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A Meta-Analysis of the CSI Effect: The Impact of Popular Media on Jurors' Perception of Forensic Evidence

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abstract: *The CSI effect describes the perception in the criminal justice system, popular media, and general population that consumption of crime-based television programming focusing on the forensic sciences has created a juror bias toward the requirement of forensic evidence at trial to justify a conviction. It is proposed that this bias has resulted in increasing the burden of proof laid upon the state at trial from beyond a reasonable doubt to beyond any doubt. This raised standard of proof has allowed guilty defendants to go free because of this bias. This article provides a meta-analysis of empirical studies of the CSI effect that examine the behavior of jurors and the influence of popular media on the trial decision-making process.*

> *Physical evidence cannot be wrong; it doesn't lie. It's not influenced by emotion or prejudice; it's not confused by the excitement of the moment.*
>
> *CSI: Crime Scene Investigation*
> (Bruckheimer, Zuiker, and Fink, 2005)

Introduction

In 2000, U.S. and British television launched two crime drama series focusing on forensic science and its use in the criminal justice system. These two programs were, respectively, *CSI: Crime Scene Investigation* and *Waking the Dead* (Cole, 2013). *CSI* became a cultural phenomenon over its 15-year run, spawning several spin-offs, including *CSI: Miami*, *CSI: New York*, and a variety of others. Forty-two million people viewed one or more of the three series in October 2009, while all of these shows and their reruns ranked in the top 30 in global markets (Cole, 2013; Shelton, 2010). Researchers have investigated whether viewers' perceptions of the validity of forensic science could be skewed if later summoned to serve as jury members. Popular media had already introduced the idea of *jury incompetence* as early as 1997 (Edmon & Mercer, 1997). This phenomenon was related to another made popular by the media in the wake of the new programs: the *CSI effect*. *Time* magazine first used this phrase in 2002 to describe the increasing public awareness of the importance of crime scene investigation evidence and subsequent police laboratory findings in U.S. criminal cases (Cole, 2013). Anecdotal reports from prosecutors at the time suggested that potential jurors were developing unrealistic expectations of the state's ability to provide forensic evidence. Prosecutors feared that juries, under bombardment from forensic-related shows, were erroneously acquitting defendants based on expectations created by these fictional representations (Lawson, 2009).

Could a belief in assertions like those of one of *CSI*'s main characters in the epigram influence U.S. jurors' deliberation process? In the following, we first review the main definitions of the CSI effect and explore the role popular media play in perpetuating it. We then utilize a meta-analysis of empirical studies that examined data on this question. Finally, we assess whether the data support the anecdotal claims put forward by U.S. popular media, prosecutors, and defense attorneys.

Defining the CSI Effect

The CSI effect can be defined in three ways. The first and most common definition holds that the televised portrayal of forensic investigations creates, "unreasonable expectations on the part of jurors, making it more difficult for prosecutors to obtain convictions" (Podlas, 2006, p. 433). The counterpart to this is the *reverse CSI effect*, by which "*CSI* raises the stature of scientific evidence to virtual infallibility," (Podlas, 2006, p. 433) creating an almost insurmountable obstacle for the defense where this type of evidence is presented. The third definition

recognizes the shows' effect on creating general interest, producing more public funding for and educational opportunities in the forensic sciences (Podlas, 2006). We focus on the first two definitions.

Increasing the Burden of Proof for Prosecutors

The CSI effect has taken up residence in many courtroom attorneys' minds. For example, the Maricopa County Attorney insisted that the *CSI* franchise had a "real-life impact on justice" (Cole & Dioso-Villa, 2009, p. 1340), and called on the CBS network to place disclaimers in the television shows. Some prosecutors fear that juries will reject the typical testimony and circumstantial forms of evidence presented at actual trials on the grounds that they lack the scientific certainty inherent in forms that dominate these fictional representations. "Typically, the State attempts to bear its burden by piecing together many types of evidence, each having some probative value but also carrying a degree of uncertainty and, potentially, error" (Tyler, 2006 p. 1053). The phenomenon would effectively make these forms of evidence irrelevant.

In contrast to these claims, others in the court work group, including prosecutors and defense attorneys, dispute the very existence of the phenomenon. Some researchers concur, arguing that these accounts are not universally accepted and that prosecutors are split on their validity (Tyler, 2006). Cole and Dioso-Villa observed that "'To argue that 'CSI' and similar shows are actually raising the number of acquittals is a staggering claim, and the remarkable thing is that, speaking forensically, there is not a shred of evidence to back it up'" (quoted in Tyler, 2006).

However, high profile cases such as the trials of actor Robert Blake and real estate heir Robert Durst that unexpectedly end in acquittals further the perception among court officials of the CSI effect's reality. Jurors in the Blake trial felt latent prints, DNA analysis, and the presence of gunshot residue should have played a role in the prosecution's case. This despite the fact that such evidence is rare compared to its omnipresence in the television shows (Tyler, 2006). Durst confessed to shooting, dismembering, and then throwing his victim's remains in the ocean. A jury consultant for the defense advised council to select jurors familiar with *CSI* in the hope that they would find the lack of forensic evidence significant (Call, Cook, Reitzel, and McDougle, 2013). The victim's head was never found and Durst was acquitted. The defense argued that if the head had been found, it might have revealed evidence that could have substantiated Durst's claim that he killed the man in self-defense (Mann, 2005).

Judges also assert the presence of the CSI effect. In a 2004 Phoenix murder trial, jurors "noticed that a bloody coat introduced as evidence had not been tested for DNA. They alerted the judge. The tests hadn't been needed because the defendant had acknowledged being at the murder scene. The judge decided that TV had taught jurors about DNA tests, but not enough about when to use them." (Willing, 2004) Such partial education of the juror pool results in steps being taken to counter misinformation. "In Arizona, Illinois, and California, prosecutors now use 'negative evidence witnesses' to try to assure jurors that it is not unusual for real crime-scene investigators to fail to find DNA, fingerprints and other evidence at crime scenes" (Willing, 2004). The FBI even created a video addressing the phenomenon (Cole & Dioso-Villa, 2009).

These anecdotes raise the question whether the state now faces the burden of proving its case not beyond a reasonable doubt but beyond any doubt. Yet, given that the Bureau of Justice Statistics reports only 10% of criminal cases ever make it to trial, does it matter? These cases do still involve the most serious offenses and severe possible sentences. In such cases false acquittals can, therefore, pose a significant threat to public safety (Lawson, 2009).

Problems for the Defense

Defense attorneys for their part argue that there exists a reverse CSI effect. They believe that glorified television portrayals of crime scene investigators and the forensic scientists they work with elevate the credibility of their real-life counterparts (Cole & Dioso-Villa, 2009). Data collected two years prior to *CSI*'s debut by the National Opinion Research Center's 1998 General Social Survey showed the scientific community enjoyed a 40% approval rating. A scant 19% of Americans in contrast had a "great deal of faith" in the criminal justice system (Tyler, 2006). At the time of *CSI*'s debut, therefore, the public was predisposed to believe the scientific community over the legal community. The concern is that this predisposition toward over-confidence in science combined with the reverse CSI effect "will lead jurors to blindly believe in forensic science" (Podlas, 2006, p. 437). Indeed, "scientists say *CSI*'s main fault is this: The science is always above reproach" (Willing, 2004, p. 28). In the programs, we "'never see a case where the sample is degraded or the lab work is faulty or the test results don't solve the crime'" (Willing, 2004, p. 31).

Ironically, some in the crime scene investigation community also share the maxim that "the physical evidence never lies" (Gardner, 2012, p. 7) and is completely

objective. This objectivity, however, can be affected by the subjectivity of investigators or technicians interpreting evidence (Gardner, 2012). Defense attorneys worry that "jurors will be unwilling to accept that forensic proof could be compromised by human error, or is merely an educated guess" (Podlas, 2006, p. 438). Anecdotally, the misconception that investigators and the evidence they collect are infallible is said to favor the prosecution in any case where forensic evidence plays a role (Willing, 2004).

Another consideration is the reality of the ongoing evolution of evidence collection techniques versus their fictional portrayal. DNA testing has been evolving for the past 20 years. Several old verdicts were reversed based on new evidence found after retesting DNA samples. Yet, while DNA testing continues to become a more exact science, the evolving field of bite mark evidence is far less so. Similarly, the use of microscopic hair comparisons is also lagging. DNA testing of hairs from older cases has proved that hair comparison is not accurate. These are just a few examples in which DNA testing has revealed what was believed to be an exact science to be less so (Godsey, 2011).

The Role of the Popular Media

While the CSI effect's specific influence on jury deliberations remains debatable, the media's influence, in general, is not. The effect of mass media on public beliefs concerning crime and investigations has been present at least since Sir Arthur Conan Doyle's creation of Sherlock Holmes (Schweitzer, 2007). Television has portrayed its own version of the legal system since the 1960s. The CSI effect is only the most recent in a string of effects attributed to television programming. For example, *Perry Mason* purportedly changed the public's expectations of defense attorneys because of the way in which its title character always won his case or cross examination (Mann, 2006). Similarly, entire generations have no difficulty reciting their Miranda Rights after having heard them read to suspects on television since *Dragnet* and in subsequent, ubiquitous police procedurals (Call et al., 2013). Considering that 97% of U.S. households as of 2005 had a television (Media > Households with television, 2005), it is easy to assume that the medium would have some effect on views, preconceptions, and expectations. As the theory and *CSI* grew in popularity so did media attention. In 2003, the CSI effect was mentioned only twice after the first 2002 *Time* article (Cole and Dioso, 2009). By 2006, the number skyrocketed to 78 individual news articles on the topic. Many of these were in major publications such as *National Geographic* and *Scientific American*. The subject became sensationalized with news reports declaring that there was no debating the existence of the CSI effect (Cole & Dioso, 2009).

Episodes of *CSI* rarely leave any doubt as to the identity of the guilty party, and must often provide resolution in an hour. However, unlike television depictions of the legal system, the real one can often lead to uncertainty as to what the truth actually is. A not guilty verdict can be frustrating. "This frustration is most palpable when perpetrators are never identified, but even lingering doubts about whether justice has been served trigger this sentiment" (Tyler, 2006, p. 1050). The psychological desire for closure and the popular media's ability to fulfill it may play a substantial role in what is considered to be the pervasive influence of television on the public's perception of the legal system. The state seeks through the legal system to fulfill its responsibility to restore balance when the social contract is violated. The system's goal is to establish the truth through which justice can be served (Tyler, 2006). Toward this end, Podlas (2009) describes the trial courtroom as the setting for competing narratives in which prosecutors tell one story while the defense tells another. Both place evidence in specific contexts that lead to the desired verdict (Podlas, 2006). Whoever provides the most satisfying story generally wins. Partly because "television is one of society's primary storytellers" (Podlas, 2009, p. 496), the story jurors hear in court is not the first one they encounter, especially about the legal system. Most people do not study the law or read scholarly legal sources, but instead obtain most of their education about the legal process from television (Podlas, 2006). Jurors enter the courtroom with a lifetime of stories concerning crime, attorneys, and justice. Many of those stories and the morals and lessons they impart inevitably create preconceptions (Podlas, 2009).

Tyler (2006) found 44 tests where pre-trial publicity shaped verdicts. In trials where jurors were exposed to a large amount of negative pre-trial publicity there was a significant increase in the likelihood of a conviction. This was in comparison to those jurors who had been exposed to positive publicity or no publicity at all prior to jury selection. Still, most jurors probably watch television; do they really have a clear comprehension of forensic science? If jurors do understand forensics, is it possible for them to apply this knowledge in the courtroom or could they use it in committing a crime? Vicary and Zaikman (2017) examined police chiefs' attitudes toward the CSI effect. They found that despite high levels of crime show viewership, this did not relate to an understanding of forensic science. Individuals were able to discuss various components of forensics pertaining to footprints, finger-

prints, hair, and dirt. This conceptual knowledge indicates that they thought about this more than those who did not view crime shows. The study was inconclusive and only indicated a need for further investigation.

Preconceptions driven by the media, "are only problems if jurors are unable to put them aside" (Tyler, 2006, p. 1050). Hawkins and Scherr (2017) found that individuals watching crime dramas tended to be less questioning of forensic science application in the trial process. These individuals tended to focus more on the value of the forensic examples brought into the trial when making their decisions. Tyler (2006) suggests that the influence of mass media depictions of the criminal justice system on the future deliberations of media consumers may persist even when attempts are made to mitigate their effect. This inability to set aside fictional notions is said to be the primary result of the CSI effect. The belief in the CSI effect has further consequences affecting both sides in court. Call, Reitzel, and McDongule's (2013) national survey of prosecutor and defense attorneys found that 58% of prosecutors and 47% of defense attorneys reported spending additional time during voire dire questioning potential jurors about their television viewing habits. The answers to these questions are then used to eliminate jurors that one or both sides felt were unable to distinguish between fact and fiction.

The Meta-Analysis of Empirical Studies of the CSI Effect

Several studies investigate the CSI effect directly. Some of these examine whether or not the claimed CSI effect is empirically sound. The following meta-analysis evaluates five of these studies, including the two largest conducted.

1. Call, Cook, Reitzel, and McDougle (2013)

This minor study was conducted in the Mid-Atlantic region in 2013. It focused on what the researchers refer to as "malicious wounding cases." Five cases were examined, with post-verdict surveys being conducted with each of the 12-member juries. These surveys were voluntary and all 60 jurists chose to participate. Each of the cases involved trials where forensic evidence would play a factor in determining guilt or innocence (Call et al., 2013).

The jurors completed a questionnaire consisting of seven questions assessing jurors' attitudes about the necessity of evidence. These included whether forensic evidence should always be found, their willingness to convict with or without said evidence, and their television viewing habits. The last specifically referred to the *CSI* television program. Those who watched *CSI* also answered whether or not they believed it accurately portrayed the techniques and procedures used by real police departments (Call et al., 2013).

The researchers found some support for the theory that viewing *CSI* was affecting juror decision-making processes. Specifically, a juror's belief in the television program's realism provided a significant indicator whether individual jurists voted not guilty (Call et al., 2013).

Privacy and legal constraints prevented collevtion of demographic data on the jurors. These data might have indicated of other influences on jurors such as a general mistrust of the system and police or previous personal involvement in the criminal justice system affect their perception of the validity of any evidence presented. This, combined with a small sample size, led the researchers to conclude that, "we cannot isolate the true significance of the *CSI* effect in comparison to other jury influences" (Call et al., 2013, p. 63).

2. Cole and Dioso-Villa (2009)

The CSI effect primarily claims that jurors influenced by these programs have a tendency to acquit in cases where forensic evidence is not presented to the degree that the programs have led them to expect. Cole and Dioso-Villa (2009) examined acquittal rates between 1986 and 2008. This study made 132 observations over nine jurisdictions including eight different states and the federal criminal justice system. Their observations included a total of 22,878 trials (Vermont = 60; Florida = 4,131; North Carolina = 2,025; Illinois = 1,009; New York = 2,478; Hawaii = 260; Texas = 3,180; California = 5,594; Federal = 4,141). The acquittals ranged from a low of 11% in federal trials from 2005 to 2007 to a high of 46% in Vermont in 2008. The researchers concluded, "when we tested the change in acquittal rates between these two groups (pre- and post-*CSI*), we found that the difference between them may have occurred due to chance or by coincidence, rather than inferring the events somehow correlated" (Cole & Dioso-Villa, 2009, p. 1361). Analysis of the data indicated a statistically insignificant 1% increase in acquittals from the period before the introduction of *CSI* and after. The possibility that this change was merely chance cannot be discarded (Cole & Dioso-Villa, 2009).

Recognizing weaknesses in the initial observation such as variations in the number of trials between large and small states (e.g., California versus Vermont), a second analysis was conducted in which individual state and federal rates were omitted. Data was analyzed as random

Table 1. Aggregate Number of Trials and Acquittals from 1997–2006

Year	Trials	Acquittals	Acquittal Rate
1997	24,343	5,405	21.9%
1998	22,553	5,316	23.5%
1999	22,133	5,311	24.1%
2000	21,291	5,399	25.0%
2001	19,768	5,027	25.5%
2002	19,179	4,957	25.9%
2003	20,219	4,887	24.2%
2004	19,235	4,747	24.7%
2005	18,807	4,345	23.2%
2006	19,746	4,728	24.0%

Adapted from Cole and Dioso-Villa (2009)

samples of jury verdicts in the United States. These observations were made over a shorter time frame of 1997 to 2006 with acquittal rates pre- and post-*CSI* being the focus (Cole & Dioso-Villa, 2009). The study's findings appear in Table 1.

The researchers found, "a statistically significant increase in acquittal rates from the year's pre-*CSI* to post-2001 and post-2002, but not post-2003" (Cole & Dioso-Villa, 2009, p. 1335). This trend could be attributed to a general increase in acquittal rates beginning in 1997. The researchers attempted to account for this possibility by comparing acquittal rates from 2000 to 2006 with different aggregate groups beginning in 2001, 2002, and 2003. This resulted in there being no noteworthy increase in the rates of not guilty verdicts. Contrary to expectations there was a statistically significant decrease in acquittals (Cole & Dioso-Villa, 2009).

The study concluded that a CSI effect that favors the defense and a *reverse CSI effect* that favors the prosecution may be canceling each other out. "Given the equivocal nature of the data and the relatively small changes in acquittal rates, existing acquittal rate data would not seem to warrant panic about the existence of the CSI effect" (Cole & Dioso-Villa, 2009, p. 1335).

Table 2. Viewing Profiles in the Podlas Study

Responses	Frequent Viewers	Non-Frequent Viewers
n=250	187 (75%)	63 (25%)
Television	164 (88%)	40 (63%)
Law Genre	148 (79%)	36 (57%)

Adapted from Podlas (2006)

3. Podlas (2006)

Podlas conducted one of the first empirical studies of the effects of *CSI* on juror deliberations. Her focus was based on the definition of the CSI effect that emphasized a heightened burden on the prosecution. The forensic issues the series portrayed are broken down based on prevalence. The empirical portion of her study used a 2-part instrument to analyze show content. It was designed to determine whether or not guilty verdicts "of frequent viewers of *CSI* rested on *CSI*-oriented reasons" and if "frequent viewers of *CSI* would rely on *CSI*-oriented reasons in reaching 'not guilty' verdicts to a greater degree than would non-viewers" (Podlas, 2006, p. 454).

The study's first part examined the viewing habits of 306 undergraduate participants. This section included *CSI*, legal dramas, and reality courtroom shows such as *Judge Judy* and *The People's Court*. The number of viewing hours per month was also counted. The second part was built on a criminal law scenario. The respondents learned the facts surrounding a hypothetical case involving a sexual assault in whivh intercourse was not disputed. They were then asked to render a verdict in the matter and select reasons that played a role in their determination. Four of the seven reasons they could select focused on the lack of forensic evidence. Since sexual contact was not disputed, the scenario relied on witness credibility rather than forensic evidence in order to determine if the lack of forensics would sway deliberations despite this form of evidence being irrelevant to the case (Podlas, 2006). The remainder of the study focused on 250 respondents who reached a not guilty verdict. Viewing profiles were created for these individuals dividing them between frequent and non-frequent viewers (Table 2). Post-verdict questions were analyzed, scoring the *CSI*-related answers in relation to how many respondents selected them and if they selected more than one (Tables 3 and 4). Only 10% selected any of the *CSI*-related reasons as determining factors in their choice of the verdict.

In related findings, when broken down between frequent and non-frequent viewers of law-related television, only 12% marked any *CSI*-related reason, while 16% of non-frequent viewers marked at least one reason. The most commonly cited reason was the absence of DNA evidence. It is interesting to note that the most selected

Table 3. Denominations (Respondents' Selections) of *CSI* Viewing in the Podlas Study

Reasons	*CSI* Viewers	Non-*CSI* Viewers
Evidence not tested for fingerprints	3	3
Prosecution did not perform forensic tests that could have shown defendant was innocent	5	3
No DNA evidence or no DNA test completed	8	6
Prosecution did not perform forensic tests to prove defendant was in apartment/bedroom	7	5

Adapted from Podlas (2006)

Table 4. Frequencies and Percentages of Denominations (Respondents' Selections) of *CSI* Viewing in the Podlas Study

Number of Reasons	*CSI* Viewers		Non-*CSI* Viewers	
	Frequency	Percent	Frequency	Percent
1	8	4	5	8
2	5	3	4	6
3	2	1	1	2
4	0	0	0	0

Adapted from Podlas (2006)

Table 5. Juror Expectations for Scientific Evidence in the Shelton Studies

Case	Scientific	DNA	Fingerprint	Ballistics
Every Case	52.8	32.9	47.3	41.5
Murder	79	61.9	73.8	73.8
Assault	49.6	38.8	45.2	34.7
Rape	78.6	81.5	53.9	27.7
Breaking & Entering	53.3	24.6	78	23.5
Any Theft	41.9	18.7	66.2	22.4
Gun Related Crime	60.4	28	75.4	83

Adapted from Shelton (2010)

answer chosen was the least relevant to the case provided in the study because intercourse was not disputed. In this case, DNA evidence would have no probative value in any determination of guilt or innocence.

In order to be valid, the CSI effect theory defined in the study would have to be supported by data indicating a greater disposition in respondents to desire or require forensic evidence in order to come to a guilty verdict. This desire should be reflected in the study by the selection of answers in the post-verdict questionnaire that indicate a lack of forensic evidence as a determining factor in a not guilty verdict. Podlas found the exact opposite. "The results do not support the hypothesis that *CSI* viewers are influenced by *CSI*-marked reasons any more than non-viewers may be." Furthermore, "the empirical evidence does not support any anti-prosecution 'CSI Effect'" (Podlas, 2006, p. 461).

Podlas (2006) concluded that despite media warnings of a CSI effect, there is little evidence to support this conclusion. While not the focus of her study, she went on to note, "the data hints that, if there is any effect of *CSI*, it is to exalt the infallibility of forensic evidence, favor the prosecution, or pre-dispose jurors towards findings of guilt" (Podlas, 2006, p. 465).

4. Shelton, Kim, and Barak (2006) – Phase One, Washtenaw County

5. Shelton (2010) – Phase Two, Wayne County

Podlas focused on non-jurors in her 2006 study. Shelton et al.'s (2006) methodology was based on a survey administered to persons selected for jury duty in, Washtenaw County, Michigan in 2006. To address issues pertaining to demographic limitations in this suburban county with 53% of the population having this college degree in this first study, a second study by Shelton (2010) was conducted in Wayne County, which includes Detroit. The following meta-analysis will provide an overview of the methodology of both studies and will analyze the conclusions of each.

Phase One: Washtenaw County

In phase one, groups of 100–150 potential jurors participated in a 4-part survey. These jurors were selected randomly through computerized selection based on state law (Shelton et al., 2006).

Part one of the survey examined television viewing habits. This focused on news, crime news, forensic and general crime documentaries and forensic and general crime dramas. Frequency of viewing and the degree to which respondents found the programs accurately portrayed reality were also measured on a scale of 1 to 5, with 1 representing the most time spent viewing or most accurate representation (Shelton et al. 2006). Part two focused on jurors' expectations as related to the types of evidence they would expect to see if selected to a jury. Expectations were further divided based on the type of trial: any criminal case, murder or attempted murder, breaking and entering, assault, rape or other sexual misconduct, theft, and any gun-related offense. For each of these scenarios, jurors were asked what form of evidence they would expect to see presented at trial. This included testimony from victims and witnesses, circumstantial evidence, and any potential scientific or forensic evidence (Shelton et al., 2006). Part three focused on the burden of proof required for conviction. It also examined particular types of evidence that may influence decision-making. The subjects were provided with the same jury instructions given to every jury in the State of Michigan (Shelton et al., 2006).

Thirteen scenarios were then given to the respondents based on the types of crimes presented in part one. Each scenario presented a different type of evidence. The type of evidence varied from case to case. Some cases focused specifically on DNA, ballistics, or fingerprint evidence that could be relevant. In each scenario, participants were requested to assume that the prosecution offered no scientific evidence at trial (Shelton et al., 2006).

The fourth and final portion of the survey focused on the demographics of the participants. This included age, race, gender, education, and income levels. Potential jurors were also asked for their views on crime in their community, what type of community they came from, whether or not they had personally been the victim of crime, and political tendencies (Shelton et al., 2006).

Phase Two: Wayne County

The phase two study was conducted using the same methodology in Wayne County. It was conducted several years after the first study from 2008–2009. Wayne County reflected a demographic quite different than that of Washtenaw County. Respondents were generally more ethnically and racially diverse, less affluent, and less educated. They had more instances of having experienced crime on a personal level. A 93% level of urban residents in the second survey reflected the change from Washtenaw County to Wayne County; the location of Detroit (Shelton et al., 2006; Shelton, 2010).

Table 6. Findings of the Meta-Analysis - Empirical Studies of the CSI Effect

Study	Year	Finding
1. Call, Cook, Reitzel, and McDougle	2013	Inconclusive
2. Cole and Dioso-Villa	2009	Not Significant
3. Podlas	2006	Not Significant
4. Shelton, Kim, and Barak	2006	Not Significant
5. Shelton	2010	Not Significant

Results of Studies

Despite the demographic differences between the two locations in which the studies were conducted, similar results were found in both (Shelton et al., 2006; Shelton, 2010). In both locations juries exhibited an expectation that scientific evidence would be provided. This expectation increased with the seriousness of the alleged offense. The combined data on the expectation of scientific evidence, varying by type of case, is represented in Table 5 (Shelton, 2010).

From the data represented above it becomes clear that the type of evidence expected varies depending on the type of case. Firearms offenses require ballistics while breaking and entering cases see a rise in the expectation of fingerprints. Over 81% of respondents surveyed report an expectation of DNA evidence in crimes of a sexual nature (Shelton, 2010). This seems to indicate a more informed public at least in terms of having a rational understanding of why they expect certain evidence to be presented in specific types of cases. Does this finding correlate with an increase in acquittals?

While jurors clearly have some expectation of some forensic evidence, Shelton found that even without the benefit of this evidence, jurors remained more likely to convict rather than acquit if presented with some form of testimony from either victims or witnesses. "The combined data reflected the conclusion that jurors still repose a considerable weight in the testimony of fact witnesses" (Shelton, 2010, p. 20). Only in cases involving rape where the demand for scientific evidence is excessively high or where the prosecution formulates their narrative based solely on circumstantial evidence does this trend reverse itself. This holds true even in cases of homicide where, if based on circumstantial evidence alone, "over one-third would reach a similar result" (Shelton, 2010, p. 20).

Unfortunately, for popular media proponents of the CSI effect, the combined empirical data from both studies does nothing to support the theory's premise. "The results of the combined data showed no significant relationship in any of the thirteen scenarios between the likelihood of a not-guilty verdict without scientific evidence and whether jurors watch *CSI*-type programs" (Shelton, 2010, p. 22). Furthermore, "there is no significant difference in the demand for scientific evidence as a condition of guilt between those jurors who watch *CSI* and those who do not" (Shelton, 2010, p. 23). The only influence the CSI effect has on acquittal rates is in the minds of the popular media and the members of the court that believe it (Shelton, 2010).

Table 6 represents a summary of the meta-analysis. No empirical study provided significant support for the CSI effect in any of its forms.

Conclusions

A series of television programs popularized the science of crime scene investigation. The public were so fascinated with these programs and their content that a theory known as the CSI effect came to life that ingrained itself through a feedback loop in the minds of viewers (and, thus, potential jurors), the popular media, and those working in the criminal justice system.

It should be pointed out that publicizing this phenomenon was certainly in the popular media's interest to keep viewer ratings high. Shelton (2008) purports not a CSI effect but a tech effect created by the public's knowledge of advances in the sciences and the societal expectation that science, including forensic science, will continue to move forward. Driven by media messages

that crime is rampant and that the criminal justice system is ill-equipped to deal with the danger, the public may now see technology as a means of holding back the storm (Shelton, 2008, 2010).

Regardless of the empirical evidence of a direct CSI effect, the belief that it exists may have more power than the effect ever could. The anecdotal evidence presented in this study suggests that a few officers of the court believe that some action must be taken to mitigate the alleged consequences of the CSI effect. This is apparent in changes in questioning during voire dire discussed earlier and the fact that time and resources have gone into studying the subject. The idea of a CSI effect has also found a home in the community of crime scene investigations. The primary investigator of this study continues to work in this field and regularly discusses the subject with colleagues. If only anecdotally, he has found that all of them believe the CSI effect exists to one degree or another.

While the research summarized in this meta-analysis strongly suggests that the CSI effect does not exist in terms of the popular media definition, it has still affected the criminal justice system. Shelton (2008) argues that one response to changing juror expectations would be to give juries the evidence they are seeking. While this may be impossible or unreasonable given the cost, the issue itself must be addressed regardless of the reality of the CSI effect. Nonetheless, officers of the court must find more convincing methods of explaining to jurors the relevance or irrelevance of forensic science in the courtroom. They must also come to terms with the fact that many jurors enter the courtroom "with a lot of knowledge about the criminal justice system and the availability of scientific evidence" (Shelton, 2008, p. 6). This knowledge, be it accurate or not, is sitting in the jury wells of our criminal justice system and the court work group must adapt to the expectations of those we call upon to render verdicts of guilt or innocence.

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Evaluating Walkability and Bikeability in a Campus Setting

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abstract: *This study identifies how well a road or a pathway can serve the needs of pedestrians and cyclists on a university campus. An audit of campus walkability and bikeability is designed to capture objective and perceived aspects of road use for bikers and walkers. By analyzing the audit results, we present the walkability and bikeability scores of every road segment on 2 maps created using GIS to identify the patterns of road quality. Advantages and challenges of using an audit as well as suggestions are made for campus decision-makers to enhance green transportation.*

Now more than ever, planning and health officials encourage sustainable transportation modes. For instance, to mitigate the negative health effects of obesity, the Centers for Disease Control and Prevention (CDC) recommend at least 30 minutes of physical activity a day and a moderate-intensity aerobic activity such as brisk walking for 150 minutes a week (U.S. Department of Health and Human Services [HHS], 2016). Following this, researchers have investigated the role of built-environment and travel behavior on healthy modes of travel such as walking and biking (Rodríguez & Joo, 2004; Shay & Khattak, 2012). As Shafer, Lee, Turner, and Hughart (1999) succinctly put it, "quality of life . . . is achieved through increased interaction with other community members . . . and with the surrounding environment" (p. 1).

Sidewalks and bike lanes are critical facilities that help alleviate obesity at all age levels. Some studies show a significant relation between the availability of walking and biking facilities and residents' preferences for transportation modes other than automobiles and public transit (Ball, Bauman, Leslie, & Owen, 2001; Humpel, Marshall, Leslie, Bauman, & Owen, 2004; Hoehner, Brennan Ramirez, Elliott, Handy, & Brownson, 1994; Rodríguez & Joo, 2004). Higher use of these alternatives to automobiles can ultimately lead to better health (HHS, 2001). These factors are critically related to recommendations for young adults who are as a group at risk of becoming obese (HHS, 2003). The introduction of everyday walking and biking or utilitarian walking and biking can increase physical activity for this group (McCracken, Jiles, & Blanck, 2007). College campuses can, therefore, be one of the best locations to increase utilitarian walking and biking for students, faculty, and staff.

Typically, streets and roads in and around college campuses are better than those in residential areas. With higher population density and a demand for cleanness and quiet, walking and biking are often more suitable means of transportation on campus. Not only can walkability and bikeability determine public health and safety as well as the quality of life on campus, they are also important components of environmentally sensitive transportation, economic vitality, and neighborly interaction. The construction of walkways and bikeways determines the level of campus design.

This study serves two major aims. First, it identifies the spatial patterns of walkability and bikeability levels of a university campus. Second, it evaluates the strengths and weaknesses of the biking and walking infrastructure on that campus. Following this, it provides pragmatic recommendations to fulfill the needs of pedestrians and cyclists so as to encourage walking and biking on campus. To do so, we conducted an audit to evaluate the walkability and bikeability, both objectively and subjectively, on the main campus of the University of North Texas (UNT) in Denton, TX. Following the audit, we mapped the standardized scores of walkability and bikeability in a geographic information system (GIS) to illustrate the current infrastructure quality and to propose recommen-

dations to increase on-campus walking and biking. Upon examining the data collected, we argue that UNT has the potential to become a more walkable and bikeable campus. It should be noted that although this is a cross-sectional analysis of a campus, its recommendations are still adaptable for campuses across the United States, as colleges and universities possess significant walking and biking infrastructure. This study recommends changing the aims of planning and government funding to reembrace this tradition, enhancing the convenience of individuals' walking and biking.

Walkability and Bikeability

The capacity of physical spaces to provide residents opportunities to walk and bike is a critical measure of the convenience and quality of a community in urban planning (Ewing, Handy, Brownson, Clemente, & Winston, 2006). This capability also determines the willingness of residents to go outside their homes and use walking and biking facilities (Cervero & Kockelman, 1997; Saelens, Sallis, & Frank, 2003). Walkability is measurable by how safe it is for people to walk from one place to the other (Moudon et al., 2006; Shay, Spoon, & Khattak, 2003). A walkable neighborhood can be further characterized by the socialization amongst neighbors that enhances the physical, mental, and spiritual health of people in the community (Moudon et al., 2006). Banerjee, Mente, Miller, and Anand's (2010) definition of walkability focuses on the features of a certain place that encourage people to walk. They also emphasize the capacity of the place to make walking safe and accessible. Similar to the concept of walkability, which is characterized by characteristics ranging from safety to attractiveness, bikeability can be evaluated using comparable factors. It is argued that both activities can be done to serve multiple but similar purposes—leisure, recreation, exercise, transportation to work and shopping (Saelens et al., 2003), and can be characterized by several environmental and non-environmental features.

Transforming walkability and bikeability to observable measures is somewhat challenging, as the measurement needs to embed physical indicators and subjective attitudes of users. Well known built-environment studies consist of four types of measurements that are suitable for different aims: survey, GIS, audit, and observation (Maghelal & Capp, 2011). GIS and audit measurements often contain objective variables that can be replicated in other studies. On the other hand, the data collected by observation are normally limited to the particular analysis only, while survey instruments can capture subjective data better (Maghelal & Capp, 2011).

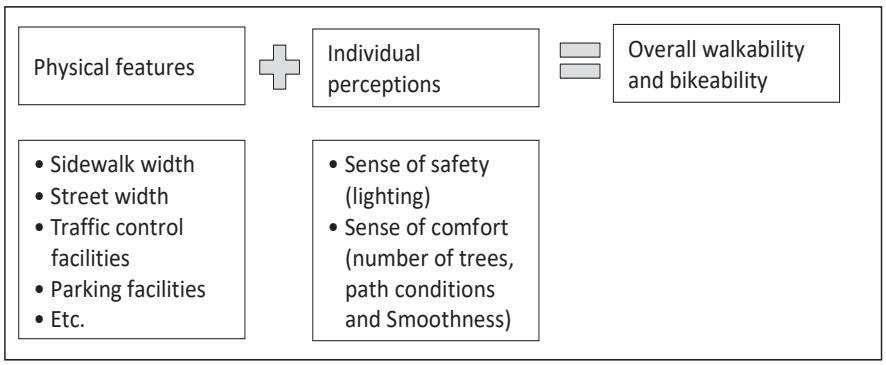
GIS tools are recommended to measure the objective aspect of walkability (Maghelal & Capp, 2011). But current walkability indexes that embrace both objective and subjective measures often use surveys and audits rather than GIS methods (e.g., Bradshaw, 1993; Fort Collins, 1996; Wellar, 2003; Dannenberg, 2004; Saelens et al., 2003). These surveys and audits can capture the standardized measures well, but may fall short of studying specific cases with less-standardized characteristics (Maghelal & Capp, 2011). Hence, a combination of both audits and GIS can be a good measure of built-environment related to walking and probably biking. The following studies are good examples of how both concepts can be measured.

Shay et al. (2003) generalize five infrastructural factors of walkability. The first is pedestrian facility, which includes sidewalks and trails, crosswalks, and other street treatments. A second component of walkability is accessibility and convenience, which includes proximity to multiple destinations. The third factor is connectivity, measured by short block lengths of 400–600 feet, a grid pattern with many intersections and few cul-de-sacs, and efficiency to destinations. Fourth is the aesthetic aspect of walkability involving a pleasant atmosphere, attractive architecture, landscaping and street trees throughout the streetscape. The last factor is traffic calming or street safety, which can be operationalized as street designs limiting vehicle speed (curb extensions, street narrowing, tree canopies, on-street parking, etc.) and street lighting.

Most of these environmental factors affect bikability as well. Pedestrians and cyclists share many sidewalks and trails, and cyclists are sensitive to sloping terrain, path and route information, and sidewalk also (Rodríguez & Joo, 2004). Even though cyclists have higher mobility compared to pedestrians, their ability on daily commutes to travel long distances is significantly less than automobiles (see National Household Travel Survey 2009 data) and they are influenced by similar built-environment factors, even if not to the same degree. Although the built environment that encourages walking and biking may vary a little, the barriers for both are very similar (Rodríguez & Joo, 2004).

Ewing et al. (2006) evaluate these concepts subjectively by analyzing the qualities and individual perceptions of physical features. They believe that urban design qualities may be assessed with a degree of objectivity by outside observers. Accordingly, safety and attractiveness

Figure 1. Conceptual Framework



are for them the major elements determining walkability and bikeability. Evaluating the walkability and bikeability of a street can be viewed as the attempt to answer the question: to what extent can a certain street be safe and attractive for people to walk and bike? Ewing et al. (2006) used physical features and individual reactions to measure the walkability and analyze people's walking behavior. Using this framework and other theoretical approaches (e.g., Leslie et al., 2005), this study reviews the quality of a walking and biking environment by analyzing both physical features and individual perceptions of a community. Figure 1 illustrates the conceptual approach this study takes toward assessment of walkability and bikeability on campus.

Research Design

In contrast with residential communities in the United States, university campuses are characterized by higher density and less automobile transportation generally. Even when students, faculty members, staff and residents commute by automobile they frequently bike and walk for their last miles on campus. Thus, a campus can provide us more opportunities of multi-modality including walking and biking in a relatively smaller area. We assessed UNT's residential campus located about 29 miles north of Dallas, TX in a semi-urban setting. Its enrollment of over 36,000 students has rapidly increased in recent years, which creates higher demand for walking and biking facilities. These characteristics make UNT a good study area for a few reasons. First, the distance from the well-developed Dallas downtown makes it a self-governed system managing the walking and biking facilities. Second, its location in a populated metropolis attracts students and employees who create a significant demand of on-campus walkability and bikeability. Finally, the tension between rapid growth and limited campus area lends this study a practical import that is applicable to other areas encountering similar challenges.

As the student population of UNT and in Denton continues to grow, assessment of sidewalks and bike paths is more imperative than ever. Therefore this study maps this information analytically. A three-step data collection was carried out to examine campus walkability and bikeability. We first geo-coded all sidewalks, pedestrian trails, and bikeable roads using a recent aerial image of the campus. Next, we conducted a comprehensive audit that included multiple measures of biking and walking paths. All the measures in the audit were assigned values in the third step to develop a ranking for each segment.

The audit was generated from the existing tools that were selected based on whether they fit in the research framework. That is, the audit should capture the most critical elements that may affect walkability and bikeability applicable to a campus context. For example, a campus can have more restrictions to automobiles and attract more pedestrians and biking, compared to a residential community. But the functions of the buildings on campus might be less diverse than those in a non-university downtown area. Thus, the audit tool should not be as comprehensive as those applicable to all-type communities (e.g. with mixed land uses), but can address the needs of on-campus students and employees. Five audits were selected that could be adapted for campus setting that matched criteria of: (1) simplicity of content and adaptability, (2) ease of use and understanding for non-expert users, and (3) addressed several criteria that can support walking and biking (e.g., safety, convenience, built environment). A combination of varied elements of each

Table 1. Comparing the Four Audits

Audit	Strength/Weakness		Items Used	Items Not Used (Reasons)
SPACES	S	Reliable, simple to use, somewhat comprehensive	Walking/biking path: type, location, material, condition, permanent obstructions; On-road path: type, condition, lanes, parking restriction signs, kurb type, traffic control devices, crossings and aids, streetlights, lighting coverage, destinations, car parking at destination, bike parking, driveway crossovers, garden and verge maintenance, trees number and height, cleanliness, type of views, alike building design; Overall segment: attractiveness, walking/biking difficulty, path continuity, neighborhood legibility	Type of buildings/features; Predominant buildings/features (lack of variance in research area); Slope, other routes, surveillance (lack of variance)t
	W	Some key items missed		
Pedestrian and Bicycle Information Center	S	Distinguishable bikeability and walkability	Bikeability: sharing road with motor vehicles, problems of off-road path, problems of path surface, problems of intersections; Walkability: barriers to walk, problems to cross streets, easiness to follow safety rules	Bikeability: driver behaviors (long period observation), easiness to bike (duplicated with SPACES), rider's personal safety activities and self-description (low inter-rater reliability); Walkability: driver behaviors, pleasure to walk (random event, e.g., scary dogs), self-rating the neighborhood (subjective)
	W	Not research-based; over-simplified for general resident usage; lack of clear units of analysis		
WABSA	S	Distinguishable bikeability and walkability, practical guide	Bikeability: number of lanes, speed limit, pavement condition, presence of a curb, rough railroad crossing, storm drain grate; Walkability: sidewalk/path continuity, material, curb ramps	Bikeability: average traffic (long period observation), on-road lane width (duplicated), location factors (duplicated or not applicable); Walkability: average traffic, speed limit, number of lanes, lighting, isolated problem spots (all duplicated)
	W	Lack of measures other than safety		
PEDS	S	Simple to use, well organized	Pedestrian facility: types, material, condition, obstruction, buffer between road and path, path distance from curb, sidewalk width, continuity, connectivity; Road attributes: conditions, number of lanes, speed limit, traffic control devices, crosswalks, bicycle facilities; Walking/cycling environment: lighting, amenities, trees shading, cleanliness/maintenance	Environment items (lack of variance or duplicated); Road attributes: on/off-street parking (duplicated), med-hi volume driveways and crossing aids (lack of variance); Walking/cycling environment: wayfinding aids (lack of variance), degree of enclosure (low inter-rater reliability), power line (lack of variance), building design and height (low inter-rater reliability), building setbacks (inconsistent within one segment)
	W	Lack of reliability and external validity test		

audit were used in designing an audit that encompassed all the indicators of the walking and biking environment and was easy to use for a campus setting.

The first audit selected was the Systematic Pedestrian and Cycling Environmental Scan (SPACES) conducted by Pikora, Bull, and Jamrozik (2000). This audit is used to evaluate the academic built environment that is suitable for biking and walking. Along with its ease of use and application, it reported high the inter- and intra-rater reliability (Day, Boarnet, Alfonzo, & Forsyth, 2006). However, SPACES may fall short in its over-simplification in an all-type community setting (Day et al., 2006; Boarnet, Day, Alfonzo, Forsyth, & Oakes, 2006). We therefore made changes based on other campus-specific audit tools while retaining its major structure (see Table 1 for detailed comparison of the audits).

The second audit was the self-evaluated checklists created by the Pedestrian and Bicycle Information Center in the National Highway Traffic Safety Administration. These lists help residents assess their community's walkability and bikeability, and report problems to local authorities. This audit is designed for residents who would like to evaluate their own community and report certain disadvantages of walking and biking facilities. Therefore, we only selected some items that are critical to campus walkability and bikeability and were not included in the SPACES tool.

The third audit is the walking and bicycling suitability assessment (WABSA) project, conducted by the University of North Carolina at Chapel Hill. This audit provides a guide for community members who would like to participate in building and making improvements to a walkable-bikeable neighborhood. So it aims at multiple-level users, including interest groups, organizations, and active individuals. Its instruction theoretically illustrates whether and how walking and biking networks are connected. However, the audit tool itself is too general to incorporate many important factors other than safety issues (School of Public Health, 2002). Thus, our selection from this audit was to measure the safety for pedestrians and cyclists.

The University of Maryland developed the Pedestrian Environment Data Scan (PEDS) audit, that offers us several valuable measures, such as path obstructions, sidewalk width, traffic control devices, crossing aids, and bicycle facilities. This audit is part of a research project used mainly in the Montgomery County, Maryland with a high social and geographic diversity (About the Project). Although it may lack external validty that can be applied elsewhere, the PEDS audit questions can capture many elements in the SPACES but are organized for easier data collection. Consequently, we treated it as a reference to reorganize some audit items we used from other tools to balance the reliability and ease of use.

Besides these four audits applied to our study, we also reviewed the Irvine-Minnesota Inventory (Day et al., 2006; and Boarnet et al., 2006), but decided not to use it. This inventory is one of the most comprehensive audits evaluating the built environment. Boarnet et al. (2006) also tested the geographic and inter-rater reliability of the inventory in California and Minnesota and found positive results in most of its audit items. However, a paper version of the Irvine-Minnesota Inventory may require at least 20 minutes per segment, in addition to the time for training or other administrative tasks (Boarnet et al., 2006, p. 156). Such a time-consuming audit can hamper the willingness of a university with tight budgets to conduct the study like this, limiting its application to the largest audience. Thus, we applied the Irvine-Minnesota Inventory as a reference to reevaluate our audit and double-check if anything important was missed. The following sections discuss the methodology used for the study of walkable and bikeable infrastructure at UNT, including the boundaries of the study area (Figure 2), the geocoding process, how we conducted the audit, and the way we assign weights to the audit items in detail.

Step 1: Geocoding segments

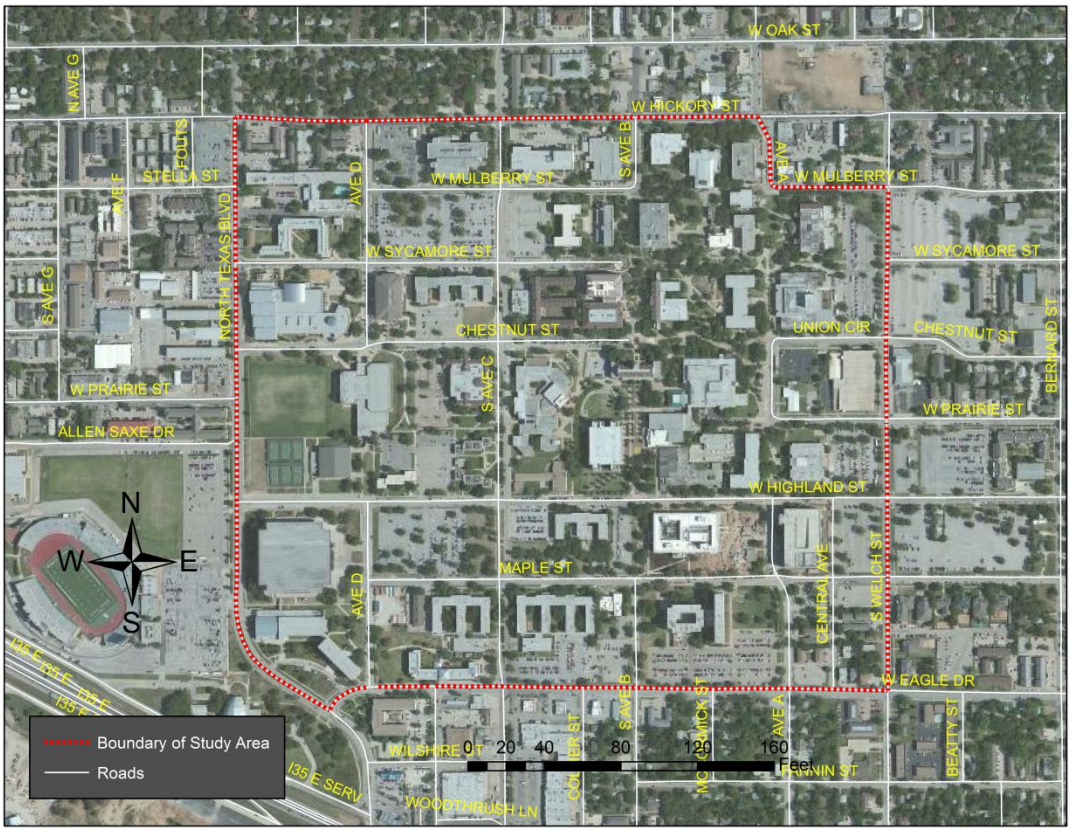
The auditors separated into three groups: one group defined all the segments from the aerial image, while the other two double-checked the built-environment features by walking through all the segments. ArcGIS shapefiles were created to represent the segments of the network (Figure 3).

Step 2: Auditing

The audit items selected were driven by a pretest observation of the study area, which determined what data could be observed and obtained. The reasons why certain items were not included in our audit in Table 2 help illustrate our selection criteria. This process can be a limitation if the audit were to be applied to another campus that differs significantly from UNT, such as those in urban settings. Nevertheless, a study such as this can help use the implications to assess and improve the built-environment in the campus setting around the country, with only a few modifications, according to the specific geographic characteristics.

After compiling the audit tool, groups of two of the authors were assigned to collect data from two out of the

Figure 2. Study Area In University of North Texas



three sections in the study area identified in Figure 3. Hence, every segment was evaluated by four individual authors. After the first-round audit, all the segments with inconsistent observations were reviewed and re-audited to eliminate differences. Finally, all six audits were compared and after consistency was achieved they were incorporated into one outcome.

Step 3: Weighing items and options

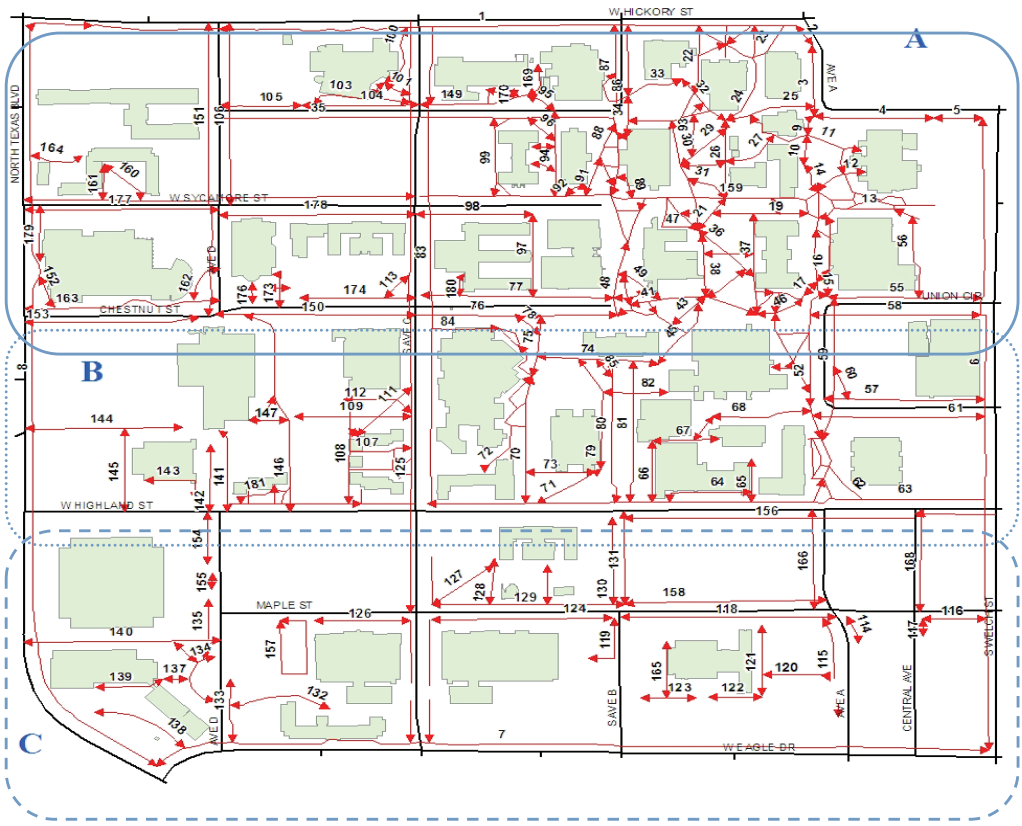
The physical and subjective measures or the questions of walkability and bikeability were incorporated into two final scores for every segment. This step provided us with a clear-cut result illustrating the walkability and bikeability of each segment. As each measure is not equally important to pedestrians or cyclists, and may influence walking and biking differently, we assigned different weights to each measure of walkability and bikeability.

The means of creating these values was a survey distributed to each author. Two questionnaires were created representing perspectives from pedestrians and cyclists, respectively. All the questions and items were assessed with five scales. The questions and the options are evaluated independently, which means that the importance of a question does not influence the goodness of the options in this question. Once the scores were assigned, a "weights" column represented the final weight for each option automatically. These weights are utilized to calculate the walkability and bikeability scores for each segment, as an average of all the option values. Lastly, two maps were created using ArcGIS to illustrate the goodness of walking and biking of all the segments.

Results and Discussion

We found some patterns from the maps shown in Figures 4 and 5. (1) The best paths are clustered in the northeast part of campus, which is the oldest part of the university. Most of the buildings there were constructed a decade ago, when walking was the major transportation in town (Taaffe, Gauthier, & O'Kelly, 1996). This part of campus is still where most students attend classes, and automobile-

Figure 3. Segment and Section Definitions



dominated travel mode is highly limited. (2) The worst walking and biking paths are along the main roads across and around the campus. Motorized traffic is the prevailing mode of transportation on-campus. So it would be hard to walk or bike across campus and around certain areas. (3) Another pattern is that the bikeability and walkability of UNT campus are generally similar with bikeability being only slightly better. This may indicate that the reasons for people to bike and walk are similar, but biking has higher accessibility and speed than walking. Cyclists can be less critical of longer distances and sharing roads with automobiles.

We also found advantages and challenges to the campus with respect to walkability and bikeability (Appendix A). The three advantages are, respectively: (1) Most path locations, materials, and conditions are good. Sixty-eight percent of path widths are more than 3 m from a curb. While only a small portion (18%) of walk-bike paths are close to curbs, this raises a safety issue due to their proximity to automotive traffic (Schneider, Ryznar, & Khattak, 2004). A great majority of paths have good conditions and are made of continuous concrete, which promote walking and biking experiences and convenience. (2) It was noticeable that the university paid attention to the pleasure of walking and biking. About 93% of merges are well maintained, and 79% of paths have one or more trees per house block, providing adequate shade for walkers and bikers in the summer. Trees can also help absorb noise and clean the air. (3) A majority of segments are free from potential harms: 73% of off-road paths and 53% of on-road paths have no obstructions at all; vehicle parking restriction signs are presented in most of the segments, keeping pedestrians and cyclists away from the chaotic automobile traffic.

Nevertheless, we also discovered some aspects of walking and biking facilities that needed to be enhanced on the campus. (1) More than half of the segments have no bike facilities. Bike parking facilities were especially inadequate on campus. This might result in more illegal parking on campus, increasing the probability of conflict with pedestrians and lower students' willingness to bike. (2) More than 80% of footpaths were shared with bikes

Figure 4. Walkability Map of the University North Texas (UNT)

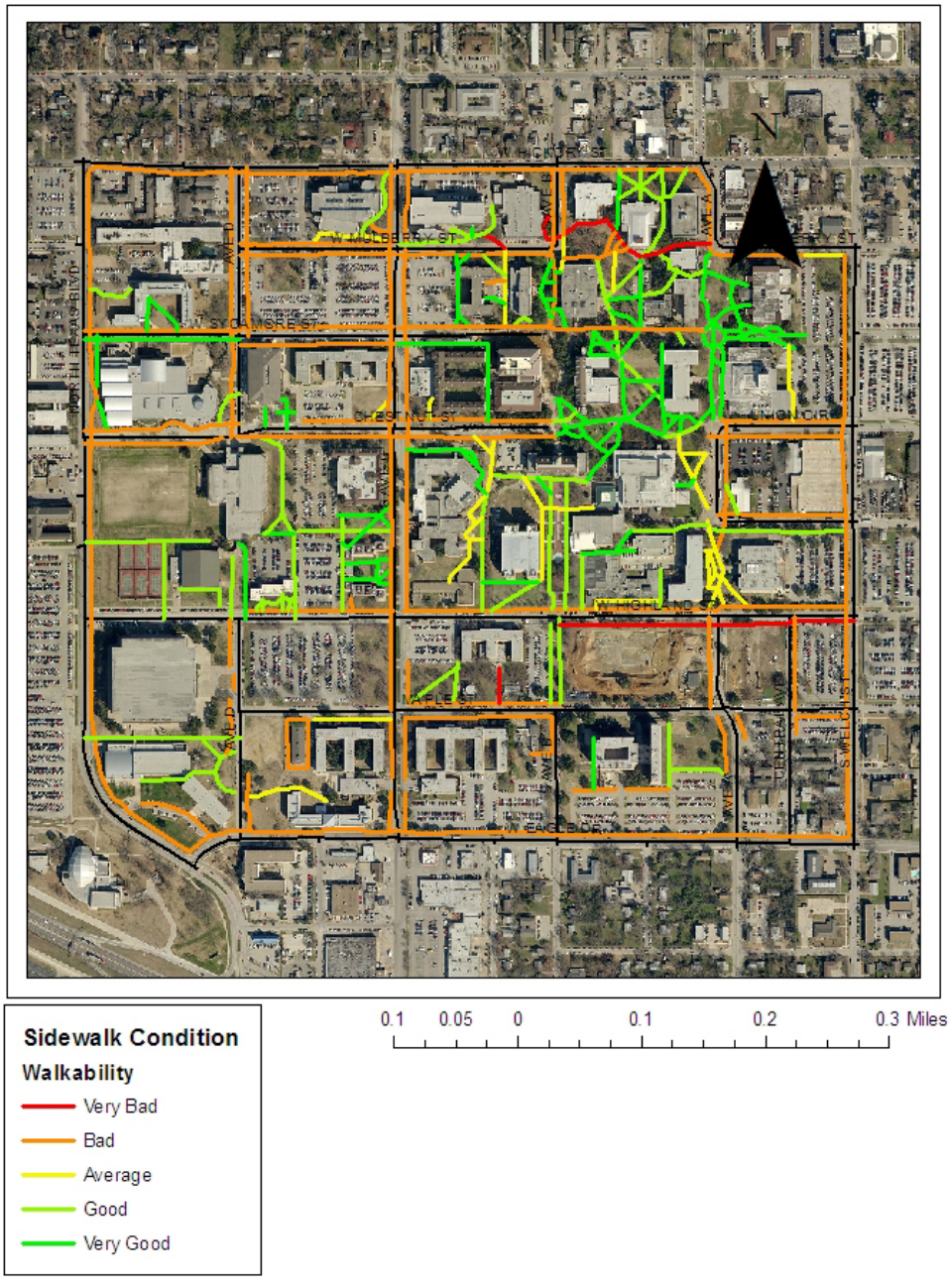
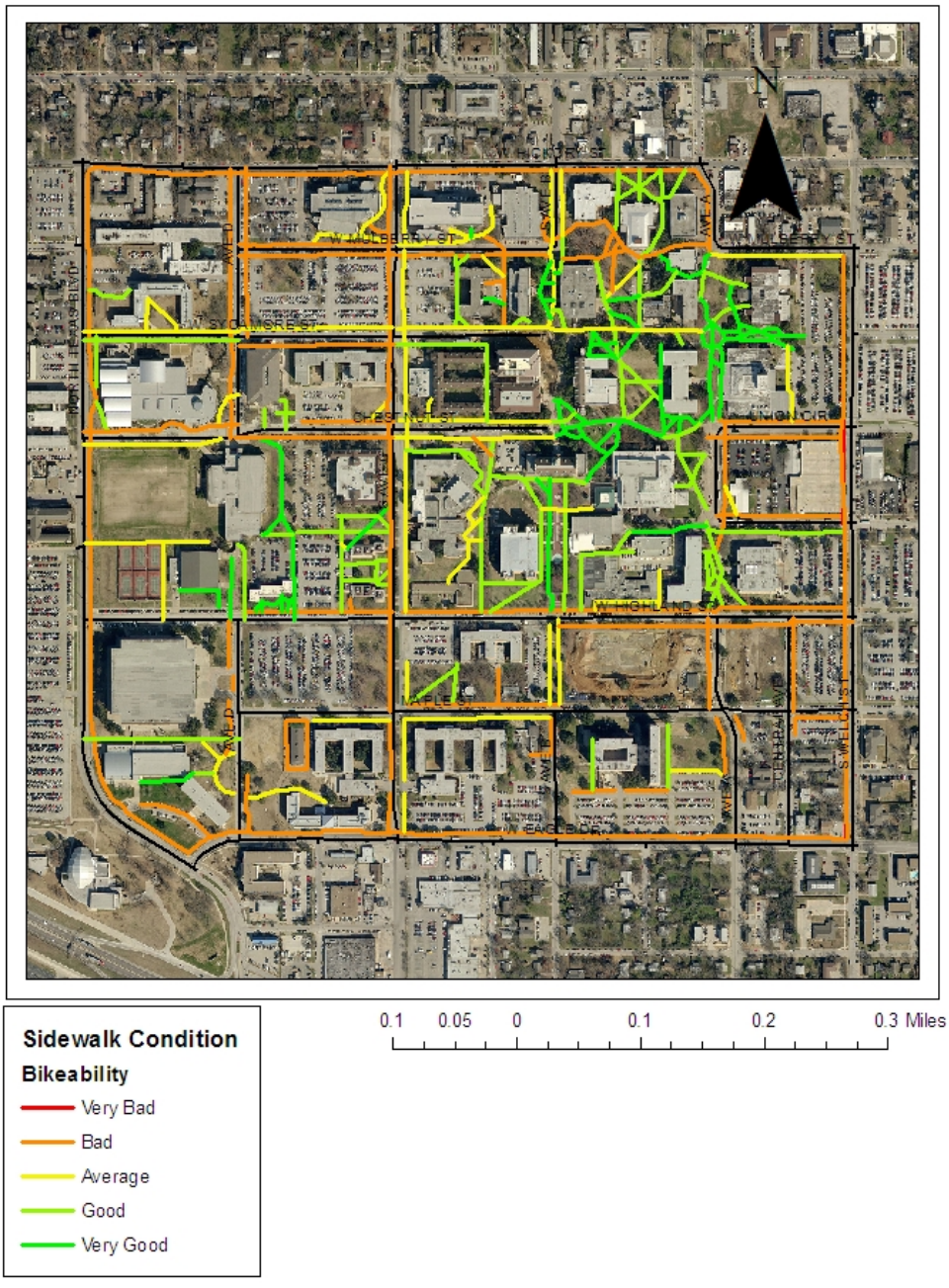


Figure 5. Bikeability Map of the University North Texas (UNT)



but failed to have adequate markings on them. To make things worse, 76% of paths were less than 8 feet in width but cyclists and pedestrians share the path. (3) Some areas were dangerous for both pedestrians and cyclists after sunset because of inadequate lighting. This problem may increase the possibility of traffic accidents and hamper the perception of safety. (4) Traffic controls rely heavily on stop signs (49%) or no control at all (12%). Mandatory traffic control devices, such as traffic signals (10%) and speed bumps (12%) on the campus, might be required to enforce safe speeds for automobiles. (5) A noticeable amount of the road segments on the campus have inadequate crosswalks (35% had none). Missing crosswalks could lead to pedestrian-vehicular conflict resulting from unawareness of pedestrian usage by drivers.

Conclusion and Recommendations

This study assessed the existing walking and biking infrastructure in a campus setting and evaluated its suitability to walk and bike. As a campus with sufficient need for walking and biking by its patrons, this study provides an audit tool and recommendations that enhance the walking and biking experience across university campuses in the United States.

Based on the outcomes of our analysis, we believe the UNT campus houses a well-maintained and smooth environment for pedestrians and cyclists in general. However, lack of adequate lighting and shared routes lower the safety levels. More bicycle parking facilities might be necessary in order to increase convenience and attract cyclists. The sidewalks classified as "footpaths only" reported higher scores of walkability compared with shared routes, indicating that shared routes can increase potential conflicts between pedestrians and cyclists. Another interesting finding is that most of the segments that gained high scores are located in the oldest area and have well-developed walking route network.

Some recommendations could be generated from previous literature that aim to create a walking- and biking-friendly campus. First, it may be helpful to establish a biking and pedestrian committee to assess the needs and issues that pedestrians and cyclists on campus face. The voice of the committee should be heard by the administrative agencies before and during the transportation plan making for campus. The committee should involve the stakeholders (i.e., students, faculty and staff, local residents, etc.) with real demands for the facilities and services. In addition, user surveys can be a good tool to collect public opinions.

Second, promotional offers could be useful to attract biking or walking as major modes of travel on campus. For instance, brochures offering special discounts at local bike stores could be a good way to stimulate biking. Creating a comprehensive transportation network might also encourage communication with other modes of transportation, such as public transit and reduction in auto usage on campus.

The third recommendation is related to education. Safety classes and materials can educate pedestrians and cyclists how to share the road effectively. The idea of green transportation can be embedded in them so that walking and biking might become the preferred mode of travel on campus over driving. A university website encouraging green transportation and elimination of private automobiles could help increase walking and biking on campus.

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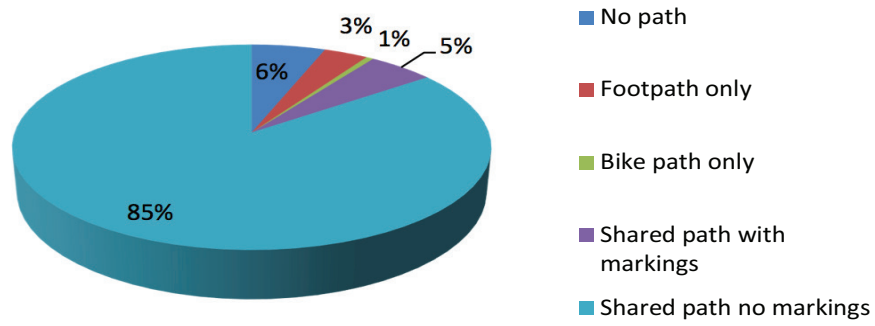
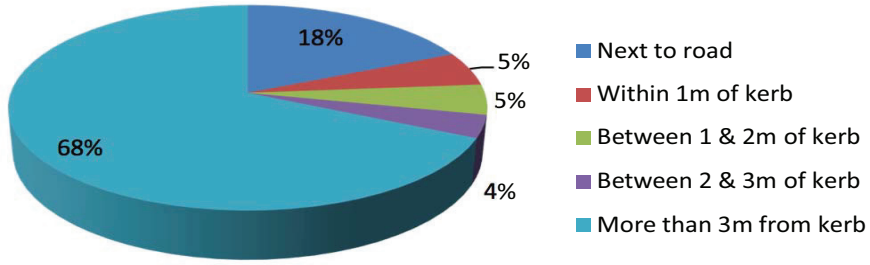
Appendix A
Results

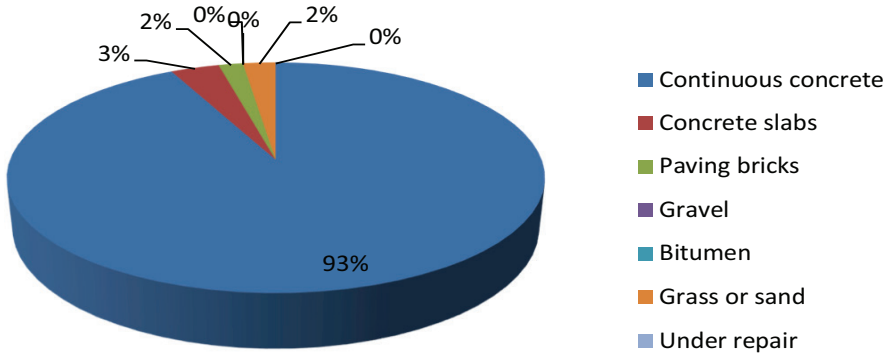
1. Type of Path



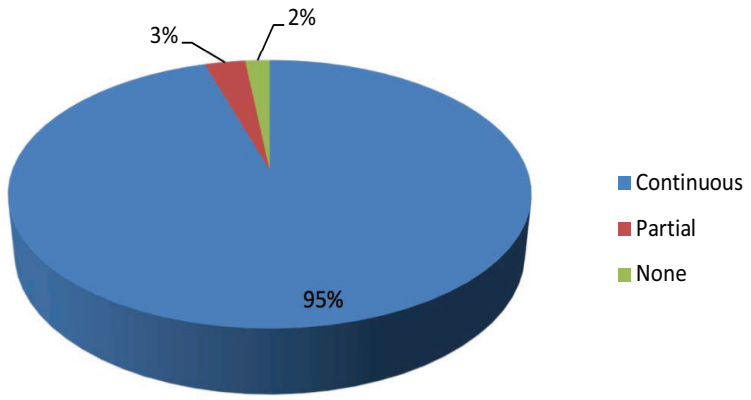
2. Path Location



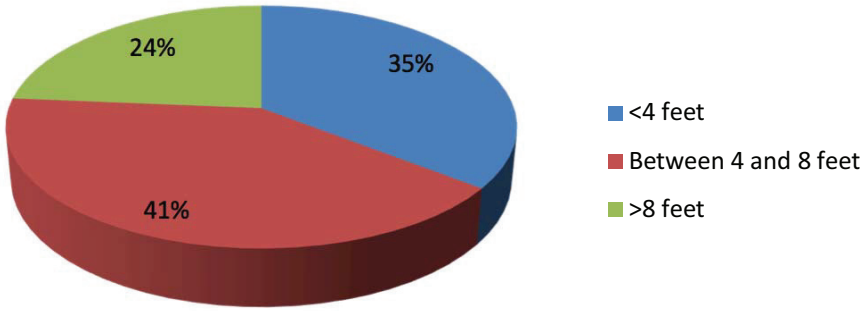
3. Path Material



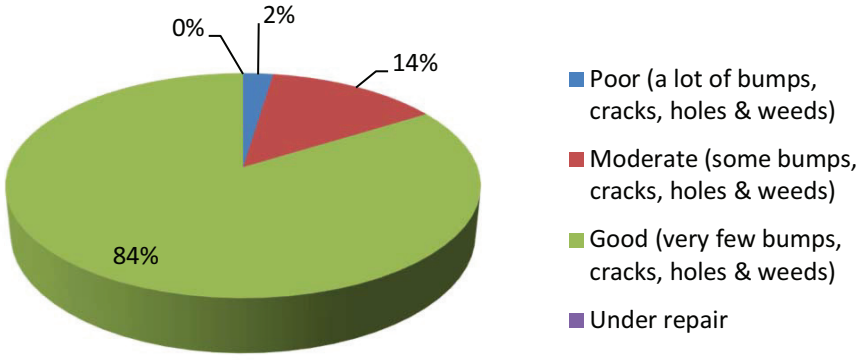
4. Sidewalk or Path



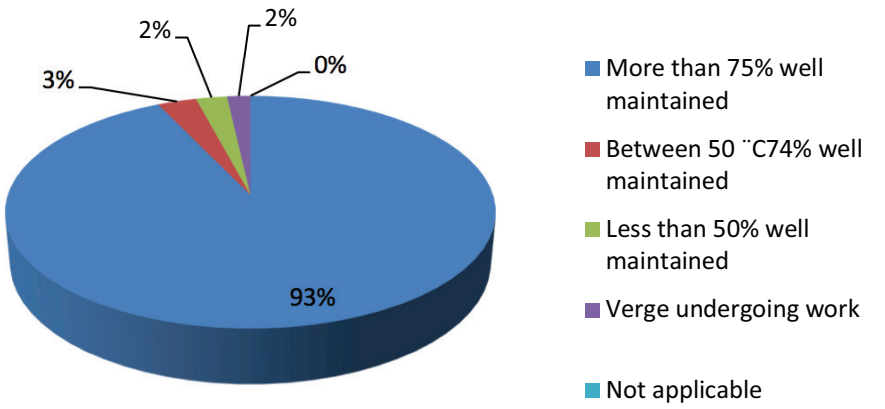
5. Sidewalk or Path Width



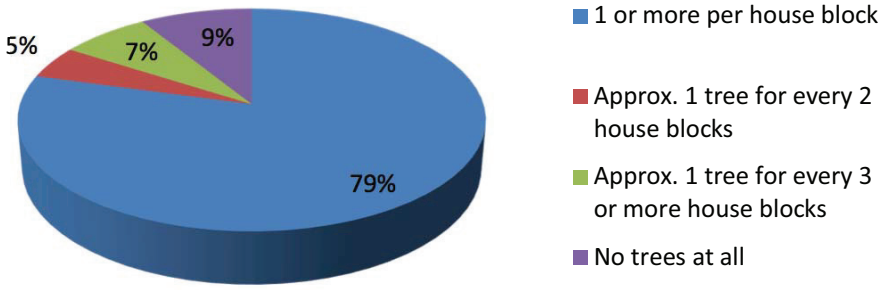
6. Path Condition and Smoothness (Off-Road)



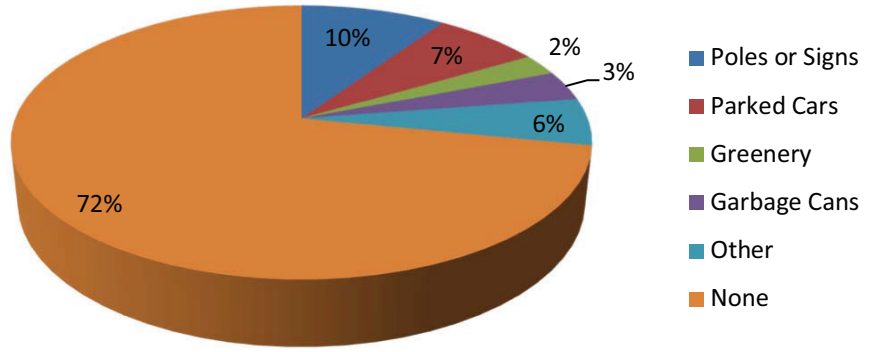
7. Verge Maintainance



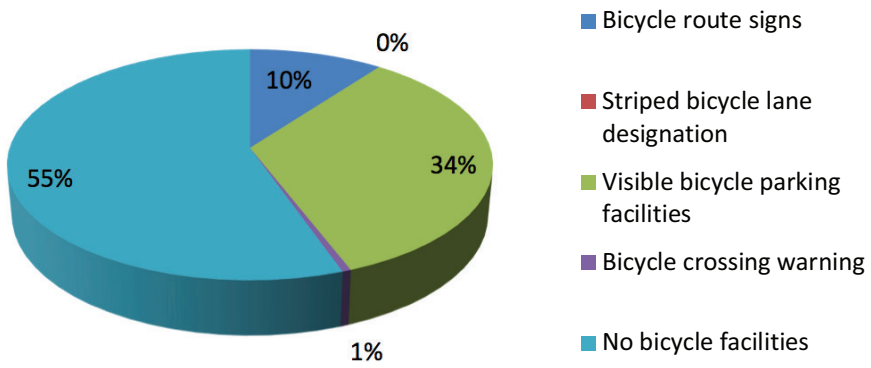
8. Number of Verge Trees



9. Path Obstructions (Off-Road)



10. Bicycle Facilities (Off-Road)



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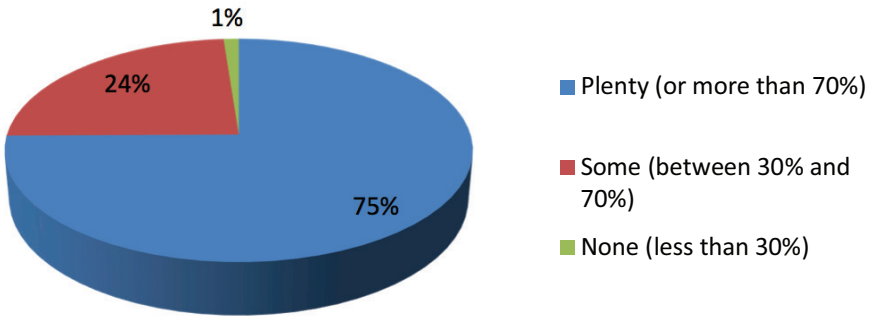
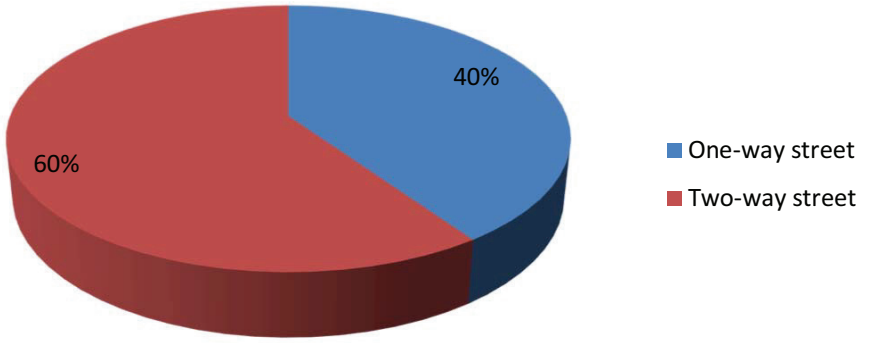
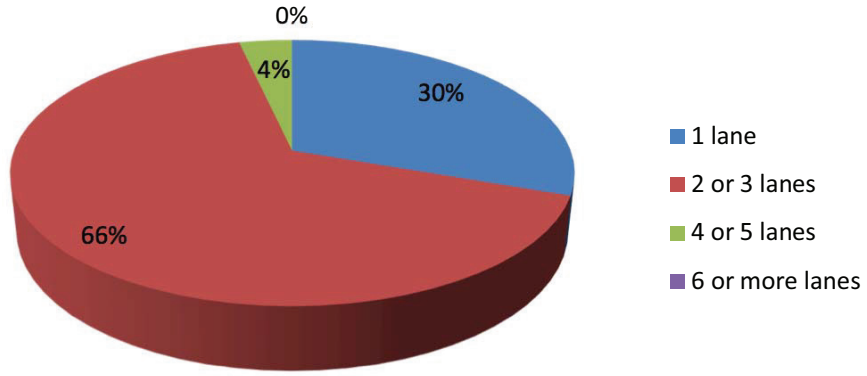


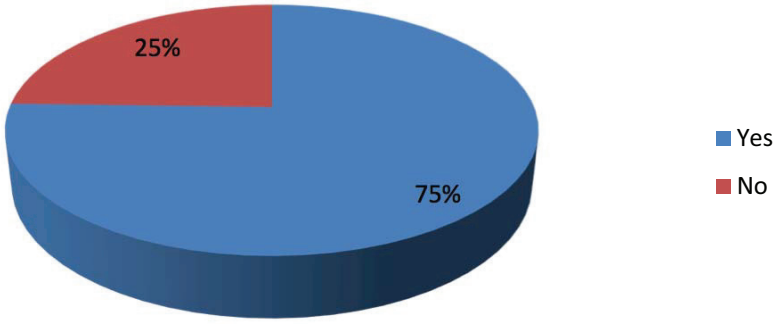
12. Direction of the Road



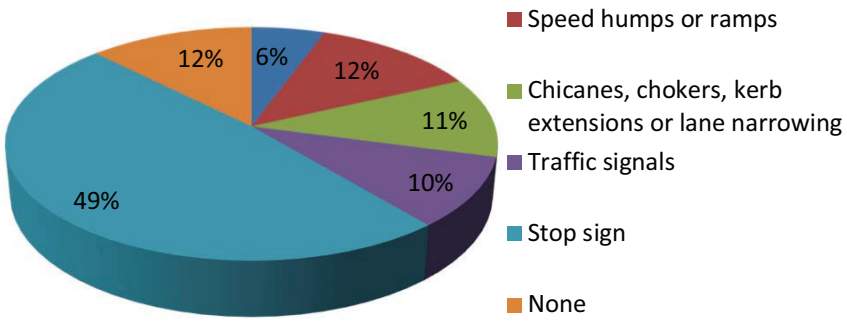
13. Number of Lanes on Road (In Total)



14. Vehicle Parking Restriction Signs Presents



15. Trafic Control Devices



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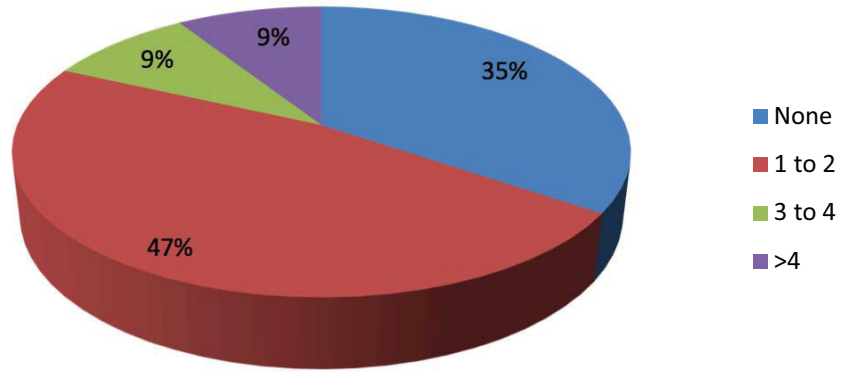
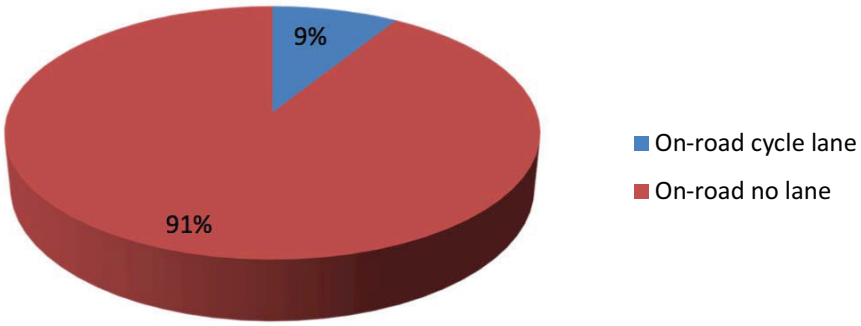
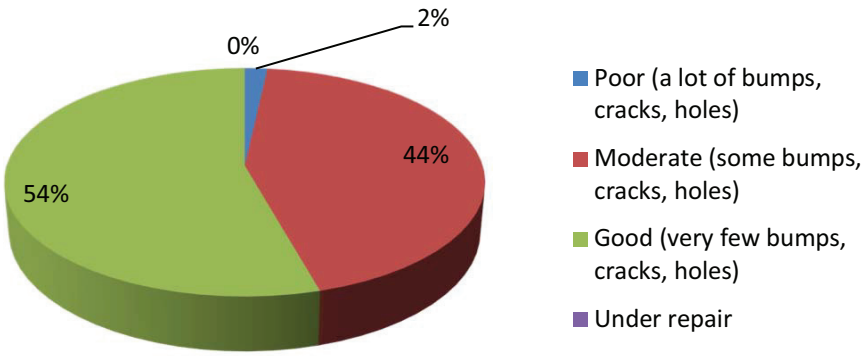


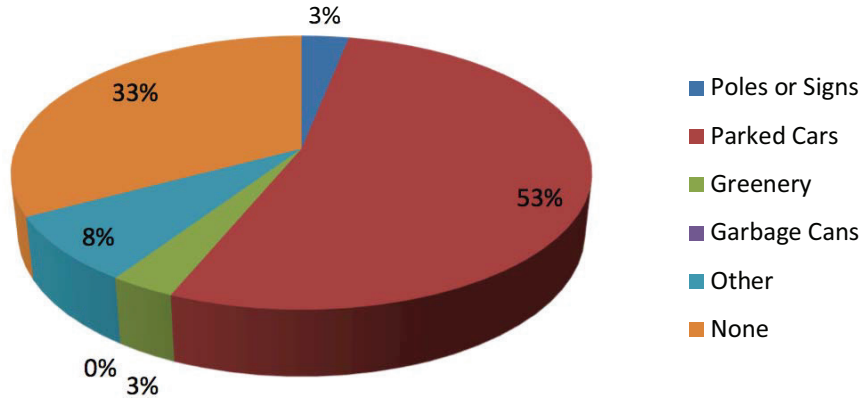
17. Cycling Path Type



16. Road Condition (On-Road)



19. Path Obstructions (On-Roard)



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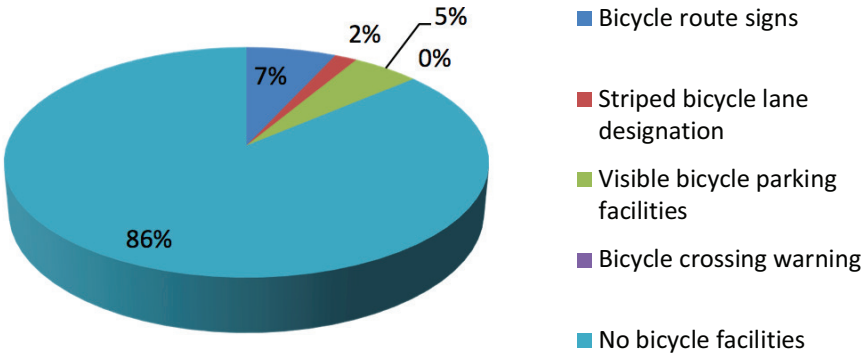
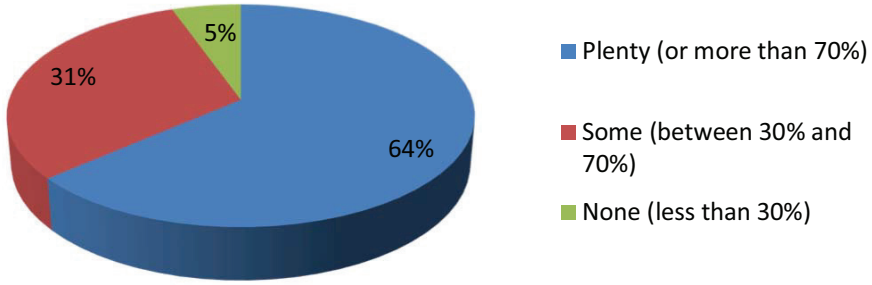


21. Adequate Lighting (On-Roard)



Who Votes for Taxes? An Examination of Voter Support for Local Property Taxes

John David Rausch Jr., *West Texas A&M University*

abstract: *This article examines voter support for local property taxes by focusing on two rare elections in Randall County, Texas, in 2001. This area is growing in population causing some conflict between rural and suburban residents. The data used to analyze voting patterns in both elections were collected by exit polls and indicates that rural-suburban conflict can be seen in the votes on both issues that were subjects of the elections. This research also contributes to our understanding of the public's relationship with two local governments: counties and school districts.*

> *If this poll had asked about Randall County Commissioners rather than CISD [Canyon Independent School District] Board members — it would have been very negative. Accountability, responsibility of CISD board is why I was willing to vote, Yes.*
>
> Respondent, 2001 CISD
> School Bond Election Exit Poll[1]

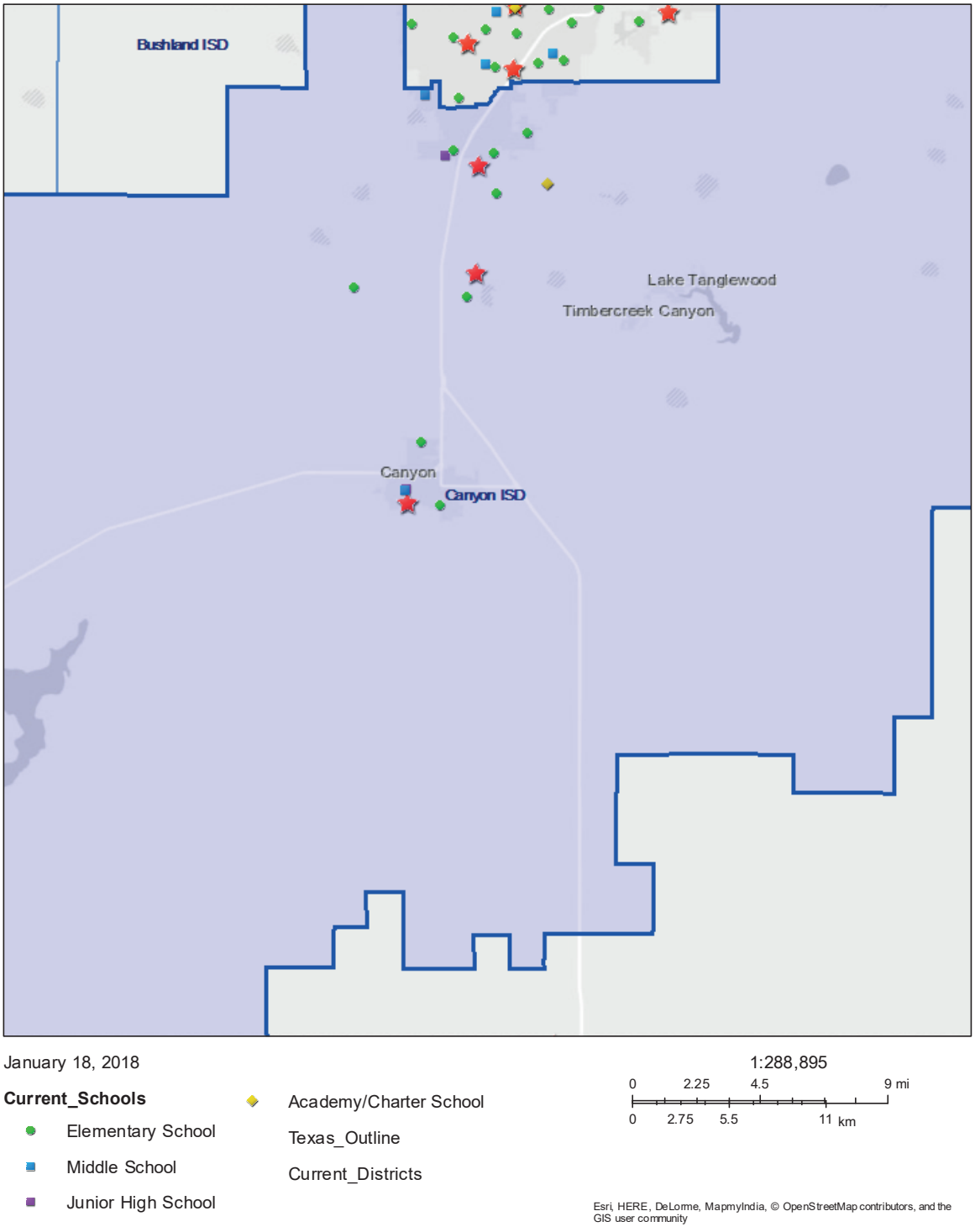
Voters in Randall County, Texas, had two opportunities to voice their opinions regarding property taxes in 2001. In February 2001, voters participated in a property tax rollback election. In this form of direct democracy, voters are asked to accept a property tax rate increase approved by the County Commissioners Court.[2] The rollback was successful, reducing property tax collections to no more than 8% above the previous year. In September of the same year, voters in the Canyon Independent School District (CISD), which includes a large part of Randall County (see Figure 1), decided a $66.6 million school bond issue. The bond issue was approved by a wide margin. The confluence of these two elections was a very rare occurrence. While CISD has enjoyed three successful bond elections since 2000, a bond election during the same year as a rollback election has not been repeated since 2001 (Barrington, 2015; Bryant, 2015).

This research examines voting on these two issues and seeks to identify the determinants of support for increased property tax rates. Why did the rollback succeed, thereby cutting taxes, while the substantial bond issue passed, increasing property taxes for district residents? In order to best understand the vote, the question of support for higher property taxes is examined using data collected at the level of individual voters. An exit poll was conducted during the early voting period before each election and on Election Day. This article presents the results of the exit polls.

Randall County is one of 26 in the Texas Panhandle. It is one of the fastest growing counties in the region with most of the growth in the southern and southwestern parts of the city of Amarillo. Its population in 1960 was about 33,000. The 1970 Census recorded 54,000 residents. By 1980, the county had 75,000 residents. Randall County shares Amarillo with Potter County to the north. The city's 2000 population was 173,627, a 10% increase from the 157,615 people recorded by the 1990 Census. The 2000 Census recorded Randall's population as 104,312, more than 16% above the 89,673 residents in 1990. Earlier estimates suggested that the population would be greater than 110,000 in 2000 (Albright, 2001). Other population centers include Canyon, the county seat with a population of 12,875; and smaller communities like Palisades (352); Lake Tanglewood (825); and Umbarger (327). As Welch (2001a) observed, "from mobile homes and prefabricated homes east of Interstate 27 filling the gap between Amarillo and Canyon, to the new subdivisions with custom-built homes all around the county, especially west of Interstate 27, the face of the county has changed."

The county was once largely rural with family farms comprising the population base. "In 1975, there were 1,339 farms in the county" with life centering on Canyon and its businesses. By 2001, the number of farms had dwindled to about 850 (Welch, 2001a). With 69.5% of the county's population, most residents now call Amarillo home. About 19.3% live in rural areas and the remaining 11.2% live in Canyon (Welch, 2001a).

Figure 1. Canyon Independent School District (CISD) in Randall County



Population growth increases tax revenues, especially as property values increase, but the growth also presents challenges in providing county services. These challenges can result in large budgets and potentially higher tax rates.

The Canyon ISD "spans 711 square miles from south of the city of Canyon north to [just across] the southern city limits of Amarillo," according to their website. The district's total enrollment in 2000–2001 was 7,424 students. There are two high schools: Canyon High in Canyon and Randall High in the southern part of Amarillo. Several elementary and intermediate schools are located in the area between Canyon and Amarillo as well as in Canyon and Amarillo. The bifurcated nature of the school district could pose problems for policymakers, especially those trying to sell a $66.6 million bond issue. The district continues to grow, but the growth is not spread equally. The northern part of the district (south Amarillo) is growing about 2.4% each year, while the "south end" that comprises Canyon and vicinity adds only about 1.5% to the number of students annually (Kanelis, 2001). According to one observer, 70% of the tax revenue in the district comes from south Amarillo (Zamora, 2001).

Public Opinion, Property Taxes, and the Tax Revolt

U.S. public opinion views local property tax as the worst, most unfair, tax (Advisory Commission on Intergovernmental Relations, 1994). Academic interest in popular opposition to local property taxes can be traced back to the 1978 vote on California's Proposition 13 the beginning of a "tax revolt" in the United States. During a brief period in the late 1970s and early 1980s, a number of states changed tax policy, specifically focusing on the property tax. Many of these state-level efforts included citizen initiatives, the form of direct democracy found primarily in the western states in which people circulate petitions in order to place a policy question or constitutional amendment on the ballot. In other states, property taxes were attacked through the regular legislative process. Texas was one of the states that changed its property tax law, enacting "truth-in-taxation" laws in 1979. State Representative Wayne Peveto (D-Orange) and state Senator Grant Jones of Abilene shepherded "a complete overhaul of tax administration" through the legislative process ("Appraisals Blamed for High Taxes," 1997). The legislation, the result of about a seven-years effort, was designed to allow taxpayers to understand their property taxes better. According to one brief history of property tax policy in Texas:

> The law did away with assessment ratios that were used to raise taxes without raising rates, required disclosure of the effect of increases in market values on current rates, and required annual disclosures to taxpayers of appraisals, rates, and exemptions claimed on each property. Another section of the . . . bill required the over 2,000 taxing districts to consolidate their appraisal functions, bringing the number down to no more than two per county. And it required training for appraisers" (Mathis, 1998).

Another section of the "Peveto Bill," as the legislation became known, provides for a referendum process if the local government increases property taxes. Chapter 26.07 of the Texas Tax Code specifies

> if the governing body of a taxing unit other than a school district adopts a tax rate that exceeds the rollback tax rate calculated as provided by this chapter [currently 8%], the qualified voters of the taxing unit by petition may require that an election be held to determine whether or not to reduce the tax rate adopted for the current year to the rollback tax rate calculated as provided by this chapter.[3]

This referendum process applies to all local governments, but the school district rollback rate is based on a district's financial officers' estimates of student population (R. Petree, personal communication, Febraury 26, 2001). In addition, school districts are automatically subject to an election if their effective tax rate is above the rollback rate. However, the ballot question was worded so that the affirmative vote approves the higher rate. For all other local governments, the affirmative vote repeals the higher property tax rate.

A number of local governments in Texas experienced rollback elections from 1982 through 2001. The efforts to hold down property taxes have been most successful in counties. From 1982 through 2001, rollback elections were held in 40 counties with the tax rate successfully rolled back in 34 counties. With 48 successful efforts out of 128, rollbacks have been least successful in school districts ("2000 Tax Rollback Elections," 2001). Considering that Texas has 254 counties with annual budgets and there have only been 40 county rollback elections in 20 years, rollback elections are rare events.

Explaining Support for Higher Taxes

Why did voters reject higher property taxes in one election while voting to approve higher property taxes in a second election held the same year? As evidence of the academic interest in explaining the causes of the tax revolt, Lowery and Sigelman (1981) point to the nearly 100 articles that appeared in the political science literature from 1978 through 1980. The authors identify eight themes to explain support for tax limitation measures in the states. They then subject these explanations to rigorous analysis and find each lacking. I test several of these explanations using individual-level data collected during elections when property tax increases were on the ballot. As a starting point, then, I use the following eight explanations that they identify: taxpayer self-interest; tax level; tax efficiency; tax distribution; political ideology; political disaffection; and lack of information on the part of the taxpaying voter. Of course, not all of these explanations are testable at the individual-level; those that are not applicable are removed from this analysis. Judging from the respondent's comment in the epigram, I hypothesize that political disaffection is the most significant factor in both elections. Voters distrusted the county commissioners or desired to punish the commissioners using the rollback election while the same voters saw the school bond election as a way to demonstrate trust in the leadership of the CISD Board of Trustees. In addition, place of residence also is tested as a factor.

The Campaigns

A brief examination of both campaigns reveals insight into the factors that led to the success of the rollback and school bond issue. The rollback campaign began in the hot days of September when the Randall County Commissioners Court approved a budget requiring a 27% increase in the effective property tax rate (Ludington, 2001). The dramatic increase became necessary because of a more than $3 million shortfall in county revenues caused by a decrease in court fee collections, increased demand for court-appointed attorneys, and a decrease in fee revenue from real estate and auto sales collections. (Lutz, 2001). A group of county residents, Concerned Voters for Randall County, organized only a few weeks after the 2000–2001 budget was implemented. This group circulated petitions, collecting about 8,000 signatures, to force a rollback election. The signatures were enough for the commissioners to schedule an election for February 10, 2001. The weeks leading up to election were marked by an often-angry debate over the proper role of county government. The sides in the debate, carried in the letters to the editor of the Amarillo and Canyon newspapers and on the Amarillo paper's website, were divided by the rural and urban population or by employment with the county. Almost 19% of registered voters turned out, either during early voting or on Election Day. The turnout was unexpectedly high for a local special election (Welch, 2001b). Ludington (2001) reports that "voters turned out in numbers that were nearly double the number of voters" (p. 2) who participated in previous special elections. Voters approved the rollback by a narrow margin of 6,743 (52%) to 6,271 (48%). Amarillo voters provided strong support for the rollback with 5,014 votes coming from the city. Voters in rural areas and Canyon cast more votes (2,430) against the rollback than for it (1,729) (Welch, 2001b). The rollback reduced the tax rate from 34 cents per $100 of assessed valuation to 29 cents per $100 and required the commissioners to cut about $2.8 million from a budget already in effect.

In light of the successful rollback election earlier in the year, a large portion of Randall County voters went to the polls again in September 2001 to decide whether or not the Canyon Independent School District could borrow up to $66.6 million to engage in a renovation and building program. The bond issue passed with 68% of the voters approving the bond issue (Munsch & Werpney, 2001). The Board of Trustees was careful in making sure that all parts of the district would receive some money blunting opposition based on location. A small opposition coalesced around the issue of increased taxes. According to materials distributed by the district, school property taxes will increase a maximum of 17.7 cents (per $100 of assessed valuation) over a five-year period. This article examines a very rare set of events: A school bond issue is approved in the same year that voters in the same county reduced county property taxes through a popular referendum.[4] The following examines this apparent paradox more closely.

Determinants of Voting on Property Taxes

Lowery and Sigelman (1981) protest that the bulk of research on tax revolts seeks to explain individual-level reasons for support using aggregate-level data. That flaw, however, should not hinder a researcher from using the same factors to study individual-level voting on property tax issues. This research tests a number of explanations identified in the tax revolt literature to suggest the fac-

tors that led to the outcomes of the two 2001 property tax votes.

Self-interest

Since most Americans view the property tax as the least fair tax, the self-interest of a taxpaying voter clearly plays a role in determining his or her vote on a ballot question that could potentially increase property tax rates. To measure self-interest, the exit polls I conducted included questions on homeownership, education attainment, race, and family income. The rollback exit poll queried whether the respondent lived in a rural area, an urban area, or a suburb (see Courant, Gramlich, & Rubinfeld 1979, 1980; Citrin 1979). Some discussion of self-interest can be identified in the campaign leading up to the rollback vote. For example, the principle organizer of Concerned Voters for Randall County, the group that circulated the petition to bring the rollback to a vote, owns a number of apartment complexes and other rental properties.

A voter's race or ethnic group should not play a role in determining vote on these property tax issues. The population of Randall County is not diverse. According to the 2000 Census, 86% of the county population was Anglo white, almost 2% of the population was African-American, and 10% was Hispanic. The exit polls did not capture the opinions of many members of the nonwhite population in the county. Of the 243 respondents in the rollback exit poll, 93% were white. Approximately 90% of the respondents questioned in the school bond issue poll were Anglo white.

Most important to the issue of voter self-interest is the location of the voter's residence. Rollback voters were asked if they live in a rural, suburban, or urban area. I expect to see a divide in rollback support based on where the respondent thinks he or she lives. This prediction is based in part on observation of meetings and discussions that preceded the rollback vote. Residents of urban and suburban Amarillo did not seem to see a connection between the county property taxes they paid and the services they received. Residents in rural areas were more concerned about losing rural fire protection, a service subsidized by the county. Approximately 38.9% of the respondents claimed to be urban residents while 20.1% were rural and 37.2 suburban.[5]

A canvass of the election precincts supports the proposition that where a voter lives affected his or her vote. The rollback was approved by 52% of county residents who voted. Within the city of Amarillo, the measure won with 56% of the vote. "Only one precinct that lies fully within the Amarillo city limits rejected the rollback – by a mere three votes out of 459 ballots cast." Outside Amarillo, the measure was defeated 59 to 41% (Welch, 2001c).

The issue of place was narrowed for the CISD school bond exit poll. In addition to the rural, suburban, and urban question, respondents were asked to identify if they lived in Canyon, in Amarillo, or not in Canyon or Amarillo. More than 30% identified themselves as rural or urban residents while 36% identified themselves as living in a suburb. A large majority of the respondents (83%) were Canyon residents. Only 13% indicated that they did not live in either Canyon or Amarillo and 5% identified themselves as Amarillo residents. To simplify the analysis, respondents were recoded as either living in Canyon or not living in Canyon.

Political Ideology and Partisanship

A person's political ideology is one important explanation of support for tax limitations, but Lowery and Sigelman (1981) argue that the literature is unclear how ideology works in determining voting on tax limitation measures. Citrin (1979) finds that liberals and voters with Democratic Party affiliations are less likely to support the aims of the tax revolt. Other research did not uncover any connection between ideology or partisanship and support for the tax revolt (Lowery & Sigelman, 1981). Several questions tapping a respondent's party affiliation and ideology were included on both exit polls.

The Texas Panhandle is well known as one of the most conservative parts of Texas (see Roche, 2001; Mojtabai, 1986). Since the 1960s, the region has steadily become more Republican. A majority of Randall County voters cast ballots for Republican Barry Goldwater instead of President Lyndon Johnson in 1964. George H.W. Bush, the Republican U.S. Senate candidate in 1964, was defeated statewide while carrying Randall County (Albright, 2000).

Party affiliation and ideology serve primarily as a constant. More than 63% of the respondents on the rollback exit poll reported a Republican Party affiliation, identical to the number reporting the same affiliation on the school bond issue poll. Nearly 55% of the rollback exit poll respondents reported that they favored smaller government with fewer services. Nearly two-thirds of the respondents in the school bond issue poll took the same position. Because of the relative uniformity of partisan affiliation across the county, it should not be a factor in the voting decision in the two elections under study here. In fact, it is not too difficult to hypothesize that the conser-

vative character of Randall County residents would make them want to keep their taxes low and reject the school bond issue.

A Lack of Confidence in Government

The final attitudinal variable to be considered in understanding the 2001 votes on property taxes in Randall County is one measuring the degree of connection to county politics. Support for the tax revolt could be spurred by negative feelings toward government, specifically the feelings among residents that government is ineffective in solving problems (Lowery & Sigelman, 1981). Voters who lack confidence in the government or who feel alienated from it are more likely to vote to reduce property taxes. This variable will be strongly associated with the vote on the rollback: voters who disapprove of the job county government is doing will vote to rollback property taxes. The exit poll asked respondents to gauge the job performance of the county judge and the job performance of the Commissioners Court (the county judge plus the four commissioners). About 48% disapproved of the job the County Judge was doing with 36% approving. A majority of respondents (56%) disapproved of the job being done by the Commissioners Court. In contrast, 77% of the school bond exit poll respondents reported a favorable opinion of the Canyon Independent School District Board of Trustees.

Data and Methods

Data from two exit polls conducted during the early voting period and Election Day form the basis of this analysis. Self-selected groups of my students[6] administered the questionnaires to voters as they exited the polling places after casting their ballots. The exit polls yielded 243 usable questionnaires for the Randall County Rollback Election and 174 for the Canyon ISD School Bond Election. I did not feel comfortable using a logistic analysis because of the small number of cases relative to the number of variables. In addition, a large number of the predictor variables are measured at the nominal or ordinal levels. Measures of association are used to find which variables are associated with support for higher property taxes in Randall County.

Table 1. Approval Ratings of the County Judge and Randall County Commissioners Court in Percentages (N = 235)

	County Judge	Commissioners Court
Approve	35.7	30.2
Disapprove	48.1	55.8
No Opinion	16.2	12.0

Table 2. County Judge Approval by Residence in Percentages

	Urban Area	Suburban Area	Rural Area
Approve	39.3	35.3	32.6
Disapprove	34.8	52.9	63.0
No Opinion	25.8	11.8	4.3
	100.0 (N = 89)	100.0 (N = 85)	100.0 (N = 46)

Chi-square = 18.199; $p = .006$

Table 3. Commissioners Court Judge Approval by Residence in Percentages

	Urban Area	Suburban Area	Rural Area
Approve	39.8	22.4	23.4
Disapprove	43.2	65.9	74.5
No Opinion	17.0	11.8	2.1
	100.0 (N = 88)	100.0 (N = 85)	100.0 (N = 47)

Chi-square = 22.802; $p = .001$

Table 4. Vote on Rollback by Approval of County Judge in Percentages

	Approve	Disapprove	No Opinion
Against	60.2	54.0	50.0
For	39.8	46.0	50.0
	100.0 (N = 83)	100.0 (N = 113)	100.0 (N = 38)

Chi-square = 1.326; $p = .515$

Table 5. Vote on Rollback by Approval of Commissioners Court in Percentages

	Approve	Disapprove	No Opinion
Against	61.4	52.2	56.7
For	38.6	47.8	43.3
	100.0 (N = 70)	100.0 (N = 134)	100.0 (N = 30)

Chi-square = 1.590; $p = .452$

Findings

Some of the descriptive information regarding the data has been presented above. Testing for association yielded a few variables that were associated with vote on the rollback. I examined the approval ratings of the County Judge and the Commissioners Court using the following two questions:

- Do you approve or disapprove of the way Ted Wood is handling his job as county judge?
- Do you approve or disapprove of the way the Randall County Commissioners Court is doing its job?

I collapsed the response categories into Agree, Disagree, and No Opinion. Neither the County Judge nor the Commissioners Court attained high approval ratings (Table 1).

The most interesting feature of the approval ratings of the County Judge and the Commissioners Court is that the level of disapproval is associated with where the voter lives. This feature is illustrated in Tables 2 and 3.

The tables illustrate that while the judge and the commissioners have low job approval ratings countywide, voters who claim to live in suburban or rural areas *really* disapprove of the jobs of the elected officials. A large number of voters do not have any opinion of the judge and commissioners. I am not able to identify the actual residences of the voters who claim to reside in suburban areas; my guess would be that they live in southwest Amarillo or Canyon.

Despite the conventional political wisdom that pervaded Randall County in the weeks leading up to the rollback election, the vote was not a direct referendum on Judge Wood and the commissioners. Tables 4 and 5 represent evidence that voters who expressed approval at the performance of Judge Wood and the commissioners were more likely to vote against the rollback. The association is not significant, in part due to the number of respondents with no opinion. A voter's sense of where he or she lives is associated with vote on the rollback, as illustrated by Table 6. Rural and suburban voters were more likely to vote against the rollback, a significant association according to the chi-square test. The data suggests that while rural and some suburban voters disapprove of the jobs being done by the county judge and the commissioners, the same voters recognize the importance of the services provided by county government. In order to keep receiving the services, rural and some suburban residents were willing to overlook their dissatisfaction with county government and vote against the rollback.

Adding weight to the position that voters were voting out of disaffection with Randall County government when they approved the rollback, I find an association between another question measuring disaffection and vote. Respondents were asked to agree or disagree to the following statement: "The Randall County Commissioners Court doesn't care about people like me."

The results represented in Table 7 exhibit support for an ideological explanation of the vote for the rollback. Respondents were asked to choose from two options regarding government services:

> Would you say you favor:
> 1. A smaller government with fewer services
> 2.A larger government with more services

The association is presented in Table 8. Respondents' positions on this question were not associated with whether or not respondents claimed to live in a rural, suburban, or urban area.

The September vote on the Canyon ISDbond issue displayed the opposite condition. Voters had a high approval rating of the Board of Trustees and they also felt that the trustees valued citizen input. In order to avoid burdening the reader with large numbers of tables, I summarize the findings in Table 9. Voters in the Canyon Independent School District feel attached to their school board and schools and this is reflected in their vote.

The issue of voter's residence did play a small role in the vote. After the election, Superintendent James Veitenheimer noted "a higher percentage of residents in the south part of the district voted in favor of the bond." The vote in the northern part of the district (including south Amarillo) was 61% in favor and 39% against while southern residents voted 73% in favor and 27% against (Wilson, 2001). This pattern appears in the exit poll data as well (illustrated by Table 10), but it is not very pronounced in part because of the paucity of respondents

Table 6. Vote on Rollback by Residence in Percentages

	Urban Area	Suburban Area	Rural Area	Don't Know
Against	45.6	67.1	53.2	66.7
For	54.4	32.9	46.8	33.3
	100.0 (N=90)	100.0 (N=85)	100.0 (N=47)	100.0 (N=9)

Chi-square = 8.761; $p = .033$

Table 7. Vote on Rollback by Commissioners Do Not Care in Percentages

	Agree	Disagree	No Opinion
Against	46.7	64.5	44.0
For	53.3	35.5	56.0
	100.0 (N = 90)	100.0 (N = 121)	100.0 (N = 25)

Chi-square = 8.118; $p = .017$

Table 8. Vote on Rollback by Position on Size of Government in Percentages

	Smaller Government/ Few Services	Larger Government/ More Services
Against	47.7	63.7
For	52.3	36.3
	100.0 (N = 109)	100.0 (N = 91)

Chi-square = 5.149; $p = .023$

Table 9. Association with Vote on School Bond Issue

Exit Poll Question	Chi-square	*p*
Do you approve or disapprove of the way the CISD Board of Trustees is doing its job?	45.135	.000
CISD does a good job educating students.	22.886	.000
The CISD administration doesn't care about people like me.	21.091	.000
The district does a good job making sure all schools receive adequate funding.	18.767	.000
The CISD Board of Trustees values the input of citizens in making decisions.	38.064	.000

Table 10. Vote on Bond Issue by Residence in Canyon in Percentages

	Not in Canyon	In Canyon
Against	63.3	22.9
For	36.7	77.1
	100.0 (N = 30)	100.0 (N = 144)

Chi-square = 19.355; p = .000

Table 11. Vote on Bond Issue by Actual Vote on Rollback in Percentages

	Against Rollback	For Rollback
Against Bond Issue	30.5	46.7
For Bond Issue	69.5	53.3
	100.0 (N = 82)	100.0 (N = 45)

Chi-square = 3.292; p = .070

claiming to live in Amarillo. The votes on both property tax issues are associated, although the association does not quite reach significance. Table 11 depicts this association. The school bond exit poll asked respondents how they voted on the rollback. For purposes of clarity, respondents who did not vote on the rollback or who could not recall how they voted were removed from the analysis. We would expect a person who voted for the rollback to vote against increasing property taxes through a school bond issue. Table 11 almost depicts this situation. A majority of the voters who against the rollback also voted for the bond issue, but 53% of the voters supporting the rollback also voted in support of the bond issue. What explains this apparent paradox?

Discussion and Conclusions

The general lesson uncovered by the findings is that a government trusted by voters is better situated to overcome financial obstacles by enacting property tax increases. Randall County voters did not approve of the job being performed by the County Judge and the Commissioners Court and they reacted at the ballot box by rolling back property taxes. County government is known for its political infighting, a feature of a one-party political system. Since the 1980s, Randall County Democrats have rarely sought county office. County government receives significant headlines when a commissioner, another official, or a previous candidate for the same office is suing a commissioner or other official. The non-partisan Board of Trustees rarely receives negative coverage for political conflict.

The political infighting apparent in county government is one result of constitutional structure. All department heads, including county sheriff, county clerk, and county treasurer, are elected in partisan elections. In fact, all department heads are elected at the same time as the County Judge, who serves as both a judicial officer and county executive. Members of the Board of Trustees are elected in nonpartisan elections and the board is able to appoint the department heads who manage the district. Political conflict seems to occur rarely on the school board and if there is conflict, it rarely is reported in the media.

The Board of Trustees also did a better job of convincing the voting public of the need for the school bond. During the early voting period before Election Day, a number of parents meetings and open houses were held at schools in the district. Polling places were available at the schools during these meetings, although the ballot boxes were set up a legally specified distance from the meetings. One report observed the bond issue was more popular among early voters than among those voting on the scheduled Election Day (Wilson, 2001). Apparently, the strategy of providing polling places with the parents meetings worked.

In contrast, the county provided for early voting locations for the rollback elections including the county courthouse in Canyon and the Randall County Annex in Amarillo. An additional early voting location was set up at a supermarket in Amarillo, a location that may have contributed to the success of the rollback. One elected county official, requesting anonymity, told me "it was probably a stupid move allowing voters to vote at the Homeland at 34th and Coulter [in Amarillo]. People go into the grocery store, see the ballot boxes, and decide to vote at the spur of the moment. What a convenient way to stick it to the county commissioners!" Despite the efforts of a group of county employees who organized to fight the rollback, the public relations campaign to explain to voters the need for additional tax revenue was muted.

While the school bond election provided interesting findings, the real story lies in the challenges faced by a county government in a rapidly growing county. Property taxes are based on a property's assessed values. County government controls the tax rate while the central appraisal district determines the assessed value of property. The assessed value is affected by the market value of land. As more people wish to move into an area, market values increase as demand begins to outstrip supply. There is an interesting irony that Randall County is a popular residential destination for people moving to Amarillo from other parts of the Panhandle because of the county's history of low property taxes. Population growth causes increased demands on county services, but voters do not appear to want to pay more in property taxes to fund those services. Residents of south Amarillo do not feel that they receive any services from the county since they have city services. A popular refrain is "let the rural folks pay for county services because they need them."

Future research should look at property tax rollbacks in other counties. One month after Randall County's rollback, a rollback election was successful in Ellis County (Waxahachie). According to Ellis County Judge Al Cornelius, the increase in property tax rates was caused by a "tremendous [population] growth spurt."[7] What are the factors that contribute to both a property tax rate increase and a rollback election? Rollback elections are not automatic; aggrieved citizens must collect signatures on

petitions to get the question placed on the ballot. How much of the trend toward urbanization in Texas can explain rollback elections? A review of the 40 rollback elections between 1982 and 2001 would provide some answers to this question.

The findings uncovered by the exit polls paint a picture of a more dynamic political landscape than that seen by observers like Mojtabai (1986). Randall County voters are not "knee-jerk" conservatives, opposed to any taxes. The school bond vote demonstrates that if provided with enough evidence, voters will support higher property taxes. If not convinced that the stewards entrusted with property tax revenue are trustworthy, voters will not support significant increases in the amount of money they have to send to government.

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Notes

1. An important point to be noted about this respondent's comment is that the CISD school board election was cancelled in 2001 because only the incumbents chose to file for election. The county commissioners regularly face opponents in the Republican Party primary.
2. The County Commissioners Court is comprised of the County Judge, elected at-large countywide, and four Commissioners elected by precinct. Candidates run for both positions in partisan elections.
3. The rollback tax rate is calculated using the property tax rate and assessed property values.
4. One of the questions on the bond issue exit poll queried about vote on the rollback election. Of the 174 respondents, 26% voted for the rollback, 47% voted against the rollback, and 22% "didn't vote on the rollback." Clearly, I cannot make the connection that the voters were the same in both elections, in part because CISD only includes a small portion of the city of Amarillo. It remains important to test the importance of location in voting on very local property taxes.
5. Location self-identification is fraught with difficulties. In discussing the issue with my wife, I learned that she considered our residence to be in a suburban area (we live in Canyon). I consider our house to be located in a rural area because during the summer I can see cattle grazing from our living room window (I grew up on a farm). Amarillo residents could consider themselves urban or suburban, even though my observation would consider most of south Amarillo to be suburban because of the presence of fenced yards and strip malls.
6. The students were awarded extra credit in my State and Local Government class.
7. Bisected by Interstate 35, Ellis County is a southern suburb of Dallas, 30 miles away.

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