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Crash Analysis of I-64 Closure in St. Louis County

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Abstract

On January 2, 2008, the Missouri Department of Transportation (MoDOT) closed significant portions of Interstate 64 (I-64) in St. Louis County, Missouri, for reconstruction. During the planning stages of this project, the proposal to close all lanes of I-64 was met with public concern regarding the possible safety risks associated with diverting I-64 traffic to adjacent roadways. A specific concern was the possibility of increased crash rates on roads designated to receive I-64 traffic flow. The following research was conducted to assess the actual outcomes related to these concerns. Crash analyses and crash rate analyses of 2008 and 2009 crash data were performed. The data were compared to four years of pre-closure crash data. Overall results suggest no evidence of increased crash rates on roadways adjacent to I-64 resulting from the two-year closure period. The study indicated that crash rates on 17 roadways were 8.9% below average in 2008 and 14.7% below average in 2009. Crash rates declined for most freeways, expressways, and major arterials in the surrounding region. Rear-end crashes declined noticeably from 7,757 in 2007 to 6,728 in 2009.

Chapter 1 Introduction and Analysis Strategy

1.1 Research Purpose

On January 2, 2008, the section of Interstate 64 (I-64) in St. Louis County, Missouri, from Ballas Road to Interstate 170 (I-170) was completely closed for reconstruction (fig. 1.1). The main closure lasted through the end of 2008. An easterly section of I-64 was closed for the bulk of 2009. These closures raised questions regarding potential increase in crash rates on roads adjacent to I-64 on which traffic flow was diverted as a result.

1.2 Analysis Strategy

To test for potential trends in higher crash rates on roadways adjacent to I-64, an analysis was conducted of 2008 and 2009 crash data derived from roadways adjacent to I-64. The results were compared to the four years of crash data (2004-2007) derived from the same roadways. The data included all crashes occurring on 17 roadways in the vicinity of the closures, including sections of I-64 that remained open during the construction period.

For the following sections, all tables and graphs were grouped by three roadway types in order to facilitate efficient data comparison. These roadway types are:

- a) Freeways (I-44, I-55, I-64, I-70, I-170, and I-270).
- b) Expressways (US 40, US 61, US 67, MO 141, and MO D).
- c) Major arterials (MO 30, MO 100, MO 115, MO 180, MO 340, and MO 366).

To analyze the crash trends, all the crashes that occurred from 2004 to 2009 on all roadways were summarized. Figures 1.2-1.4 illustrate the total frequency of crashes by roadway type.

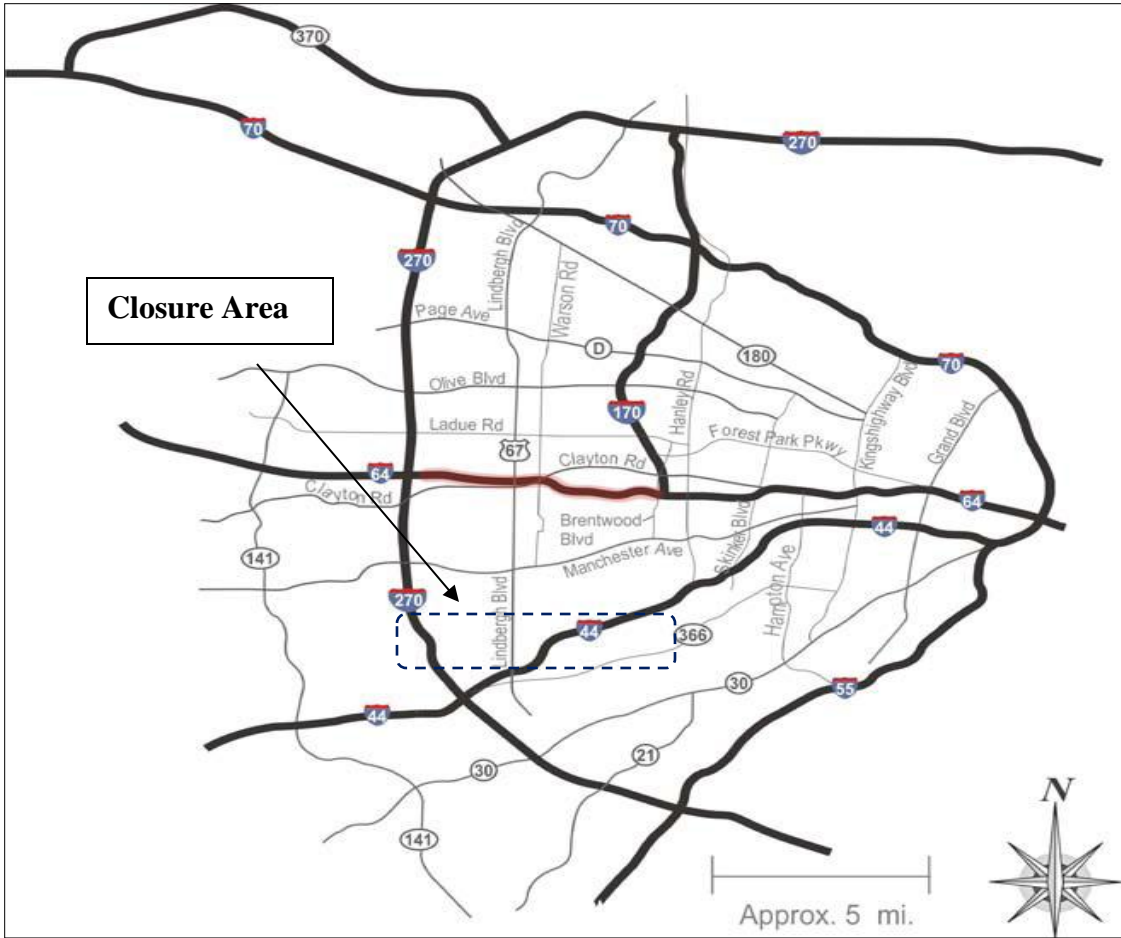


Figure 1.1 Section of I-64 closed from Ballas Road to I-170

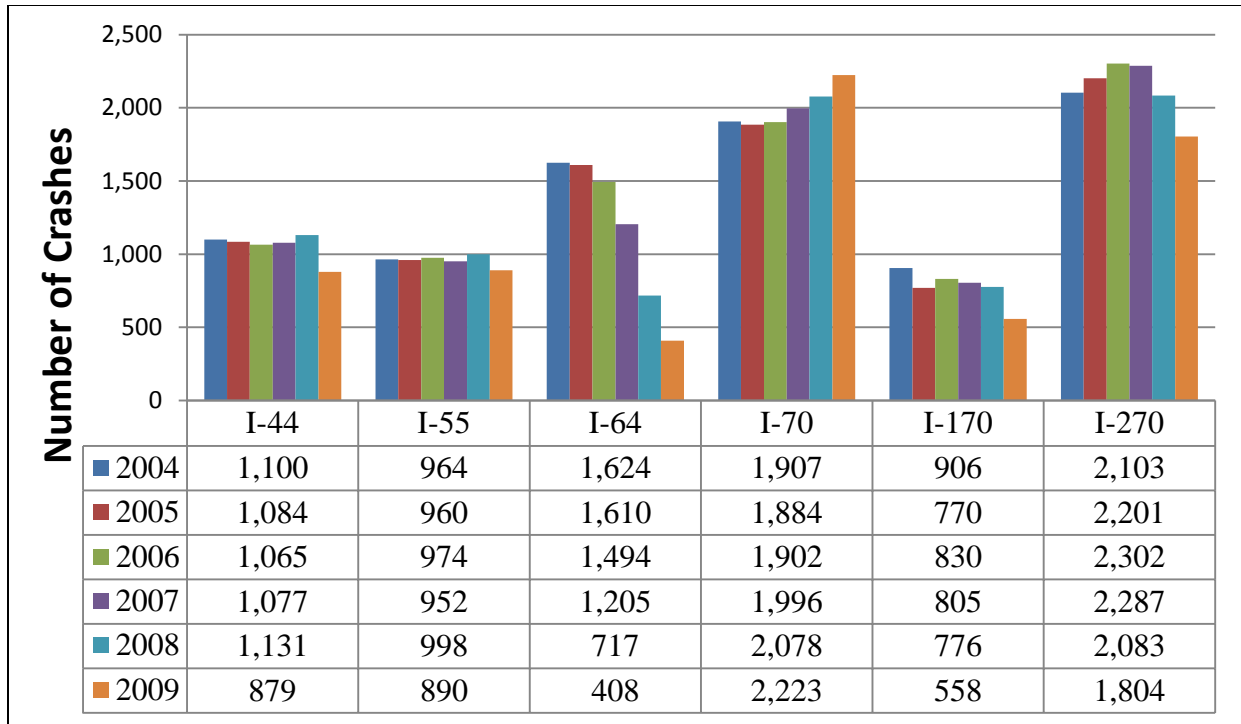


Figure 1.2 All Crashes on Freeways

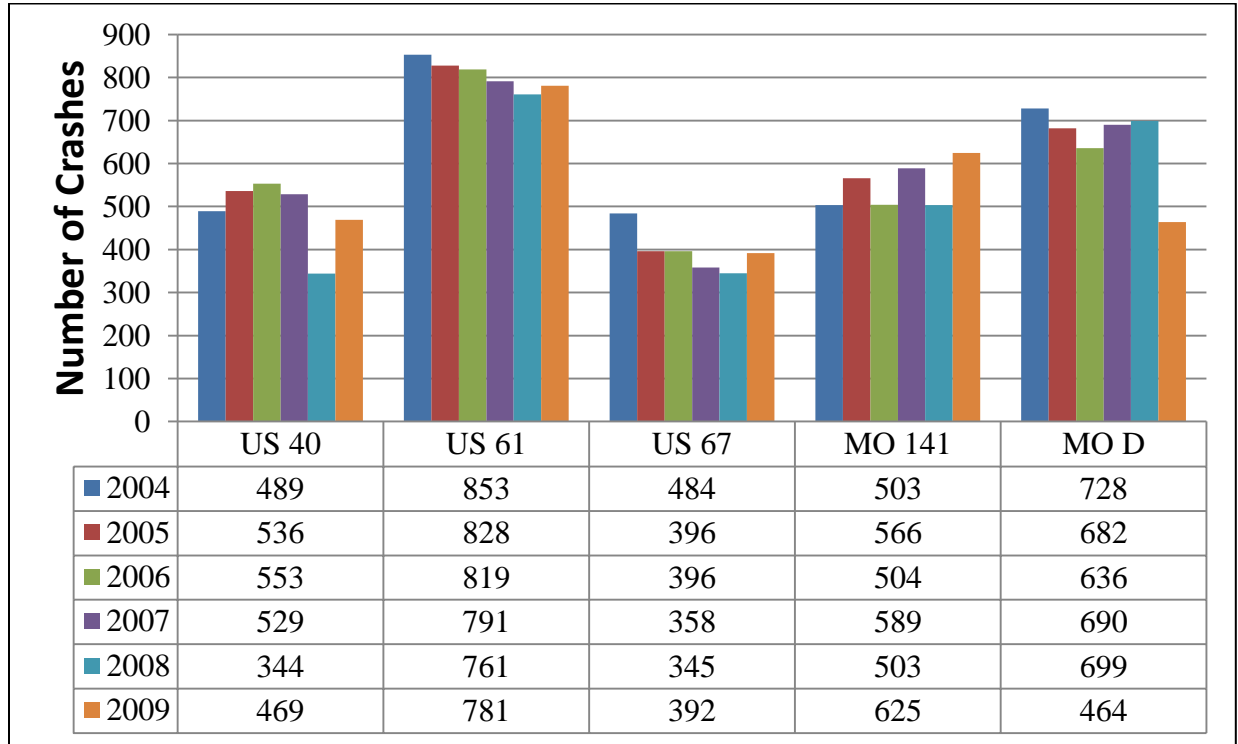


Figure 1.3 All Crashes on Expressways

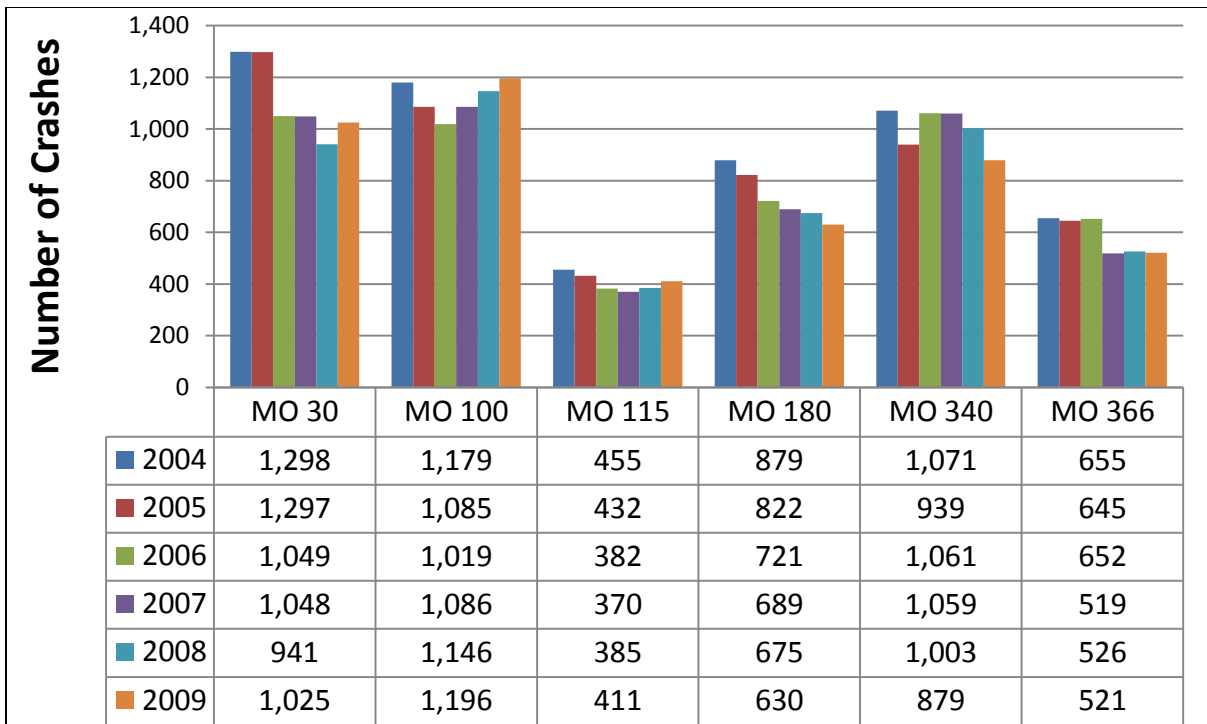


Figure 1.4 All Crashes on Major Arterials

Chapter 2 Results

2.1 General Trends

Different patterns and trends were observed upon analysis of several years of crash data. For all freeway crashes, there was a noticeable decline in crash rates beginning in 2006. Similar trends were also observable for expressways, beginning in 2007, and major arterials, beginning in 2005. I-270 displayed decreased crash rates starting in 2007, while I-70 demonstrated an increase in crash rates beginning in 2007. These freeway facilities were designated and marked as alternative routes during the closure.

In 2008 and 2009, the Missouri section of I-64 experienced a significant reduction in crash rates, declining by 429 and 797 crashes since 2007, respectively (a reduction of 36-66%). This reduction was due to the closures of portions of this interstate for reconstruction. Notably, in comparison to 2007, total crashes in 2008 and 2009 on all freeways decreased by 539 and 1,560 crashes, an overall reduction that exceeds the reduction on I-64. This indicates that although I-64 closures caused traffic to spread to other routes, major interstate roadways around the closure area still experienced a noticeable reduction in total crashes.

On the whole, most roadways did not experience a significant change in crash rates over the six-year period examined in this study. This finding reinforces the conclusion that I-64 closure did not adversely impact safety on highways used as alternative routes around the closed sections. Overall crashes reduced during the two-year period, even though many of these roadways experienced an increase in traffic volume.

2.2 Crash Rate Analysis

Crash rate represents the intensity of or exposure to crashes relative to total vehicle miles traveled. For example, if roadway A displays a higher crash rate than roadway B, it indicates that roadway A was more vulnerable to crashes than roadway B. Crash rates take into consideration

traffic volume, roadway length, and days in analysis period as variables for comparing roadways. Crash rates over the past six years (2004-2009) are presented in table 2.1.

Another method of examining crash rates is to analyze the annual crash rate in comparison to a base year. This method provides a quick glance of the change in crash rates over time compared to rates from the base year. A value greater than 1 represents an increased crash rate, while a value less than 1 represents a decrease. Corresponding “relative” crash rates are provided in table 2.2.

2.2.1 Freeways

Freeways, I-44, I-64, I-170, and I-270, displayed a general decreasing trend in crash rates, especially evident after 2007. As previously noted, I-64 (I-270 to I-55 downtown) demonstrated a significant reduction in crash rates resulting from reconstruction closures. In reviewing the 2009 crash rate index, I-44, I-55, I-64, I-170, and I-270 experienced reductions in crash rates from the 2004 base year (28%, 9%, 75%, 35%, and 17% reductions). I-170 was the only freeway to experience an increased crash rate in 2009. In comparison to the year 2008, 2009 resulted in lower crash rates for most freeways, with the exception of I-70. An increased crash rate on I-70 in 2008 was due, in part, to record-breaking heavy rainfall occurring in that year.

Table 2.1 Crash Rates

Classification	Route	2004	2005	2006	2007	2008	2009
Freeways	I-44	142	139	134	135	137	103
	I-55	158	157	149	144	152	144
	I-64	225	224	206	168	102	57
	I-70	182	179	189	196	203	210
	I-170	223	190	203	195	188	139
	I-270	142	149	152	150	138	117
Expressways	US 40	89	98	103	99	66	92
	US 61	425	423	402	388	382	401
	US 67	516	432	488	441	429	494
	MO 141	371	428	375	438	381	437
	MO D	398	380	353	384	397	254
Major Arterials	MO 30	574	584	468	470	434	477
	MO 100	413	389	370	395	426	435
	MO 115	426	482	431	417	444	511
	MO 180	448	434	429	410	411	404
	MO 340	446	400	477	475	453	369
	MO 366	443	438	444	353	366	364

Table 2.2 Crash rates relative to base year of 2004

Classification	Route	2004	2005	2006	2007	2008	2009
Freeways	I-44	1.00	0.98	0.95	0.95	0.97	0.72
	I-55	1.00	1.00	0.94	0.91	0.96	0.91
	I-64	1.00	1.00	0.91	0.74	0.45	0.25
	I-70	1.00	0.98	1.04	1.08	1.11	1.15
	I-170	1.00	0.85	0.91	0.87	0.85	0.62
	I-270	1.00	1.05	1.07	1.06	0.97	0.83
Expressways	US 40	1.00	1.10	1.15	1.11	0.74	1.03
	US 61	1.00	0.99	0.95	0.91	0.90	0.94
	US 67	1.00	0.84	0.95	0.86	0.83	0.96
	MO 141	1.00	1.15	1.01	1.18	1.03	1.18
	MO D	1.00	0.95	0.89	0.96	1.00	0.64
Major Arterials	MO 30	1.00	1.02	0.81	0.82	0.76	0.83
	MO 100	1.00	0.94	0.90	0.96	1.03	1.05
	MO 115	1.00	1.13	1.01	0.98	1.04	1.20
	MO 180	1.00	0.97	0.96	0.92	0.92	0.90
	MO 340	1.00	0.90	1.07	1.07	1.02	0.83
	MO 366	1.00	0.99	1.00	0.80	0.83	0.82

2.2.2 Expressways

US Route 40 (between I-270 and Missouri Research Park) was recently designated as I-64, coinciding with the completion of an upgrade to I-70 near Wentzville, Missouri. Route 40 followed the same design standard as a freeway and its crash rates reflect the same higher standard and the rates are similar to other freeways. US Route 61, 67, and Route D remained mostly stable over the six years of evaluation, with the exception of Route D, which experienced a 36% decrease in crash rates in 2009 compared to the 2004 base year. Route 141 exhibited no noticeable trends, other than regular fluctuation, rate increased one year followed by decrease the next year and this continued over the analysis period. Reductions in crash rates in three of the four expressways have been, in part, the result of the long-term investment of the regional arterial management system in these adjacent roadways.

2.2.3 Major Arterials

Routes 30, 180, 340, and 366 exhibited declining crash rates across the last four years of the six-year study period, with decreases of 17%, 10%, 17%, and 18% in comparison to the 2004 base year. Routes 100 and 115 experienced fluctuating trends across the six-year study period.

Chapter 3 Conclusions

The major conclusions from the crash analyses are as follows:

- From this evaluation, we can conclude that no evidence was found in support of the possibility that I-64 closure increased crash rates on adjacent highways.
- Crashes and crash rates declined for most freeways, expressways, and major arterial routes. Only I-70, Route 141, Route 100, and Route 115 exhibited increased crash rates during the two-year closure period.
- Evaluation of sixteen adjacent roadways indicated a decline in crashes in 2008 and 2009; a decrease of 2,125 crashes in comparison to the 4-year pre-closure average for 2004-2007.
- Rear-end crashes (highest frequency crashes) decreased from 7,757 in 2007 to 6,835 in 2008 and 6,728 in 2009.
- For the 17 roadways analyzed, severity type showed a similar reduction trend, exhibiting a significant reduction in fatal crashes (table 3.1).
- Rear-end, passing, and other vehicle characteristics showed a similar reduction trend, whereas out-of-control vehicles displayed an increasing trend (table 3.1).
- Rear-end, out-of-control, and passing vehicles represented 72.4% of total crashes (table 3.1).
- The 17 roadways investigated experienced 15,111 (8.9% decrease) crashes in 2008 and 14,155 (14.7% decrease) in 2009, in comparison to a four-year pre-construction average of 16,595 crashes.
- Comparing the crash average of the pre-closure period (2004-2007) to the closure period (2008 and 2009), the number of crashes increased an average of 2.1-8.1%

for I-44, I-55, I-70, MO D, and MO 100 in 2008. The number of crashes increased an average of 0.1-15.7% for I-70, MO 100, and MO 141 in 2009. The crash numbers decreased an average of 2.9-51.7% for all other routes in 2008, and decreased 4.2-72.5% for all other routes in 2009.

- Comparing the average of the pre-closure period (2004-2007) to the closure period (2008 and 2009), crash rates increased on average 2.1-8.6% for I-55, I-70, MO D, and MO 100 in 2008. Crash rates increased on average 0.1-15.5% for I-70, MO 100, MO 115, and MO 141 in 2009. Crash numbers decreased by 0.7-50.5% for all other routes in 2009.
- For I-70 and MO 100, the increasing trend began prior to the I-64 closure (i.e., before 2008). Based on these pre-closure trends, there is little justification to imply that the I-64 closure caused an increase in crashes and crash rates for these roadways.
- Although each route displays its own unique trend, the overall crashes in all three types of highways (i.e., freeways, expressways and major arterials) decreased for both 2008 and 2009.
- The significant crash reduction (50-70%) along segments of I-64 that were not closed could be a good indicator of regional public awareness of the project and a cooperative consensus to use designated alternative roadways.
- Observations from Routes D and 340 revealed noticeable safety improvements in 2009 that could have been partially caused by the increase of arterial management implemented along these corridors.

Table 3.1 Comparison of severity and crash types

Severity	2004-2007 Average	2008	2009	Percent Change 2008 and 2009
Fatal	46	39	26	-15% and -43%
Disabling Injury	306	295	247	-4% and -19%
Minor Injury	3766	3367	3148	-11% and -16%
Property Damage Only	12477	11410	10734	-9% and -14%
All Crashes	16595	15111	14155	-9% and -15%
Crash Type	2004-2007 Average	2008	2009	Percent Change 2008 and 2009
Rear-end	7913	6835	6728	-14% and -15%
Out-of-Control	2280	2584	2490	+13% and +9%
Passing	1934	1660	1367	-14% and -29%
Other Type	4464	4035	3523	-10% and -21%

Note: Negative (-) indicates a decrease in crashes and positive (+) indicates an increase in crashes