd	Drift	KY 680 at KY 122	71	68	63	66	66	74	85	76	81	73
Rowan	Morehead	I-64 at Exit 137	89	89	83	92	95	90	93	87	89	86
Laurel	Corbin	US 25E at US 25	81	85	82	83	83	92	92	85	85	83
Pulaski	Somerset	KY 80 at KY 2296	81	85	88	84	90	84	89	84	88	74
Statewide Usage			**87.4**	**87.6**	**87.2**	**87.5**	**89.4**	**88.3**	**90.4**	**87.8**	**89.6**	**86.5**

Appendix G R Code for County and Site Selection

```
library(factoextra)
library(nilde)
library(tigris)
library(ggplot2)

setwd("/Users/derekyoung/Documents/Safety Belt Survey/FY22 Report/FY22 Updated (Revised)/")

VMT <- read.table("VMT_16_20.txt",header=T)
VMT <- VMT[order(VMT$Total,decreasing=T),]
VMT[,"VMT20"] <- VMT$DailyVMT*366
VMT[,"cumper"] <- cumsum(VMT$Total)/sum(VMT$Total)
cutoff <- min(which(VMT$cumper>=0.85))

Stage1 <- VMT[1:cutoff,]

Stage2 <- lapply(1:12, function(i) Stage1[which(Stage1$District==i),1])
names(Stage2) <- 1:12
Stage2[[5]] <- Stage2[[5]][-which(Stage2[[5]]=="Jefferson")]
Stage2[[7]] <- Stage2[[7]][-which(Stage2[[7]]=="Fayette")]

set.seed(10)
sample.23 <- c("Jefferson","Fayette",unlist(sapply(1:12,function(i) sample(Stage2[[i]],size=ifelse(i==6,2,1)))))

Stage3 <- Stage1[VMT$County%in%sample.23,]

Stage3 <- Stage3[order(Stage3$VMT20),]

#3-5 Clusters looks appropriate
fviz_nbclust(data.frame(Stage3$VMT20), kmeans, method = "wss",k.max=8)
fviz_nbclust(data.frame(Stage3$VMT20), kmeans, method = "gap",nboot=500,k.max=8)
VMT_cluster <- kmeans(Stage3$VMT20,centers=5,iter.max=100,nstart=200)$cluster
levs <- unique(VMT_cluster)
VMT_class <- unlist(sapply(1:length(levs),function(i) rep(i,length(which(VMT_cluster==levs[i])))))
Stage3[,"VMT_class"] <- VMT_class

site.selection <- as.numeric(table(VMT_class))
de.out <- nlde(a=site.selection,n=150)
de.out.cand <- de.out$solutions[,which(apply(de.out$solutions==0,2,sum)==0)]*site.selection

#150 sites divided by 5 clusters means we should have roughly 20-30 sites per cluster
de.out.cand <- de.out.cand[,which(apply(de.out.cand,2,min)>=20)]
de.out.cand <- de.out.cand[,sapply(1:ncol(de.out.cand), function(i) all(mod(de.out.cand[,i],3)==0))]

#We can then look for a solution where the number of sites per county increases with the cluster
site.cand <- t(de.out.cand/site.selection)
site.inc.ind <- sapply(1:nrow(site.cand),function(i) all(sort(site.cand[i,])==site.cand[i,]))
site.cand <- site.cand[site.inc.ind,]
site.cand <- site.cand[sapply(1:nrow(site.cand), function(i) all(mod(site.cand[i,],3)==0)),]

#Solution 297600 looks good
number.sites <- data.frame(de.out.cand/site.selection)[,"sol.297600"]
Stage3[,"no.sites"] <- rep(number.sites,site.selection)

#County selection map
ky <- counties(state = "KY")
ind <- ky$NAME%in%Stage3$County
col.fill <- rep("white",120)
col.fill[ind] <- "red"

ggplot() + geom_sf(data = ky, color="black", fill=col.fill, size=0.25) +
ggtitle("County Selection Map")
```

```
#Site selection process
setwd("/Users/derekyoung/Documents/Safety Belt Survey/FY22 Report/Road Segments (Revised)/")

file.loc <- "FINAL_Road_Segments_2023_counties_Second_Submittal.xlsx"
Barren <- read_excel(file.loc, sheet = "Barren")
Christian <- read_excel(file.loc, sheet = "Christian")
Fayette <- read_excel(file.loc, sheet = "Fayette")
Floyd <- read_excel(file.loc, sheet = "Floyd")
Franklin <- read_excel(file.loc, sheet = "Franklin")
Greenup <- read_excel(file.loc, sheet = "Greenup")
Harlan <- read_excel(file.loc, sheet = "Harlan")
Jefferson <- read_excel(file.loc, sheet = "Jefferson")
Jessamine <- read_excel(file.loc, sheet = "Jessamine")
Kenton <- read_excel(file.loc, sheet = "Kenton")
Larue <- read_excel(file.loc, sheet = "Larue")
Marshall <- read_excel(file.loc, sheet = "Marshall")
McCreary <- read_excel(file.loc, sheet = "McCreary")
Pendleton <- read_excel(file.loc, sheet = "Pendleton")
Wolfe <- read_excel(file.loc, sheet = "Wolfe")

#Function to apply to each county
roadsel.fn <- function(county,sites){
 county <- data.frame(county)
 total.VMT <- sum(county$DVMT)
 county$ROAD_CLASS <- as.factor(county$ROAD_CLASS)
 road.levels <- levels(county$ROAD_CLASS)
 county <- lapply(1:length(road.levels), function(i) county[county$ROAD_CLASS == road.levels[i],])
 names(county) <- road.levels
 road.levels.VMT <- sapply(1:length(county), function(i) sum(county[[i]]$DVMT))
 road.level.POS <- road.levels.VMT/total.VMT
 sites.class <- round(sites*road.level.POS)
 if(sum(sites.class)>sites) sites.class[which.max(sites.class)] <- sites.class[which.max(sites.class)]-1
 if(sum(sites.class)<sites) sites.class[which.min(sites.class)] <- sites.class[which.min(sites.class)]+1
 POS <- vector("list",length(county))
 for(i in 1:length(POS)){
  POS[[i]] <- county[[i]]$DVMT/sum(county[[i]]$DVMT)
  county[[i]] <- cbind(county[[i]],POS=POS[[i]]*sites.class[i])
 }
 roadsel <- lapply(1:length(county),function(i) county[[i]][sample(1:nrow(county[[i]]),replace=FALSE,size=sites.class[i],prob=POS[[i]]),] )
 all.roadsel <- NULL
 for(i in 1:length(roadsel)) all.roadsel <- rbind(all.roadsel,roadsel[[i]])
 all.roadsel
}

#Actual selection, followed by outputting it to Excel
set.seed(1)
Barren_Road <- roadsel.fn(Barren,sites=9)
Christian_Road <- roadsel.fn(Christian,sites=12)
Fayette_Road <- roadsel.fn(Fayette,sites=21)
Floyd_Road <- roadsel.fn(Floyd,sites=9)
Franklin_Road <- roadsel.fn(Franklin,sites=9)
Greenup_Road <- roadsel.fn(Greenup,sites=6)
Harlan_Road <- roadsel.fn(Harlan,sites=6)
Jefferson_Road <- roadsel.fn(Jefferson,sites=24)
Jessamine_Road <- roadsel.fn(Jessamine,sites=9)
Kenton_Road <- roadsel.fn(Kenton,sites=12)
Larue_Road <- roadsel.fn(Larue,sites=6)
Marshall_Road <- roadsel.fn(Marshall,sites=9)
McCreary_Road <- roadsel.fn(McCreary,sites=6)
Pendleton_Road <- roadsel.fn(Pendleton,sites=6)
Wolfe_Road <- roadsel.fn(Wolfe,sites=6)

out <- rbind(Barren_Road, Christian_Road, Fayette_Road, Floyd_Road, Franklin_Road,
        Greenup_Road, Harlan_Road, Jefferson_Road, Jessamine_Road, Kenton_Road,
        Larue_Road, Marshall_Road, McCreary_Road, Pendleton_Road, Wolfe_Road)
write_xlsx(out,"Road_Selections.xlsx")
```