School-Related Traffic in Holden, Massachusetts

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Abstract

This thesis looks at the school-related traffic congestion that is being experienced in Holden, Massachusetts due to Wachusett Regional High School. This traffic is caused by the amount of parent drop-offs outnumbering the students taking the bus, traffic signals around the school not being synced up with peak traffic times, and the population of Holden outgrowing the roads. By conducting research and a study that was conducted at the high school, there are two possible solutions to limiting the amount of traffic in this certain area. These solutions are notifying the parents, through flyer or email of the effects dropping their children off at school has on the traffic, and manipulating the traffic signals around the school to coordinate with peak traffic times.

Chapter 1

Introduction

School-related traffic congestion affects numerous stakeholders in communities nationwide. These stakeholders include, but are not limited to, police, students, parents, and residents. Congestion around school zones can be caused by population increases, not enough students taking the bus to school, or school location. Traffic congestion is a problem that needs to be looked at seriously as it could cause an increase in car accidents, reckless driving or speeding in residential areas, and traffic violations (La Vigne 1). When traffic congestion around a school zone becomes too much of a problem there are certain techniques and measurements local authorities can take to help, such as the building or expansion of new roads or implementing programs to encourage more students to take the bus to school.

A quick fix to traffic congestion around school zones would be to set up safe walking routes to school, which would help limit the number of cars involved in the backup ("Why Do Parents Drive Their Kids to School"). This solution is not applicable in New England due to inclement weather for the better part of the school year. Another solution to this problem is to seek alternate routes for residents who are going about their business so they don't add to the traffic. This solution only works if a school is in a good location that has multiple roads and routes around it.

The problem of school-related traffic congestion is affecting Wachusett Regional High School, located on Main Street in Holden, Massachusetts. This local problem upsets students and faculty who attend the school and residents who frequent this route on their morning

commute. In order to get in and out of Holden or to the high school one must use Main Street, which causes a massive backup as people are trying to get to school or work. The traffic congestion is at its peak during weekdays in the morning when student drivers, faculty, buses, parents dropping off their children, and residents commuting to work all converge on Main Street. This traffic congestion is dangerous to the community as it causes residents to neglect traffic laws and ride in break-down lanes in order to get to their destination faster, which could cause accidents and frustration. This traffic congestion in the morning could also be potentially dangerous to the students and faculty in Wachusett Regional High School if there were ever an incident at the school, such as a bomb threat or school shooting. If that were to happen it would be difficult for the Holden Police, Fire, and Emergency Medical Services (EMS) to respond to the incident in an adequate amount of time.

Alas, discovering what the potential causes of this problem are would be beneficial to the entire Holden and Wachusett Regional High School Community. Finding a solution to mitigate the traffic would help ease frustration among drivers, make the commute to school or work less time-consuming, and make it more accessible for first responders to get to the high school if there ever were an incident.

Statement of the Problem

The traffic congestion occurring at Wachusett Regional High School can be attributed to the number of students being dropped off by parents and not by bus, the placement and timing of traffic signs and signals around the school, and the population increase in Holden and

surrounding communities that outgrew the roads. Identifying these main causes is the first step to solving this traffic congestion.

The number of students being dropped off at school by their parents surpassing the amount of students taking the bus to school has been a main cause of traffic congestion around schools throughout the country. Nancy La Vigne, author of “The Problem of Traffic Congestion around Schools” states that the most obvious and biggest cause of traffic congestion around schools are parents bringing their kids to school. In fact, studies have shown that there is an increasing amount of parents who prefer to provide their children transport instead of letting them walk or take the bus (La Vigne 3). Raw data taken on January 30, 2018 on a Tuesday morning at Wachusett Regional High School shows that there were 266 parent drop-offs recorded from 6:50 AM to 7:38 AM. This data is a direct reflection of how the number of parent drop-offs is affecting traffic at the school and limiting the number of students on the buses.

The location of traffic signs and the timing of traffic signals also contributes to congestion around schools. An article entitled “ Traffic congestion: Should U.S. cities use cordon pricing, which charges who enter the most congested part of the city at the busiest times, as a way of reducing traffic?” states that signals that don’t fit the flow of traffic in a particular area are a cause of traffic congestion (“Traffic Congestion”). This problem corresponds with the traffic at Wachusett Regional High School as there is only one traffic light within a mile of the school, and it doesn’t adjust to the heavy traffic that the street sees during the morning rush.

The final cause of the traffic backup is the population increase in the town of Holden and surrounding communities that roads weren’t ready for, and the location of the school. A

booklet titled “School Site Planning: Guidelines and Best Practices” suggests that when choosing a school site, it should be close to residential areas and far away from roadways that see a high volume of traffic (School Site Planning”). While WRHS is near a residential area, it is located on the busy road of Main Street and since this is the only street that gives access to the high school, it sees a large amount of traffic. This roadway and location of school may have worked in the past, but the roadways have not adjusted to the population increases of both people and cars on the road (“Traffic”). This is prevalent in Holden as the town has seen a recent growth in population and the number of students that attend WRHS.

The problem of traffic congestion at WRHS is caused by too parent drop-offs and not enough students on the bus, the location and timing of traffic signals, and the population increase of communities that attend WRHS and the lack of road expansion. Each one of these situations contribute to the morning traffic that is experienced by local residents on Main Street.

Background and Need

Traffic is an inconvenience for everyone involved. It can also be dangerous, as it causes road rage which leads to risky driving behaviors, negative emotions while driving and acts of aggression (Dula). Citizens must adjust their daily schedules to fit around traffic, such as leaving early for school or work, to get to their destination on time (“Right to Ride”). The traffic congestion around WRHS on Main Street could also be the cause of a major problem if there were ever an incident in the morning such as a school shooting or bomb threat, as it would be difficult and time-consuming for first responders to arrive on the scene. By finding a solution to

this car back-up through looking at how to get more students to take the bus, adjustments that can be made with street lights and signals, and insufficient roadways caused by a population increase, it will make residents lives easier and less dangerous.

Encouraging the students to take the bus instead of getting dropped off by their parents is an important step to solving traffic congestion. In order to decrease the number of parent drop-offs at school, parents must be educated about other ways to get to school, such as the bus (La Vigne 12). A simple way to get this information out would be to send a mass email or pamphlet to student's homes. The main subject that this information should address is the safety of buses (McDonald) and the positive environmental affect taking buses has compared to cars, as one bus replaces 36 private vehicles (Mcdevitt). This fact can also be geared to eliminating traffic congestion near schools. The main audience of these emails or pamphlets are working parents, as they are the most likely group to drive their children to school (Ahern). A second way to encourage public transportation to school is making more buses available by increasing the amount of money in the budget. This has been done in Atlanta and has helped reduce traffic congestion and create more jobs ("Right to Ride"). These two options will help to get more students on the bus and eliminate traffic in problem areas.

A traffic light that corresponds with peak traffic hours can immensely help reduce congestion in a heavily populated area. This is a simple, yet effective approach and works well with school-related traffic if the light is paired up with school start and dismissal times (La Vigne 12). Public officials and the transportation and planning department in towns have the ability to change lights ("Traffic Congestion") and reduce or increase the time the light remains green or red. This solution helps to clear out traffic on busy streets during peak traffic hours.

Planning out a good location that has sufficient roadways that factor in a population increase goes a long way towards making sure traffic congestion doesn't build up. New school planning committees are careful to locate their buildings near residential areas and avoid busy streets (School Site Planning). This helps make sure that residents who aren't going to the school rarely get caught in school-related congestion. The increase in the number of cars over the past decades has stretched the capacity of roads while road expansion and the building of new roads hasn't kept pace ("Traffic Congestion"). By building alternate roads or expanding existing roadways, more cars will be able to travel without being stuck in traffic and be given more than one option to get to a certain place.

By researching solutions that have helped reduce school-related traffic congestion in the past, it paints a clearer picture of what works and what doesn't. It is a matter of looking into the problem at hand and seeing what solutions can work best towards a long-term solution. Getting more student on the bus, altering traffic lights, and factoring in school location and population increase will all help to form a solution towards traffic problems.

Purpose of the Study

The purpose of this study was to collect data and use research from different studies to analyze what was causing the school-related traffic at Wachusett Regional High School and affecting students, faculty, residents, and police. Since there is only one road, Main Street, which can be used to get to the high school, there is a major traffic congestion for anyone utilizing the road and makes people late for work or school. Being stuck in traffic can cause major frustration for a driver and lead to road rage (Dula). What's more, if there were ever an

incident at the school in the morning that needed the police, firefighter, or EMS attention, it would be incredibly difficult and time-consuming for them to respond. In order to find out what was causing this traffic, the researcher consumed data from various studies and collected data by counting parent drop-offs at the high school. The strategy of counting parent drop-offs was to see how many kids were not taking the bus and to see how many cars were adding to the traffic. As a result of the research and data collected, the school-related traffic can be attributed to not enough students taking the bus and too many parent drop-offs, traffic signals not being synced with the peak hours of traffic, and a bad location for the high school that didn't account for a population growth.

Research Questions

What is causing the traffic congestion at Wachusett Regional High School in the morning?

Is there a possible low-cost solution?

Significance to the Field

This study benefits the residents, students, and faculty of Wachusett Regional High School who travel on Main Street in Holden on their way to work or school. The short-term benefit of this study is the traffic signals can be adjusted in a short amount of time which can be a quick fix to the problem. The long-term benefit of the study is the suggestion of updating the roads to match the population size of the town of Holden, which could lead to less time spent in traffic and make life easier for residents. Another benefit from researching this traffic problem is that there should now be urgency to fix the problem so that first responders would be able to make it on scene if there were an incident at the school in the morning.

Definitions

School-related traffic congestion: The overcrowding and blocking of streets on or near school property that is typically associated with car transportation of children to and from school (La Vigne 1).

Limitations

The limitations of this study were the lack of time and resources and the research design. With more time to conduct the study there could have been more data collected and more time to review the pre-existing literature related to the field. The research design should have included surveys sent out to parents who drive their kids to school to find out why and if they have a problem or safety concerns with sending their children on the bus.

Ethical Considerations

Due to the type of research conducted in this study, there are no ethical considerations to be made.

Chapter 2: Literature Review

Throughout the country, there is a backup of traffic caused by start and dismissal times of schools. This scenario can be seen locally on Main Street in Holden Massachusetts as there is a traffic congestion caused by the local high school. This congestion affects citizens who are trying to get to work and students going to school, and often causes these subjects to be either late or have to leave their houses early to get to a certain destination on time. The reasons for this particular traffic jam can be blamed on too many parent drop-offs and not enough kids taking the bus, the timing of traffic signals on Main street, and the population increase in Holden and neighboring communities that the roads couldn't keep pace with. By looking at these root causes, the traffic that is seen on Main Street could be significantly reduced.

The Literature review will address three areas of research related to the traffic congestion caused by Wachusett Regional High School. The first section will address research related to parent drop-offs and understanding why parents choose to drive their child to school. The second section will focus on research studies about the timing of traffic lights and how it could reduce congestion in backed up areas of traffic and discuss congestion related to population increases, its effect on roads and how to combat it.

Parent Drop-offs

One of the leading causes of school-related traffic is the number of parent drop-offs outweighing alternative modes of transportation, such as taking the bus or walking to school. By dropping a child off at school, it adds one more car to the traffic that doesn't need to be there. This is a serious problem at Wachusett Regional High School, as on any given day there

could be upwards of 250 parents dropping off their children at school. Fighting this problem must start with understanding why parents bring their kids to school in the first place and how they can be convinced to open their minds to other forms of transportation to school.

The purpose of the study was to understand why parents drop off their children at school no matter the distance, short or long, they have to drive and what implications it has for programs to increase walking and biking to school (Aalborg & McDonald, 2009).

The study took place in the San Francisco Bay and focused on the parents of children who ranged in age from 10-14 and lived in one of nine economically and racially diverse zip codes selected for the study. These zip codes were chosen because of the climate, flat topography of the land, and the fact that walking or biking to school was common in these areas instead of being dropped off. The subjects of the study were randomly chosen, and after their selection were mailed a letter that let the parents decide if they wanted to participate or not. The final sample size ended up being 403 parents.

The subjects of the study were interviewed and ask open-ended question such as why their child is brought or escorted to school and who they travel with. The interviewers also collected basic demographic information from the subjects including but not limited to, income, number of vehicles the household owns, household structure, parents work and commute routes, age of child, and race.

The study was conducted through a telephone survey of parents whose children live as close as two miles to their school. This was the preferred method because phone surveys reduce cost and help to reach a further audience.

Since this study used a telephone survey, which is a measurement instrument, the researchers asked questions adapted from the National Household Travel Survey. These questions let the interviewees answer the things asked in any way they felt necessary. It included both open and closed ended questions that focused on how their child was getting to school and why the parents chose that mode of transportation.

After the phone survey was complete, the researchers grouped the answers to each question in to a graph so it was easily and readily available for readers to view. The researchers then compared their data to past studies that were similar to this one to see if there were any correlation or change from then to now.

The results indicated that 46% of students whose parents were interviewed were driven to school no matter the distance, 10% took the bus or public transit to school, and the rest of the 44% walked a short distance to school. The researchers revealed that the percentage of students taking the bus to school was so low because the school districts that the subjects were from only had a limited amount of buses. Nationally however, 35% of children take the bus to school. Also, when asked why parents drive their children to school, 75% cited either convenience or safety concerns regarding walking or taking the bus.

The researchers made the conclusion that if safe walking routes were set up in each school district that took part in the study more parents would allow their children to walk to school. This implies that the more kids walking to school, the less parent drop-offs there would be which would help to reduce traffic around the school. Understanding why parents drop off their children was a large part of the study, as the researchers now know that if walking routes

were proven to be safe and convenient that more children would walk to school in warmer climate areas, such as the San Francisco bay, where the study took place. Finally, the researchers concluded that the most effective way to convince drivers to walk to school if they live less than two miles away would be to set up safe walking routes that are supervised.

A major limitation and weakness of this study was that it only focused on warm weather climate areas. By doing this, the researchers may have been suggesting that safe walking routes to school wouldn't be able to work because of the cold-weather climate in the north. Also, the study doesn't address the possibility of safe walking routes to school for students who live further than two miles. It depends on the location and size of the school but there is probably only a small percentage of children who live close enough to school to even think about the possibility of walking. Although, this may be a good idea in a select few areas of the country, it is not a feasible option for school's located in colder-weather climates.

Traffic Lights Coordinating with Peak Traffic Hours/ Population Increases Affecting Roads

In the early 2000's Officer Nors of the Plano Police Department was notified of a certain section of town that was experiencing traffic congestion. This traffic was caused in part by the Barron Elementary School as it is located in a small enclosed neighborhood that sees commuters going to work and residents attempting to use the roadway all at the same time. Motorists using the roadway at peak traffic times became frustrated and started to run red lights to get out of traffic or park illegally to pick their child up from school, which in turn cause several accidents. This traffic congestion needed to be looked at by the police department as it was an inconvenience and a danger to everyone involved.

The purpose of this study was to investigate what was causing the traffic congestion and if it could be solved. Officer Nors and the Plano Police Department were tasked with figuring out if it was a problem with the location of the school, road conditions from the sudden population growth in Plano, Texas, or other environmental factors. ("It Takes a Village…" (2004).

The study took place in Plano, Texas and focuses on the traffic congestion around Barron Elementary School, which is located on the corner of Parker Road and P Avenue. The participants of the study are those most affected by the traffic on a daily basis. This includes residents, the staff of Barron Elementary School, and the parents of children who attend the school.

Officer Nors conducted interviews with the participants of the study and tried to gage the affects the traffic congestion had on them and their thoughts on what was causing it. Nors also worked with the traffic engineering department to see if coordinating the traffic lights at peak hours of traffic would help relieve the congestion. There was also random observations that took place to see how bad the traffic was, what times it was occurring, and the dangers this congestion posed to residents and the students of Barron Elementary School.

The procedures that were used to conduct the study were interviews, observation, communication with other city departments and residents, and planning. In the interviews, subjects were asked how the traffic affected them and what they thought could be done. In the observation stage, Officer Nors was tasked with watching the traffic and seeing what the peak hours were, how long the congestion lasted, and if there were any violations. At the end of the

observation stage, Officer Nors started to hand out citations to every violation she saw to try and reduce dangerous driving. The communication stage saw Officer Nors working with Traffic Engineering and a planning team to devise a plan to divert the traffic. Once a plan was in place, Officer Nors spent a week standing out on the busy road to hand out pamphlets on the plan to drivers and answer any questions they may have had. This intervention lasted for almost 3 years until the traffic congestion was solved and all parties were happy.

Some variables that were measured in this study were the number of traffic violations and accidents that occurred both before and after the traffic study, the amount of time drivers spent in traffic near Barron Elementary School and the number of complaints the Plano Police Department received about this specific traffic congestion. All of the variables measured significantly decreased after the new plan was put into place.

The data was analyzed by the Plano Police Department, the Village planning team, and the traffic engineering division. It was used to see what changes could be made and if the traffic could be reduced without drastic measures, such as building a brand new road.

The results of this study saw the city make several changes to the road that Barron Elementary School is on. The four major changes that happened were posting signs directing traffic exiting the carpool lane to turn right during posted times, painting the curbs of prohibited parking areas yellow, creating four marked crosswalks for pedestrian traffic and synchronizing the school zone lights with school dismissal times. Another change that was made was to make another road that would help to disperse traffic and give motorists another road option.

After the traffic management plan was completed there was a great impact on the number of car crashes, traffic congestion, and complaints made by residents.

The conclusions that can be made from this study are that making minor changes to busy roadways, such as syncing traffic lights with peak traffic times, can help to reduce traffic congestion at a low cost to the town or city. Also, when there is a school-related traffic problem it is beneficial to include the people affected by the traffic and other city departments to help plan out and form a solution. Finally, by updating roads that haven't grown with the rise of the population to a city can greatly help to relieve traffic.

One weakness or limitation that this study has was that it may not work everywhere. Plano, Texas is a relatively large city with great resources that are extremely helpful when faced with a problem like this. However, a small town would not have these resources at hand and would have to find another way to figure out how to disperse traffic in busy areas. Of course, these small towns could make the minor changes such as changing the timing of the lights but, sometimes those minor changes won't work and there needs to be an additional road built.

Summary

In order for school-related traffic congestion to reduce, there needs to be a commitment from authority figures in the community and its residents. If both of these parties are able to work together, the goal of less-backed up roadways is achievable. Researchers found that in order to fix this certain type of traffic problem it takes time, interviewing those affected, communication, and planning. Without these things, a solution is plausible but not likely. Minor changes in traffic signals can help to reduce traffic as well. This change is cost

effective as it takes little to no money to change the traffic signals on a busy street to correspond with peak traffic hours. Another change that can made to combat school-related traffic congestion is building new roads or adding on to a road to give drivers another option to avoid the traffic. This option is limited to cities or towns that have the money and resources to build new roads when this problem pops up. Research has also pointed to the fact that too many parent drop-offs can add to traffic as well. Parents have cited that they bring their children to school for convenience and safety reasons regarding other modes of transportation. By understanding why parents do this, researchers can work on making other modes of transportation, such as walking or taking the bus, more safe and convenient, which will help to reduce traffic around schools. However, walking to school in a cold-weather region is not feasible as there are often below freezing temperatures in the winter that makes it unsafe to walk.

Chapter 3: Methods

Introduction

The school-related traffic problem caused by Wachusett Regional High School in Holden, Massachusetts effects the town and its residents in a number of ways. The three causes of this traffic backup can be broken down into too many parent drop-offs and not enough students taking the bus, traffic signals not being lined up with peak traffic hours, and the town of Holden's recent growth that the roads couldn't keep up with. Some of the solutions to these problems, such as building or expanding new roads, would take a massive amount of time, money, and resources that most towns don't have. On the other hand, solutions such as handing out flyers to parents giving them other options on how to get their children to school besides driving them and sequencing the traffic lights to match up with prime traffic hours, take a limited amount of time and energy. By conducting a study at Wachusett Regional High School, it is apparent that one of, if not both, low cost solutions could be beneficial to the problem.

The first research question that drove this study was what is causing the traffic congestion at Wachusett Regional High School in the morning and how can it be solved? The second question that was asked was, "Is there a low-cost solution that can be effective in solving the problem?" Attempting to answer these questions as thoroughly as possible helped to guide the study.

The research design that this study used was a quantitative case study that used multiple observation sessions that took place at Wachusett Regional High School during a school day morning. The observation started at 6:45 in the morning and went until around 7:45

and concentrated on counting the number of parent drop-offs to see if that was one of the main problems that caused the traffic. Data was collected by parking at the front of the school, where the parent drop-offs take place, and counting the number of cars that dropped of students. The times were split up into 10 minute increments in order to make it easier to analyze the peak times students were being dropped off and see if that corresponded with peak traffic times.

Setting

This study took place at Wachusett Regional High School, located in Holden, Massachusetts on January 16 and January 30 from 6:45 to 7:45. This setting was chosen due to the high number of complaints the local police department has received about the early morning traffic caused by the school. The school is located on Main Street, a two-lane road which connects the two towns of Holden and Rutland and has two traffic signals within a mile of the school. Wachusett Regional is a large school that educates students from five neighboring towns, so in the morning all of these students and faculty go to Main Street, which causes a backup.

Participants

The participants in this study were people who dropped off students on either January 16, January 30, or both. Since this was an observation, there was no interview or contact made with the participants, but according to secondary sources most people who drop their children off at school are working parents. On January 16, there were 251 cars counted that dropped off students and on January 30, there were 266 cars.

The participants from this study were assumed to be from one of the five towns that Wachusett Regional High School is home to, which are Holden, Paxton, Rutland, Sterling, or Lancaster. These participants were also assumed to be the parents or guardians of these children who are old enough to have a driver's license.

Measurement Instruments

The measurement instrument that was used in this study was a structured observation list. The purpose of this observation list was to count the number of parent drop-offs in the easiest, most simple way possible. This list was split up into 10 minute increments on the time of arrival to count how many cars were dropping off their students during a certain time period. The observations were conducted at two different times, to weeks apart from each other at the same location for about an hour each. The car counting started at 6:50 and the last car arrived at 7:38 on both days. This means that there were five sections that each car was put into based on their arrival to school. The observation consisted of being parked facing the front of the school, giving the researcher the best vantage point to count cars. During the observation it was observed that a majority of cars would only drop off one student, and they would wait until the car was near the front of the school to let their student out. After dropping off their student, the cars would travel down the road, drive around the flag pole and exit the same way it came in.

The validity and reliability of this measurement instrument was tested and established. During both observation dates, the researcher was accompanied by Holden Chief of Police,

Dave Armstrong, who also counted cars. After the observation period ended both researcher and Chief Armstrong compared their results and had the same findings.

Procedures

On both observation days the researcher and Chief Armstrong arrived at Wachusett Regional High School at 6:45 in the morning and proceeded to count cars at 6:50. The counting of cars lasted until 7:38 and then both researcher and Chief compared notes and departed the site at 7:45. The day of January 16, when there were 251 cars counted it was very cold and gloomy. On January 30, when there were 266 cars counted, there was a light snow and temperatures were in the 30's. The data was collected through observation under natural, non-manipulative settings using an observation list. The observations were conducted outside of the school, right near where all of the parent drop-offs occur, and the researcher was a non-participant observer. There were two observation periods, slated two weeks apart from each other and took place at the same site, under the same research conditions.

Data Analysis

The collected data was transcribed and analyzed shortly after the observation periods by both researcher and Chief Armstrong. The data was used to answer the question of what was causing the traffic around Wachusett Regional High School and if there was a cost-effective way to reduce the traffic. This study observed the number of parent drop-offs to see if this was one of the major problems affecting the traffic. If parent drop-offs were a major reason for the traffic backup, this information could prove to be extremely helpful in reducing the congestion around the school and may lead to a cost effective way to solve the problem.

Chapter 4: Results

The measurement tool used in this study assessed the number of parent-drop offs at Wachusett Regional High School. The researcher and Chief Armstrong both counted cars on January 16 and January 30 from 6:50 to 7:38 and departed the site at 7:50. The data was split up into 10 minute increments (see figures 1 & 2) to get a better idea of how many cars were coming at what times and what the peak traffic times were surrounding the school. The total range of cars generated from the two observation periods was 15 (January 16- 251, January 30- 266) giving the cars counted a mean score of 258.5. The most popular 10 minute increment for parent drop-offs was 7:20- 7:30 during both observation sessions as well. This information was used to see if there was a correlation between the number of parent-drop offs and the school related traffic congestion occurring at Wachusett Regional.

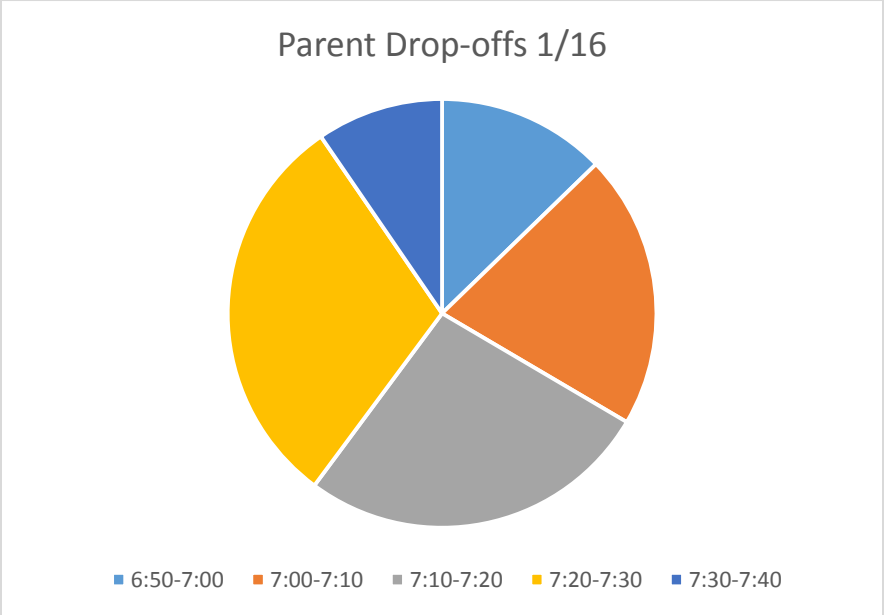

Figure 1: Distribution of parent drop-offs on January 16 at Wachusett Regional High School

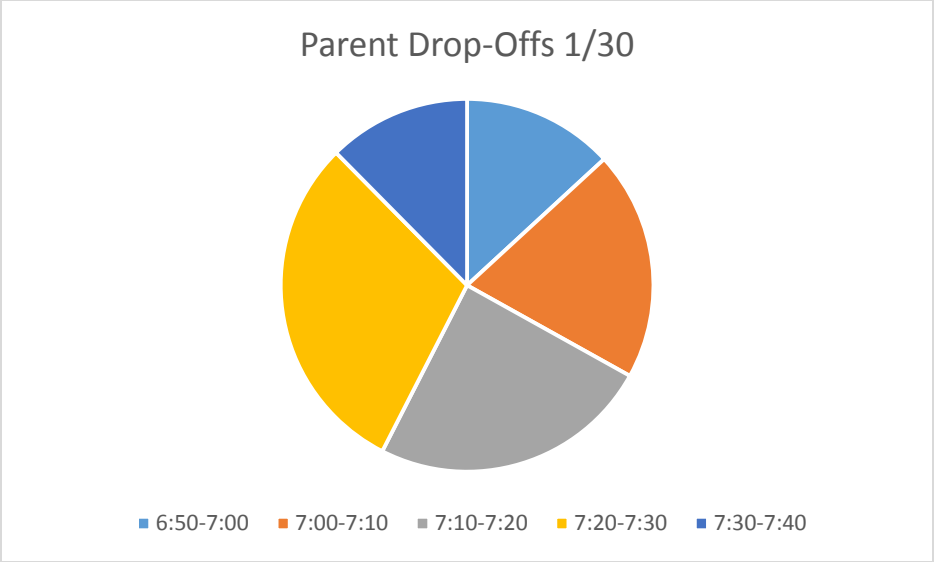

Figure 2: Distribution of parent drop-offs on January 30 at Wachusett Regional High School

The first research question that drove this study was what is causing the traffic congestion at Wachusett Regional High School and how can it be solved? An analysis of the data collected from these two observation periods revealed that there is a link between the number of parent drop-offs and the traffic that occurs on Main Street in the mornings. As reported earlier, the mean number of cars that drop off their children in the mornings is 258.5. This means that everyone single morning nearly 259 cars travel on Main Street, adding to the already congested area and making commutes for residents who travel on this street even more difficult. Also, the most popular time for parent drop-offs to arrive at the school is 7:20-7:30. This piece of data tells us that as the time for school approaches, more cars are adding to the traffic, which may lead to students being late to school or residents being late for work if they travel on Main Street. If there were a way to promote other modes of transportation to the parents of these children and convince them that driving their kids to school is an

inconvenience for everyone else, traffic may be able to decrease. This leads us to the second research question that guided this study.

The second research question is, is there a low-cost solution that can be effective in solving this problem? After conducting these observations, it is clear that there is a low cost solution to helping reduce, or even solve, this traffic congestion. This solution is handing out a pamphlet, flyer, or even sending out an email to all of the parents who have children that attend Wachusett Regional. This will inform them of how parent-drop offs add to the traffic that everyone complains about, and by sending their child to school using another form or transportation (bus, walking, biking) they could help reduce it. This solution seems simple enough, but it all depends on if the parents who drop their kids of will listen. Studies that have been done on school-related traffic congestion cite that educating parents in the role they could play in reducing traffic can be an effective strategy (La Vigne). If this announcement was sent out to the parents it would have a positive effect on the reduction of the traffic surrounding the school at a low cost.

In conclusion, this study set out to answer the two research question of what was causing the traffic congestion and if there were a low-cost solution that would help reduce traffic. After analyzing the two observation periods, it is clear that the number of parent drop-offs is a main factor in the traffic congestion and the low-cost solution to this problem is to send out an announcement to all parents about the role they play in the reduction of this traffic. Conducting this study to answer the research questions has helped to point out what is causing the traffic and coming up with solutions to reduce it as well.

Chapter 5: Discussion

Introduction

Traffic is a problem that mostly everyone faces on a daily basis. Whether it be going to school, work, or out on a causal drive, traffic always seems to pop up and inconvenience our lives. School-related traffic congestion, however, can be the most frustrating as it happens early in the mornings on weekdays and can cause students to be late to school or citizens to be late for their jobs or meetings. In addition to this, being faced with something like school-related traffic can cause anger, road-rage, and dangerous driving that could be particularly harmful in a school setting. Since this is the case, it is important to find ways to reduce traffic congestion around schools as much as possible, to makes the lives of students and citizens easier.

The purpose of this study is to look at a local case of school-related traffic and to see what is causing this traffic and if there are any low-cost effective ways to stop or reduce the problem. The local case that is being examined is at Wachusett Regional High School, in Holden, Massachusetts. This traffic has been the cause of many complaints made to the local police department over the years and is frustrating to anyone who is stuck in the traffic. The design of the study is to look at previous studies on school-related traffic and then conduct a quantitative study using a series of observations to see what the root cause of the traffic is and answer the research questions that have guided this study.

The two observation periods were conducted to answer the questions of what is causing the traffic and if there is a low-cost effective way to reduce the problem. These observations focused on only one of the three possible root causes of the traffic laid out in the study which

were the timing of traffic signals not being lined up with peak traffic times, the population of Holden outgrowing the roads, and the number of parent drop-offs compared to children riding the bus, which the observations focused on.

What is Causing the Traffic?

These observations were set up to see if the number of parent drop-offs was actually one of the main factors causing the traffic congestion around Wachusett Regional High School. After the study was conducted, it is apparent that the number of parent drop-offs is one of the main reasons for the traffic. As discussed previously in chapter four, there is an average of 258.5 cars dropping off their kids at school each day. If there were a law or provision put in to make it parent-drop offs illegal that would mean that over 250 cars would be taken out of the traffic on any given day, reducing the number of cars on Main Street and making traffic flow more smoothly. Also, there would be less cars stopping to make turns into the school, which subsequently slows down the traffic in its own right, and helps to keep things moving. Obviously there is no law that would make it illegal to drive your child to school, but if parents kept this in mind and knew the impact they were having on this traffic problem, maybe they find another mode of transportation for their child to get to school.

Is there a Cost-effective Way to Reduce the Traffic?

By conducting these observations and realizing the effect parent drop-offs have on the traffic congestion, a low-cost solution came about. This solution would be to send out an announcement to parents of children who attend Wachusett Regional High School and let them know the logistics of the traffic that they have personally dealt with, how dropping their child

off at school is making the traffic worse, and the role they can play in reducing the traffic. This role would be to find another mode of transportation for their child to get to school, such as taking the bus. One of the reasons that there are so many parents dropping off their child maybe that they are unaware of the effect they are having on the traffic. If they were to be informed that they could help reduce the congestion and make life easier for anyone who has to travel on Main Street for a commute, they may be happy to put their child on the bus to school. Parents also cite convenience and safety as reason why they bring their child to school, so if safety concerns were addressed in the announcement that may also convince parents to let their child take the bus.

Limitations

Although the observation periods were able to answer the two research questions that guided the study, there were still limitations. The first limitation was related to the lack of time and resources. If there were more time and resources to conduct this study it could have been much more in depth. One thing that could have happened if it weren't for the lack of time was to conduct a study on the effect an announcement to the parents would have. It would be interesting to see if that low-cost effective solution could actually work. Something that could've happened if it wasn't for the lack of resources was a study done on the effects of syncing up peak traffic times with the traffic signals surrounding the school area. This should be looked at as it could be another solution that would cost the town little to no money and seems as though it would be effective.

Other limitations were related to the scheduling of the observations. It would have been a better study if there were observations done once a month to see if inclement weather, such as the cold or rain, had an effect on the number of parent drop-offs.

Recommendations for Future Research

Bases on the results of this study, there are several recommendations for future research. In order for the limitations in this study to be minimized in the future, there should be at least four observation periods conducted at different points in time. This way the researcher can get an accurate sense of how weather and time of the year affects the amount of parent drop-offs, if at all. Secondly, in the future this research should include a survey handed out to all of the parents who dropped of their children on one of the observation days. The survey should ask the questions of how often they drop their child off, reasons for dropping their child off, and if they are aware of how they are negatively affecting the traffic by bringing their child to school. By doing this, the researcher will now have a sense of the effectiveness an announcement regarding the correlation of parent drop-offs and school-congested traffic would have. Lastly, there should be studies conducted on the two other factors that may have caused this traffic congestion, which are the lights not being synced with peak traffic times and the population of Holden outgrowing the roads. The study on the lights would be the most important of the two as that could serve as a low-cost solution to the problem, while the study on the roads would be hard to conduct and might just be further research into the population growth of Holden and at what point the local police department started getting complaints about this traffic, which would be effective in its own right.

Conclusion

Three major conclusions can be made from this study. First off, the number of parent drop-offs outweighing the number of students taking the bus to school has a direct effect on the school-related traffic on Main Street in Holden, Massachusetts. The second conclusion that can be made is that there are two possible low-cost solutions to fixing this problem, which are sending out an announcement to all the parents who have students at Wachusett Regional High School and telling them the effects parent drop-offs have on traffic, and syncing up the traffic signals on Main Street to match peak traffic hours. Lastly, in order to reduce school-related traffic congestion it takes all the major stake holders such as police, students, parents, residents, and the city or towns traffic commission working together to fix the problem ("It Takes a Village").

The first conclusion was tested by several observation periods and was analyzed by both the researcher and a second party. The findings pointed to the number of parent drop-offs being a direct cause to the severity of the traffic as on any given day there are over 258 cars dropping off their child that just add to the traffic, when they don't need to be there. If there were a way to get rid of those cars, the traffic would be much less congested and be able to flow more smoothly. This conclusion also points to the lack of children who are riding the bus. If every student that got dropped off by a parent took the bus to school it would help the traffic congestion immensely, as one bus is equal to 36 cars in terms of the capacity it holds.

The second conclusion points to two possible low-cost solutions to this traffic problem. Although these solutions were not tested, they make the most sense and have the highest

probability of working based on the research done in this study. Since they do not cost much money and are fairly easy to implement, the town of Holden should try these two solutions out. The first solution, sending out an announcement to all the parents of the school should be done first, as it takes less time and can be done by one person. If this does not work, changing the lights to match peak traffic times should be tried. This solution is low-cost but it takes planning by several stake holders in the community, such as the traffic commission and police (La vigne). If these two solutions were tried, they should make a positive effect on reducing the traffic.

The last conclusion made from this study is that in order for traffic to reduce it must take effort from the people it affects most. The local police, the students and teachers of Wachusett, the town's traffic commission, and residents all must work together to come up with a viable solution and make it work. The police and the school can do all they can to help reduce traffic, but if the residents do not want to listen it simply won't work.

This study has proven one of the major factors that have led to this traffic congestion, given two viable, low-cost solutions that could possibly help to reduce the traffic, and pointed out the importance of the whole town working together.

References

Bibliography

Aalborg, E., Annette & McDonald, C., Noreen (2009, June 30). *Why Parents Drive Children to School: Implications for Safe Routes to School Programs.* Retrieved from http://www.tandfonline.com/action/showCitFormats?doi=10.1080%2F01944360902988794

Ahern, M., Sara; Arnott, Bronia; Chatteron, Tim; de Nazelle, Audrey; Kellar, Ian; & McEachan, R.C.,Rosemary (2017, March). *Understanding parents' school travel choices: A qualitative study using the theoretical Domains Framework.* Retrieved from Journal of Transport & Health Volume 4.

Bullung, Ron; Howard, Andrew; Macarthur, Colin; Macpherson, Allison; Rothman, Linda; & To, Teresa (2015, September). *Associations between parents' perception of traffic danger, the built environment and walking to school.* Retrieved from Journal of Transport & Health Volume 2 Issue 3.

D'Haese, Sara; Cardon, Greet; De Bourdeaudhuij, Ilse; Van Dyck, Delfien; & Vanwolleghem, Griet (2014,October 28). *Feasibility and effectiveness of drop-off spots to promote walking to school.* Retrieved from International Journal of Behavioral Nutrition and Physical Activity.

Dula, S., Chris; Geller, E., Scott; & Chumney, L., Frances (2011, December). *A Social-cognitive Model of Driver Aggression: Taking Situations and Individual Differences into Account.* Retrieved from Current Psychology.

Falk, Kay (2005, September). *Nothing new Under the Sun: Problem-oriented policing puts a new Spin onan Old Skill and Helps Officers Effect Change in Their Communities.* Retrieved from Law Enforcement Technology.

La Vigne, Nancy (2007). *The Problem of Traffic Congestion around Schools.* Retrieved from http://www.popcenter.org/problems/school_traffic/print/.

Mcdevitt, Caitlin (2008, September 15). *Waving Goodbye to the Bus.* Retrieved from 2008 Newsweek LLC.

"The Right to Ride," (2017, January 2). Retrieved from http://americanmagazine.org/.

"Traffic Congestion: Should U.S. Cities use Cordon Pricing," (2006, February 10). Retrieved from http://icof.infobaselearning.com/articles/energy-and-environment/traffic-congestion

Traffic Diversion Plan: Wachusett Regional High School (2007, September 18). *WRHS Traffic Diversion Plan.*

"Why Do Parents Drive Their Children To School?" (2006, June 5). Retrieved from http://www.gov.scot/Publications/2002/09/15148/9194.