Meta-Analysis of the Effect of Road Work Zones on Crash Occurrence

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Abstract

There is strong evidence that work zones pose increased risk of crashes and injuries. The two most common risk factors associated with increased crash frequencies are work zone duration and length. However, relevant research on the topic is relatively limited. For that reason, this paper presents formal meta-analyses of studies that have estimated the relationship between the number of crashes and work zone duration and length, in order to provide overall estimates of those effects on crash frequencies. All studies presented in this paper are crash prediction models with similar specifications. According to the meta-analyses and after correcting for publication bias when it was considered appropriate, the summary estimates of regression coefficients were found to be 0.1703 for duration and 0.862 for length. These effects were significant for length but not for duration. However, the overall estimate of duration was significant before correcting for publication bias. Separate meta-analyses on the studies examining both duration and length was also carried out in order to have rough estimates of the combined effects. The estimate of duration was found to be 0.953, while for length was 0.847. Similar to previous meta-analyses the effect of duration after correcting for publication bias is not significant, while the effect of length was significant at a 95% level. Meta-regression findings indicate that the main factors influencing the overall estimates of the beta coefficients are study year and region for duration and study year and model specification for length.

Key-words: Work zones; Crashes; Meta-analysis; Meta-regression

1. Introduction

The safe and efficient movement of drivers through work zones is a major concern to transportation engineers, road industry and researchers. There is strong evidence that work zones a hazardous roadway environment to drivers that increases the risk of road crashes and injuries. The reduction of number and capacity of road lanes, the changes in road delineation and signage, the presence of workers, construction machinery, roadside construction barriers and other objects and obstacles, may create more complex environment with increased conflicts that in turn lead to high risk conditions.

Early research on this topic indicates that crash rates increase in work zones (Juergens, 1972; Liste et al., 1976; Graham et al., 1977; Rouphail et al., 1988). More recent research used statistical models in order to examine the relationship between work zone characteristics and crash frequency (Pal and Sinha, 1996; Khattak et al., 2002; Venugopal and Tarko, 2000; Chen and Tarko 2012 and 2014) and severity (Khattak et al., 2002; Venugopal and Tarko, 2000; Li and Bai, 2008; Khatak and Targa, 2004) and largely confirmed the earlier results. The most common significant work zone factors found to increase the number of crashes in work zone areas are duration of works and length of the work zone (Pal and Sinha, 1996; Khattak et al., 2002; Venugopal and Tarko, 2000; Chen and Tarko 2012). Other contributory factors were found to be traffic conditions and driver behavior at work zones (Chen and Tarko 2012; Daniel et al., 2000; Wang et al., 1996), as well as work zone configurations such as signage, alternate one-way traffic etc. (Qi et al., 2013).

More specifically, a study by Khattak et al., (2002) quantified the effect of work zone presence, duration and length on non-injury and injury accidents on the basis of California crash data for 1992 and 1993. The authors found that both length and duration increase occurrence of both non-injury and injury crashes. Another similar study (Ozturk et al., 2013) used 2004-2010 crash data in work zones of New Jersey and argued that increased length and increased duration are associated with increased number of crashes. Chen and Tarko (2012) examined 3 year of work zone crash and indicated that increased lengths increase number of crashes. Similar findings were reported in Chen and Tarko (2014). Venugopal and Tarko (2000) investigated the effect of work zone characteristics on the crash frequencies for different injury severity levels and found similar relationships across different injury categories. Yang et al. (2013), examined frequency of property-damage only and injury crashes by applying Bayesian negative binomial models and found a consistent positive influence (increase in numbers) of work zone length on crashes by different severity levels.

A focus on rear-end crashes was put in Qi et al. (2013); this study used truncated count data models to examine the effect of various factors, including driver impairment (e.g. alcohol), environment (nighttime, road or junction type) and work zone layout (e.g. contra flow, lane closures, signage and control devices), on rear-end crashes at work zones that occurred in New York State between 1994 and 2001.

In general, the main technique used to model crash frequency in work zones was found to be the negative binomial model (Pal and Sinha, 1996; Venugopal and Tarko, 2000; Ozturk et al., 2013 and 2014), in which work zone length and duration are used either in their original form or log-transformed. Other approaches were also found; for example, Li and Bai (2008) proposed an alternative approach by developing a crash severity index for work zone safety evaluation.

Overall, work zone safety is considered an issue of high importance, however there is relatively limited research on the topic (Chen and Tarko, 2014; Wang et al., 1996), and this may be attributed to a) the small available samples of crashes during the works (due to the usually short duration of work zones) and b) the small samples of relevant data after the end of the work zone (also due to the improvement of the safety level). It is therefore needed that crash data around work zones are better reported in police records. Although there are several studies on the topic, with largely consistent findings, to the best of the authors' knowledge, there has not been an attempt to summarise these findings to an overall effect of work zones on the number of crashes.

In this framework, the aim of the present study is to investigate the overall effect of work zones on road safety. In particular, the effects of work zone duration and length on crash frequencies are examined. Meta-analysis techniques on the estimates of existing studies are implemented. Moreover, by developing meta-regression models, it is aimed to identify study design or other characteristics have an effect on the overall estimate of work zone characteristics on safety.

The remainder of the paper is organized as follows: the data section provides a list and a short description of studies considered in the meta-analyses as well as the selection criteria. The methodology section illustrates the theoretical background for fixed and random effects meta-analysis and for meta-regression. Tests for detecting and correcting publication bias are also presented. The results section illustrates meta-analysis and modeling results of the study. Finally, the conclusion section presents the main conclusions drawn from the study and suggestions for further research on the topic.

2. Data and Methods

2.1. Selection of Studies

Initially, a literature search was performed to identify relevant studies. The search terms used was "work zones". The search strategy aimed at identifying the best quality and recent studies to estimate the effect of the examined risk factors. Three main databases were consulted: Google Scholar, TRID and Science Direct. In general, only recent (after 1990) journal studies and papers in the field of Engineering were initially considered. No "grey" literature was examined.

The basic search terms used included [work zones] AND [risk OR crashes] AND [length OR duration]. The initial search returned more than 3,500 "hits", which were screened for relevance to the purposes of this research by title. This narrowed down the results into 64 studies, for which an abstract screening was further carried out, eventually leading to 29 studies to screen full-text. The selected studies for inclusion in the meta-analysis were 8 recent and high quality studies.

Studies considered for meta-analyses need to be roughly comparable (same type of statistical model, similar dependent variable etc.). For that reason, only studies applying fixed effects negative binomial models were considered for meta-analysis. A very important requirement is that studies report standard errors. In cases that the independent variables were defined in different units (e.g. km vs miles) the appropriate transformations took place. Table 1 illustrates the characteristics of the selected studies.

*****Table 1 to be inserted here*****

In most of studies identified, negative binomial models were used and it was decided to perform a meta-analysis on the beta coefficients. Despite the similar analysis methods, it can be also noticed that the studies vary to a more or less considerable extent in their sample sizes and moderator variables used in the models. For example, not all studies account for traffic volume at the examined sites; some studies focus on the traffic arrangements at the work zone sites (e.g. type of works, traffic management, speed limits and enforcement), while others focus on controlling for road type or road element type (e.g. urban area, ramp, intersection). Therefore, heterogeneity in the examined effects estimates is expected.

Meta-analysis of regression coefficients in this case is not straightforward and involves complexities which are not encountered when meta-analyzing simple effects such as odds ratios, relative risks etc. Card (2012), provide a list of such problems. Nevertheless, Elvik and Bjornskau (2015) state that many examples of published meta-analyses in international literature do not adhere to restrictions of Card (2012). Following Elvik and Bjornskau (2015), it was decided to perform a meta-analysis keeping in mind the above differences in study designs. Studies applying random effects, random parameters or full Bayesian models were considered only for meta-regression analysis.

2.2. Fixed and Random Effects Meta-analysis

Meta-analysis is a statistical analysis of set of numerical research results of studies aiming to develop a weighted overall mean result and identify sources of systematic variation in individual results. A meta-analysis can help to combine the results from several studies, if these results are produced under comparable conditions. There are several techniques for meta-analysis. The theoretical background illustrated here can be found in more detail in (Elvik and Bjornskau 2017; Hedges and Olkin 1985; Berkey et al., 1995; Van Houwelingen et al., 2002; Viechtbauer, 2016). The reader is also encouraged to refer to Elvik (2005) and Elvik (2011), who provide detailed overview of carrying out meta-analyses.

Overall, in the field of road safety several informative meta-analyses have been found to exist (Elvik 1994, 2001, 2011, 2013, 2016, Phillips et al. 2011) and the most commonly applied technique is the inverse variance technique. Each estimate of the effect of a risk factor or a safety measure is assigned statistical weight which is inversely proportional to its sampling variance.

The results of meta-analyses are normally reported in terms of one or more summary estimates of effect, i.e. weighted mean estimates using the inverse of sampling variance as weight. The summary estimate of risk or effect based on g individual estimates is:

Summary mean = $\bar{Y} = \frac{\sum_{i=1}^{g} Y_i \cdot W_i}{\sum_{i=1}^{g} W_i}$ (1)

Where $\bar{Y}$ is the estimate of the weighted summary mean, based on g individual estimates, each of which is assigned a statistical weight:

Statistical weight = W = $\frac{1}{SE_i^2}$ (2)

In fixed effects meta-analyses, if i=1,…,n independent effect size estimates, each is estimating a corresponding true effect size.

$$y_i = \theta_i + \varepsilon_i, \quad (3)$$

where yi is the observed effect in the i-th study, θi is the corresponding (unknown) true effect, εi is the sampling error (εi~N(0,vi)). As a result, all the yi's are assumed to be unbiased and normally distributed estimates of their corresponding true effects. Note that the sampling (within-study) variances vi are assumed to be known, as the standard errors of the estimates are reported in the studies. However, variability (or heterogeneity) can be present among true effects.

A random effect model is used to account for potential heterogeneity. In this case, the true effect θ_i is:

$$\theta_i = \mu + u_i, \quad (4)$$

where μ is the mean of all true effects and u_i reflects the distribution of true effects around their mean and follows a normal distribution with mean value zero and (between-study) variance τ^2. If τ^2 equals zero, then the true effects are assumed to be homogenous (i.e. $\theta_1=\theta_2=\ldots\theta_n$). To determine whether there is systematic between-study variation in results, the following statistical test is performed:

$$Q = \sum_{i=1}^{g} W_i \cdot Y_i^2 - \frac{\left(\sum_{i=1}^{g} W_i \cdot Y_i\right)^2}{\sum_{i=1}^{g} W_i} \quad (5)$$

where Q is an estimate of variance, chi-square distributed with g – 1 degrees of freedom. If Q is significant, the variance between studies is larger than would be expected on the basis of the within-study variation. Whether Q is significant or not depends – next to the heterogeneity – also on the sample size. With a very large sample, Q would practically always be significant and with a very small sample almost never. Therefore it has been suggested to calculate the percentage of variance that is due to heterogeneity between studies I^2.

$$I^2 = \left(\frac{Q-(g-1)}{Q}\right) * 100\% \quad (6)$$

This expresses the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance).

2.3. Meta-Regression

Another way to deal with potential heterogeneity is to conduct a meta-regression. In this case, the moderators (e.g. study characteristics) included in the model may account for heterogeneity in the true effects (or for a part of it). In this case, the model is:

$$\theta_i = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_k x_{i\kappa} + u_i \tag{7}$$

In this equation, x_{ij} is the value of j-th moderator variable in the i-th study. Again, u_i follows a normal distribution with mean value μ and variance τ^2. It is noted that in meta-regression, τ^2 is the amount of residual heterogeneity among the true effects (the variability among the true effect that cannot be explained by the moderators entered in the meta-regression model).

2.4. Funnel Plots and Publication Bias

A funnel plot is a tool used to visualize results of exploratory meta-analyses (Elvik and Bjørnskau, 2015) in which the estimate of interest (e.g. odds ratio, relative risk) is plotted on the horizontal axis, while the standard error is plotted on the vertical axis. Funnel plots are also helpful to detect potential publication bias, i.e. a tendency of not publishing findings which are not statistically significant or go against a priori expectations of researchers (Elvik and Bjørnskau, 2015). Therefore, if studies with non-significant or small effect remain unpublished, an asymmetric funnel plot will be generated (Sterne et al. 2001; Rothstein et al., 2005).

In this study two methods were applied in order to test for publication bias. Initially, potential asymmetry in funnel plots was detected by testing whether the effects (or the model residuals when a meta-regression is carried out) are related with their standard errors. This can be tested via the regression test proposed by Egger et al. (1997). Secondly, the trim-and-fill method is applied (Duval and Tweedie, 2000a and 200b), which is non-parametric and can estimate the number of studies missing from a meta-analysis due to asymmetric funnel plot. It is noted that the trim-and-fill method cannot be applied in meta-regression models.

3. Results

In this study meta-analysis and meta-regression techniques were applied in order to have an overall estimate on the basis of the individual beta coefficients reported in the studies for the effect of the explanatory variables a) work zone duration and b) work zone length, on the dependent variable "number of crashes". Moreover, the studies in which both variables are considered, are examined in an additional analysis in order to produce estimates of the combined effect of both variables (work zone length and duration) on crashes. Meta-analysis was considered feasible for 9 beta coefficients of work zone duration, 14 beta coefficients of work zone length and 9 coefficients of the combined effect. In meta-regression models, 9 beta coefficients were included for duration and 19 for work zone length.

3.1. Meta-Analysis of the Effect of Work Zone Duration

A random-effects meta-analysis was carried out, because there was considerable heterogeneity in coefficient estimates of work zone duration as indicated by I^2 and Q-test. The individual study estimates and the overall estimate of work zone duration (in days) are listed in Figure 1 (forest plot) as beta coefficients and their related odds ratios. These are estimated as the exponent of the beta coefficient and may be interpreted as incidence rates or risk ratios (given that the outcomes are crash counts). The overall beta coefficient was found to be 1.035 and the 95% confidence intervals were found to be 0.247 and 1.823 respectively as shown in the forest plot (Figure 1). This effect was found to be 95% significant (p-value=0.01). The related odds ratio is equal to 2.85, suggesting that a unit increase in work zone duration nearly triples the crash incidence rate. However, after correcting for publication bias, an estimate of 0.1703 was produced (odds ratio equals 1.185, indicating an increase of 18.5% in the incidence rate for a unit increase of work zone duration), which was however not significant. The initial and the corrected for publication bias funnel plot are illustrated on Figure 2. A vertical solid line represents the overall effect, while the dots represents each effect of each study.

*****Figure 1 to be inserted here*****

*****Figure 2 to be inserted here*****

3.2. Meta-regression of the Effect of Work Zone Duration

In order to further explain the heterogeneity in the existing effects reported in the literature, a meta-regression analysis was carried out. Summary results are provided on Table 2. Results indicate that the main moderator variables (study characteristics) affecting the overall estimate of work zone duration are the year and the region (State) of study. More specifically, the sign of the beta coefficient of the year of the study, shows that more recent studies are more likely to report higher estimates. The estimates of work zone duration on accident frequencies in California (reference case) are higher than in Indiana and New Jersey. As stated in section 2.4, meta-regressions have their own tests for publication bias. The test for funnel plot asymmetry of the meta-regression of the effect of work zone duration revealed no indication of publication bias (p-value = 0.1195); the funnel plot is not presented here for the economy of space. This may be attributed to the fact that the meta-regression also included random effects models, while the meta-analysis included only fixed effects models.

*****Table 2 to be inserted here*****

3.3. Meta-analysis of the Effect of Work Zone Length

Results of the random-effects meta-analysis indicate that the overall estimate of the effect of work zone length (in Km) is 0.862 and the 95% confidence intervals are 0.810 and 0.913 respectively (Figure 3). This effect was found to be 95% significant (p-value=<0.001). The related odds ratio equals 2.368, suggesting that a unit increase in work zone length increases the crash incidence rate by more than 2 times. Figure 4 illustrates the funnel plot. The test for funnel plot asymmetry was not significant (p-value=0.145), therefore, the effects did not present publication bias.

*****Figure 3 to be inserted here*****

*****Figure 4 to be inserted here*****

3.4. Meta-regression of Work Zone Length

Results of the meta-regression model of the effects of work zone length are shown in Table 3. It was found that the main moderator variables (study characteristics) affecting the overall estimate of work zone length are the year and model specification. More specifically, the sign of the beta coefficient of the year of the study, shows that more recent studies are more likely to report lower estimates. The negative sign of the beta coefficient of 'fixed effect' is negative, implying that studies applying fixed effects negative binomial models, report lower estimates than studies using more complex models (e.g. random effects or random parameters). The test for funnel plot asymmetry of the meta-regression of the effect of work zone length revealed no indication of publication bias (p-value = 0.453).

*****Table 3 to be inserted here*****

3.5. Combined Effect of Work Zone Duration and Length

In these series of meta-analyses only studies utilizing models which examine both duration and length of work zones are considered. Figure 5 presents the respective forest plots, while Figure 6 presents the final funnel plots.

Regarding work zone duration, the random-effects meta-analysis showed existence of considerable heterogeneity in coefficient estimates. The overall estimate was found to be 1.531 (odds ratio = 4.6), while and the 95% confidence intervals were found to be 0.523 and 2.538. This effect was found to be 95% significant (p-value=0.029). However, the regression test for funnel plot asymmetry was significant (p-value<0.001) suggesting existence of publication bias (similar to the previous meta-analysis of work zone duration). The trim-and-fill method was applied to correct for publication bias and revealed a corrected non-significant estimate (beta=0.925, odds ratio=2.522, p-value=0.147).

When the effect of work zone length is examined, it was found that the overall estimate was 0.909 (odds ratio=2.48), which was significant for 95% level. The statistical tests showed low heterogeneity and consequently a fixed-effects model was applied. When testing for publication bias, the regression test revealed that funnel plot asymmetry was statistically significant, indicating publication bias. After correcting for publication bias with the trim-and-fill method, the new corrected overall estimate was 0.8466 (odds ratio=2.33), which was significant for 95% level, similar to the previous meta-analysis of all studies examining work zone length.

*****Figure 5 to be inserted here*****

*****Figure 6 to be inserted here*****

4. Discussion

In this paper, several meta-analyses and meta-regression models were applied in order to provide an estimate of the effects of work zone duration and length on crash frequencies. Table 4 summarizes the main findings of the study.

Overall, duration has a positive but non-significant effect on crash numbers. However, before correcting for publication bias the effect was found to be significant. The meta-regression analysis showed that more recent studies tend to report higher and more significant estimates of work zones. Consequently, researchers or policy makers may use with caution the initial uncorrected estimate, especially if their study setting is similar to that of more recent studies. On the other hand, length of work zones was found to have a positive significant effect, indicating a higher increase in the number of crashes in longer work zone areas.

The combined meta-analysis included studies which examined both duration and length. This approach allows to assess the combined effect of these two parameters on crash frequency. The results are similar with the previous separate meta-analyses. More specifically, the corrected estimate of duration was not significant, while length was significant. It appears that a combined assessment of the effect of duration and length would depend on the researcher's careful decision whether to trust the uncorrected estimate; in this case, it is indicated that a combination of longer work zones and for increased duration has an even more detrimental effect on road safety, but this tendency remains to be validated in future studies.

*****Table 4 to be inserted here*****

When considering these findings, one should keep in mind the limitations of the analysis. The number of selected studies is limited, as only a few studies met the rigorous quality selection criteria to be included in this meta-analysis (recent studies, pertinent models, quantitative estimates and reported standard errors). Many work zone related studies were not performed under similarly-controlled samples. Each study selected different moderator variables in the analysis. Few of them took into account the prevailing traffic conditions; instead, most of them used AADT. These modeling differences lead to heterogeneity in the estimated effects of each variable, including duration and length.

In order to explain the heterogeneity of effects and to investigate which study characteristics (moderator variables) and in what way they affect the overall estimates, meta-regression analysis also carried out. The year and the region of the study (all studies were conducted in the US) have an impact on the size of the estimated effects of work zone duration on road crashes. On the other hand, the year of the study and the analysis method (fixed vs random effects model specification) influence the size of the effects of work zone length on road crashes. It was not possible to include the type of moderator variables used in the original models as a variable in the meta-regression, due to the large diversity in the moderators used; this would have shed more light in the factors that affect the meta-estimates produced by the meta-analyses.

Although this heterogeneity was taken into account in random effects meta-analyses, and the meta-estimates were corrected for publication bias as well, the differences in study designs are considerable and the final estimates in principle cannot be generalized. Therefore, although the present study considered existing recommendations on how to proceed with meta-analysis when studies are few and heterogeneous, the results should be interpreted with caution.

5. Conclusions

This paper focuses on existing literature examining the relationship between work zone duration, work zone length and crash frequency. It describes meta-analyses undertaken to summarize findings of the selected studies and reports the summary estimates of the effects from these analyses. Tests for publication bias were also carried out for all performed analyses.

Furthermore, the main study design characteristics affecting the summary effects were investigated by means of meta-regression analysis, showing that study characteristics do matter.

Although the presence of work zones and their characteristics are generally considered potentially hazardous areas, the number of relevant literature on the field is rather limited. Therefore, the present findings provide meta-analyzed overall estimates of the risks associated with work zone duration and length in terms crash occurrences, as well as some insight on how these estimates vary on the basis of the different areas and methods through which the topics have been studied over the years.

The results of this paper reveal the need for future research in this area. More studies investigating work zone safety are needed in order to update and strengthen the present meta-analyses, especially with studies from other regions (e.g. Europe, Australia etc.). Type of road (e.g. motorway, rural or urban) and type of works would be additional interesting aspects to include in the analyses. In addition, it would be interesting to meta-analyze work zone characteristics in terms of their effect on crash injury severity as well. Finally, the present results revealed publication bias in the existing estimates, underlining the need not to discount negative findings in the future. Non-significant or unexpected findings should not be excluded and remain unpublished as they can contribute to increasing the evidence-base on this topic.

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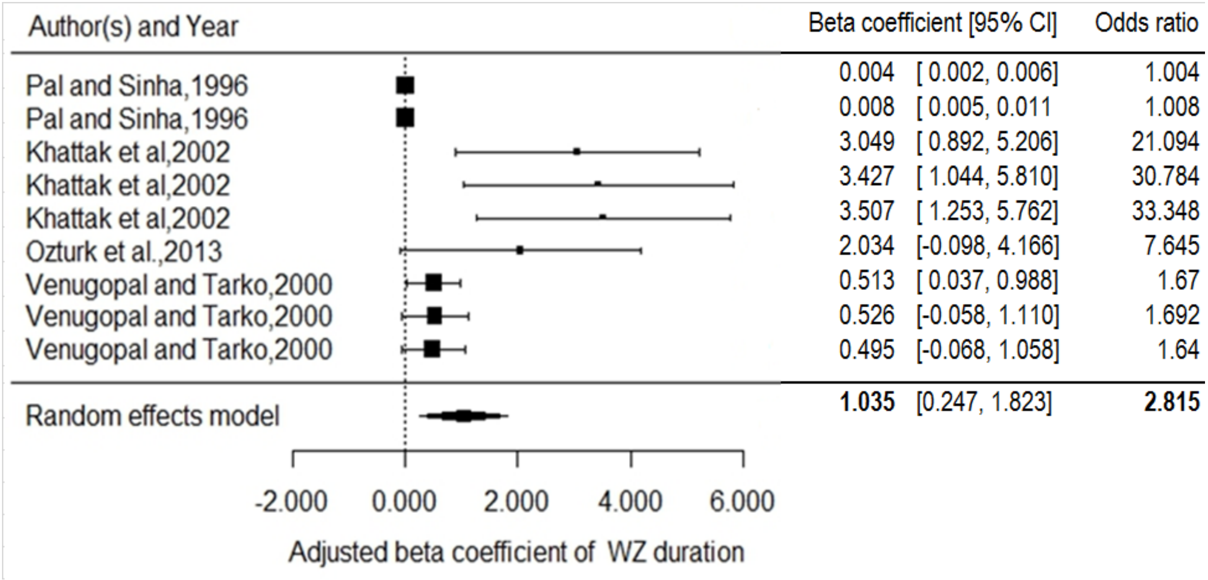

Figure 1. Forest plot of beta coefficients and odds ratios of Work Zone duration

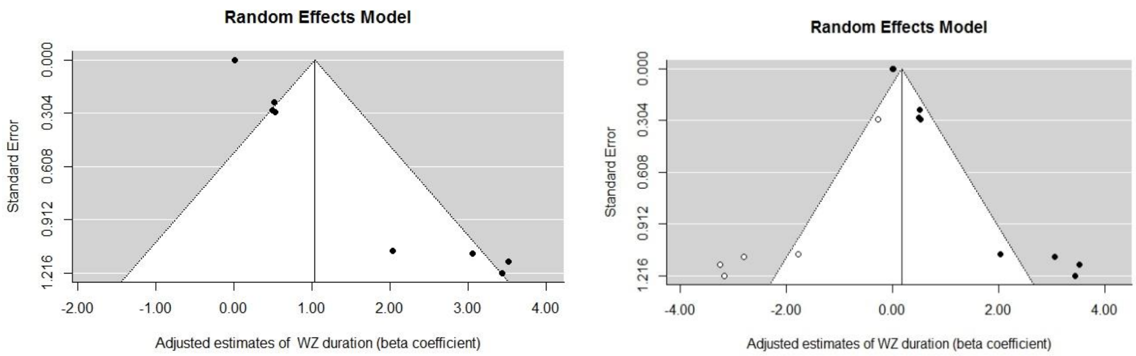

Figure 2. Initial funnel plot of beta coefficients of work zone duration (left panel) and after correcting for publication bias (right panel)

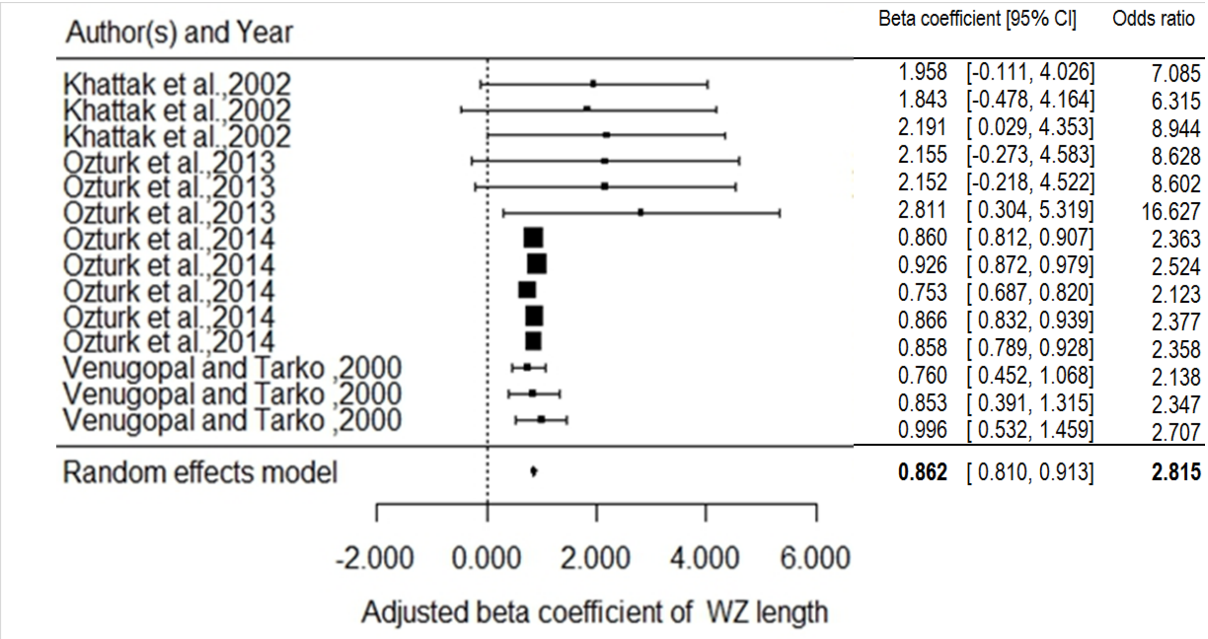

Figure 3. Forest plot of beta coefficients and odds ratios of work zone length

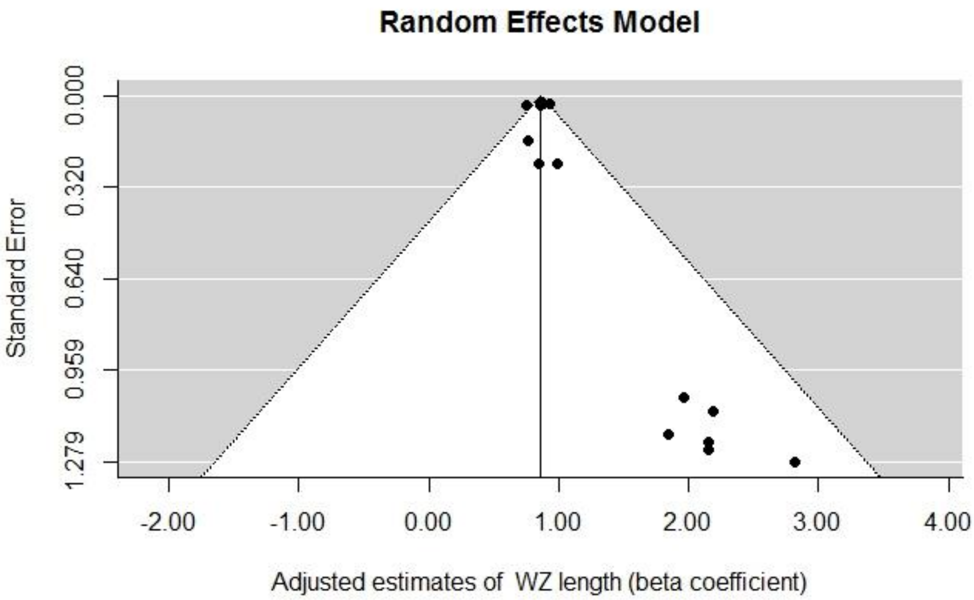

Figure 4. Funnel plot of beta coefficients of work zone length

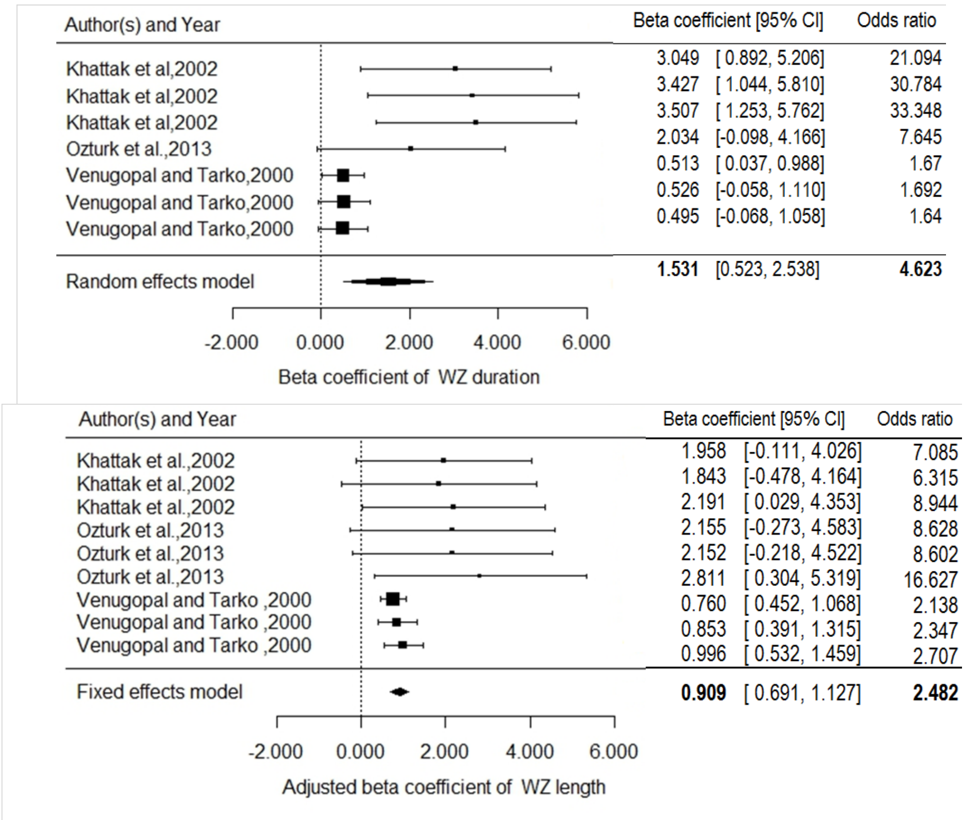

Figure 5. Forest plots of beta coefficients and odds ratios of work zone duration (top panel) and length (bottom panel) (combined effect)

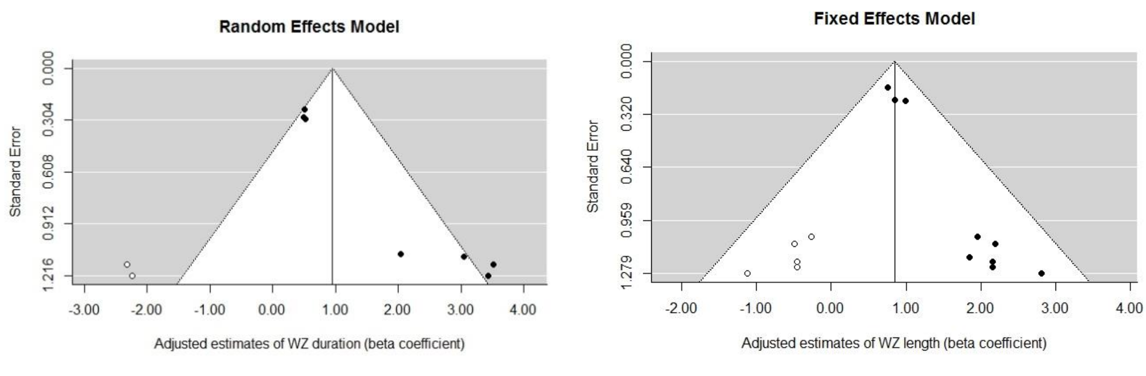

Figure 6. Corrected Funnel plots of beta coefficients of Work Zone duration (left panel) and length (right panel) (combined effect).

Table 1. Studies selected for meta-analysis

Authors/Year	Model	Effects			State	Sample crashes	Sample sites	Moderator variables										
		Number	Duration	Length				traffic	work type	work intensity	roadway characteristics	traffic management	enforcement	temporal variables	road type	speed / speed limit	ramp	intersection
Chen and Tarko, 2012	Random effects Negative Binomial	1		•	Indiana	2712	-			•	•	•	•	•				
Chen and Tarko, 2014	Poisson random effects/parameters	2		•	Indiana	547	72		•	•	•	•						
Khattak et al., 2002	Fixed effects Negative Binomial	3	•	•	California	2038	36								•			
Ozturk et al., 2013	Fixed effects Negative Binomial	1	•	•	New Jersey	5382	-	•				•			•	•	•	•
Ozturk et al., 2014	Fixed effects Negative Binomial	5		•	New Jersey	8749	60	•							•	•	•	•
Pal and Sinha, 1996	Fixed effects Negative Binomial	2	•		Indiana	-	34	•										
Venugopal and Tarko, 2000	Fixed effects Negative Binomial	3	•	•	Indiana	5025	-		•	•								
Yang et al., 2013	Bayesian Random Effects Neg.Binomial	2		•	New Jersey	-	-											

Table 2. Parameter estimates of meta-regressions coefficients for the effect of work zone duration

Moderator Variable	Estimate	Standard error	p-value
Constant term	-251.738	47.305	0.003
Year	0.126	0.024	0.003
Indiana state	-0.406	0.148	0.041
New Jersey state	-1.849	0.268	0.001
California state (ref.)	-	-	-

Table 3. Summary estimates of meta-regression model for work zone length

Moderator Variable	Estimate	Standard error	p-value
Constant term	32.320	8.099	0.000
Year	-0.016	0.004	0.000
Fixed effects	-0.325	0.032	0.000

Table 4. Summary findings of the meta-analyses

Parameter	Initial estimate (95% CI)	Corrected estimate (95% CI)	Conclusion	Parameters affecting the estimate
Length (km)	0.862 (0.810, 0.913)	-	Significant effect	Study year, model specification
Duration (days)	1.035 (0.247, 1.823)	0.170 (-0.874, 1.214)	Non-significant effect	Study year, region
Length Duration (combined)	0.909 (0.691, 1.127) 1.531 (0.523, 2.538)	0.847 (0.633, 1.06) 0.953 (-0.333, 2.238)	Significant effect/ Non-significant effect	-