2015

EMS Use by the Young Adult Population in the Region of Waterloo

Karen J. Totzke
Wilfrid Laurier University, hank8@rogers.com

EMS Use by the Young Adult Population in the Region of Waterloo

by

Karen J. Totzke

Bachelor of Applied Business: Emergency Services,

Lakeland College, 2008

THESIS

Submitted to the Faculty of

Graduate and Postdoctoral Studies

in partial fulfillment of the requirements for

Master of Science in Kinesiology

Wilfrid Laurier University

Abstract

Anecdotal evidence suggests that university students are accessing local Emergency Medical Services (EMS) more frequently, usually as a result of alcohol consumption. In doing so, they endanger their personal health and create challenges for EMS and local hospitals. This study examined EMS use by young adults (ages 16-24 years) to identify differences between university students and youth in the Region of Waterloo, and to determine predictors of transport to hospital. This cross-sectional study used retrospective data collected during a six-year period (2006-2011) from a large, mixed urban and rural municipal ambulance service located in southwestern Ontario. Data were extracted from electronic ambulance call reports completed by paramedics responding to 9-1-1 calls. Individuals accessing EMS within the university zone were compared with those outside this area on demographics, patient presentation, pick-up locations, transport status, and 9-1-1 call generation characteristics. Given the large sample size ($N = 16,577$), and the probability of a type I error, we determined statistical significance based on a 20% change in the odds ratio (i.e., OR of 1.20). Among university students, across years, the number of calls that involved alcohol rose from 29% to 38%. Based on the OR, university students, compared with other young adults, were 2.6 times more likely to call EMS with alcohol as a contributing factor, 1.3 times more likely to be assigned a low priority by paramedics, and 1.4 times more likely to refuse transport. They were 1.9 times more likely to be picked up in a bar and 1.8 times more likely to call 9-1-1 at night. Using logistic regression, significant predictors of transport to the hospital (yes/no) were: a scene time less than 20 minutes; advanced life support (ALS) care provided; pick-up at a school; and day of the week. These findings suggest that there has been an increase in

alcohol-related EMS calls by Region of Waterloo university students. EMS services need to be aware of these factors when developing deployment strategies. Further, there is a need to coordinate with university administrators in order to develop strategies to optimize the care of students who have been using alcohol, particularly those who refuse transport to hospital.

Table of Contents

1.0 Introduction 1

2.0 Literature Review 6

2.1 Drinking in Young Adults 6

2.2 Drinking in Academia 8

2.3 Impact of Alcohol Use on Emergency Medical Services 14

3.0 Region of Waterloo Emergency Medical Services: An Overview 18

4.0 Methodology 22

4.1 Data Selection, Cleaning, and Quality 23

4.2 Analyses 26

4.2.1 Trends and Population Comparisons 26

4.2.2 Predictors of Transport to Hospital 27

5.0 Results 29

5.1 Predicting Transport to Hospital 33

6.0 Discussion 37

6.1 Factors that Predict Being Transported to the Hospital 42

6.2 Limitations 44

7.0 Conclusion 48

References 51

Appendix A 54

Appendix B 59

Appendix C 63

List of Tables

Table 1. Variables of Interest..67

Table 2. Community versus University on all EMS Calls..70

Table 3. Community versus University on Alcohol-Related EMS Calls 72

Table 4. Region-Wide Calls across Years 74

Table 5. Region-Wide Calls against Transport to Hospital 84

Table 6. Transport Model using Region-Wide Population..86

Table 7. Transport Model using University Population..87

Table 8. Transport Model using Community Population 88

List of Figures

Figure 1. WREMS Offload Delay Losses in 24-Hour Days..89

Figure 2. Offload Delay Losses in Hours per Month..89

Figure 3. Offload Delay Losses by Receiving Hospital 90

Figure 4. Sample Selection Determination 91

Figure 5. UTM Map of University Population Area...92

Figure 6. Comparison of CTAS Levels for Both Populations......................................92

Figure 7. Comparison of Pick-up Locations for Both Populations...............................93

Figure 8. Daytime versus Nighttime EMS Calls for Both Populations 93

Figure 9. Population Comparison of Alcohol-Related EMS Calls across Six Years 94

Figure 10. EMS Calls per Capita for the University Population 94

Figure 11. EMS Calls per Capita for the Community Population 95

1.0 Introduction

Ambulance Dispatcher: "2189. Call for a Code 4."
Vehicle 2189: "2189. Go ahead with the information."
Ambulance Dispatcher: "2189. Code 4 in Waterloo to 200..."
Vehicle 2189
(paramedic off radio to partner): "Let me guess…200 University Ave. West for an unconscious female; 19 years of age. Has been drinking."

Ambulance Dispatcher: "...University Avenue West. The University of Waterloo.

20 year old female. Unconscious. Has been drinking. Unknown amount of alcohol this evening. Unknown if other drugs involved."

Vehicle 2189: "10-4. We copy. Enroute to the University. Over."

If one works at a job long enough, certain aspects become automatic. In the field of emergency medical services (EMS), paramedics become adept at intubation or intravenous insertion after a year or two on the job and perform these skills instinctively. Treatment modalities often become second nature when handling patients with the same types of medical problems (e.g., cardiac chest pain, abdominal pain, etc.). In addition, some addresses become landmarks, generating more 9-1-1 calls than do others. On particular nights of the week, even a rookie paramedic, with only a few months on the job, can accurately predict the volume, type and location for EMS calls. As depicted in the above scenario, calls to certain addresses become so habitual that the paramedic crew can guess the call location and the nature of the call based on the building number alone.

Although the frequency of alcohol use among young adults has remained steady over the past 15 years, the amount of alcohol ingested has not (Health Canada, 2007). Binge drinking is a pattern of drinking that brings blood alcohol concentrations to 0.08

percent (alcohol content per 100 mL of blood) or above, usually a result of consuming five or more drinks (male) or four or more drinks (female) in about two hours (National Institute of Alcohol Abuse and Alcoholism [NIAAA], 2004). Notably, binge drinking has increased, with young adults consuming twice the amount of alcohol than adult drinkers (Health Canada, 2007). This pattern of frequent heavy drinking increases the risk for alcohol-related harm and associated consequences in the young adult population. In addition, university students reportedly drink significantly more than their non-university peers, further increasing the potential for alcohol-related incidents in communities with academic institutions (Hingson, Wenxing, & Weitzman, 2009).

Health risks associated with alcohol use can take many forms including unintentional injury or death, with the latter claiming 1,825 American college student lives in 2005 (Hingson et al., 2009). Other dangers inherent to alcohol ingestion include alcohol poisoning, physical and sexual assault, as well as other risky behaviours such as driving while impaired or engaging in unsafe sexual acts. Alcohol misuse may also negatively affect the drinker's friendships, physical health, studies or employment, and financial status. In addition, frequent or high risk drinking can be a precursor to alcohol dependence, a complication that will further affect young adult lives (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001).

Not only does the misuse of alcohol place a burden on young adults (e.g., physical, social, financial, emotional, etc.), it creates challenges for the community. The financial costs for 9-1-1 responses and hospital treatment alone can reach into the millions of dollars. White, Hingson, Pan, and Hsiao (2011) reported hospitalization expenditures of $266 million (USD) for 18-24 year olds treated for alcohol overdoses in

2008. Notably, these figures do not include the expenses required to repair damage to personal or public property often resulting from these incidents.

In recent years, anecdotal evidence amongst Region of Waterloo Emergency Medical Services (WREMS) personnel suggests that university and college students are accessing the Region of Waterloo's 9-1-1 emergency system with increasing frequency. These young people (16-24 years of age) are engaging in activities that endanger their personal health without recognizing the challenges created for the community as a whole. The increase in call volume, as well as the nature and severity of the emergencies, is becoming a growing concern for emergency service providers. Police, Fire, EMS, and local hospitals are recognizing this trend. The students' actions are straining the entire local emergency service system and are negatively affecting the institutions' reputations within their respective neighbourhoods. What is unknown is whether the increased numbers of calls to 9-1-1 are a result of medical amnesty policies, or whether their drinking habits have changed in some manner.

Research into alcohol use amongst young adults has been quite extensive, both in Canada and the United States. What has not been well studied is the use of EMS for alcohol-related calls by this same population. In Canada, there are no known studies on this topic and only a few exist outside of Canada. As a paramedic with over 30 years of experience in EMS, 25 of those working within the Region of Waterloo, my impression is that alcohol-related 9-1-1 calls in the area encompassing the two universities have risen. The purpose of this study was to examine the way young adults utilize the Region of Waterloo's EMS service, with a focus on alcohol-related occurrences within the university group. Similar to work done by McLaughlin (2010), I categorized 9-1-1 calls that occurred either within, or around the two local universities, as 'university population' calls. This allowed a comparison of how the university group used EMS compared to the same-aged community group. Through my employment with the Region of Waterloo EMS and with the approval of the Region of Waterloo Research Ethics Board and WLU Research Ethics Board, I was able to access electronic call reports completed by paramedics responding to 9-1-1 calls. Based on my clinical experience, specific information (e.g., gender, time of call, day of call, pick-up location, treatment rendered, etc.) was extracted from the call reports in order to answer my research questions and to provide relevant information about this specific population. The ambulance call reports (ACR's) used in this study spanned six years and were based solely on the implementation and termination of the charting program in use at that time. The goals of this research were threefold: (1) to accurately identify the patterns of EMS use within the Region of Waterloo by young adults between the ages of 16-24 with an emphasis on the university population; (2) to determine the predictors of use for emergency services by this cohort; and, (3) to identify the outcomes for these individuals when the 9-1-1 system has been activated. Examples of potential outcomes included treat and release without EMS transport to hospital, transport to hospital, or transfer of care into police custody.

This investigation may prove to be useful in improving our understanding of how young adults use EMS, whether this use has changed over a specific time frame, and what level of care (advanced versus basic) paramedics are providing to this group. In addition to the analytical implications, the answers to these questions may also serve some practical purposes. Improved knowledge of service requests for a specific population, along with the level of care required to assist these patients, may provide valuable insight for local emergency services, hospitals, and teaching institutions in developing plans for timely and appropriate health care.

2.0 Literature Review

2.1 Drinking in Young Adults

Alcohol is the psychoactive substance most commonly used by young adults in both Canada and the United States of America (US) (Adlaf, Demers, & Gliksman, 2004; Health Canada 2007; Johnston, O'Malley, Bachman, & Schulenbarg, 2011a). The *Monitoring the Future Survey* (Johnston et al., 2011a & b), the *Canadian Addiction Survey: Substance Use by Canadian Youth* (Health Canada, 2007), and the *Canadian Campus Survey* (Adlaf et al., 2004) are three large cross-sectional studies that analyzed alcohol and drug use within this population. These authors noted that approximately 90% of young adults have tried alcohol at least once in their lifetime, and over 80% currently consume it. Given that many young adults in the American-based *Monitoring the Future Survey* (Johnston et al., 2011a) were under the age of 21, it is interesting to note that a majority of the procurement and consumption of alcohol in this group was illegal. As a result of a lower age of majority in Canada (19 years of age), fewer young Canadians are involved in illegal alcohol practices.

While youth drink less often than adults, they consume alcohol in much greater quantities. Binge drinking, along with heavy weekly and monthly drinking is twice as prevalent in this young population, 33% versus 12% among adults. Although the incidence of drinking was comparable between males and females, binge drinking occurred twice as often in the male population, typically in the 18-19 year old demographic (Adlaf et al., 2004; Health Canada, 2007; Johnston et al., 2011a).

According to the *Substance Use by Canadian Youth Report* (Health Canada, 2007), youth have significantly higher rates of alcohol-related harms than does the adult population. These present in the form of arguments, verbal and physical abuse, and problems within the family unit. Likely related to binge drinking, 1 in 3 youth reported some type of harm to themselves or others at some point in their lifetime. Youth who started drinking at a younger age encountered more alcohol-related harm during their lifetime, generally affecting their friendships, social lives, physical health, and financial status. Early onset of drinking, a factor identified as a predictor for binge drinking, is likely the reason that 36% of Canadian youth are categorized as high-risk drinkers, double the national average seen in the adult population. In addition, young adults experienced twice as many harms as adults because of another's drinking. Twenty percent of young adults drove while under the influence of alcohol, at an average of 1.6 times per person. As well, 39% of young adults admitted to being a passenger with someone who had used some type of illicit drug, thus increasing their own personal risk of being involved in a motor vehicle collision. The *Canadian Campus Survey* (Adlaf et al., 2004) identified several alcohol-related health risks and harms commonly reported by the post-secondary student population. These included unplanned or unsafe sexual relations, hangovers, memory loss, feeling regret or guilt, missing school, and sustaining an injury. In addition, students reported study and sleep interruptions, arguments, and sexual harassment because of other students' drinking habits.

Alcohol overdoses, commonly associated with binge drinking, have steadily increased in the US since 1999. White et al. (2011) identified a 25% increase in hospitalization rates for young adults (18-24 years of age), between 1999-2008, reaching 29,412 cases in 2008. In addition to hospitalizations, Hingson et al. (2009) found that, amongst US college students, unintentional alcohol overdoses caused more deaths than any other factor including burns, hypothermia, drowning, falls, and gunshots.

Although not the focus of this current study, several articles analyzed the costs associated with young adults' misuse of alcohol. In 2008, the costs associated with hospitalizations in the US totaled $266 million (USD) (White et al., 2011). In addition, ambulance response and transport for alcohol-related calls, consistently ranged between 17% - 25% of an EMS organization's calls (Carey et al., 2009; Martin et al., 2012) with an estimated cost of $600 (USD) per 9-1-1 call (Carey et al., 2009). These findings suggest that voluntary, recreational use of a psychoactive substance, such as alcohol, has the potential to account for up to one quarter of an EMS organization's budget. Currently, there are no comparable Canadian studies assessing alcohol-related costs in this sub-population.

2.2 Drinking in Academia

Numerous studies suggest a correlation between alcohol consumption and 'university life'. The post-secondary student population is more likely to use alcohol than any other illicit drug, and while half of this demographic drink moderately, one-third report binge drinking (Adlaf et al., 2004; Health Canada, 2007; Johnston et al., 2011b). This group is more likely to partake in binge drinking than their non-college/university peers with 1 in 8 (13%) college students reportedly drinking 10 or more drinks on a single occasion and 1 in 20 (5%) drinking 15 or more drinks on a single occasion (Johnston et al., 2011b). While in high school, college-bound young adults drink less alcohol than their same aged peers; however, once they began attending a post-secondary institution, their alcohol consumption exceeded their non-college peers (Adlaf et al., 2004; Health Canada, 2007; Johnston et al., 2011b). Notably, the majority of Canadian students who reported binge drinking attend universities in either Ontario or Atlantic Canada (Adlaf et al., 2004).

The impetus for university students to drink alcohol may stem from beliefs that alcohol is a normal part of post-secondary academia and students may view binge drinking as a means to social acceptance. These factors, along with the ease of procuring alcohol on or near campus, partnered with "happy hours" aimed at the student body, may suggest that drinking is an acceptable practice. The research indicates that the demands of academia coupled with a student's underdeveloped coping skills are the predisposing elements for increased alcohol use.

Benningfield, Trucco, and Greenfield (2010) examined the demographics, clinical characteristics, and drinking patterns of students presenting with alcohol intoxication at a university health centre. In a 7-month prospective case review, they analyzed 80 medical charts and found that females and freshmen were more likely to require hospitalization due to alcohol intoxication than males and older university students. The authors suggested that physiologic and metabolic factors increased females' sensitivity to alcohol intoxication at lower levels. In addition, Benningfield et al. (2010) proposed that the freshmen's general inexperience with alcohol was the reason this group represented 50% of hospital admissions, most of them occurring within the first two months of the school year.

Several US studies examined the normative beliefs regarding drinking amongst university students and the link between these beliefs and resultant drinking behaviours. Since alcohol consumption is a common element of many university events, those wishing to participate may interpret drinking as a required component of that participation. Borsari, Murphy, and Barnett (2007) suggested that students' perceptions of social academic norms and their need to establish a social identity influenced their behaviours. Bergen-Cico (2000), and Harford, Wechsler, and Muthen (2003) reported alcohol consumption appeared to be influenced by university-sponsored and local social events with evidence indicating that first year students were more vulnerable to alcohol-related harms than those in their second or higher year of study. Borsari et al. (2007) also identified significant variations in drinking rates over the course of the student's first year at an academic institution and found heavy drinking was most often seen shortly after arriving on campus, at the start of each semester, and during holidays and university breaks. Pedersen and LaBrie (2008) found that students significantly overestimated the amount of alcohol consumption for other students, including their views on same-sex and opposite-sex drinking behaviours. Maggs (1997) identified a positive relationship between negative self-image and heavy alcohol use within first year students. In related work, Vohs et al. (2008) examined the anxiety and depression levels associated with drinking behaviours and found a high percentage of frequent high-risk drinkers in a university sample (31%) compared to past research ($\leq$ 25%). Their work suggests that today's undergraduate students may be less prepared for the challenges of university life, thereby self-medicating with alcohol in order to decrease anxiety levels.

Although the importance of intercollegiate sport in Canada and the US may not have a similar social value, American-based research examining the relationship between alcohol consumption and sporting events can be considered. Merlo, Ahmedani, Barondess, Bohnert, and Gold (2011) assessed the characteristics of participants who engaged in tailgating parties prior to football games at two large US universities. They found that only 11% abstained from consuming alcohol while 36% had a blood alcohol concentration over the legal limit for driving. Ninety-two percent of participants were of legal drinking age, with males and non-student attendees exhibiting higher blood alcohol readings than other subjects. The high rate of inebriated non-student fans indicates a link between university events and alcohol consumption. Shook and Hiestand (2011) analyzed alcohol-related emergency department (ED) visits associated with university football games at Ohio State University and found that patients between the ages of 21-29 years, and males were most likely to present to the ED with alcohol-related complaints. In addition, games that had close scores between teams resulted in increased alcohol-related visits to the emergency department.

Campaigns aimed at responsible drinking (i.e., Mothers Against Drunk Driving) have had some effect on young adults, decreasing the incidence of alcohol use in both the college and non-college groups since 1980. College drinking however, has only declined 7% when compared to a 13% decrease in the non-college population (Johnston et al., 2011b). This trend implies that the college and university environment may have a cultural influence on student drinking habits.

Although academic institutions have employed educational and safety policies intended to protect students, these policies may actually encourage excessive drinking in some instances. Despite education regarding the signs and symptoms of alcohol poisoning, university students have difficulty making this diagnosis for their peers (Lewis & Marchell, 2006; Oster-Aaland, Lewis, Neighbors, Vangness, & Larimer 2009). Oster-Aaland et al. (2009) employed an online survey that focused on the recognition of alcohol poisoning versus other alcohol-related behaviours, along with helping behaviours exhibited in these situations. The majority of students reported helping another student with symptoms of alcohol poisoning and most often sought help from other students or parents rather than school or medical officials. When students did not seek help for a peer it was because they believed that help was not required. In related work, Misch (2011) investigated the effectiveness of relying on student peer assessments to determine alcohol poisoning and cited obstacles including a reluctance to report alcohol intoxication in schools without a Medical Amnesty Program, a lack of clear guidelines surrounding when to call for help, and difficulty in following an ‘alcohol poisoning’ algorithm that is both highly specific and highly sensitive in determining when medical care is actually required.

Amnesty policies remove the fear of negative repercussions related to alcohol use amongst university students as evidenced by an increase in EMS 9-1-1 calls after policy implementation. Lewis and Marchell (2006) attempted to identify the effectiveness of a Medical Amnesty Program (MAP) program at Cornell University after the first two years of implementation. The authors reviewed emergency department and health care centre charts, 9-1-1 calls to EMS, and student self-report surveys in order to identify changes in accessing help for alcohol-related emergencies. While calls for EMS assistance increased 22% during the two years after MAP implementation, respondents who thought about calling for medical help and those who actually called for medical help remained unchanged (Lewis & Marchell, 2006).

Alternatively, prohibitive policies implemented by universities to control under-age and excessive drinking may have unintended negative consequences. According to

Lewis and Marchell (2006), students were either unsure whether the student required medical assistance or did not want to get the afflicted student in trouble. Concerned with eviction from campus residence and other disciplinary actions, students may have been reluctant to call 9-1-1 for themselves or their peers when faced with a medical emergency.

To summarize, although the data showed a significant reduction in fear for one's involvement in an alcohol-related incident, the gap between considering calling for help and actually obtaining assistance suggests that documented EMS calls may represent a small percentage of incidences that actually occur on campus. The study by Lewis and Marchell (2006) indicated that removing the fear of judicial repercussions through a MAP does not eliminate all risks for students involved with alcohol. The failure of students to recognize the signs and symptoms of alcohol poisoning and the need for intervention appears to be a factor in alcohol-related death and injury.

On a related note, Wilfrid Laurier University (WLU) has a *Medical Amnesty, Good Samaritan Policy* (WLU Residence Life Handbook 2011-2012) that exonerates the 'severely intoxicated or drug altered' student and those who assist in the event of a medical emergency. The university also has a *Residence Alcohol Policy* (WLU Residence Life Handbook 2011-2012) outlining an incremental four-step sanction process for students who violate this policy. Currently, it is unclear whether the WLU *Medical Amnesty, Good Samaritan Policy* or the *Residence Alcohol Policy* is shaping the high-risk drinking behaviour of students.

2.3 Impact of Alcohol Use on Emergency Medical Services

As was previously noted, an extensive literature search on "EMS use by young adults" resulted in limited information on this topic. Overall, five related articles were found: three from the US that observed EMS use by the college population (Carey et al., 2009; McLaughlin, 2010; Rosen, Olsen, & Carey, 2012); one from the United Kingdom that examined alcohol-related EMS use by the general population (Martin et al., 2012), and one from Switzerland that studied 10-year trends in EMS use specific to alcohol-related calls (Holzer et al., 2012). To date, it appears that there have been no published Canadian studies.

Two retrospective studies explored the prevalence of alcohol-related EMS utilization by US college populations (Carey et al., 2009; McLaughlin, 2010). Using data from ambulance call reports, the authors noted similarities in the types of patients using EMS and when these patients called for help. McLaughlin (2010) reported that 45% of all calls within the university area resulted from alcohol use. The majority of EMS calls (50%-73%) involved males (Carey et al., 2009; McLaughlin, 2010, respectively), 80% involved students less than 21 years of age (Carey et al., 2009) and calls for those under the legal drinking age (21 years of age) rose from 1% to 25% across the four years of McLaughlin's study (2010). In both studies, the majority of alcohol-related calls occurred on the weekend for patients presenting with substance misuse, trauma, unconsciousness, and sexual assault (Carey et al., 2009; McLaughlin, 2010). McLaughlin (2010) noted that these four chief complaints were associated with 76% of alcohol-related calls although these classifications accounted for only 22% available for documentation. In addition, Carey et al. (2009) reported that 58% of calls required basic life support (e.g., oxygen, wound dressing, non-invasive airway adjunct), 17% required advanced life support (e.g., intravenous therapy, intubation, medication administration, etc.), and the remaining 25% of patients refused treatment from paramedics.

Two studies examined the use of EMS by the general population, with a focus on alcohol-related 9-1-1 calls. Martin et al. (2012) investigated the prevalence, pattern, and associated financial costs of alcohol-related calls in a large metropolitan area in the United Kingdom (population 2.6 million) over a one-year period. A total of 10,463 calls met the study criteria and represented 3.2% of total calls for the service. Twenty-five percent of these calls involved 20-29 year olds, and males were significantly more likely to call 9-1-1 than females (26% vs. 22%, respectively). Younger patients (20-29 years of age) were more than twice as likely to call 9-1-1, from a 'street' location, than the middle-aged group, and calls from the 'street' were significantly more likely to occur on Friday and Saturday between 4:00pm to midnight. Over 70% of alcohol-related patients were transported to the hospital and Martin et al. (2012) noted that alcohol-related calls accounted for 20% of costs overall, or $3.6 million (CAD). Holzer et al. (2012) looked at ten-year trends in intoxication and requests for emergency ambulance service in Zurich, Switzerland, a major metropolitan area. This retrospective study used data from paramedic call reports to investigate trends over time related to the number of alcohol-related calls, the types of alcohol intoxication, and the distribution of gender and age. Findings included annual increases of 6.4% for alcohol-related calls, with alcohol alone, rather than combined with other drugs, present in 73% of cases. A significant increase (14% to 31%) for alcohol-related calls was seen in those younger than 25 years of age, and in the number of females in this age group (41%). The Glasgow Coma Scale (GCS) for patients in the study averaged 13.2 (slight impairment), and there were no concomitant injuries associated with 70% of alcohol-related cases.

Further to the work of Lewis and Marchell (2006) that found an increase in calls to EMS after the introduction of a medical amnesty program, Rosen et al. (2012) examined the impact of implementing a college-based EMS on the frequency of alcohol-related transports to the hospital. The authors used Student Health Service reports, from a small, private college in Pennsylvania to compare the fall semester one year before the implementation of a college ambulance service with the same semester a year after implementation. Although, the sample size was small (n = 50), twice as many students were transported the year following the start-up of EMS (35 versus 15). Analysis of blood alcohol concentrations (BAC) taken at the hospital emergency department showed no changes across the two years, and there were no significant differences found in the distribution of freshman and upperclassmen over the study period. The increase in EMS calls, and subsequent transports, suggests increased reporting by the student body rather than an increase in consumption or a cohort effect. The authors concluded that having a college-based emergency medical service could promote increased reporting and, as a result, a safer campus, similar to medical amnesty programs implemented at numerous academic institutions.

In summary, the research shows that alcohol use by young adults is changing in terms of consumption patterns. Binge drinking, linked to related harms and health risks, is on the rise. Numerous studies support the connection between the university environment and alcohol-related behaviour. Further, the number of alcohol-related EMS calls is increasing and these constitute a higher percentage of an organization's calls. The

Region of Waterloo is not unlike any other community with respect to the challenges of providing adequate healthcare services to all citizens. The question does arise, however, about whether or not this community, home to two universities and one college, has an alcohol-related problem within the youth sector.

3.0 Region of Waterloo Emergency Medical Services: An Overview

Emergency Medical Services (EMS) in the Region of Waterloo (also referred to as WREMS), which is housed within the Public Health Department, provides ambulance service for three cities (Cambridge, Kitchener, and Waterloo) and four townships (North Dumfries, Wellesley, Wilmot, and Woolwich) within the region's 1,382 square kilometer boundary. During daytime hours (7:00am-7:00pm), 15 ambulances and two single-paramedic response units serve the Region's populace of 534,900 (Region of Waterloo, 2011), while coverage is reduced to seven ambulances through the nighttime hours (7:00pm-7:00am). Current staffing consists of 186 paramedics; 57 full-time and 71 part-time primary care paramedics, and 51 full-time and seven part-time advanced care paramedics (Region of Waterloo, 2014). At the management level, the service has one Director/Chief, three Deputy Chiefs, one Supervisor of Professional Practice, one Supervisor of Training, eight Field Supervisors, and 11 Fleet staff. In addition, the Centre for Paramedic Education and Research, in Hamilton, is the Base Hospital Paramedic Program that certifies, monitors, and provides continuing medical education for Waterloo Region's paramedics.

There are three hospitals within the Region of Waterloo: Grand River Hospital (GRH) and St. Mary's General Hospital (SMGH) in Kitchener-Waterloo, and Cambridge Memorial Hospital (CMH). All three hospitals are full service community hospitals that have fully functioning Emergency Departments that operate 24 hours per day, seven days per week, and, they all accept 9-1-1 patients transferred by WREMS. Of note is that in recent years GRH and SMGH have rationalized the delivery of some healthcare services: GRH delivers care in the areas of orthopedics, cancer treatment, renal dialysis, trauma, obstetrical care, stroke treatment, pediatrics, and psychiatry, and SMGH provides cardiac treatment, sexual assault, domestic violence, and respiratory care.

In 2011, WREMS responded to 38,979 calls for service and achieved a response time of 12 minutes 24 seconds or less for all emergency calls (90^{th} percentile) (Region of Waterloo, 2011). Although Regional Council has defined 10 minutes and 30 seconds as an acceptable ambulance response time, several factors have affected this target. These include: a steady increase in call volume; increased scene times due to complex treatment modalities; and, delays in offloading patients at local hospitals (also referred to 'offload delay').

Although prevalent in Toronto, Ottawa, and Windsor, offload delays in local hospitals were not evident in Waterloo Region until the fall of 2004. Unfortunately, offload delays are now common throughout the province (WREMS Council Report, 2011). Since 2009, local offload delays have steadily increased, resulting in annual losses of over $500,000 (CAD) in lost ambulance coverage (WREMS Council Report, 2011). The most extreme impact on WREMS because of offload delays occurred in February 2011, during which time over 500 offload delays occurred, the longest lasting 8.5 hours. As a result, ambulance coverage during this month dropped to no vehicles available (Code Red status) 32 times, with one Code Red status lasting over four hours (WREMS Council Report, 2011). The following figures outline 2009-2011 offload delay statistics for WREMS and include 24-hour ambulance day losses (Figure 1), offload delay losses by hospital (Figure 2), and patient distribution by hospital (Figure 3).

Although offload delays are not normally driven by 9-1-1 call volume, a combination of increased call volumes and offload delay occurrences have had a significant impact on EMS coverage within the Region of Waterloo. Therefore, it is important to identify local trends amongst community groups that may affect this 9-1-1 call generation. Anecdotal evidence, which suggested an increase in 9-1-1 call volume within the university student population over the last several years, was the impetus for this research. Increased use of both EMS and local health care systems by a particular demographic contributes to emergency department overcrowding, limits EMS resources, and increases the risk to both the health and financial status of the entire community.

Over the past few years, emergency service providers, and local hospitals, have implemented new policies and programs to mitigate the impact of offload delays. The Ontario Ministry of Health and Long Term Care (MOHLTC) provided funding for an offload nurse at both GRH and SMGH. Dedicated to patients arriving by ambulance, this nurse assumes care of the patient, thereby clearing the paramedic crew for return to service within the community. Several factors however, have posed challenges to this program including: the re-deployment of the offload nurse into the emergency department as the need arises; a shortage of available nurses to staff the offload position; and a lack of space within the emergency department for disposition of ambulance patients. The WREMS has developed a policy to deal with these offload delays that entails placing two patients under the care of one paramedic crew in order to allow the other crew to return to community response status. Using an up-staffing ambulance to deal with offloads is an option; however, this may not always be possible and is limited by resources (i.e., staffing and equipment).

As a result of the local EMS deployment situation, the purpose of this study was to examine and describe the population serviced by WREMS in the area surrounding local universities. Specifically, this research set out to accurately identify the patterns of EMS use within the Region of Waterloo by young adults between the ages of 16-24 with an emphasis on the university population. A second research question aimed to distinguish the patterns of EMS use for this cohort and trends over time. The third research question examined the predictors of transport by EMS to the hospital.

4.0 Methodology

This cross-sectional study involved secondary analyses of data from the Region of Waterloo Emergency Medical Services (WREMS). Data were extracted from electronic ambulance call reports (e-ACR) (Appendix A) completed by paramedics responding to all 9-1-1 calls. The ambulance call report used by Ontario paramedics is a mandatory medical record that captures events and procedures for each 9-1-1 call. This legal document contains administrative information, and details of the physical exam, clinical procedures, medical treatments, and results regarding intervention with a patient. WREMS uses an electronic documentation program that has dropdown menus, along with narrative text boxes, which allow paramedics to capture both common patient conditions and call-specific information. A number of areas on the ambulance call report (e.g., patient demographics, receiving facility, location code, etc.) must be completed in order for the paramedic to close and save the document. The use of an e-ACR instead of the traditional hardcopy ACR was implemented in an effort to collect consistent and comprehensive documentation for all ACRs. Once completed and closed, the ambulance call report is uploaded and saved on the Region's server. From here, two copies are faxed to the receiving hospital (Billing Department and Emergency Department), and one copy is sent to the Base Hospital Paramedic Program. WREMS has access to the Region's server in order to review ambulance call reports according to a quality assurance/quality improvement schedule.

Ethics approval for this study was obtained from Research Ethics Boards at both Wilfrid Laurier University and the Region of Waterloo. The data set was limited to patients aged 16-24 years, who accessed EMS via 9-1-1 between January 1, 2006 and

December 31, 2011 (*N* = 16,577). All statistical analyses were completed using SAS v.9.2 (SAS Institute Inc., Cary, NC).

4.1 Data Selection, Cleaning, and Quality

The Region of Waterloo's Information Technology Specialist (ITS) captured records eligible for this study. Initial search criteria were limited to calls between January 1, 2005 and December 31, 2011, and to patients aged 16 - 24 years (*N* = 25,769). Using the narrative section of the ambulance call report to search for terms frequently associated with alcohol involvement (e.g., drunk, drank, drink*, alcohol*, intox*, etoh [ethyl alcohol], bar, party, pub, beer*, wine, liquor, vodka, cooler*, nightclub, whiskey, mickey, shooter, HBD [has been drinking], rye, gin, club [* = forms of]), calls were divided into two categories: alcohol-related (*n* = 5,271) and non-alcohol-related (*n* = 20,498). In order to complete a random review (10% of all calls), a pdf file was provided for each category. These files contained an abbreviated form of the ambulance call report (e.g., run number, gender, age, date, call times, call narrative, etc.) and the author reviewed the narrative sections for accuracy. Since numerous classification errors were found during this exercise, the review process was stopped and a second search term exercise was undertaken based on the alcohol-related terms noted above. The author then completed a manual review of each call narrative that met the search criteria (*n* = 5,271). As a result, 657 calls were moved from the 'alcohol' file into the 'non-alcohol' file, and 180 calls were moved from the 'non-alcohol' file into the 'alcohol' file. This manual step ensured that calls were not miscategorized and to confirm that terms such as drink*, drank, and drunk were specifically associated with alcohol. The ITS re-categorized the identified calls and combined both files into one Excel spreadsheet. At this time, the ITS limited the spreadsheet to the variables of interest necessary for this investigation, and per directions given by the author, recoded certain variables for ease of use in the analyses (Table 1). For example, gender was recoded into 0 for males and 1 for females, and the 59 problem codes were recoded into 11. This allowed for specific areas on the ambulance call report to be categorized into broader terms for ease of interpretation and reporting (i.e., respiratory distress, respiratory disease, and inhalation injury were recoded into the respiratory variable). Due to the large number of calls in this study, the ITS was asked to complete these reclassifications prior to sending the final spreadsheet. Using frequency tables, data cleaning was conducted for each variable to ensure accurate recoding and to identify any missing data. During this process, it was discovered that the age variable included 25 and 26, which were too old to be included in the sample, and resulted in 6,805 calls that were eliminated. In addition, inter-hospital transfers (n = 50), duplicate calls (n = 25), completed on the same patient, and calls with missing 'call location/UTM' codes (n = 91) were removed from the dataset. Errant codes, such as negative code numbers were defined as missing and variables with a large number of missing data were further investigated. Since 55% of the 'call location/UTM' variable was missing for 2005, the data set was restricted to calls occurring between 2006-2011, which eliminated 2,312 calls from the dataset. The Canadian Triage Acuity Scale (CTAS) variable was missing in 25% of calls (across all years) and a cross tabulation indicated that CTAS designations were not assigned to patients who were not transported to hospital. This prevented further investigation into the severity of patients not transported to hospital and eliminated the use of this variable when developing the model to predict transport of patients. The CTAS variable, however, was used to analyze the severity of the condition of patients who were transported to hospital. As a point of interest, current practice now requires the mandatory assigning of CTAS designations for all patients, whether transported or not. In future research, this will allow for the investigation of the level of acuity for patients who paramedics do not transport to the hospital. Any missing ‘scene time’ and ‘total call time’ variables were manually calculated and entered into the spreadsheet (n = 811). These were generally associated with patients not transported to hospital. The final data set for this study had a sample size of 16,577, a reduction from the original of 25,769 (Figure 4).

In an attempt to verify the accuracy of coding, the author compared the large number of missing CTAS entries against the actual ambulance call reports to ensure that these missing entries were associated with those patients not transported to the hospital. At this time, a separate examination of the accuracy of the problem code documentation was conducted. Since most of the checked ambulance call reports had problem codes that did not match the coding done by the ITS, it became apparent that a recoding error for the years 2006 – 2011 had been made. At this time, an email was sent to the ITS in order to investigate the possibility of a recoding error, and a response was not received. Subsequently, the ITS recoded the problem code correctly; however, assimilation of the problem codes into the existing dataset that was being used for the analysis would have required manual entry. Since all other analyses had already been completed, the decision was made to exclude this variable from the study and note this situation as a research limitation. As such, all analyses were completed without the inclusion of the problem code variable.

4.2 Analyses

The research questions aimed to compare the university population with same-aged youth within the Region of Waterloo (i.e., community population); therefore, similar to McLaughlin (2010), a demarcation of the university area was identified. For this study, calls that occurred within a 12 square kilometer area (4.6 square miles), encircling the two universities, were considered the 'university population'. This area included on and off-campus student housing, and recreational areas such as bars, clubs and restaurants (Figure 5).

Given the large sample size (N = 16,577), and the increased risk of making a type I error, statistical significance was based on a 20% change in the odds ratio (e.g., OR of $\leq$ 0.8 or $\geq$ 1.20) rather than using an alpha level. Logistic regression, which is based on the probability of an event occurring, was used to calculate the odds ratios for each of the research questions. This test, which is used to determine the observed outcome for a dependent variable with only two possible types (occurring vs. not occurring), allowed for a comparison of 25 independent variables against populations (university vs. community), between years, (2006 vs. 2011), and on transport to the hospital (transport vs. no transport).

4.2.1 Trends and Population Comparisons

Two of the research questions examined the differences between the 'university population' and the 'community population' based on the following: 25 individual variables of interest; alcohol-related EMS calls; across the six-year study period; and between two specific years (2006 and 2011). Logistic regression was used to determine significant findings in the unadjusted odds ratios. To determine trends across the six years, rates were calculated for the variables of interest in each of the six years. From this, the variables showing systematic changes in the pattern, over time, were analyzed further. For this, logistic regression was used to determine if these patterns translated into significant changes between the first and last year of the data (i.e., 2006 versus 2011). If the OR was considered significant, then an important trend in the variable was assumed; however, non-linear patterns across years were not considered important as potential trends, despite a significant odds ratio.

4.2.2 Predictors of Transport to Hospital

The third research question attempted to determine which covariates were predictive of a patient's transport to the hospital by EMS. Logistic regression was used to develop a model for this dichotomous outcome (transport to hospital: yes/no). Univariate analyses were completed, using logistic regression, to examine the influence of individual covariates as predictors of 'transport'. These were then ranked in order of importance, based on the size of the odds ratio, and introduced into the model in this order. After all significant covariates were individually introduced into the model, non-significant variables, reflective of previous literature and the author's knowledge of the subject matter, were added (separately) in order to determine the overall effect on the model. Examples of these variables included: age, presence of alcohol, gender, university population, date, and pick-up location. Additional criteria used to determine the strength of the model included the overall c Statistic (greater than 0.6), the Hosmer and Lemeshow Goodness of Fit test (greater than 0.5), and odds ratios ($\leq$ 0.80 OR $\geq$ 1.20).

Logit plots were created for all continuous variables (e.g., age, call times) to determine the assumption of linearity of the logit, a requirement for the introduction of a continuous variable into a regression model. When the logit plot indicated a non-linear relationship, the covariate of interest was modified into a categorical variable for reintroduction into the model.

The preliminary final model was checked for confounding and multicollinearity using the Cochrane-Mantel-Haenszel (CMH) test and chi-square test, respectively. Confounding between two covariates required that both be kept in the model, whereas multicollinearity required the removal of one of the covariates. If multicollinearity was present, each of the two variables of interest was placed into the model on its own to assess its unique effects. If there was not a change of greater than 20% in the OR then both covariates were retained in the model.

5.0 Results

After cleaning, the dataset consisted of 16,577 patients, between the ages of 16 - 24 years who called 9-1-1 for medical assistance between January 1, 2006 and December 31, 2011 in the Region of Waterloo. This dataset was further delineated into the 'university population' (*n* = 3,974) and the 'community population' (*n* = 12,512) in order to answer the research questions. The mean age for the entire sample was 20.0 years (*SD*=2.3), compared to 20.1 years (*SD*=2.0) for the university population, and 19.9 years (*SD*=2.5) for the community group. Males made up 51% (*n* = 8,430) of the entire sample versus 53% (*n* = 2099) in the university group, and 51% (*n* = 6331) in the community population.

Those in the university population were 1.7 times more likely to be 19 years of age or older (95% CI: 1.52-1.80) with 77% of EMS calls occurring in this age group (Table 2). The university group was 2.6 times more likely to call EMS with alcohol as a factor (2.41-2.84), 1.2 times more likely (1.02-1.57) to be classified as less-urgent (CTAS 4), and less likely to be assigned a resuscitative status (CTAS 1) than those in the community group (OR = 0.59, 95% CI: 0.34-1.02) (Table 2 and Figure 6).

In addition, the university population was 23% less likely (OR = 0.77, 95% CI: 0.71-0.83) to receive medical treatment from anyone (e.g., bystander, police, fire) before the arrival of EMS. The university population was significantly more likely to be picked-up at a school (OR = 5.4, 95% CI: 4.86-6.06) and 1.9 times more likely to be picked-up by EMS at a bar (95% CI: 1.63-2.27) (Table 2 and Figure 7). Although there were no significant differences found between groups for those transported to hospital, the university population was 1.4 times more likely to refuse transport by EMS than the community group (95% CI: 1.00-2.01). The university group was less likely to call 9-1-1 early in the week (versus a Saturday), with a 31% lower chance of calling on a Monday (0.61-0.80), a 26% lower chance on a Tuesday (0.65-0.84), and a 34% lower chance on a Wednesday (0.58-0.76). They were also 1.8 times more likely to call during the night (95% CI: 1.68-1.95) (Figure 8). During Frosh Week, on St. Patrick's Day, and during Oktoberfest, the university population was 2.2 (1.76-2.67), 1.4 (0.77-2.50), and 1.2 (0.97-1.50) times, respectively, more likely to call 9-1-1 for assistance. No significant differences in call times were found between the university and the community populations.

When comparing the community population against the university group, on alcohol-related calls only, there was no significant difference found between the mean age of each population other than a slightly narrower standard deviation in the university group (mean=19.9, *SD*=1.84) and a comparatively larger standard deviation in the community group (mean=20.0, *SD*=2.34) (Table 3). Males constituted 60% of the university population calling 9-1-1 compared to 64% in the community. Those in the university population were 1.3 times more likely to be 19 years of age or older (95% CI: 1.11-1.52) and constituted 75% of EMS calls for this age group (Table 3). The university group was 1.3 times more likely to have a lower GCS score ($\leq$ 8) when alcohol was involved (95% CI: 1.07-1.68) yet were still 1.2 times more likely (95% CI: 0.78-1.90) to be classified as less-urgent than the community group (CTAS 4), and less likely to be assigned a CTAS 1 or 2 (resuscitative or emergent, respectively) (OR = 0.76, 95% CI: 0.24-2.40; OR = 0.72, 95% CI: 0.45-1.16). Similar to the comparison for all EMS calls discussed above, the university population was also less likely (OR = 0.63, 95% CI: 0.55-0.73) to receive medical treatment from anyone before the arrival of EMS.

When alcohol was involved, the university population was 1.6 times more likely to be picked-up by EMS at a bar (95% CI: 1.22-1.99), and significantly less likely to be picked-up at a residence (OR = 0.59, 95% CI: 0.52-0.69) when compared to the community group. Although there were no significant differences between groups for those transported to the hospital, the university population was significantly more likely to refuse transport by EMS (OR = 2.4, 95% CI: 1.00-2.01), and 5.9 times more likely to leave the scene before ambulance arrival than the community group (95% CI: 1.01-33.81). The university group was 1.4 times more likely to call 9-1-1 for an alcohol-related call on a Thursday (95% CI: 1.07-1.78) when compared to a Saturday, and 3.0 times more likely than the community population to call EMS at night (95% CI: 2.09-4.82). During Frosh Week and on St. Patrick's Day, the university population was 3.1 and 3.0 times more likely (95% CI: 2.09-4.82; 0.91-10.08), respectively, to summon EMS for help. In addition, during Oktoberfest activities, the university population requested emergency medical assistance 1.4 times more often than the community group. In terms of scene time for alcohol-related problems, the university population had more instances of scene times that were 10 minutes or less than did the community group (OR = 1.2, 95% CI: 1.00-1.51).

Looking at the trends over time (from 2006-2011), no significant changes were noted within the university population nor the community group for mean age; however, clear trends were noted for those 19 years of age and older (age of majority variable) (Table 4). Across years, the university group had significantly fewer patients in the

$\geq$ 19 age group over each year of the study (OR = 1.30, 95% CI: 1.00-1.70) (Appendix B), ranging from 79% of calls in 2006 to 75% in 2011. Conversely, the community group appeared to be getting older, with calls for this age group at 64% in 2006 versus 70% in 2011 (OR = 0.77, 95% CI: 0.67-0.88). A per capita review of all EMS calls revealed an increase of 3 calls per 1000 population, which was consistent in both groups, although the university enrolment increased 26% between 2006 and 2011 compared to a 1% increase in the community population (Figure 10). Paramedic crews responded to 20.3-23.3 (2006 versus 2011) calls per 1,000 population within the university group and 28.9-32.0 (2006 versus 2011) calls per 1,000 population for the community group (Figure 11). The proportion of alcohol-related calls showed the largest increases within the university population. While the percent in the community group remained static across years (ranging from 15%-17%), a steady increase was seen in the university population, rising 9% over the six years (29%-38%). (Figure 9)

Analysis showed that the university group was much less likely (OR =0.68, 95% CI: 0.54-0.86) to call EMS for alcohol-related calls in 2006 compared to 2011. Both groups had downward trends with respect to level of consciousness as demonstrated by the GCS. The university group had 12% of patients assigned a GCS of $\leq$ 8 or less (meaning they were comatose) in 2006 compared to 5% in 2011 (OR = 2.59, 95% CI: 1.79-3.98). Similarly, the community group GCS went from 11% in 2006 to 4% in 2011 (OR = 2.74, 95% CI: 2.10-3.58). Across years, the community population showed a consistent decline in the number of calls (42%-35%) being classified as urgent (CTAS 3) by the paramedic crew (OR = 3.28 95% CI: 2.15-4.99) with related increases (2%-4%) in being classified as a CTAS 5, non-urgent status. For the community group, residential pick-ups increased significantly across years (43%-51%) and street pick-ups decreased significantly (31%-27%). In the university population, a significant upward trend for pick-ups at school occurred, increasing from 19% to 27%. In 2006, the university group was significantly less likely to call for a pick-up at school than in 2011 (OR = 0.70, 95% CI: 0.79-1.24). For the community population, the rate of transports to the hospital decreased over time (79%-73%); however, the likelihood of being transported was greater in 2006 (OR = 1.50; 95% CI: 1.28-1.75). Those in the community group were 1.5 times more likely to refuse transport by EMS (95% CI: 0.80-2.69) and the rates across years increased from 20% to 25% of all EMS calls. Calls on specific days of the week remained unchanged for the community group, yet within the university population, 9-1-1 calls on Wednesday showed a significant decrease (12%-10%) when compared to calls placed on Saturday (OR = 1.27, 95% CI: 0.84-1.91). Although the number of nighttime calls to EMS from the university group rose steadily across years, this increase was not found to be significant. In addition, the percentage of weekday calls decreased significantly for the university population, changing from 48% to 44% (OR = 1.20, 95% CI: 0.96-1.51). During Frosh Week, calls servicing the university population rose significantly across years from 2% to 5% of all calls. In 2006, the university group was significantly less likely to call during Frosh Week than in 2011 (OR = 0.47, 95% CI: 0.24-0.91). All 9-1-1 times, including response, scene, and the total time to complete a call remained static across the six years for both groups.

5.1 Predicting Transport to Hospital

The first step in determining which covariates were associated with predicting the dichotomous outcome of transport (1=transport; 0=no transport) was to perform univariate logistic regression analyses against the outcome. For the purposes of this research, analyses were deemed significant when the odds ratio was less than or equal to 0.80, or greater than or equal to 1.20. This reduced the 25 covariates down to eight that were significant, and included: scene time $\leq$ 20 minutes; level of EMS care; residential pick-up; school pick-up; street pick-up; day of week; GCS $\leq$ 8; and St. Patrick's Day (Table 5). These eight, along with other covariates (e.g., age, gender, presence of alcohol, university and community populations), were introduced into the model. These additional covariates were believed to be relevant to the outcome as a result of the author's experience or were identified through the review of literature.

The covariates were introduced into the model, in order of significance, the first of which was scene time $\leq$ 20 minutes, followed by level of EMS care, pick-up at a residence, etc. As a result of each being introduced, the finding of a c Statistic 0.6 or greater, along with high *p* values for the Hosmer and Lemeshow Goodness of Fit, and odds ratios, which fit the 20% parameters, indicated that the model's estimates fit the data at an acceptable level. Two models were found to be strong for the 'transport' outcome; the first included the covariates of scene time $\leq$ 20 minutes, level of EMS care, and a school pick-up; whereas the second consisted of the covariates of scene time $\leq$ 20 minutes, level of EMS care, and day of the week. These two models were then combined, resulting in a strong four-covariate overall model. At this point, age (continuous and categorical) and gender were re-introduced into the model individually, but neither variable remained.

The four covariates were then assessed for confounding and multicollinearity. To check for confounding, stratified analyses using the Cochrane-Mantel-Haenszel (CMH) were done on two pairs of variables: scene time/level of EMS care and school/day of the week. To determine whether scene time and level of EMS care were confounders leading to the outcome of transport, the CMH test was done twice. The first analysis controlled for the scene time variable, and the second analysis controlled for the level of EMS care variable against the outcome. This stratified analysis resulted in statistically significant findings ($p = .0001$), requiring both variables to remain in the model since neither could be distinguished against the outcome of transport. Further analyses indicated the presence of confounding in both pairings, which required that all of these variables remain in the model. Although scene time $\leq$ 20 minutes and level of EMS care were found to be collinear, the correlation coefficient found no relationship between the variables ($r = .2118$). In addition, the absence of large changes in the standard error, odds ratios, or confidence intervals, indicated that both of these covariates could remain in the model.

The final four-covariate model was selected to be the main effects model for predicting transport to the hospital. This decision was based on the Hosmer and Lemeshow Goodness-of-Fit test (chi-square = 6.51; p = .5908), the c Statistic (.74), along with significant odds ratios. This model included the following covariates: scene time $\leq$ 20 minutes, level of EMS care, a school pick-up; and day of the week. Scene time was divided into three distinct groups ($\leq$ 10 minutes, 11-20 minutes, $\geq$ 20 minutes) and analyses showed that the shortest scene time group was much more likely to be transported than the mid-range group (OR = 10.3, 95% CI: 0.1-11.7 versus OR = 2.8, 95% CI: 2.6-3.1) when compared to the greater than 20 minutes group. The level of EMS care, specifically when the patient received advanced medical care (i.e., an intravenous line at a minimum), increased the odds of transport by 4.2 times (95% CI: 3.8-4.6).

Patients calling from a school location were 1.4 times more likely to be transported (95% CI: 1.2-1.6), and patients were more likely to be transported on Sunday, Monday, Tuesday, or Wednesday when compared to Saturday (used as the reference) (Table 6).

Due to the disproportionate numbers in the university population relative to the community group, the main effects model (with four covariates) was run separately for each of these populations in order to determine the fit of the transport model for these two groups. When the model was run with only the university population (n = 3,974), there were minor differences in the odds ratios and parameter estimates for scene time $\leq$ 20 minutes and for level of EMS care (Table 7). The main difference was that there was no significant relationship between the day of the week and the transport outcome. In this main effects model only calls that took place on Tuesday (OR = 1.20, 95% CI: 0.9-1.6) were significant. In addition, the Hosmer and Lemeshow Goodness of Fit dropped slightly (chi-square 7.31; p =.5031) as did the c Statistic (.721). The main effects model appeared to align more with the community group, showing a higher Goodness-of-Fit (chi-square 5.75; p = .6747) and c Statistic (.749) as well as closely matched odds ratios for all four covariates. This was also a better fit than was seen when using the Region-wide population (Table 8). The odds ratios for a school pick-up (OR = 1.9, 95% CI: 1.5-2.5) and level of EMS care (OR = 4.8, 95% CI: 4.3-5.4) were higher in the community population.

6.0 Discussion

This investigation may be useful in improving our understanding of how young adults use EMS and whether this use has changed over a specific time frame, as well as what level of care (advanced versus basic) paramedics are providing to this group. Discussion of the results focuses on, and includes, changes in: alcohol use, age of majority grouping, patient condition, transport to hospital, and event-related EMS calls. These findings are notable as a result of the differences found between the university population and the community group. Also of interest is the relative lack of medical assistance provided to those in the university population prior to EMS arrival.

The results indicate significant differences in alcohol-related EMS calls both between groups (university versus community), and within the university group, across the six years of the study. Although the proportion of alcohol-related calls (39%) within the university population was less than the 45% reported in McLaughlin's work (2010), the increase in the number of calls over time is similar. In this study however, the static rates for alcohol-related calls within the community population (17%), suggests a change in the pattern of drinking with respect to university students (i.e., binge drinking), and aligns with the findings of research focused on the culture of drinking at academic institutions (Adlaf et al., 2004; Health Canada, 2007; Hingson et al., 2009; Johnston et al., 2011b) In addition, the current study supports a study by Johnston et al. (2011b) that suggests that responsible drinking campaigns are more effective for the general population rather than for those in an academic environment. The significant finding that the university group was nearly three times more likely to call for an alcohol-related problem than the community group also supports the link between drinking and academia. Slight changes in the gender-split for alcohol-related calls were also identified in this study. Specifically, university females made up a higher percentage of the alcohol-related 9-1-1 calls when compared to the community population (40% versus 36%). While significantly higher than the percentage identified in McLaughlin's work (2010), yet similar to the research of Carey et al. (2009), this result supports findings of the shrinking gender gap related to alcohol use within the university populace (Adlaf et al., 2004; Health Canada, 2007; Johnston et al., 2011b).

Also of note in this study is the change in the number of calls relative to the age of majority. The legal drinking age in Canada is 19 years of age and older and, despite the fact that only 25% of alcohol-related calls for the university group were for those under the legal age to drink, a review of all EMS calls for this group, showed the proportion of patients under 19 years of age, was increasing. Although not proven in this study, an increase in underage alcohol-related calls within the university population may be suggested by these findings.

Another point of interest is the change in GCS scores across years. Trends indicated higher GCS scores across both populations for all types of 9-1-1 calls. In this study, both populations were significantly more likely to present with a higher level of consciousness in 2011 than in 2006. These results indicate that patients transported by EMS were more 'sick' in the first year of the study when compared to those in the last year. This is different from the findings of Holzer et al. (2012), whose ten-year trend for GCS averaged 13.2 (slight impairment) for alcohol-related calls.

Although GCS scores improved across the years for both groups, in terms of level of acuity, the university group was significantly different from the community. The university group presented with fewer critical patients than did the community when EMS was accessed. Within-group analyses showed that those in the university group were significantly more likely to be classified as less urgent (CTAS 4) and less likely to be classified as resuscitative or emergent (CTAS 1 & 2, respectively) than those in the community. This was the case when examining all EMS calls, as well as the alcohol-related calls. In addition, when the GCS results were restricted to alcohol-related calls only, the university group was significantly more likely to have a low GCS ($\leq$ 8) than the same-aged community youth. In medical theory, the relationship between a higher GCS and the low classification of severity assigned to patients under the influence of alcohol by the paramedic crew would be the expected situation. In this study, what was not clear was the connection between a low GCS (altered level of consciousness) and a low acuity designation (CTAS 4). In terms of alcohol-related calls, although the university population patients were more impaired than the community patients according to the GCS, paramedics were not prioritizing them with the same level of urgency in terms of CTAS level. Although it may seem counterintuitive for patients to be deemed less urgent while presenting with a lower GCS, members of the medical community may perceive alcohol use as a less complicated condition or issue. Patients under the influence of alcohol are often easily rousable when stimulated, require minimal medical care and, therefore, are assigned a lower level of severity. These findings could indicate that paramedics may minimize the severity of alcohol-related calls found within the university population, which may be a result of the increased frequency of alcohol-related calls. Additional support for this situation may be derived from the significant differences in scene times $\leq$ 10 minutes found for the university population. In terms of alcohol-related calls only, those at the university had significantly more instances of short scene times than did those in the community population. These individuals, who present with relatively uncomplicated alcohol-related conditions, require fewer medical interventions yet are transported to the hospital because there are no other supports in place in the community.

Examination of the community population in this study revealed a notable change in the number of patients transported to the hospital. Specifically, there was a significant decrease in transports to a medical facility across the six years that were analyzed. While the university group remained unchanged with respect to the number of patients transported to the hospital, there were differences between groups in terms of those refusing transport. For all EMS calls, the university population was more likely to refuse transport than the community group and twice as likely to do so when alcohol was involved. In addition, alcohol-related 9-1-1 calls for the university group had a significantly higher likelihood that the patient would leave the scene before the arrival of the ambulance unit (OR = 5.9; 95% CI: 1.01-33.81). When compared to work by Carey et al. (2009), the current study indicated a higher number of transports (76% vs. 65%) and lower rates of patient refusals (22% vs. 25%). This may be related to the universal health care system in Canada that does not require direct payments from patients at the time of pick-up.

The examination of event-related EMS calls such as Frosh Week, St. Patrick's Day, and Oktoberfest does not permit direct comparisons to other research; however, these findings do relate to a collection of work linking on-campus events, normative beliefs of others' drinking levels, and sporting events to alcohol consumption within the university student population (Borsari, Murphy, & Barnett, 2007; Pedersen and LaBrie, 2008; Merlo, Ahmedani, Barondess, Bohnert, & Gold, 2011). In this study, the university population was significantly more likely to call EMS during the aforementioned events, whether alcohol was involved or not. When compared to the community group, the university population was twice as likely (OR = 2.2, 1.4, and 1.2) to call 9-1-1 during Frosh Week, on St. Patrick's Day, and during Oktoberfest for a non-alcohol-related issue, respectively. When there was alcohol involved, the odds that the university group would call 9-1-1 changed from 3.1 to 3.0 for Frosh Week and St. Patrick's Day, respectively. These findings support the culture of alcohol in academia, illustrate the patterns of drinking seen in this population, and identify a group of young people that relies heavily on the local medical system. Across years, a significant change in 9-1-1 utilization for the university population was identified during Frosh Week events since this group was less likely to call EMS in 2006 than in 2011 (OR = 0.47, 95% CI: 0.24-0.91). This finding is strongly supportive of the hypothesis that there have been changes, specific to university-related events, over time.

The lack of any medical assistance provided to patients within the university population prior to EMS arrival is important to note. Differences were identified between the university population and the community group, with those in the university population being significantly less likely to receive any type of pre-EMS care than those in the community. This was more evident with alcohol-related calls. The lack of medical assistance offered by the community, allied medical services, or university medical teams, may be a result of concerns regarding the assumption of liability, insufficient staffing levels, or a lack of knowledge that assistance may be required. While a comparison to previous research cannot be made, this is a point for further investigation within the local emergency services system and for the educational institutions.

Finally, having a comprehensive account of the young adult population accessing EMS via 9-1-1 provided high power for this study and reduced the risk of making a type II error. Conversely, the large sample size had the potential to increase the probability of making a type I error; however, the census sample increased the study's power and made it easier to identify small effects seen in the analyses. Since the study had high power, odds ratios, less than or equal to 0.80 and/or greater than or equal to 1.20, were used to determine significant differences between the university population and the community group, rather than *p* values. The fact that the sample represented all calls for young adults, aged 16 – 24 years, in the Region of Waterloo, increased the external validity allowing for comparison to other like communities. Based on the results presented within this thesis, recommendations for future work can be found in Appendix C.

6.1 Factors that Predict Being Transported to the Hospital

Four covariates predicted transport to hospital in this young adult population and included: a scene time less than 20 minutes; ALS care provided by the paramedic; pick-up location at a school; and certain days of the week. A scene time of less than 20 minutes fits a transport model in several ways. A patient, who is extremely ill will meet the 'scoop and run' standard of care that all emergency service providers follow and, by default, has a short scene time. Since the pre-hospital goal for unstable patients, both medical and trauma, is definitive care (i.e., emergency surgery), transportation to the hospital after initial stabilization by the paramedic crew is the standard operating

procedure. Ten minutes is the accepted timeline for trauma patients, and similarly, although not numerically identified, for patients presenting with a critical illness.
In addition, patients who are deemed low priority on assessment (CTAS 4 or CTAS 5) and require fewer medical procedures would result in the paramedics being on scene for shorter times. Scene times that exceed 20 minutes generally occur for patients who are undecided about whether or not they want to be transported (minor issues), or for those who require full resuscitation at the scene. In the Region of Waterloo, patients in cardiac arrest and not responsive to cardiac life support measures, are deemed futile and are not transported. Scene times on these types of calls, may be 45 minutes or longer. In cases where the paramedic provides ALS care, the decision to transport to the hospital, for most calls, has already been made as a result of the patient consenting to medical care from the paramedics. Medical treatment provided by EMS (e.g., intravenous, medication administration, etc.), is an adjunct to care that will continue at the hospital.

A school pick-up location generally results in the transportation of an individual to the hospital. Often the patient is under the jurisdiction of the school system and whose parents are not on scene. In these circumstances, the institution must adhere to policies that transfer liability to a higher medical authority such as the paramedics and/or a hospital. One may only speculate that these constitute the reasons for the fact that school location predicts transportation to the hospital.

Specific to the community group, the model shows increases in the odds ratios for school pick-up. This likely reflects the higher proportion of high schools situated outside of the university area (14 versus 2). In addition, the level of EMS care odds ratio, is likely higher due to an increase in transport time to the hospital. This lengthened time would allow a paramedic to perform additional advanced skills and treatment while en route without delaying access to definitive care at the receiving hospital.

Transport to a medical facility was also predicted by the days of the week. Overall, Sunday, Monday, and Wednesday were the days when the community patients were more likely to be transported, whereas Tuesday was the most likely day for the university group. Of interest in this study, however, is the finding of high rates of patient refusals within the university population despite the number of calls for medical assistance. For example, 56% of calls from the university population were generated on weekends (Friday-Sunday), yet patients refused transport 1.4 times more than the community group. When alcohol was involved, the university population was 2.4 times more likely to refuse transport. It should be noted, that direct comparisons to other research cannot be made with respect to transport status since most focused on call volume rates rather than transportation rates.

Of note, St. Patrick's Day and a street pick-up were found to be protective against transport to the hospital. Although it is not practical to adjust the provision of ambulance service for street pick-up, these findings could be useful in adjusting EMS transport requirements during St. Patrick's Day activities.

6.2 Limitations

The ambulance call report used by the Region of Waterloo Emergency Medical Services Division is an electronic document that must be completed by the paramedic as soon as possible after a 9-1-1 is concluded. Waterloo Region EMS is not unlike other Ontario ambulance services, in that there is often insufficient time for paramedics to complete this documentation after a call and before another is assigned. This can lead to a backlog in the documenting of patient care, and the potential to inadvertently omit relevant pieces of information specific to a call. Furthermore, the narrative areas on the ambulance call report that are used to descriptively explain the events of a call, create the potential for bias. The self-report nature of interviewing a patient can lead to reporting bias, specifically if the patient is deceptive when answering the paramedic's questions. Paramedics may also exhibit interviewer bias depending on their priorities at a call. For example, if a paramedic is more focused on treating a patient's serious injuries, s/he may neglect to document that there was alcohol involved. In these examples, biases can lead to inaccurate or missing patient characteristics, which may cause under-reporting of alcohol involvement in 9-1-1 calls. The electronic format of the ambulance call report (e.g., drop down box, typographical errors, etc.) can lead to data entry errors by paramedics, affecting the accuracy and precision of the data. In addition, the manual inspection of each alcohol-related call narrative is subject to human error. Lastly, recoding errors are possible any time a researcher refines a data set in order to examine variables of interest. In the case of this research, a recoding error of the primary problem code variable was discovered late in the analyses stage, which prevented the investigation of problem codes other than those categorized as 'alcohol'. This recoding error resulted from a personnel change during the initial extraction of ambulance call reports from the Region's database. The initial ITS had been located directly at WREMS headquarters since the inception of electronic ambulance call reports and was familiar with this multi-layered program. Shortly after the data collection process was begun, the initial ITS terminated employment with the Region of Waterloo and a new ITS was assigned to the study. This individual's lack of familiarity with, and knowledge of, the program led to the miscoding of the problem code variable. Suggestions that may help to eliminate some limitations for future EMS research are related to changes that could occur at the EMS-organizational level. These include: providing adequate time and equipment for paramedics to complete electronic charting during the shift; a more comprehensive audit program for the review of ambulance call reports; and an Information Technology Specialist who is dedicated to EMS-related computer programs.

The absence of the Canadian Triage Acuity Scale (CTAS) rating from calls where the patient was not transported was also a limitation of this study. Since the CTAS level provides information on the level of illness for a specific patient, I was unable to analyze this aspect for all patients that were not transported to the hospital in this study. This information would have been valuable in assessing the level of acuity of patients refusing to go to the hospital.

The method used to determine trends across years also has limitations. Traditionally, time series analyses are used to determine trends across years. Since these analyses were beyond the scope of this research, the decision was made to look for obvious upward or downward trends across the six years of data. Logistic regression analyses were completed on any variables that showed a consistent trend between the years of 2006 and 2011.

Another limitation of this study was the assignment of the sample to population groups. The university population was determined by location of 9-1-1 calls, rather than by clarification by the attending paramedics that the patient was a university student. This assignment of population groups is similar to work done by McLaughlin (2010). A

12-square kilometer area (4.6 square miles), encompassing the two universities and including student housing and recreation areas such as bars, clubs, and restaurants was the determinant for inclusion in the university population. All calls occurring outside of this geographical area were considered to be originating from the community group. The fact that students were not directly identified within the group is a limitation in this research; however, the association between behaviour and university events and drinking culture is well documented. Ambulance call reports could be adjusted to include an area identifying whether the patient is a student at either a university or college, eliminating a misclassification. Finally, the substantial increase in university enrollment over the course of this study compared to the static growth in the Region of Waterloo as a whole, could explain the significant changes seen in EMS calls in the university area.

7.0 Conclusion

The results of this study indicate that there are distinct differences between the populations of interest. Specifically, the university group is accessing EMS via 9-1-1 for more alcohol-related calls than in past years; more so during Frosh Week. In addition, the university population is more likely to refuse transport to the hospital or leave the scene of the incident. Finally, there is a greater tendency for the university population to be designated as low acuity by the paramedic crew when compared to the same-aged population outside of the university area. This study provides preliminary information regarding the relationship between alcohol use and EMS for young adults within the Region of Waterloo. The results may be used to increase the awareness, understanding and knowledge of the extent and severity of alcohol use amongst community partners. The data may provide EMS administrators with information that will allow them to determine costs associated with providing pre-hospital care to this section of the community. This might include differentiated staffing models as well as the staging of ambulance resources on the university site. This research outlines the prevalence of alcohol-related issues with the university population that may provide the impetus for university officials and emergency service providers to develop a strategic plan for education, policies and procedures and possibly alternative treatment options for this cohort (i.e., campus infirmary). In addition, the results may facilitate the creation of an action plan for university-based events such as Frosh Week where EMS 9-1-1call volume is known to increase.

Future work could investigate whether young adults picked-up in the university area are actually affiliated with the academic institutions. This could help to determine the universities' association (i.e. number of enrolled students) to EMS calls in the designated area and may provide direction for the development of policies and procedures regarding student alcohol use. A follow-up of the treatment provided to young adults transported to the hospital with alcohol-related problems would also be a next step. By identifying the type and degree of care received in the hospital, decisions could be made about the feasibility of implementing alternative out-of-hospital treatment options for this demographic. Finally, an investigation into other injuries resulting from alcohol use would provide information to both the academic institutions and emergency service providers about the full extent of the effects of alcohol in terms of the social, physical and economic implications.

Anecdotal evidence suggesting an increased use of EMS services by the university population, specific to alcohol use, has been a point of interest amongst paramedics within the Region of Waterloo for quite some time. The results of this study indicate a significant change in the number of alcohol-related calls over a six-year period. Using a sample of all EMS calls for the population aged 16-24 years, extensive analyses reviewed demographic and patient characteristics, pick-up locations, transport status, call generation, and call times. Findings indicated distinct differences between the university population and same-aged community group in how each group utilizes local emergency medical services. This EMS research, the first in Canada, builds upon previous investigations from the US and abroad and may provide a foundation for a local solution to the issue of increased alcohol use. The temporal and geographical patterns of EMS calls found in this work offer statistical support for potential logistical changes in ambulance coverage and crew configuration. In addition, the changes in patient presentation noted in this study could formulate the basis of future training for paramedics responding to these types of calls. While this research did not examine any comorbid factors associated with alcohol-related calls (e.g., trauma, unconsciousness, respiratory problems, etc.), the low rates of advanced life support (ALS) care identified in this study support the development of non-traditional transport and treatment options for this demographic (i.e., on-campus infirmaries) (Table 4).

To summarize, other than calling for alcohol-related incidents, the results of this study do not identify the related or underlying reasons why young adults call for EMS assistance. As such, a more in-depth analysis, which includes specific problem codes, may be beneficial when attempting to describe the true impact of alcohol use. Adjusting the ambulance call report to indicate whether a patient is actually a student would help to determine the extent of alcohol-related calls associated with this demographic. These suggestions for future research could provide valuable information to both the academic institutions and emergency services organizations to assist in determining long-range planning.

References

Adlaf, E.D., Demers, A., & Gliksman, L. (2004). Centre for Addiction and Mental Health: *Canadian Campus Survey*. Retrieved from: http://www.utsc.utoronto.ca/~facilities/documents/CanadianCampusSurvey2004Report.pdf

Babor, T.F, Higgins-Biddle, J.C., Saunders, J.B., & Monteiro, M.G. (2001) AUDIT – Alcohol Use Disorders Identification Test. Guidelines for Use in Primary Care. 2nd Edition. Retrieved from http://whqlibdoc.who.int/hq/2001/who_msd_msb_01.6a.pdf

Benningfield, M.M., Trucco, E.M., Barreira, P.J., & Greenfield, S.F. (2010). Treatment of alcohol intoxication at university health services examining clinical characteristics, drinking patterns and adherence with referral. *Journal of Alcohol and Drug Education*, *53*(1), 54-69.

Bergen-Cico, D. (2000). Patterns of substance abuse and attrition among first-year students. *Journal of The First Year Experience, 12*, 61-75.

Borsari, B., Murphy, J.G., & Barnett, N.P. (2007). Predictors of alcohol use during the first year of college: Implications for prevention. *Addictive Behaviors 32*, 2062-2086.

Carey, K.B., McClurg, A.J., Bolles, J.R., Hubbell, S.J., Will, H.A., & Carey, M.P. (2009). College student drinking and ambulance utilization. *Journal of Public Health Management Practice, 15*(6), 524-528.

Harford, T. C., Wechsler, H., & Muthen, B. O. (2003). Alcohol-related aggression and drinking at off-campus parties and bars: A national study of current drinkers in college. *Journal of Studies on Alcohol, 64*, 704-711.

Health Canada. (2007). *Canadian Addiction Survey*. Retrieved from http://www.hc.sc.gc.ca/hc-ps/pubs/adp-apd/cas_youth-etc_jeunes/index-eng.php.

Hingson, R.W., Wenxing, Z., & Weitzman, E.R. (2009). Magnitude of and trends in alcohol-related mortality and morbidity among US college students ages 18-24 1998-2005. *Journal of Studies on Alcohol and Drugs Supplement, July* (16), 12-20.

Holzer, B.M., Minder, C.E., Schätti, G., Rosset, N., Battegay, E., Müller, S., & Zimmerli, L. (2012). *Ten-Year Trends in Intoxications and Requests for Emergency Ambulance Service*, *Prehospital Emergency Care 2012, 16*(497), 497-504.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2011a). *Monitoring the future national results on adolescent drug use: Overview of* *key findings* (2010). Ann Arbor: Institute for Social Research at the University of Michigan.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2011b). *Monitoring the future national survey results on drug use, 1975–2010: Volume II, College students and adults ages 19–50*. Ann Arbor: Institute for Social Research at the University of Michigan.

Lewis, D.K., & Marchell, T.C. (2006). Safety first: A medical amnesty approach to alcohol poisoning at a U.S. university. *International Journal of Drug Policy, 17*, 329-338.

Maggs J. L. (1997). Alcohol use and binge drinking as goal-directed action during the transition to post-secondary education. In J. Schulenberg, J. L. Maggs, & K. Hurrelman (Eds.), Health risks and developmental transitions during adolescence (pp. 345-371). New York: Cambridge University Press.

Martin, N., Newbury-Birch, D., Duckett, J., Mason, H., Shen, J., Shevills, C., & Kanar, E. (2012). A retrospective analysis of the nature, extent and cost of alcohol-related emergency calls to the ambulance service in an English Region. *Alcohol and Alcoholism,* 1-7.

Merlo, L.J., Ahmedani, B.K., Barondess, D.A., Bohnert, K.M., & Gold, M.S. (2011). Alcohol consumption associated with collegiate American football pre-game festivities. *Drug and Alcohol Dependence*, *116*, 242-245.

Misch, D.A. (2011). College student assessment of the signs of alcohol poisoning to dream the impossible dream. *Journal of Student affairs Research and Practice, 48*(2), 165-178.

McLaughlin, M.P. (2010). Alcohol associated illness and injury and ambulance calls in a Midwestern college town. *Prehospital Emergency Care, 14*, 485-490.

National Institute of Alcohol Abuse and Alcoholism. (2004). NIAAA council approves definition of binge drinking. NIAAA Newsletter 2004; No. 3, p.3. Retrieved from http://pubs.niaaa.nih.gov/publications/Newsletter/winter2004/Newsletter_Number3.pdf.

Oster-Aaland, L., Lewis, M.A., Neighbors, C., Vangness, J., & Larimer, M.E. (2009). Alcohol poisoning among college students turning 21 do they recognize the symptoms and how do they help. *Journal of Studies on Alcohol and Drugs*, *16*, 122-130.

Pedersen, E.R., & LaBrie, J.W. (2008). Normative misperceptions of drinking among college students a look at the specific contexts of prepartying and drinking games. *Journal of Studies on Alcohol and Drugs, 69*, 406-411.

Regional Municipality of Waterloo. (2011). *Waterloo Region Emergency Medical Service Council Report*. Waterloo, ON: Region of Waterloo.

Regional Municipality of Waterloo. (2012). *Waterloo Region Emergency Medical Service Human Resources Summary*. Waterloo, ON: Region of Waterloo.

Rosen, J.B., Olson, M.H., & Kelly, M. (2012). Collegiate-Based Emergency Medical Service: Impact on Alcohol-Related Emergency Department Transports at a Small Liberal Arts College. *Journal of American College Health, 60*(3), 263-265.

Shook, J., & Hiestand, B.C. (2011). Alcohol-related emergency department visits associated with collegiate football games. *Journal of American College Health*, *59*(5), 406-411.

Statistics Textbook. (nd). How to Identify patterns in time-series data. Time Series Analysis. Retrieved from http://www.statsoft.com/Textbook/Time-Series-Analysis.

Vohs, C.J., Gable, R.K., Ward, C.V.L., Martel, R.L., Barresi, J., & Slocumb, D. (2008). Anxiety and depression as comorbid factors in drinking behaviors of undergraduate college students attending an urban private university in the Northeastern United States. *Higher Education*. Paper. Retrieved from http://scholarsarchive.jwu.edu/highered/3.

White, A.M., Hingson, R.W., Pan, I.J., & Hsiao, Y.Y. (2011). Hospitalization for alcohol and drug overdoses in young adults age 18-24 in the US 1999-2008 results from the nationwide inpatient sample. *Journal Studies Alcohol Drugs*, *72,* 774-786.

Wilfrid Laurier University. (2011). Wilfrid Laurier University Residence Life Handbook 2011-2012. Retrieved from http://waterloo.mylaurier.ca/content/documents/fileItemController/handbook2011.pdf.

Appendix A

Ontario Ministry of Health and Long Term Care Ambulance Call Report

Ontario Ministry of Health and Long-Term Care

Ambulance Call Report

Confidential when completed

Please press hard, you are making multiple copies.

Crew Type: ☐ EMA ☐ PCP ☐ ACP ☐ CCP ☐ FLIGHT ☐ FR

Call Type: ☐ BLS ☐ SR ☐ AED ☐ IV ONLY ☐ ALS ☐ CCT

ADMINISTRATION

Surname

Given Name

Mailing Address

City / Town

Province Postal Code

Hospital Registration Number | Date of Birth (YMD) / /

Health Card No. | Ver.

Service Name

CACC | CALL NUMBER / PATIENT NUMBER | Call Date (YMD) / /

Vehicle Number | Service | Station | Status | Start (km) | PU (km) | Dest. (km)

UTM Code / Flight # | Dsp. Prb. Cde. | Dispatch | Return | Patients | Seq

Special Codes

Warning Systems: To Scene / To Destination — ☐ None ☐ | ☐ Lights ☐ | ☐ Lights & Siren ☐

Pick-up Location or Sending Facility

City / Town

Same as above ☐ | Pick-up Location Code | Sending Hospital | Landing Site

CLINICAL INFORMATION

Chief Complaint | Primary Problem | Secondary Problem | Time of Occurrence

Incident History: P Q R S T A E I O U Mechanism of injury / direction of force

Traumatic Injury Site/Type

	Location	Type	Mechanism
1			
2			
3			

Relevant Past Hx: ☐Previously Healthy 1 ☐ Cardiac 2 ☐ Respiratory 3 ☐ Stroke/TIA 4 ☐ Hypertension 5 ☐ Seizure 6 ☐ Diabetes 7 ☐ Psychiatric 8 ☐ Other 9 ☐ Cancer

Medications: ☐ None ☐ Nitrates ☐ Digoxin ☐ Insulin ☐ ASA ☐ Ventolin ☐ Oral Diabetic Meds ☐ Lasix ☐ Oral Contraceptive ☐ Not Determined

Allergies: ☐ NKA ☐ ASA ☐ Sulpha ☐ Penicillin ☐ Codeine ☐ Other ☐ Not Determined

Treatment prior to arrival: ☐ None ☐ Fire ☐ Police ☐ E.F.R.T. ☐ Other Ambulance ☐ Bystander ☐ Other Sending Physician

☐ **Further Clinical Information, see procedures**

Cardiac Arrest Information

Arrest Witnessed By: ☐ EMS Personnel ☐ Bystander ☐ Unwitnessed

☐ DNR ☐ Fire/Police ☐ Family Member ☐ Bystander

CPR Started By: ☐ P.C.P. ☐ A.C.P./C.C.P. ☐ Other Medical ☐ Other

Duration of CPR Prior to arrival of transporting crew

Est. Time of Arrest

Time of first shock delivered to patient by any provider

PHYSICAL EXAM

Age | Gender | Weight (kg) | C.T.A.S. ☐ 1 - Resus ☐ 2 - Emerg. ☐ 3 - Urgent ☐ 4 - Less Urg. ☐ 5 - Non-Urg.

DECEASED ☐ Pronounced Dead By BHP ☐ Obviously Dead

Skin (Initial Assessment)

Colour	Temp	Cond.
☐ Flush	☐ Hot	☐ Dry
☐ Normal	☐ Normal	☐ Normal
☐ Pale	☐ Cool	☐ Wet
☐ Jaundiced		
☐ Cyanosed		

General Appearance

Head/Neck Trachea ☐ - Midline Shifted ☐ - R ☐ - L JVD ☐ - Elevated ☐ - Not Elevated

Chest Air Entry: ☐ = Bilaterally Decreased ☐ - R ☐ - L Breath Sounds: ☐ - Clear ☐ - Wheezes ☐ - Crackles ☐ - Rub ☐ - Absent

Abdomen ☐ - Soft ☐ - Rigid ☐ - Distended ☐ - Tender ☐ - Mass ☐ - Pulsatile ☐ - RU ☐ - LU ☐ - LL ☐ - RL ☐ - Center

Back/Pelvis ☐ - Unremarkable

Extremities ☐ - Unremarkable Peripheral Edema ☐ - Absent ☐ - Present Pedal Pulse ☐ - Absent ☐ - Present

☐ **Further Physical Findings, see procedures**

1881-45 (02/11) 7530-4714

Call Number if more than 1 page	Page ___ of ___

1 2 3 4 5 6 7 8

Coma Scale

Eye Opening	Verbal Response	Motor Response
4 Spontaneous	5 Oriented	6 Obeys Commands
3 To Voice	4 Confused	5 Localize (pain)
2 To Pain	3 Inappropriate words	4 Withdraw (pain)
1 None	2 Incomprehen. Sounds	3 Flexion (pain)
	1 None	2 Extension (pain)
		1 None

CLINICAL TREATMENT / PROCEDURES & RESULTS

Time	Procedure Code	Route	Treatment/Procedure/Medication												Result							Crew Mbr. Initials	Crew Mbr. No.
			Pulse			Respirations			Blood Pressure						GCS			TOTAL GCS	Pupils				
			R	Rh	V	R	Rh	V	Systolic	Diastolic	Temp	ECG CODE	02 Sat	CO2	E	V	M		R ±	L ±			

GENERAL ADMINISTRATION

Intake

Fluid	Pre Trans	Enroute	Total
Total			

Output

Urine		
NG		
Chest Tube		
Other		
Other		
Total		
Fluid Balance		

Altitude	Landing Site ID	Travel Cond.

Remarks / Orders

Pt. Outcome in Emerg.	Pronounced ☐ Admitted ☐ Unknown ☐ Tertiary Trans ☐ Discharged ☐		
Final Primary Problem		Problem Code	Final Status
Base Hospital No.	Base Hospital	Base Hospital Physician Name (If Patch)	
Hospital No.	Receiving facility/destination	Receiving Facility Signature	
Crew Member 1 (Attendant) No.	Name	Signature No. 1	
Crew Member 2 (Driver) No.	Name	Signature No. 2	
Crew Member 3 (Other) No.	Name	Signature No. 3	
Crew Member 4 (Other) No.	Name	Signature No. 4	

CALL EVENTS	Call Received	Crew Notified	Crew Mobile	Arrive Scene	Arrive Patient	Depart Scene	Arrive Dest.	Depart Dest.	Arrive Base	TAT Resp.

1881-45 (02/11) WHITE - Patient Chart BLUE - Billing Office CANARY - Base Hospital PINK - Ambulance Service 7530-4714

STATION CODES

STATION #	PARAMEDIC LEVEL
00	0 EMA
01	7 PRIMARY CARE
02	8 ADVANCED CARE
etc.	6 CRITICAL CARE
	9 PRECEPTOR

STATUS CODES

0 AT BASE
77 MOBILE
88 STANDBY LOCATION
99 MAINTENANCE

DISPATCH PRIORITY CODES

1 DEFERRABLE
2 SCHEDULED
3 PROMPT
4 URGENT
8 STANDBY
9 OUT OF SERVICE / ADMINISTRATION

RETURN PRIORITY CODES

1 DEFERRABLE
2 SCHEDULED
3 PROMPT
4 URGENT
6 TRANSPORT OF DEAD PATIENT

RETURN PRIORITY - NO TRANSPORT

71 NO PATIENT FOUND
72 PATIENT REFUSED
73 PATIENT EXPIRED
74 PATIENT IN POLICE CUSTODY
75 TRANSPORTED BY OTHER AMBULANCE
76 CANCELLED BEFORE SCENE OR PATIENT CONTACT
8 STANDBY
9 OUT OF SERVICE / ADMINISTRATION

PICK-UP CODES

SITE

A AIRPORT / HELIPORT
B APARTMENT / CONDO. BUILDING
C CONSTRUCTION SITE
D MEDICAL OFFICE / CLINIC
E NURSING OUTPOST
F FACTORY / INDUSTRIAL SITE/RAILWAY/DOCKYARD
G HOTEL
H HOSPITAL (Acute & Non-Acute)
I INDOOR SHOPPING MALL
J SINGLE STORE / STRIP MALL
L SCHOOL / COLLEGE / UNIVERSITY
M MINING SITE / QUARRY
N NURSING HOME
O OFFICE BUILDING
P RECREATION FACILITY
Q FARM
R HOUSE / TOWN HOUSE
S STREET / HIGHWAY / ROAD
T SPORTS FIELD / FAIRGROUND / PARK
U STADIUM
V GOLF COURSE
W WATER / BOAT
X RESTAURANT / BAR
Y CASINO
Z OTHER (describe in remarks)

LOCATION

0 < 3 stories
3 ≥ 3 stories

SPECIAL CODES

DELAY / CANCELLED CODES

01 REFUEL
02 TEAM PICK-UP
03 MECHANICAL
04 ESCORT RETURN
05 WEATHER
06 HOSPITAL
07 CREW CHANGE
08 AMBULANCE DELAY
09 DISPATCH DELAY / COMM. PROBLEMS
10 DELAY TO PATIENT CONTACT
11 DIAGNOSTIC TESTING (x-ray, lab etc.)
12 PATIENT STABILIZATION
13 EXTRICATION / TRAPPED PATIENT
14 MEDIC DELAY
15 OTHER DELAY ie, train, language
16 PATIENT EXPIRED
17 PATIENT UNSTABLE FOR TRANSIT
18 PHYSICIAN CANCELLED
19 HIGHER PRIORITY
20 OTHER CANCELLED (see remarks)

SPECIAL CODES (CONT.)

CREW CHANGE

21 FIRST CREW
22 SECOND / LAST CREW
23 THIRD / LAST CREW
24 FOURTH / LAST CREW
25 FIFTH / LAST CREW

RELAY TRIPS

26 FIRST LEG
27 SECOND LEG AND / OR LAST LEG
28 THIRD AND / OR LAST LEG
29 FOURTH AND / OR LAST LEG
30 FIFTH AND / OR LAST LEG

ESCORTS ON BOARD

31 PHYSICIAN ON BOARD / RIDEOUT
32 RN ON BOARD
33 RRT ON BOARD
34 FIREFIGHTERS / 1ST RESPONSE ON BOARD
35 POLICE ON BOARD
36 NEONATE TEAM ON BOARD
37 CRITICAL CARE TEAM ON BOARD
38 NEXT OF KIN ON BOARD
39 ESCORT OTHER

MISCELLANEOUS SPECIAL CODES

41 LEFT PATIENT WITH ALS
42 LEFT PATIENT WITH BLS
43 LEFT PATIENT WITH POLICE/CORONER
44 PARAMEDIC ACCOMPANIED PATIENT IN VEHICLE OTHER THAN AMBULANCE
45 NO PATIENT CARRIED BUT PATIENT CARE RENDERED AT SCENE
46 AMBULANCE ACTED AS MOBILE WAITING ROOM
47 ALTERNATE DISPATCHING
48 DOUBLE DISPATCHING
49 NON-ESSENTIAL CALL (OPINION OF AMBULANCE CREW)
50 EMERGENCY DEPARTMENT NOT READY AFTER BEING NOTIFIED
51 MULTI PICKUP / DESTINATION LOCATIONS
52 ENVIRONMENTAL HAZARD
53 P.A. USED
54 MULTI-PATIENT TRIAGE FUNCTION (2 or more patients)
55 DOCUMENTATION WITH PATIENT
56 PRECEPTOR / STUDENT CREW
57 PRECEPTOR / CONSOLIDATION
58 CORONER NOTIFIED
59 OTHER SPECIAL OCCURENCE (see remarks)

SPECIAL EQUIPMENT USED

61 CARDIAC MONITOR
62 CHEST DRAINAGE SYSTEM
63 C.P.A.P.
64 DEFIBRILLATOR
65 DOPPLER
66 END TIDAL CO_2
67 EXTERNAL PACEMAKER
68 INCUBATOR
69 INFUSION PUMP
70 P.E.E.P.
71 PORTABLE SUCTION
72 MULTI PARAMETER MONITOR
73 PULSE OXIMETER
74 RESPIROMETER
75 SPECIAL CARDIAC EQUIPMENT
76 SUCTION
77 SYRINGE PUMP
78 INTRAAORTIC BALLOON PUMP
79 VENTILATOR
80 OTHER EQUIPMENT USED (see remarks)

PATIENT NOT ACCESSIBLE BY ROAD

91 PATIENT ACCESSIBLE BY BOAT
92 PATIENT ACCESSIBLE BY SNOWMOBILE / ATV
93 PATIENT ACCESSIBLE BY AIRCRAFT
94 PATIENT ACCESSIBLE BY RAIL
95 PATIENT ACCESSIBLE BY WALKING
96 OTHER (see remarks)

PRIMARY/SEC./DSP./FINAL

PROBLEM CODES

VSA

01 CARDIAC / MEDICAL
02 TRAUMATIC

AIRWAY

11 OBSTRUCTION / FOREIGN BODY
12 OBSTRUCTION / ANATOMICAL - MEDICAL AND OTHER
13 DROWNING
14 NEAR DROWNING
15 AIRWAY TRAUMA

BREATHING (Shortness of Breath)

21 RESPIRATORY DISTRESS
22 RESPIRATORY DISEASE (i.e. asthma, bronchitis, emphysema)
24 RESPIRATORY ARREST
25 CHEST TRAUMA
26 INHALATION INJURY

CIRCULATION

31 HEMORRHAGE MINOR
32 HEMORRHAGE / HYPOVOLEMIA MAJOR
33 HYPOTENSION (non-traumatic / non-hemorrhagic unknown cause)
34 SEPSIS (Previously dx by sending facility)
35 VASCULAR INJURY (i.e. aneurysm)
36 SYNCOPE

NEUROLOGICAL

41 STROKE/TIA
42 HEAD/BRAIN TRAUMA
43 ALTERED LOC (unknown)
44 HEADACHE
45 BEHAVIOUR / PSYCHIATRIC
46 SEIZURE / POST ICTAL
47 PARALYSIS / SPINAL TRAUMA
48 CONFUSION / DISORIENTATION
49 UNCONSCIOUS

CARDIAC

51 ISCHEMIC CHEST PAIN
52 CARDIAC TRAUMA
53 PALPITATIONS
54 CHF
55 POST ARREST
56 CARDIOGENIC SHOCK
57 MYOCARDIAL INFARCTION (D_x)
59 OTHER CARDIAC

ABDOMEN / BACK / MUSK / SKEL.

61 ABDOMINAL PAIN NYD
62 BACK PAIN
63 GI PROBLEMS / PAIN / VOMITING / NAUSEA
64 GU PROBLEM / PAIN
65 ABDOMINAL TRAUMA
66 MUSK/SKEL. TRAUMA

OBSTETRICS / NEONATES

71 OBSTETRICAL EMERGENCY
72 GYNECOLOGICAL EMERGENCY
73 NEWBORN / NEONATAL

ENDOCRINE / TOXICOLOGICAL

81 DRUG OVERDOSE
82 POISONING / TOXIC EXPOSURE
83 DIABETIC EMERGENCY
84 LOCAL ALLERGIC REACTION
85 ANAPHYLAXIS
86 ALCOHOL INTOXICATION

OTHER

91 EXPOSURE (Environmental) eg. hypothermia
92 GENERAL ILLNESS / WEAKNESS
93 TREATMENT - DIAGNOSTIC / RETURN
94 CONVALESCENT / INVALID / RETURN HOME
95 INFECTIOUS DISEASE
96 ORGAN RETRIEVAL
97 ORGAN DONOR
98 ORGAN RECIPIENT
99 OTHER MEDICAL / TRAUMA (see remarks)

DISPATCH ONLY CODES

06 UNKNOWN
07 TRAUMA UNKNOWN
08 MVC
09 LIFT ASSIST

TRAUMA INJURY CODES

A LOCATION

10 HEAD / FACE/EAR / SCALP
11 EYE
12 NECK (C SPINE)
13 SHOULDER
14 BACK (T & L SPINE) / FLANK
15 CHEST
16 ABDOMEN
17 PELVIS / HIP (S SPINE)
18 GENITO URINARY
19 BUTTOCKS - PERINEUM
20 ARM (Upper, elbow, forearm, wrist)
21 HAND / FINGER
22 THIGH
23 LEG (Knee, lower leg, ankle)
24 FOOT / TOES

B INJURY TYPE:

30 ABRASION
31 AMPUTATION
32 AVULSION
33 BURN
34 BLUNT
35 CRUSH
36 CONTUSION
37 PENETRATING / PERFORATION
38 POSSIBLE FRACTURE / DISLOCATION
39 LACERATION
40 SPRAIN / STRAIN
41 OTHER (Detail in incident Hx)

C MECHANISM

50 ASSAULT
51 DROWNING
52 ELECTROCUTION
53 FALL (Same level)
54 FALL FROM HEIGHT / DIVING
55 GUNSHOT
56 HANGING
57 MACHINERY
58 MVC
59 MOTORCYCLE / RECREATIONAL VEHICLE
60 PEDAL BICYCLE
61 PEDESTRIAN STRUCK
62 SPORTS
63 STABBING
64 FIRE / EXPLOSION / THERMAL
65 OTHER (Detail mechanism in Incident Hx)

ECG CODES

TACHYCARDIAS

10 SINUS TACH
11 PSVT / SVT / ATRIAL TACH
12 ATRIAL FLUTTER
13 ATRIAL FIB (TACHY)
14 VENTRICULAR TACHYCARDIA (with pulse)

BRADYCARDIA / BLOCKS

20 SINUS BRADYCARDIA
21 1st° BLOCK
22 2nd° BLOCK
23 3rd° BLOCK

ARREST

30 VENTRICULAR FIBRILLATION
31 PULSELESS V-TACH
32 PEA (AGONAL RHYTHM / IDIOVENTRICULAR)
33 ASYSTOLE

SINUS RHYTHM / OTHER RHYTHMS

40 NSR
41 ATRIAL FIB < 100
42 PACED RHYTHM
43 JUNCTIONAL RHYTHM
44 SINUS RHYTHM (Rate 60 to 100 i.e. PAC's, PJC's, etc.)
45 PVCS
46 OTHER (Detail in procedures)

VITAL SIGN CODES

PULSE

Rhythm	Volume
R Regular	F Full
I Irregular	W Weak
	T Thready
	B Bounding

RESPIRATIONS

Rhythm	Volume
R Regular	F Full
I Irregular	S Shallow
A Agonal	D Deep
	L Laboured

FINAL PATIENT STATUS

(Destination vs. First Contact)

1 MUCH BETTER
2 MODERATELY BETTER
3 SLIGHTLY BETTER
4 NO CHANGE
5 SLIGHTLY WORSE
6 MODERATELY WORSE
7 MUCH WORSE

TRAVEL CONDITIONS

1 ALTITUDE RESTRICTION (PT. CONDITION)
2 TURBULENCE
3 SEVERE WEATHER
4 POOR ROAD CONDITIONS
5 FOG
6 GOOD ROAD / FLIGHT CONDITIONS
7 OTHER (see remarks)

IV PROCEDURES
340 IV MONITORING
342 IV SALINE LOCK
343 IV HEPARIN LOCK
344 RINGERS LACTATE
345 NORMAL SALINE
346 D5W
347 2/3 - 1/3
348 PENTASPAN
349 OTHER IV SOLUTIONS
350 IV ATTEMPT UNSUCCESSFUL
351 FLUID BOLUS
352 BLOOD SAMPLING - GLUCOSE DETERMINATION
353 BLOOD SAMPLING - VENOUS
354 BLOOD SAMPLING - ARTERIAL
355 IV DISCONTINUED BY PROVIDER (INTENTIONAL)
356 IV REMOVED (UNINTENTIONAL)
357 CENTRAL VENOUS LINE MAINTENANCE
358 INTRAOSSEOUS INFUSION INITIATION
359 UNSUCCESSFUL INTRAOSSEOUS INFUSION INITIATION

MISCELLANEOUS PROC./THERAPY
360 BLOOD / BLOOD PRODUCT ADMINISTRATION
362 LAB VALUE INTERPRETATION - Interpretation of hospital lab tests (Critical Care)
363 URINARY CATHETERIZATION
364 X-RAY INTERPRETATION
365 DOPPLER
366 PRONOUNCEMENT OF DEATH
370 OTHER BLS PROCEDURES - detail in procedures section
371 OTHER ALS PROCEDURES - detail in procedures section
380 OTHER ALS AIRWAY INTERVENTION
381 UNSUCCESSFUL - OTHER ALS AIRWAY INTERVENTION
400 BASE HOSPITAL PHYSICIAN PATCH
401 RECEIVING HOSPITAL PATCH
402 BHP PATCH PHONE/RADIO FAILURE
403 BHP PATCH - NO RESPONSE

ROUTES OF ADMINISTRATION
AE AEROSOL
ET ENDOTRACHEAL
IM INTRA MUSCULAR
IV INTRA VENOUS
NB NEBULIZED
PO ORAL
PR RECTAL
SL SUBLINGUAL
SQ SUBCUTANEOUS
TQ TRANSCUTANEOUS
IO INTRAOSSEOUS
GT NASO OR ORAL GASTRIC TUBE

PROCEDURES / THERAPY
010 VITAL SIGNS
020 BLS ASSESSMENT
030 ALS ASSESSMENT
100 DRESSING
101 CONTROL BLEEDING
105 IMMOBILIZATION - HEAD
110 IMMOBILIZATION - OTHER
111 CERVICAL COLLAR
112 SPINAL BOARD
113 K.E.D.
114 TRACTION SPLINT
115 SCOOP STRETCHER
116 STAIR CHAIR
120 SUCTION
130 OXYGEN HIGH CONC. MASK
131 OXYGEN SIMPLE FACE MASK
132 OXYGEN NASAL CANNULA
133 OXYGEN OTHER
141 OXYGEN BVM
142 OXYGEN (MECHANICAL)
143 OXYGEN JET VENTILATION
144 OXYGEN POCKET MASK
150 EXTRICATE PATIENT - e.g. remove from small room where care cannot be provided.
160 OB DELIVERY
170 ORO / NASOPHARYNGEAL AIRWAY
171 LMA
180 RESTRAIN PATIENT - PHYSICAL
181 RESTRAIN PATIENT - CHEMICAL
190 THRUST ABD/CHEST
200 CPR
211 SYMPTOM ASSIST MEDICATION - e.g. assisted pt. with own meds
231 PT. TRANSPORTED SUPINE
232 PT. TRANSPORTED SEMI-PRONE
233 PT. TRANSPORTED PRONE
234 PT. TRANSPORTED SEMI-SITTING
235 PT. TRANSPORTED SITTING
236 AMBULATORY
237 PT. LEFT LATERAL (OB)
238 TRENDELENBURG

PROCEDURES / THERAPY
CARDIAC RESUSCITATION PROCEDURES
301 CARDIAC MONITOR / RHYTHM INTERPRETATION - i.e interpret a rhythm strip
302 CARDIOVERSION
303 VALSALVA MANOEUVRE
304 CAROTID SINUS MASSAGE
305 PRE-CORDIAL THUMP
306 DEFIBRILLATION - MANUAL
307 DEFIBRILLATION - SEMI AUTOMATIC
308 ANALYZE - AUTOMATED DEVICE (analyze, no shock delivered)
309 EXTERNAL PACING
310 TRANSVENOUS PACING
311 ARTERIAL LINE MONITORING
312 PULMONARY ARTERY LINE MONITORING
313 12 LEAD INTERPRETATION
314 INTRAAORTIC BALLOON PUMP MONITORING
315 SWAN-GANZ MONITORING
316 RETURN OF SPONTANEOUS CIRCULATION
317 RETURN OF SPONTANEOUS RESPIRATIONS

AIRWAY / BREATHING PROCEDURES
320 NEEDLE THORACOSTOMY
321 UNSUCCESSFUL NEEDLE THORACOSTOMY
322 NEEDLE/SURGICAL CRICOTHYROIDOTOMY
323 UNSUCCESSFUL NEEDLE/SURGICAL CRIC.
324 NASO-TRACHEAL INTUBATION
325 UNSUCCESSFUL E.T.T.- NASAL
326 ORO-TRACHEAL INTUBATION
327 UNSUCCESSFUL E.T.T. - ORAL
328 E.T.T. SUCTIONING
329 ORAL/NASAL GASTRIC INTUBATION
330 UNSUCCESSFUL ORAL/NASAL G.T.
331 LARYNGOSCOPY / FOREIGN BODY REMOVAL / McGILL FORCEPS
332 UNSUCCESSFUL ATTEMPT - LARYN./FB REMOVAL /McGILL
333 EXTUBATION BY PROVIDER (INTENTIONAL)
334 EXTUBATION (UNINTENTIONAL)
335 CHEST DRAINAGE MONITORING & MAINTENANCE
336 RESPIRATORY SYSTEM EVAL. ($ETCO_2$ AND SAO_2)
337 E.T. TUBE VERIFICATION
338 SpO_2
339 PEEP
380 ALTERNATIVE AIRWAY
381 UNSUCCESSFUL ALT. AIRWAY

MEDICATIONS
500 ADENOSINE (ADENOCARD)
501 AMINOPHYLLINE
502 AMIODARONE
503 ANTIBIOTIC
504 ASA (Aspirin)
505 ATROPINE
506 ACETYCLSTEINE SODIUM (MUCOMYST)
510 BETA BLOCKER
520 CALCIUM CHLORIDE 10%
521 CHARCOAL (ACTIVATED)
530 D50W
531 DIAZEPAM (VALIUM)
532 DIGOXIN (LANOXIN)
533 DIMENHYDRINATE (GRAVOL)
534 DIPHENHYDRAMINE (BENADRYL)

MEDICATIONS
535 DOBUTAMINE (DOBUTREX)
536 DOPAMINE
537 DEXAMETHASONE
540 EPINEPHRINE 1:1000
541 EPINEPHRINE 1:10,000
542 ERGONOVINE
543 ESMOLOL
550 FENTANYL (SUBLIMAZE)
551 FUROSEMIDE (LASIX)
552 FOMEPIZOLE (ANTIZOL)
560 GLUCAGON
561 GLUCOSE ORAL
565 HALDOL
569 HEMOBATE
570 HEPARIN
571 HEPARIN (LOW MOLECULAR WEIGHT)
572 HEPARIN LOCK SOLUTION
573 HYDRALAZINE (APRESOLINE)
580 INSULIN
581 IPRATROPIUM BROMIDE (ATROVENT)
582 ISOPROTERENOL (ISUPREL)
583 INDERAL
590 LABETALOL
591 LIDOCAINE (BOLUS)
592 LIDOCAINE (DRIP)
593 LIDOCAINE TOPICAL
594 LORAZEPAM (ATIVAN)
600 MAGNESIUM SULPHATE
601 MANNITOL
602 MEPERIDINE (DEMEROL)
603 MIDAZOLAM (VERSED)
604 MORPHINE
605 METHYLPREDNISOLONE
606 METOPROLOL
610 NALOXONE (NARCAN)
612 NITROGLYCERINE PASTE
613 NITROGLYCERINE TABLET
614 NITROGLYCERINE INFUSION
615 NITROLINGUAL SPRAY .4 MG/SPRAY
616 NITROUS OXIDE
617 NOREPINEPHERINE INFUSION (LEVOPHED)
618 NIFEDIPINE
620 OXYTOCIN (SYNTOCINON)
630 PANCURONIUM (PAVULON)
631 PHENOBARBITOL (LUMINAL)
632 PHENYTOIN (DILANTIN)
633 PHENYLEPHRINE 0.5% NASAL SPRAY
634 PHENYLEPHRINE INFUSION
635 POTASSIUM CHLORIDE
636 PROCAINAMIDE (PRONESTYL)
640 RACEMIC EPINEPHRINE (VAPONEFRIN)
641 RITODRINE
645 ROCURONIUM
646 RETEPLASE (RETAVASE)
650 SALBUTAMOL (VENTOLIN)
651 SODIUM BICARBONATE
652 SODIUM NITROPRUSSIDE (NIPRIDE)
653 STREPTOKINASE
654 STEROIDS
655 SUCCINYLCHOLINE (ANECTINE)
660 THIAMINE (VITAMIN B1)
661 TPA
680 VECURONIUM (NORCURON)
681 VERAPAMIL (ISOPTIN)
682 XYLOMETAZOLINE (Otrivine)
699 DISCONTINUE MEDICATION - explanation required
700 OTHER DRUGS - detail in procedures area
800 STUDY DRUGS - detail in procedures area

Aid to Capacity Evaluation
(Record details in 'Remark's section)

Indicate to whom this assessment refers if not the patient (e.g.: parent, or substitute decision maker) ____________________

Patient verbalizes/communicates understanding of clinical situation? (e.g. "what is wrong with you?")	☐ YES	☐ NO
Patient verbalizes/communicates appreciation of applicable risks? (e.g. "what could happen if I don't help you?")	☐ YES	☐ NO
Patient verbalizes/communicates ability to make alternative plan for care? (e.g. "what will you do once I leave?")	☐ YES	☐ NO
Responsible adult on scene	☐ YES	☐ NO

Responses in shaded areas require consideration of incapacity

Refusal of service/Refus de service

I have been advised that I should have treatment and that treatment is available immediately, I refuse such treatment and transportation to hospital having been informed of the risks involved. I assume full responsibility arising out of such refusal.

J'ai été informé que je devrais me faire soigner et que je pouvais recevoir des soins immédiatement. Je refuse les soins et le transport à l'hôpital en toute connaissance des risques auxquels cette décision m'expose. J'assume l'entière responsabilité de ce refus.

Patient/substitute decision maker - Print name and address / Patient(e) ou personne prenant les décisions en son nom - Nom et adresse en lettres moulées

Relationship to patient / Lien de parenté avec le (la) patient(e)	Signature of Patient or substitute Decision Maker / Signature du (de la) patient(e) ou de la personne prenant les décisions en son nom
Time - Hours / Heure	Signature of First witness / Signature du 1[er] témoin
Date 20	Signature of Second witness / Signature du 2[e] témoin

I have advised this patient or the party responsible for the above noted action of the risks to the patients health that are involved.
J'ai informé ce malade ou la personne responsable de la décision ci-dessus des risques que cette décision pouvait entraîner pour la santé du malade.

Time - Hours / Heure	Date 20	Signature

I was witness to the above-mentioned being given. / J'étais présent lorsque le patient a été informé des faits ci-dessus.

Time - Hours / Heure	Date 20	Signature

Appendix B

EMS Calls between Years - 2006 versus 2011

EMS Calls between Years - 2006 versus 2011 (modeled against 2006)

Variable	**Unadjusted OR (95% CI) (*=significant)**	**Unadjusted OR (95% CI) (*=significant)**	**Unadjusted OR (95% CI) (*=significant)**
	University (*n* = 3,974)	**Community (*n* = 12,512)**	**Region (*N* = 16,577)**
Age (16-24)			
Mean (SD)	1.10 (1.04-1.16)	0.96 (0.93-0.98)	0.98 (0.96-1.00)
Age of Majority ($\geq$ 19)	1.30 (1.00-1.70) *	0.77 (0.67-0.88) *	0.84 (0.75-0.95)
Gender			
Male	1.08 (0.87-1.35)	1.04 (0.91-1.18)	1.04 (0.93-1.16)
Patient Characteristics			
Presence of Alcohol	0.68 (0.54-0.86) *	0.95 (0.80-1.13)	0.82 (0.71-0.94)
Glasgow Coma Scale ($\leq$ 8)	2.59 (1.79-3.98) *	2.74 (2.10-3.58) *	2.69 (2.15-3.37) *
CTAS 0 (not assigned)	1.47 (0.70-3.10) *	2.02 (1.31-3.10) *	1.87 (1.29-2.71) *
CTAS 1	1.42 (0.29-6.99) *	5.17 (2.13-12.60) *	3.80 (1.77-8.16) *
CTAS 2	1.71 (0.78-3.72) *	3.21 (2.05-5.02) *	2.77 (1.88-4.07) *
CTAS 3	1.82 (0.88-3.77) *	3.28 (2.15-4.99) *	0.95 (0.77-1.18)
CTAS 4	1.58 (0.76-3.30) *	2.72 (1.77-4.19) *	2.36 (1.63-3.42) *
CTAS 5	1.0 (ref)	1.0 (ref)	1.0 (ref)
Level of Care (Advanced)	0.96 (0.76-1.22)	1.06 (0.93-1.21)	1.04 (0.92-1.17)
Treatment Prior to EMS	0.97 (0.87-1.24)	1.13 (0.99-1.29)	1.11 (0.99-1.24)

Variable	Unadjusted OR (95% CI) (*=significant)	Unadjusted OR (95% CI) (*=significant)	Unadjusted OR (95% CI) (*=significant)
	University (*n* = 3,974)	**Community (*n* = 12,512)**	**Region (*N* = 16,577)**
Pick Up Location			
Residence	0.99 (0.79-1.24)	0.70 (0.62-0.79) *	0.77 (0.70-0.86) *
School	0.70 (0.60-1.04) *	1.38 (1.05-1.81) *	0.99 (0.82-1.18)
Bar	1.59 (1.04-2.42) *	0.93 (0.67-1.29)	1.14 (0.86-1.44)
Street	1.07 (0.82-1.38)	1.23 (1.08-1.41) *	1.20 (1.07-1.35)
Transport Codes			
Deferrable	6.85 (0.88-53.34) *	1.59 (0.87-2.90) *	1.88 (1.07-3.30) *
Prompt	9.71 (1.26-75.10) *	2.37 (1.31-4.28) *	2.79 (1.60-4.86) *
Emergent	7.71 (0.92-64.54) *	2.52 (1.31-4.85) *	2.83 (1.54-5.21) *
No Patient Found	< 0.0001 (< 0.0001-> 999.9)	2.31 (0.14-39.31) *	0.96 (0.09-9.87)
Patient Refused	7.69 (0.98-60.05) *	1.47 (0.80-2.69) *	1.84 (1.04-3.23) *
Patient Expired	6.00 (0.26-140.05) *	0.69 (0.17-2.86) *	0.96 (0.27-3.38)
Patient in Police Custody	1.0 (ref)	1.0 (ref)	1.00 (ref)
Transport of Patient	1.22 (0.92-1.61) *	1.50 (1.28-1.75) *	1.42 (1.24-1.63) *
Call Generation			
Sunday	1.00 (0.70-1.43)	0.96 (0.78-1.19)	0.96 (0.85-1.08)
Monday	1.05 (0.69-1.59)	0.98 (0.78-1.24)	0.69 (0.61-0.80) *
Tuesday	0.88 (0.58-1.34)	1.05 (0.83-1.32)	0.74 (0.65-0.84) *
Wednesday	1.27 (0.84-1.91) *	1.17 (0.93-1.46)	0.66 (0.58-0.76) *
Thursday	1.36 (0.94-1.97) *	1.21 (0.96-1.53) *	0.94 (0.83-1.07)
Friday	0.82 (0.56-1.20)	1.03 (0.82-1.28)	0.81 (0.72-0.92)
Saturday	1.0 (ref)	1.0 (ref)	1.00 (ref)
Night (8:00pm-7:00am)	0.84 (0.67-1.06)	0.89 (0.78-1.71)	0.86 (0.77-0.96)
Weekday (Mon-Thurs)	1.20 (0.96-1.51) *	1.11 (0.97-1.26)	1.14 (1.02-1.27)

Call Generation			
Victoria Day Weekend	0.29 (0.03-2.47) *	0.82 (0.45-1.50)	0.76 (0.43-1.35) *
St Patrick's Day	1.45 (0.29-7.21) *	2.37 (0.59-9.49) *	1.87 (0.67-5.26) *
Frosh Week	0.47 (0.24-0.91) *	1.16 (0.73-1.84)	0.81 (0.56-1.18)
Oktoberfest	0.65 (0.31-1.39) *	0.84 (0.57-1.20)	0.80 (0.56-1.13) *

Variable	**Unadjusted OR (95% CI) (*=significant)**	**Unadjusted OR (95% CI) (*=significant)**	**Unadjusted OR (95% CI) (*=significant)**
	University (*n* = 3,974)	**Community (*n* = 12,512)**	**Region (*N* = 16,577)**
Times			
Scene Time ≤ 10 min	0.75 (0.54-1.03) *	0.80 (0.67-0.96) *	0.79 (0.67-0.92) *
Scene Time 11-20 min	0.87 (0.65-1.17)	0.94 (0.80-1.11)	0.92 (0.80-1.07)
Scene Time > 20 min	1.0 (ref)	1.0 (ref)	1.00 (ref)
Response (mean/SD)	0.93 (0.90-0.96)	0.96 (0.95-0.98)	0.96 (0.95-0.97)
Scene (mean/SD)	1.01 (1.00-1.03)	1.01 (1.00-1.02)	1.01 (1.00-1.02)
Total Call Time (mean/SD)	1.00 (0.99-1.01)	1.00 (1.00-1.01)	1.00 (1.00-1.01)

Appendix C

Recommendations

Recommendations

As key stakeholders in our community, the following findings and proposed recommendations will be shared accordingly with Wilfrid Laurier University, University of Waterloo, Conestoga College and the Region of Waterloo Emergency Medical Services. The purpose of these recommendations is to raise awareness amongst the stakeholders with respect to the current behavior of students as it relates to alcohol use, and to provide steps creating a safer and healthier community for students.

A) Key findings related to use of alcohol by university students:

- increase in alcohol-related EMS calls
- increase in number of EMS calls during Frosh Week
- appropriate use of EMS (incidents of minor illness and injury not necessarily requiring EMS transport)
- high incidence of patient refusals for EMS transport (implication: potential for compromised student safety after departure of EMS)
- low incidence of first aid intervention provided prior to arrival of EMS supporting the need for education program on campus

Relevant Stakeholders:

- University Federation of Students
- University Administrators

Recommendation #1:

- educate students on the implications of their behaviour, as it relates to alcohol use, and the frequent requirement for medical services

Rationale

- to create social change through increased student awareness
- reduce the number of students who are drinking inappropriately

Recommendation #2:

- promote Smart Serve Responsible Alcohol Training Program for students

Rationale:

- to promote responsible alcohol service and consumption that is aligned with public safety within the community
- to promote a change in culture and behaviour as it relates to alcohol consumption, sales, and service

B) Key findings related to use of EMS

- high number of EMS calls in the university area on weekends, at night, and during Frosh Week
- high number of patient refusals in the university area when alcohol is involved, specifically during weekends and at night
- high incidence of minor illness and injury associated with the university population

Relevant Stakeholders:
- Region of Waterloo EMS

Recommendation #1:
- increase EMS staffing in the university area particularly on weekends (Thursday to Sunday), at night (8pm-3am), and during Frosh Week

Rationale
- to provide EMS coverage reflective of actual 9-1-1 call generation

Recommendation #2:
- staff single-paramedic response unit(s) in the university area

Rationale
- the high number of patient refusals in this area supports non-transport capable EMS response

Recommendation #3:
- staff ambulances in the university area with Basic Life Support paramedics

Rationale
- the high incidence of minor illness and injury associated with the university population supports appropriate EMS care through BLS procedures

Recommendation #4:
- adjust Ambulance Call Report to include ‘student’ and ‘alcohol’ identifier sections

Rationale
- to determine cost-analysis for EMS service for the university population
- to accurately identify patients associated with the university
- to accurately identify alcohol-related EMS 9-1-1 calls

Recommendation #5:

- investigate 'problem codes' for the young adult population accessing EMS
- investigate specific treatment modalities for the young adult population accessing EMS

Rationale

- to provide a clearer picture of 9-1-1 trends within the community and medical treatments required for this demographic

C) Key findings related to treating alcohol-related illness and injury

- high incidence of minor illness and injury associated with the university population
- increase of alcohol-related EMS calls by university population

Relevant Stakeholders:

- Region of Waterloo EMS
- Grand River Hospital
- St. Mary's General Hospital
- University of Waterloo Health Services

Recommendation #1:

- examine the treatment patients from the university population receive in hospital for minor illnesses, injuries, and uncomplicated alcohol-related EMS calls

Rationale

- to identify the scope of treatment required to provide medical care for this population

Recommendation #2:

- develop an alternative care model to replace hospital transport of university students presenting with uncomplicated alcohol-related issues
    - increased staffing and clinic hours at the University of Waterloo Student Medical Clinic
    - shared partnership of the after-hours Student Medical Clinic between the University of Waterloo and Wilfred Laurier University

Rationale

- to alleviate the patient load on local hospitals
- to provide timely and appropriate medical care to the student population

Table 1. *Variables of Interest*

Variable	**Description**	**Coding Strategy**
Age	Patient age will be calculated based on the day, month and year as found on the PCR.	Continuous variable
Gender	Male or female.	Male (0) Female (1)
Treatment Prior to EMS	This variable indicates whether the patient received medical treatment prior to the arrival of EMS.	Patient received treatment prior to arrival of EMS (1). Patient did not receive treatment prior to arrival of EMS (0).
CTAS Level (Canadian Triage Acuity Scale)	This variable is a one-digit code that categorizes the severity of the patient's current illness or injury.	1=resuscitation 2=emergent 3=urgent 4=less urgent 5=non-urgent
GCS (Glasgow Coma Scale)	GCS is a standardized measure used to evaluate and quantify a patient's degree of coma. The scale is comprised of three measurements – eye opening, verbal response, and motor response. Each measurement is expressed as a discrete value. The three measures are added together to obtain a score between 3 and 15, with a score of 8 or less indicating coma. The cumulative GCS score will be the variable utilized for all analyses.	Patient has a GCS of 8 or less (1). Patient has a GCS of 9 or more (0).
Primary & Secondary Chief Complaint / Final Assessment of Problem	These problem codes are assigned by the paramedics based on the patient's main / contributing problem. A list of 63 problem codes can be found on the reverse of the ambulance call report (ACR) (Appendix).	Each code was categorized into one of the following categories: 1=cardiac arrest 2=respiratory 3=trauma 4=medical 5=neurological 6=cardiac

		7=obs/gyn 8=toxicological 9=environmental 10=psychiatric 11=other
Day of call	Day of week call occurred.	1=Sunday 2=Monday 3=Tuesday 4=Wednesday 5=Thursday 6=Friday 7=Saturday
Date of call	Day / Month / Year of call	DDMMYY
Hour of Call	EMS operates 24 hours per day.	Continuous variable. Also coded as a categorical variable: Call occurred during the day (7:00am-8:00pm) (1). Call did not occur during the day (8:00pm-7:00am) (0).
Pick-up Code	Indicates where the patient was picked up by EMS. A list of 25 pick-up codes can be found on the reverse of the ACR.	Categorical variable. Each of the codes was categorized into one of the following codes: 1=apt / condo 2=medical office 3=single store / mall 4=recreation facility 5=house / townhouse 6=street / hwy / road 7=sportsfield / park 8=stadium 9=restaurant / bar
Transport Code	The priority code assigned to the call when the paramedic crew transports/does not transport the patient.	1=deferrable 3=prompt 4=emergent 71=no patient found 72=patient refused 73-patient expired

		74=patient in police custody
Response Time	The length of time between *Crew Notified* to *Arrive Scene / Arrive Patient*	Continuous variable.
Scene Time	The length of time between the crew *Arrive Patient* (the time arrived and was close enough to touch the patient in hours/minutes) and the crew *Depart Scene* (the time the crew left the scene of the call and was Enroute to the receiving facility in minutes).	Continuous variable.
Total Time	The length of time from the *Call Received* (the time the dispatcher at ambulance dispatch obtained sufficient information to prioritize the call and dispatch an ambulance in hours/minutes) to the *Arrive Destination* (e.g. hospital) in minutes.	Continuous variable.
Scene Time Group	Time on scene was grouped into three categories.	Time on scene was $\leq$ 10 minutes (0). Time on scene was 10-20 minutes (1). Time on scene was > 20 minutes. (2)
UTM Location	This is a geographic coordinate system used to identify locations. It consists of a six-digit code; the first 3 digits relate to meters to the east (referred to as "easting"); the last 3 digits relate to meters to the north (referred to as "northing").	Patient lived within 'university community' (1) Patient did not live within 'university community' (0);

Table 2. *Community versus University on all EMS Calls (modeled against being in the university group) (N =16,577)*

Variable	**Community (*n* = 12,512)**	**University (*n* = 3,974)**	**Unadjusted OR (95% CI) (*=significant)**
	% (n)		
Age (16-24)			
Mean (SD)	19.9 (2.5)	20.1 (2.0)	1.03 (1.01-1.04)
Age of Majority (≥19)	66.6. (8335)	76.7 (3048)	1.65 (1.52-1.80) *
Gender			
Male	50.6 (6331)	52.8 (2099)	1.11 (1.03-1.19)
Patient Characteristics			
Presence of Alcohol	16.5 (2058)	33.9 (1346)	2.61 (2.41-2.84) *
Glasgow Coma Scale (≤ 8)	7.3 (911)	8.0 (317)	1.15 (1.01-1.32)
CTAS 0 (not assigned)	25.4 (3173)	23.7 (941)	0.96 (0.77-1.20)
CTAS 1	0.8 (95)	0.5 (18)	0.59 (0.34-1.02) *
CTAS 2	11.9 (1490)	9.7 (384)	0.80 (0.64-1.02) *
CTAS 3	37.4 (4674)	35.7 (1420)	0.95 (0.77-1.18)
CTAS 4	21.6 (2705)	27.5 (1091)	1.26 (1.02-1.57) *
CTAS 5	3.0 (375)	3.0 (120)	1.0 (ref)
Level of Care (Advanced)	32.3 (4037)	33.4 (1329)	1.04 (0.96-1.13)
Treatment Prior to EMS	35.9 (4497)	29.9 (1189)	0.77 (0.71-0.83) *
Pick Up Location			
Residence	48.2 (6030)	39.6 (1575)	0.71 (0.66-0.76) *
School	5.0 (619)	22.0 (875)	5.4 (4.86-6.06) *
Bar	3.2 (403)	6.0 (239)	1.92 (1.63-2.27) *
Street	28.6 (3578)	21.7 (862)	0.69 (0.64-0.75) *

*due to missing data not all ‘n’ equal ‘N’

Table 2 Cont'd

Variable	**Community (*n* = 12,512)**	**University (*n* = 3,974)**	**Unadjusted OR (95% CI) (*=significant)**
	% (n)		
Transport Codes			
Deferrable	21.4 (2677)	26.6 (1057)	1.77 (1.25-2.51) *
Prompt	48.3 (6040)	46.4 (1843)	1.37 (0.97-1.93) *
Emergent	4.9 (613)	3.3 (132)	0.96 (0.65-1.42)
No Patient Found	0.2 (29)	0.2 (7)	1.12 (0.40-3.16)
Patient Refused	21.7 (2719)	21.5 (856)	1.42(1.00-2.01) *
Patient Expired	0.4 (52)	0.3 (13)	1.04 (0.48-2.25)
Patient in Police Custody	1.6 (199)	1.1 (43)	1.00 (ref)
Transport of Patient	75.7 (9330)	76.8 (3033)	1.06 (0.97-1.15)
Call Generation			
Sunday	15.3 (1913)	17.4 (692)	0.96 (0.85-1.08)
Monday	12.9 (1608)	10.5 (418)	0.69 (0.61-0.80) *
Tuesday	12.8 (1599)	11.3 (447)	0.74 (0.65-0.84) *
Wednesday	12.8 (1595)	10.1 (402)	0.66 (0.58-0.76) *
Thursday	13.0 (1624)	14.7 (583)	0.94 (0.83-1.07)
Friday	15.2 (1905)	14.8 (586)	0.81 (0.72-0.92)
Saturday	18.1 (2268)	21.3 (846)	1.00 (ref)
Night (8:00pm-7:00am)	45.8 (5730)	60.5 (2404)	1.81 (1.68-1.95) *
Weekday (Mon-Thurs)	48.6 (6986)	53.5 (2124)	0.82 (0.76-0.88)
Victoria Day Weekend	1.1 (140)	1.0 (38)	0.81 (0.55-1.17)
St Patrick's Day	0.3 (36)	0.4 (17)	1.39 (0.77-2.50) *
Frosh Week	1.9 (234)	3.9 (155)	2.17 (1.76-2.68) *
Oktoberfest	2.5 (310)	3.0 (118)	1.21 (0.97-1.50) *
Times			
Scene Time $\leq$ 10 min	32.5 (3938)	34.0 (1312)	1.18 (1.06-1.32)
Scene Time 11-20 min	47.6 (5771)	48.6 (1876)	1.15 (1.04-1.28)
Scene Time > 20 min	20.0 (2420)	17.4 (673)	1.00 (ref)
Response (mean/SD)	8.4 (4.4)	6.8 (3.6)	0.89 (0.88-0.90)
Scene (mean/SD)	15.2 (9.4)	14.5 (8.3)	0.99 (0.99-1.00)
Total Call Time (mean/SD)	32.7 (14.3)	28.6 (11.1)	0.97 (0.97-0.97)

Table 3. *Community versus University on Alcohol-Related EMS Calls (modeled against being in the university group) (n = 3,422)*

Variable	**Community (*n* = 2,058)**	**University (*n* = 1,346)**	**Unadjusted OR (95% CI) (*=significant)**
	% (n)		
Age (16-24)			
Mean (SD)	20.0 (2.34)	19.9 (1.84)	0.98 (0.94-1.01)
Age of Majority (≥19)	70.3 (1446)	75.3 (1013)	1.30 (1.11-1.52) *
Gender			
Male	64.3 (1322)	60.1 (808)	0.84 (0.73-0.97)
Patient Characteristics			
Glasgow Coma Scale (≤ 8)	9.5 (195)	11.7 (157)	1.34 (1.07-1.68) *
CTAS 0 (not assigned)	23.9 (491)	22.8 (307)	1.00 (0.64-1.58)
CTAS 1	0.5 (10)	0.4 (5)	0.76 (0.24-2.40) *
CTAS 2	14.8 (305)	10.9 (147)	0.72 (0.45-1.16) *
CTAS 3	35.0 (720)	34.8 (468)	0.99 (0.63-1.53)
CTAS 4	23.3 (479)	28.5 (384)	1.22 (0.78-1.90) *
CTAS 5	2.6 (53)	2.6 (35)	1.0 (ref)
Level of Care (Advanced)	41.7 (859)	41.7 (561)	0.97 (0.85-1.12)
Treatment Prior to EMS	41.6 (856)	30.8 (415)	0.63 (0.55-0.73) *
Pick Up Location			
Residence	52.4 (1079)	39.7 (534)	0.59 (0.52-0.69) *
School	5.1 (104)	3.0 (40)	0.60 (0.41-0.87) *
Bar	7.1 (147)	10.7 (144)	1.56 (1.22-1.99) *
Street	32.9 (678)	29.1 (391)	0.84 (0.73-0.98)

*due to missing data not all ‘n’ equal ‘N’

Table 3 Cont'd

Variable	Community (*n* = 2,058)	University (*n* = 1,346)	Unadjusted OR (95% CI) (*=significant)
	% (n)		
Transport Codes			
Deferrable	23.2 (477)	27.1 (365)	2.24 (1.40-3.56) *
Prompt	47.8 (983)	46.7 (629)	1.87 (1.19-2.96) *
Emergent	5.3 (109)	3.3 (45)	1.18 (0.67-2.08)
No Patient Found	0.2 (4)	0.3 (4)	5.85 (1.01-33.81) *
Patient Refused	18.2 (375)	19.8 (266)	2.14 (1.33-3.43) *
Patient Expired	0.2 (3)	0.00 (0)	< 0.001 (< 0.001-> 999.999)
Patient in Police Custody	4.1 (85)	2.2 (29)	1.00 (ref)
Transport of Patient	77.1 (1569)	77.7 (1039)	1.00 (0.84-1.18)
Call Generation			
Sunday	25.6 (526)	25.5 (343)	0.93 (0.77-1.11)
Monday	6.0 (124)	3.9 (53)	0.64 (0.45-0.90) *
Tuesday	6.3 (130)	4.9 (66)	0.68 (0.49-0.95) *
Wednesday	7.5 (154)	4.7 (63)	0.59 (0.43-0.81) *
Thursday	7.9 (162)	11.4 (153)	1.38 (1.07-1.78) *
Friday	15.2 (312)	16.2 (218)	1.01 (0.81-1.25)
Saturday	31.6 (650)	33.4 (450)	1.00 (ref)
Night (8:00pm-7:00am)	82.2 (1692)	93.4 (1257)	3.02 (2.36-3.87) *
Weekday (Mon-Thurs)	27.7 (570)	24.9 (335)	0.86 (0.74-1.01)
Victoria Day Weekend	1.5 (30)	1.3 (18)	0.94 (0.51-1.69)
St Patrick's Day	0.2 (4)	0.7 (9)	3.03 (0.91-10.08) *
Frosh Week	1.7 (35)	5.4 (72)	3.18 (2.09-4.82) *
Oktoberfest	2.9 (60)	3.9 (53)	1.37 (0.94-2.00) *
Times			
Scene Time ≤ 10 min	31.5 (632)	33.4 (442)	1.23 (1.00-1.51) *
Scene Time 11-20 min	47.7 (956)	48.8 (645)	1.19 (0.99-1.44)
Scene Time > 20 min	20.8 (417)	17.8 (236)	1.00 (ref)
Response (mean/SD)	7.94 (4.21)	6.48 (3.60)	0.89 (0.88-0.91)
Scene (mean/SD)	15.57 (10.06)	14.39 (7.85)	0.99 (0.98-0.99)
Total Call Time (mean/SD)	31.71 (15.06)	27.40 (9.70)	0.97 (0.96-0.97)

Table 4. *Region-Wide Calls across Years (N = 16,577)*

Variable	2006	2007	2008	2009	2010	2011
			%(n)			
Populations (EMS calls)						
University	543	610	629	651	759	782
Community	1865	1981	2183	2136	2159	2188
Region	2493	2592	2812	2789	2920	2971
Per Capita (calls per 1000 population)						
University	20.3	22.1	21.8	21.1	23.3	23.3
Community	28.9	29.2	31.7	31.1	31.6	32.0
Region	26.5	27.1	28.8	28.0	28.9	29.1
Age (16-24) (mean/SD)						
University	20.3 (2.0)	20.1 (2.0)	20.1 (1.9)	20.1 (1.9)	20.1 (1.9)	19.9 (1.9)
Community	19.8 (2.6)	19.8 (2.5)	19.9 (2.5)	19.9 (2.5)	20.0 (2.5)	20.1 (2.5)
Region	19.9 (2.4)	19.9 (2.4)	20.0 (2.4)	20.0 (2.4)	20.0 (2.3)	20.1 (2.3)
Age of Majority (≥19)						
University **	79.4 (431)	73.6 (449)	78.2 (492)	78.0 (508)	76.9 (584)	74.7 (584)
Community **	63.7 (1187)	65.1 (1290)	65.6 (1432)	66.5 (1421)	68.4 (1476)	69.9 (1529)
Region	67.7 (1687)	67.1 (1740)	68.4 (1924)	69.2 (1931)	70.6 (2061)	71.1 (2113)
Gender						
Male						
University	54.7 (297)	50.9 (310)	50.9 (320)	54.5 (355)	53.8 (408)	52.3 (409)
Community	49.8 (925)	51.2 (1015)	51.9 (1133)	50.9 (1087)	50.7 (1094)	49.2 (1077)
Region	50.9 (1267)	51.2 (1326)	51.7 (1453)	51.8 (1444)	51.5 (1504)	50.0 (1486)

*due to missing data not all ‘n’ equal ‘N’

** significant trend between 2006 and 2011

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
			% (n)			
Patient Characteristics						
Presence of Alcohol						
University **	29.3 (159)	30.0 (183)	33.7 (212)	34.1 (222)	35.7 (271)	38.2 (299)
Community	15.9 (296)	17.1 (338)	17.1 (374)	15.4 (328)	17.1 (369)	16.1 (353)
Region	18.9 (472)	20.1 (521)	20.8 (586)	19.8 (551)	21.9 (640)	22.0 (652)
Glasgow Coma Scale ($\leq$ 8)						
University **	12.0 (65)	11.5 (70)	7.3 (46)	6.1 (40)	7.8 (59)	4.7 (37)
Community **	11.1 (206)	8.6 (171)	6.3 (137)	7.1 (151)	7.0 (150)	4.4 (96)
Region **	11.6 (290)	9.3 (241)	6.5 (183)	6.9 (191)	7.2 (210)	4.5 (133)
Level of Care (Advanced)						
University	33.2 (180)	32.5 (198)	32.0 (201)	33.6 (219)	34.7 (263)	34.3 (268)
Community	34.2 (638)	31.4 (622)	31.9 (697)	31.4 (671)	31.7 (684)	33.1 (725)
Region	33.3 (829)	31.6 (820)	31.9 (898)	32.0 (891)	32.5 (948)	33.4 (993)
Treatment Prior to EMS						
University	29.8 (162)	33.8 (206)	28.5 (179)	29.7 (193)	27.8 (211)	30.4 (238)
Community	38.7 (721)	37.4 (740)	35.9 (783)	33.1 (707)	35.5 (766)	35.7 (780)
Region	36.5 (910)	36.5 (946)	34.2 (962)	32.3 (901)	33.5 (978)	34.3 (1018)

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
			%(n)			
CTAS 0 (not assigned)						
University **	22.3 (121)	23.6 (144)	24.8 (156)	22.3 (145)	24.6 (187)	24.0 (188)
Community **	22.5 (419)	23.7 (470)	23.1 (505)	26.8 (573)	27.2 (587)	28.3 (619)
Region **	23.7 (590)	23.7 (615)	23.5 (661)	25.8 (720)	26.6 (776)	27.2 (808)
CTAS 1						
University **	0.6 (3)	0.7 (4)	0.5 (3)	0.2 (1)	0.3 (2)	0.6 (5)
Community **	1.0 (18)	0.7 (13)	0.5 (11)	1.0 (22)	0.9 (20)	0.5 (11)
Region **	0.8 (21)	0.7 (17)	0.50 (14)	0.8 (23)	0.8 (22)	0.5 (16)
CTAS 2						
University **	11.1 (60)	9.7 (59)	8.0 (50)	9.7 (63)	9.1 (69)	10.6 (83)
Community **	12.7 (236)	12.4 (246)	13.3 (290)	11.6 (248)	10.8 (233)	10.8 (237)
Region **	11.9 (296)	11.8 (305)	12.1 (340)	11.2 (311)	10.3 (302)	10.8 (320)
CTAS 3						
University **	37.6 (204)	36.1 (220)	33.7 (212)	38.3 (249)	35.6 (270)	33.9 (265)
Community **	41.7 (778)	39.8 (789)	36.7 (801)	36.2 (774)	35.4 (765)	35.1 (767)
Region	39.4 (983)	38.9 (1009)	36.0 (1013)	36.7 (1023)	35.5 (1035)	34.7 (1032)
CTAS 4						
University **	26.5 (144)	27.2 (166)	30.2 (190)	26.9 (175)	26.5 (201)	27.5 (215)
Community **	20.6 (384)	21.0 (416)	23.7 (518)	21.4 (456)	22.0 (474)	20.9 (457)
Region **	22.4 (558)	22.5 (582)	25.2 (708)	22.6 (631)	23.1 (675)	22.6 (672)
CTAS 5 (reference)						
University	2.0 (11)	2.8 (17)	2.9 (18)	2.8 (18)	4.0 (30)	3.3 (26)
Community	1.6 (30)	2.4 (47)	2.7 (58)	3.0 (63)	3.7 (80)	4.4 (97)
Region	1.8 (45)	2.5 (64)	2.7 (76)	2.9 (81)	3.8 (110)	4.1 (123)

Table 4 Cont'd

Variable	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
%(n)						
Pick Up Location						
Residence						
University	38.3 (208)	38.5 (235)	40.2 (253)	42.2 (275)	39.9 (303)	38.5 (301)
Community **	42.5 (793)	45.9 (909)	49.2 (1074)	49.4 (1056)	49.7 (1073)	51.4 (1125)
Region **	41.7 (1039)	44.2 (1144)	47.2 (1327)	47.7 (1331)	47.2 (1376)	48.0 (1426)
Bar						
University **	8.8 (48)	6.4 (39)	6.0 (38)	4.3 (28)	5.4 (41)	5.8 (45)
Community	3.5 (66)	3.0 (60)	2.6 (57)	2.7 (57)	3.7 (80)	3.8 (83)
Region	4.8 (119)	3.8 (99)	3.4 (95)	23.1 (85)	4.1 (121)	4.3 (128)
Street						
University	23.8 (129)	22.8 (139)	18.9 (119)	20.1 (131)	22.0 (167)	22.6 (177)
Community **	31.0 (578)	30.9 (612)	28.7 (626)	28.4 (607)	26.5 (571)	26.7 (584)
Region	29.2 (729)	29.0 (752)	26.5 (745)	26.5 (738)	25.3 (740)	25.6 (761)
School						
University **	18.8 (102)	22.3 (136)	23.4 (147)	20.7 (135)	23.5 (178)	26.6 (177)
Community **	6.4 (120)	4.1 (81)	5.1 (111)	4.8 (103)	4.6 (100)	4.8 (104)
Region	9.4 (233)	8.4 (217)	9.2 (258)	8.6 (239)	9.5 (278)	9.5 (281)

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
			%(n)			
Transport Codes						
Deferrable						
University **	21.6 (117)	27.7 (169)	29.9 (188)	26.7 (174)	26.9 (204)	26.2 (205)
Community **	17.8 (331)	20.6 (407)	23.3 (508)	22.1 (471)	22.1 (477)	22.1 (483)
Region **	19.4 (483)	22.2 (576)	24.8 (696)	23.1 (645)	23.3 (681)	23.2 (688)
Prompt						
University **	53.0 (288)	45.1 (275)	42.6 (268)	47.2 (307)	45.9 (348)	45.7 (357)
Community **	54.6 (1018)	51.2 (1014)	47.9 (1045)	45.5 (972)	46.1 (995)	45.5 (996)
Region **	52.4 (1306)	49.7 (1289)	46.7 (1313)	45.9 (1279)	46.0 (1343)	45.5 (1353)
Emergent						
University **	3.3 (18)	4.1 (25)	2.7 (17)	3.5 (23)	2.8 (21)	3.6 (28)
Community **	5.2 (97)	4.8 (95)	5.9 (129)	5.3 (114)	4.2 (90)	4.0 (88)
Region **	4.6 (115)	4.6 (120)	5.2 (146)	4.9 (137)	3.8 (111)	3.9 (116)
No Patient Found						
University	0.2 (1)	0.2 (1)	0.0 (0)	0.0 (0)	0.3 (2)	0.4 (3)
Community	0.2 (3)	0.3 (5)	0.4 (8)	0.2 (3)	0.3 (7)	0.2 (3)
Region	0.2 (5)	0.2 (6)	0.3 (8)	0.1 (3)	0.3 (9)	0.2 (6)
Patient Refused						
University **	21.2 (115)	20.8 (127)	22.7 (143)	21.4 (139)	21.9 (166)	21.2 (166)
Community **	19.8 (369)	19.9 (395)	20.1 (438)	22.6 (482)	23.0 (496)	24.6 (539)
Region **	21.1 (527)	20.2 (523)	20.7 (581)	22.3 (622)	22.7 (663)	23.8 (706)
Patient Expired						
University **	0.4 (2)	0.7 (4)	0.0 (0)	0.2 (1)	0.5 (4)	0.3 (2)
Community **	0.2 (3)	0.5 (10)	0.5 (10)	0.4 (8)	0.5 (11)	0.5 (10)
Region	0.3 (7)	0.5 (14)	0.4 (10)	0.3 (9)	0.5 (15)	0.4 (12)

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
			%(n)			
Transport Codes Cont'd						
Patient in Police Custody (reference)						
University	0.2 (1)	1.0 (6)	1.8 (11)	0.6 (4)	0.9 (7)	1.8 (14)
Community	1.1 (21)	1.4 (28)	1.2 (25)	2.2 (46)	1.8 (38)	1.9 (41)
Region	1.0 (25)	1.3 (34)	1.3 (36)	1.8 (50)	1.5 (45)	1.9 (55)
Transport to Hospital						
University **	78.1 (424)	77.3 (469)	75.4 (473)	77.8 (504)	76.2 (573)	76.1 (590)
Community **	78.5 (1446)	77.6 (1516)	77.8 (1682)	74.3 (1557)	73.9 (1562)	72.6 (1567)
Region **	77.2 (1905)	77.5 (1985)	77.2 (2155)	75.1 (2061)	74.5 (2135)	73.5 (2157)

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
			%(n)			
Call Generation						
Sunday						
University	16.6 (90)	17.9 (109)	16.5 (104)	19.4 (126)	17.3 (131)	16.9 (132)
Community	15.5 (289)	16.1 (319)	14.9 (326)	14.7 (314)	13.9 (299)	16.7 (366)
Region	16.0 (400)	16.5 (428)	15.3 (430)	15.8 (440)	14.7 (430)	16.8 (498)
Monday						
University	10.1 (55)	10.3 (63)	11.9 (75)	8.8 (57)	11.7 (89)	10.1 (79)
Community	12.0 (224)	13.9 (274)	12.7 (277)	13.3 (284)	12.2 (263)	13.0 (285)
Region **	11.5 (286)	13.0 (338)	12.5 (352)	12.3 (342)	12.1 (352)	12.3 (364)
Tuesday						
University	9.6 (52)	13.0 (79)	12.1 (76)	12.9 (84)	9.0 (68)	11.3 (88)
Community	13.1 (244)	12.4 (246)	12.6 (274)	13.0 (278)	13.2 (285)	12.4 (272)
Region **	12.2 (304)	12.5 (325)	12.5 (350)	13.0 (362)	12.1 (353)	12.1 (360)
Wednesday						
University **	11.8 (64)	10.5 (64)	10.3 (65)	9.5 (62)	9.6 (73)	9.5 (74)
Community	13.5 (251)	12.4 (246)	13.1 (285)	12.2 (260)	12.8 (277)	12.6 (276)
Region **	13.3 (331)	12.0 (310)	12.5 (350)	11.6 (322)	12.0 (351)	11.8 (350)
Thursday						
University **	16.6 (90)	12.5 (76)	15.4 (97)	15.7 (102)	15.4 (117)	12.9 (101)
Community **	13.3 (248)	12.5 (247)	13.1 (286)	13.6 (291)	14.0 (302)	11.4 (250)
Region	13.9 (346)	12.5 (324)	13.6 (383)	14.1 (393)	14.4 (419)	11.8 (351)
Friday						
University	13.1 (71)	16.2 (99)	14.9 (94)	14.8 (96)	13.2 (100)	16.1 (126)
Community	14.2 (264)	15.8 (313)	15.2 (332)	15.6 (333)	15.9 (344)	14.6 (319)
Region	14.0 (348)	15.9 (412)	15.2 (426)	15.4 (429)	15.2 (444)	15.0 (446)

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
%(n)						
Call Generation Cont'd.						
Saturday (reference)						
University	22.3 (121)	19.7 (120)	18.8 (118)	19.1 (124)	23.9 (181)	23.3 (182)
Community	18.5 (345)	16.9 (335)	18.5 (403)	17.6 (376)	18.0 (389)	19.2 (420)
Region	19.2 (478)	17.6 (455)	18.5 (521)	18.0 (501)	19.6 (571)	20.3 (602)
Variable	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Night (8:00pm-7:00am)						
University	58.4 (317)	58.2 (355)	59.8 (376)	61.6 (401)	60.2 (457)	63.7 (498)
Community	44.3 (826)	45.3 (898)	45.4 (990)	46.3 (989)	46.4 (1001)	46.9 (1026)
Region	47.7 (1190)	48.3 (1253)	48.6 (1366)	49.9 (1391)	50.0 (1460)	51.3 (1525)
Weekday (Mon-Thurs)						
University **	48.1 (261)	46.2 (282)	49.8 (313)	46.9 (305)	45.7 (347)	43.7 (342)
Community	51.9 (967)	51.2 (1014)	51.4 (1122)	52.1 (1113)	52.2 (1127)	49.5 (1083)
Region	50.8 (1267)	50.0 (1297)	51.0 (1435)	50.9 (1419)	50.5 (1475)	48.0 (1425)

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
			%(n)			
Special Events / Holidays						
Victoria Day Weekend						
University **	0.6 (3)	1.2 (7)	1.0 (6)	0.6 (4)	1.7 (13)	0.6 (5)
Community	1.0 (18)	1.1 (21)	1.4 (31)	0.9 (20)	1.0 (22)	1.3 (28)
Region **	0.9 (22)	1.1 (28)	1.3 (37)	0.9 (24)	1.2 (35)	1.1 (33)
St Patrick's Day						
University **	0.6 (3)	0.8 (5)	0.2 (1)	0.8 (5)	0.0 (0)	0.4 (3)
Community **	0.3 (6)	0.5 (9)	0.4 (9)	0.2 (4)	0.2 (5)	0.1 (3)
Region **	0.4 (11)	0.5 (14)	0.4 (10)	0.3 (9)	0.2 (5)	0.2 (6)
Frosh Week						
University **	2.2 (12)	2.8 (17)	4.6 (29)	3.7 (24)	4.6 (35)	4.9 (38)
Community	2.0 (37)	1.6 (31)	1.8 (40)	1.9 (41)	2.1 (45)	1.8 (40)
Region	2.1 (53)	1.9 (48)	2.5 (69)	2.3 (65)	2.7 (80)	2.6 (78)
Oktoberfest						
University **	1.8 (10)	3.4 (21)	3.3 (21)	2.5 (16)	3.7 (28)	2.8 (22)
Community	2.4 (44)	2.5 (49)	2.4 (53)	2.3 (49)	2.4 (52)	2.9 (63)
Region **	2.3 (56)	2.7 (70)	2.6 (74)	2.3 (65)	2.8 (81)	2.9 (85)

Table 4 Cont'd

Variable	2006	2007	2008	2009	2010	2011
			% (n)			
Times						
Scene Time ≤ 10 min						
University **	28.4 (149)	34.3 (205)	36.4 (223)	37.8 (240)	35.1 (259)	32.3 (247)
Community **	28.2 (506)	32.0 (615)	33.7 (717)	33.8 (707)	34.9 (731)	32.0 (677)
Region **	28.7 (686)	32.5 (820)	34.3 (940)	34.7 (947)	34.9 (990)	32.1 (924)
Scene Time 11-20 min						
University	50.4 (264)	47.8 (286)	48.9 (299)	45.2 (287)	49.4 (365)	49.1 (375)
Community	49.8 (892)	47.3 (909)	47.4 (1007)	47.5 (993)	45.3 (950)	48.2 (1020)
Region	49.4 (1181)	47.4 (1195)	47.7 (1306)	47.0 (1282)	46.4 (1317)	48.4 (1395)
Scene Time > 20 min (reference)						
University	21.2 (111)	17.9 (107)	14.7 (90)	17.0 (108)	15.6 (115)	18.6 (142)
Community	22.0 (395)	20.8 (400)	18.9 (401)	18.7 (390)	19.8 (416)	19.8 (418)
Region	21.9 (524)	20.1 (507)	17.9 (491)	18.3 (498)	18.7 (531)	19.5 (561)
Response (mean/SD)						
University	6.4 (2.9)	6.5 (3.3)	6.4 (3.1)	6.7 (3.9)	7.1 (3.5)	7.2 (4.3)
Community	8.0 (3.9)	8.2 (4.2)	8.2 (4.3)	8.5 (4.7)	8.7 (4.7)	8.6 (4.4)
Region	7.6 (3.8)	7.8 (4.1)	7.8 (4.1)	8.1 (4.6)	8.3 (4.4)	8.3 (4.4)
Scene (mean/SD)						
University	15.4 (8.3)	14.8 (9.1)	14.1 (8.5)	14.0 (7.5)	14.0 (8.4)	14.6 (8.1)
Community	15.9 (8.7)	15.4 (10.4)	15.1 (10.0)	14.8 (9.1)	14.9 (9.2)	15.2 (9.1)
Region	15.7 (8.6)	15.3 (10.1)	14.9 (9.7)	14.6 (8.7)	14.6 (9.0)	15.1 (8.8)
Total Call Time (mean/SD)						
University	28.8 (10.4)	28.5 (10.7)	27.6 (11.0)	28.0 (10.4)	29.1 (11.6)	29.4 (11.9)
Community	33.1 (13.9)	32.8 (14.0)	32.6 (13.9)	32.1 (13.5)	32.7 (15.3)	32.7 (14.9)
Region	31.9 (13.3)	31.8 (13.4)	31.5 (13.5)	31.1 (13.0)	31.8 (14.5)	31.8 (14.2)

Table 5. *Region-Wide Calls against Transport to Hospital (N = 16,577)*

Variable	**Transport (*n* = 12,398)**	**No Transport (*n* = 3,971)**	**Unadjusted OR (95% CI) (*= significant)**
	% (n)		
Age (16-24)			
Mean (SD)	20.0 (2.4)	20.0 (2.3)	0.99 (0.98.1.01)
Age of Majority (≥19)	68.7 (8521)	70.7 (2809)	0.93 (0.86-1.01)
Gender			
Male	51.1 (6335)	51.0 (2023)	1.01 (0.93-1.09)
Patient Characteristics			
Presence of Alcohol	21.1 (2616)	19.5 (775)	1.07 (0.98-1.18)
Glasgow Coma Scale (≤ 8)	6.6 (818)	9.9 (394)	0.70 (0.61-0.81) *
Level of Care (Advanced)	37.3 (4623)	17.7 (701)	2.71 (2.47-2.98) *
Treatment Prior to EMS	33.8 (4186)	35.9 (1425)	0.91 (0.84-0.98)
Pick Up Location			
University Community	24.5 (3033)	23.5 (919)	1.06 (0.97-1.15)
Residence	48.8 (6054)	38.1 (1514)	1.55 (1.44-1.67) *
Bar	3.4 (421)	3.6 (141)	0.94 (0.79-1.13)
Street	23.0 (2853)	36.7 (1456)	0.47 (0.44-0.51) *
School	4.7 (580)	3.1 (124)	1.43 (1.25-1.63) *

*due to missing data not all ‘n’ equal ‘N’

Table 5 Cont'd.

Variable	Transport (*n* = 12,398)	No Transport (*n* = 3,971)	Unadjusted OR (95% CI) (*= significant)
Call Generation			
Sunday	16.1 (1996)	15.1 (601)	1.14 (1.01-1.30)
Monday	12.6 (1558)	11.3 (449)	1.21 (1.05-1.39) *
Tuesday	12.4 (1540)	12.2 (486)	1.12 (0.98-1.29)
Wednesday	12.5 (1545)	11.2 (443)	1.22 (1.01-1.40) *
Thursday	13.4 (1665)	13.1 (521)	1.09 (0.86-1.25)
Friday	14.6 (1804)	16.9 (672)	0.94 (0.83-1.07)
Saturday	18.5 (2290)	20.1 (799)	1.00 (ref)
Night (8:00pm-7:00am)	50.3 (6237)	47.2 (1873)	1.10 (1.02-1.19)
Weekday (Mon-Thurs)	50.9 (6308)	47.8 (1899)	1.13 (1.05-1.22)
Victoria Day Weekend	1.1 (132)	1.2 (46)	0.95 (0.66-1.35)
St Patrick's Day	0.3 (38)	0.4 (17)	0.76 (0.42-1.41) *
Frosh Week	2.3 (286)	2.6 (103)	0.91 (0.71-1.16)
Oktoberfest	2.5 (311)	2.9 (116)	0.82 (0.66-1.03)
Times			
Scene Time $\leq$ 10 min	38.6 (4784)	14.6 (516)	6.65 (5.92-7.48) *
Scene Time 11-20 min	47.2 (5852)	49.6 (1749)	2.40 (2.19-2.62) *
Scene Time > 20 min	14.2 (1754)	35.8 (1261)	1.00 (ref)
Response (mean/SD)	8.0 (4.1)	7.8 (4.7)	1.01 (1.00-1.02)
Scene (mean/SD)	13.5 (7.9)	19.7 (10.9)	0.93 (0.92-0.93)
Total Call Time (mean/SD)	33.1 (13.1)	26.9 (13.3)	1.03 (1.03-1.04)

Table 6. *Transport Model using Region-Wide Population (N = 16,577)*

Covariate	Parameter Estimate (SE)	Adjusted OR (95% CI)
Scene Time (minutes)		
Scene group < 10	2.3422 (.0631)	10.3 (9.1-11.7)
Scene group 11-20	1.0544 (.0491)	2.8 (2.6-3.1)
Scene group > 20		1.0 (ref)
Level of Care		
Advanced EMS Care	1.4506 (.0511)	4.2 (3.8-4.6)
Basic EMS Care		1.0 (ref)
School		
At school	0.3424 (.0770)	1.4 (1.2-1.6)
Not at school		1.0 (ref)
Day of week		
Sunday	0.1448 (.0698)	1.2 (1.0-1.3)
Monday	0.2329 (.0761)	1.3 (1.1-1.5)
Tuesday	0.1351 (.0753)	1.2 (1.0-1.3)
Wednesday	0.1878 (.0763)	1.2 (1.0-1.4)
Thursday	0.0931 (.0732)	1.1 (0.8-1.1)
Friday	-0.0599 (.0692)	1.1 (1.2-1.6)
Saturday		1.0 (ref)

Hosmer & Lemeshow Goodness of Fit chi-square 6.51 / p = .5908
c Statistic .740

Table 7. *Transport Model using University Population (n = 3,974)*

Covariate	Parameter Estimate (SE)	Adjusted OR (95% CI)
Scene Time (minutes)		
Scene group < 10	2.3061 (.1323)	10.0 (7.8-13.0)
Scene group 11-20	0.9158 (.1010)	2.5 (2.1-3.1)
Scene group > 20		1.0 (ref)
Level of Care		
Advanced EMS Care	1.07 (.0978)	2.9 (2.4-3.5)
Basic EMS Care		1.0 (ref)
School		
At school	0.2164 (.1045)	1.2 (1.0-1.5)
Not at school		1.0 (ref)
Day of week		
Sunday	-0.1154 (.1340)	0.9 (0.7-1.2)
Monday	-0.0366 (.1572)	1.0 (0.7-1.3)
Tuesday	0.1755 (.1597)	1.2 (0.9-1.6)
Wednesday	0.0319 (.1625)	1.0 (0.8-1.4)
Thursday	-0.0853 (.1415)	0.9 (0.7-1.2)
Friday	-0.1326 (.1405)	0.9 (0.7-1.2)
Saturday		1.0 (ref)

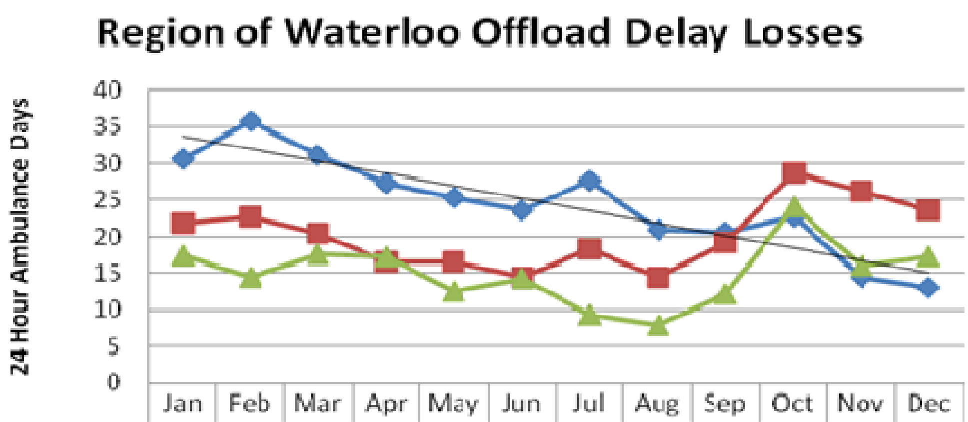
Hosmer & Lemeshow Goodness of Fit chi-square 7.31 / p = .5031
c Statistic .721

Table 8. *Transport Model using Community Population (n = 12,512)*

Covariate	Parameter Estimate (SE)	Adjusted OR (95% CI)
Scene Time (minutes)		
Scene group < 10	2.3472 (.0725)	10.5 (9.1-12.1)
Scene group 11-20	1.0904 (.0567)	3.0 (2.7-3.3)
Scene group > 20		1.0 (ref)
Level of Care		
Advanced EMS Care	1.5780 (.0606)	4.8 (4.3-5.4)
Basic EMS Care		1.0 (ref)
School		
At school	0.6505 (.1275)	1.9 (1.5-2.5)
Not at school		1.0 (ref)
Day of week		
Sunday	0.2375 (.0825)	1.3 (1.1-1.4)
Monday	0.3076 (.0878)	1.4 (1.5-1.6)
Tuesday	0.0989 (.0631)	1.1 (0.9-1.3)
Wednesday	0.2322 (.0877)	1.3 (1.1-1.5)
Thursday	0.1363 (.0860)	1.1 (1.0-1.4)
Friday	0.0460 (.0802)	0.96 (1.5-2.5)
Saturday		1.0 (ref)

Hosmer & Lemeshow Goodness of Fit chi-square 5.75 / p = .6747
c Statistic .749

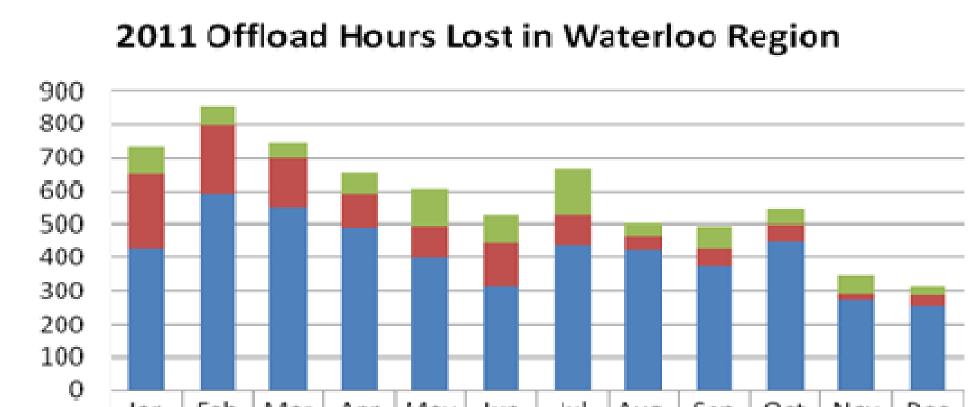
Figure 1. WREMS Offload Delay Losses in 24-Hour Days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	30.7	35.6	31.1	27.3	25.3	23.5	27.7	20.9	20.6	22.7	14.5	13
2010	21.8	22.6	20.4	16.6	16.6	14.4	18.4	14.4	19.2	28.6	26.3	23.6
2009	17.4	14.5	17.7	17.3	12.5	14.2	9.27	7.89	12.2	24.1	16	17.3

Source: WREMS Council Report, 2011

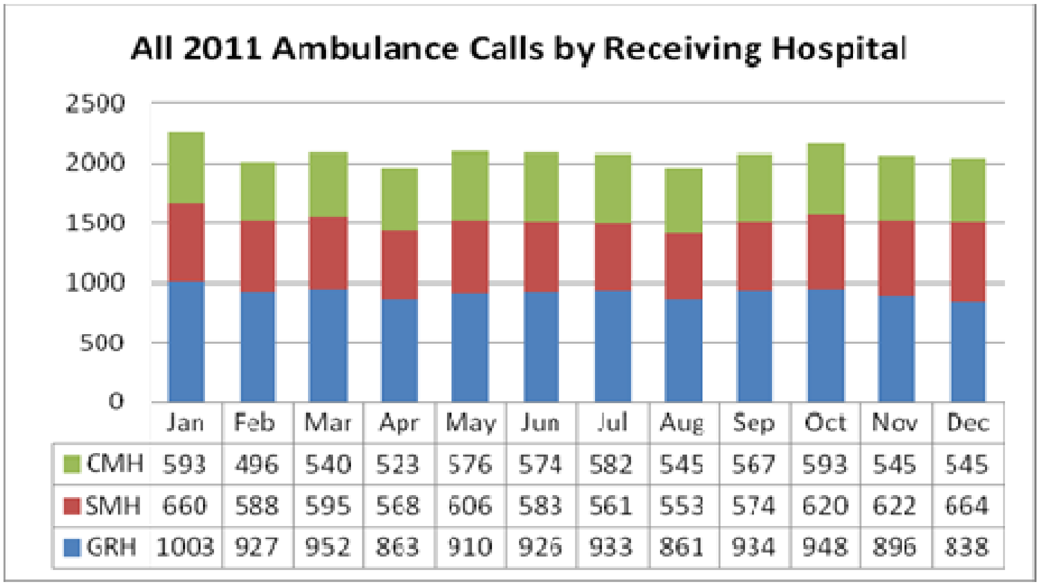
Figure 2. Offload Delay Losses in Hours per Month



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CMH	83.88	58.95	44.87	63.52	109.4	79.71	137.8	38.95	69.89	46.43	55.26	27.17
SMH	227.3	205.8	151.2	101	99.6	132.7	88.53	41.4	52.63	50.33	20.88	32.6
GRH	424.8	590.5	549.6	491.3	397.9	312.6	437.8	421.5	372.1	448	271.3	252.7

Source: WREMS Council Report, 2011

Figure 3. Offload Delay Losses by Receiving Hospital



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CMH	593	496	540	523	576	574	582	545	567	593	545	545
SMH	660	588	595	568	606	583	561	553	574	620	622	664
GRH	1003	927	952	863	910	926	933	861	934	948	896	838

Source: WREMS Council Report, 2011

Figure 4. Sample Selection Determination

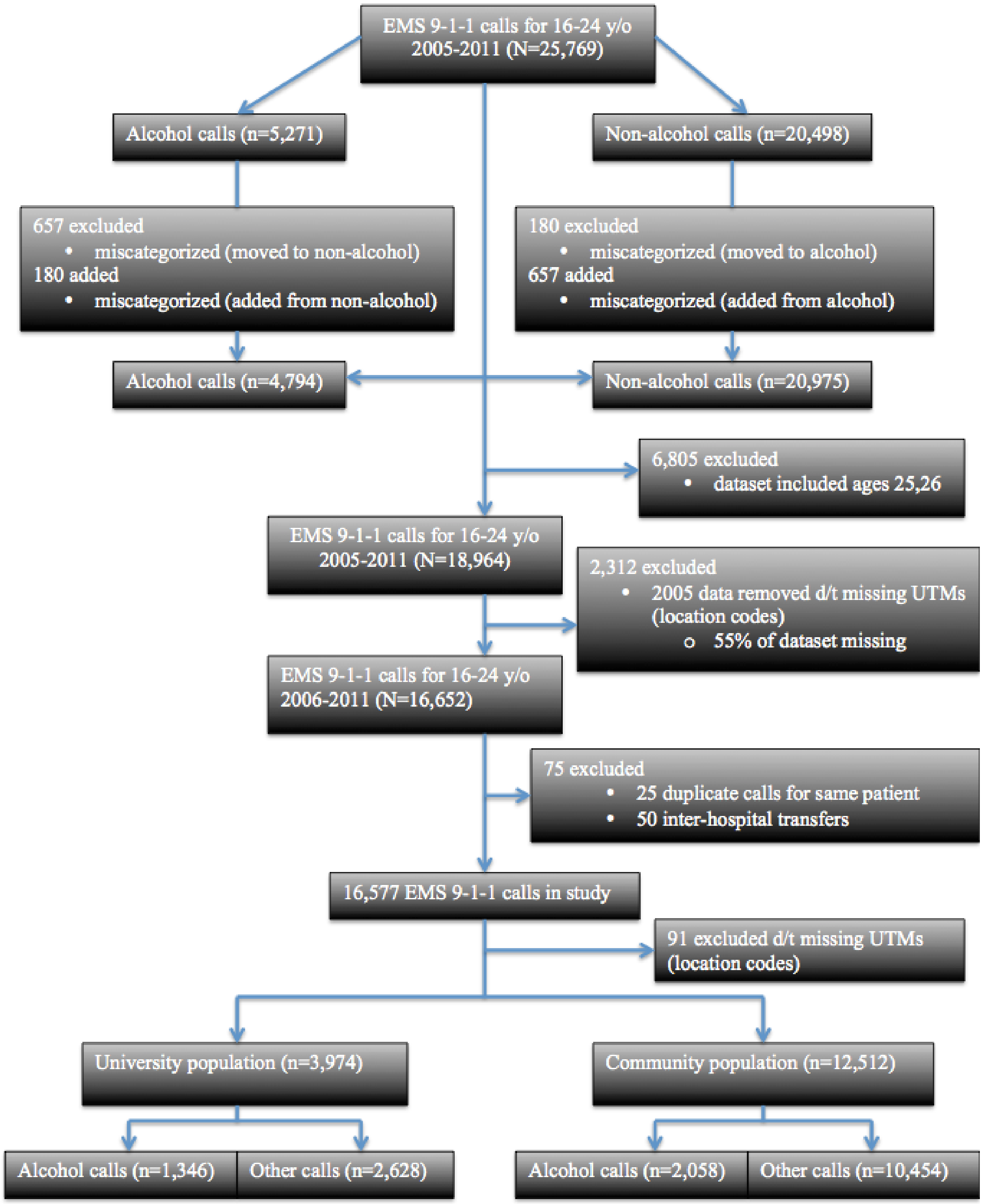


Figure 5. UTM Map of University Population Area

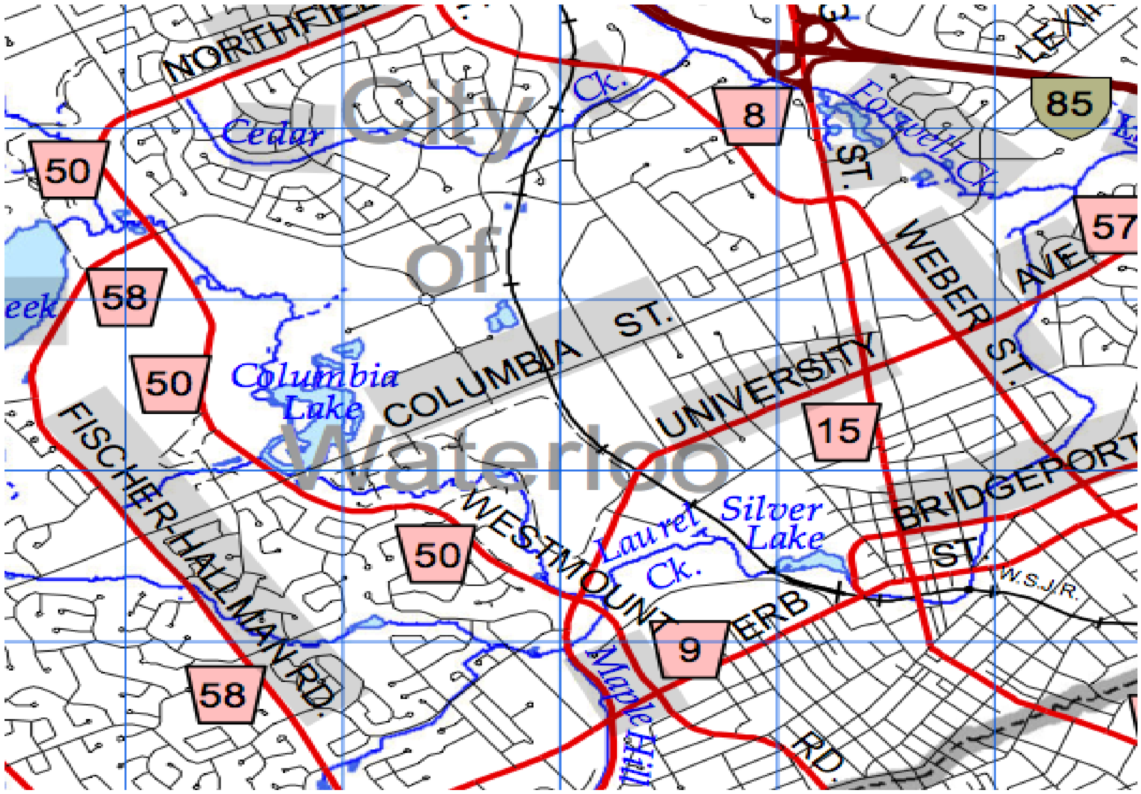


Figure 6. Comparison of CTAS Levels for Both Populations

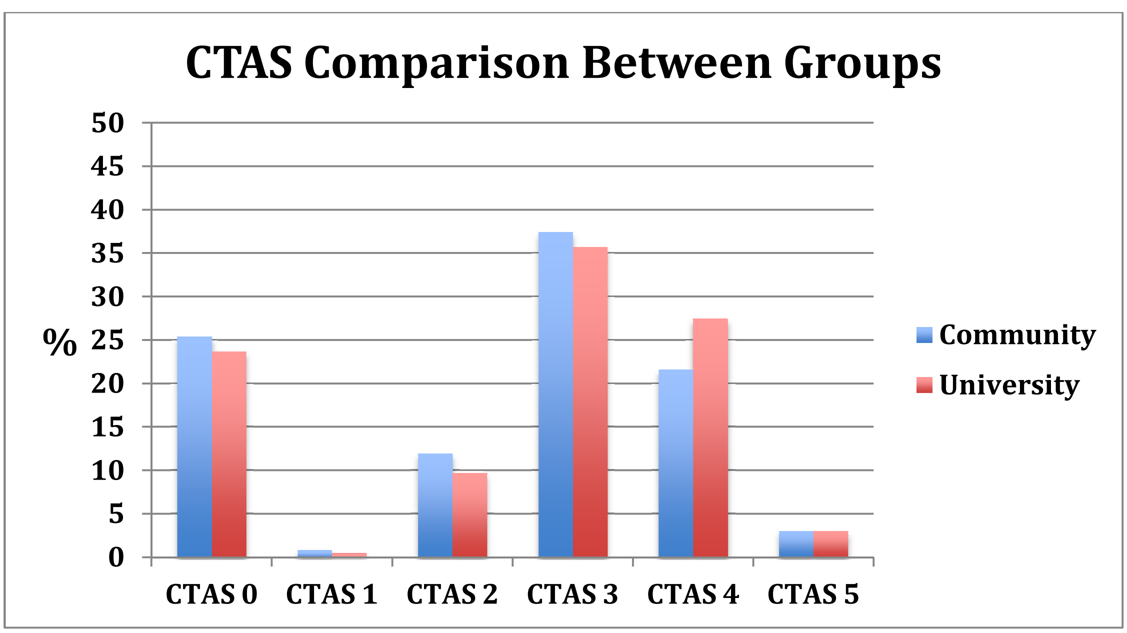


Figure 7. Comparison of Pick-up Locations for Both Populations

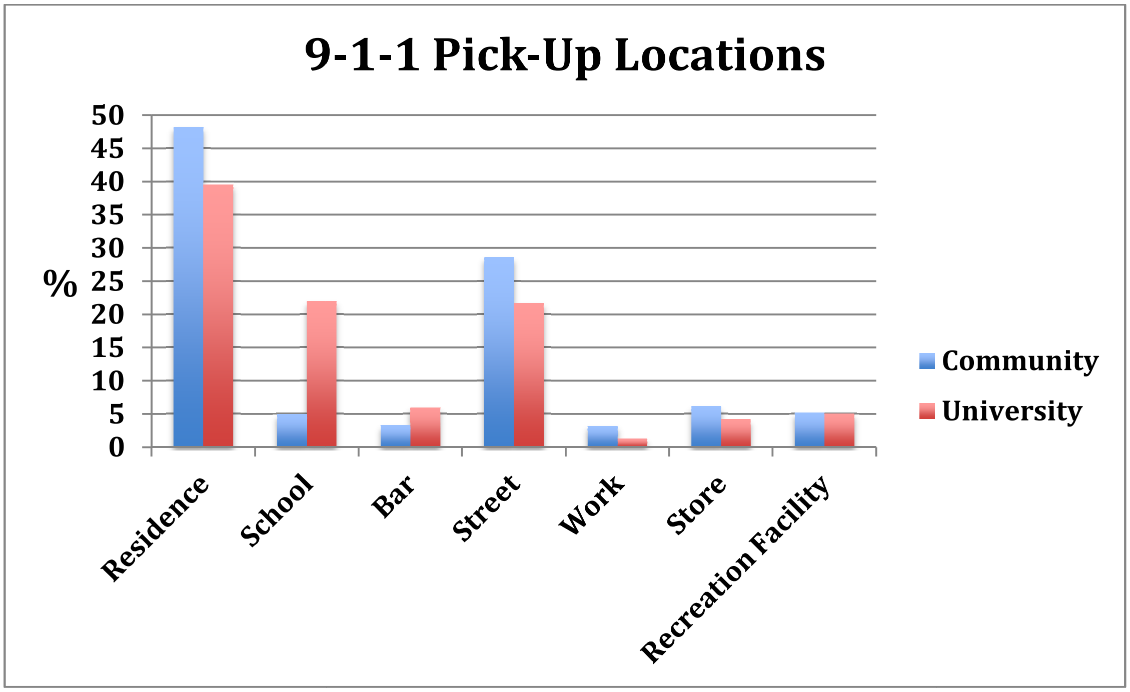


Figure 8. Daytime versus Nighttime EMS Calls for Both Populations

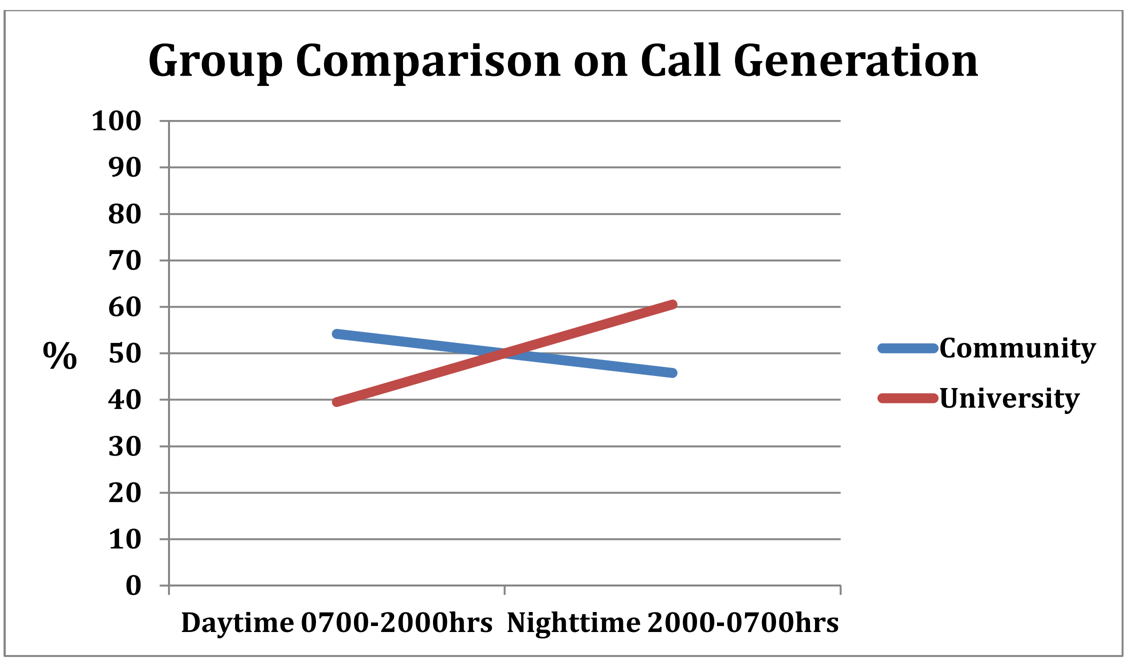


Figure 9. Population Comparison of Alcohol-Related EMS Calls across Six Years

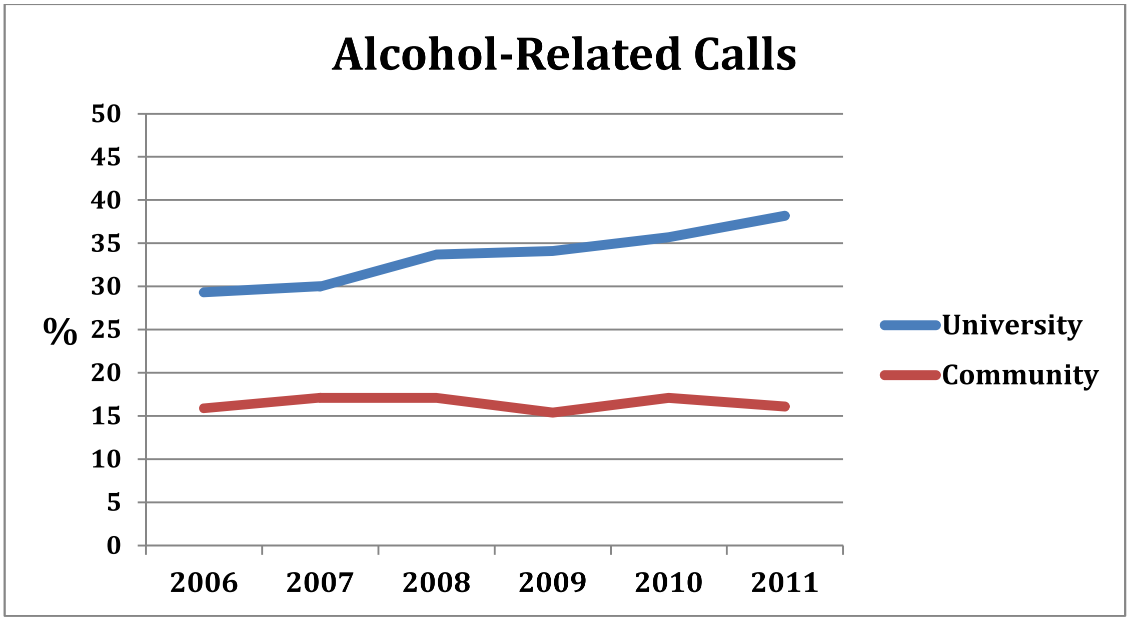


Figure 10. EMS Calls per Capita for the University Population

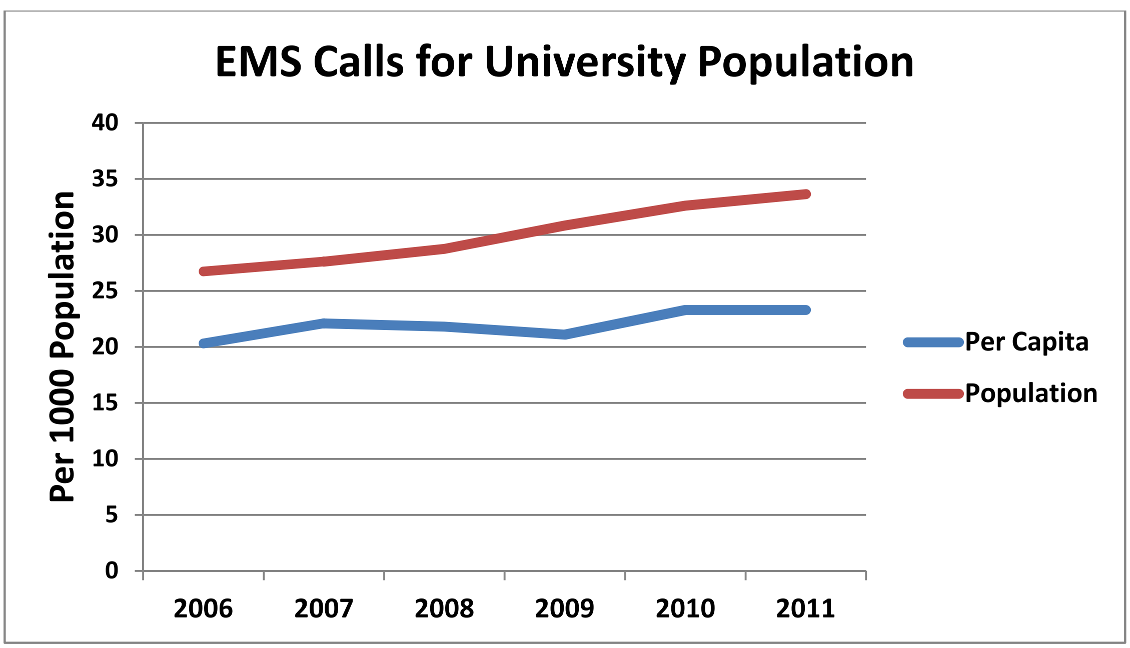


Figure 11. EMS Calls per Capita for the Community Population