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## **A STATISTICAL ANALYSIS OF TRAFFIC ACCIDENTS BY TIME AND DAY OF THE WEEK: THE METHODOLOGY FOR THIS STUDY IN TOKYO WILL SERVE AS A BLUEPRINT FOR A FUTURE STUDY IN KAZAKHSTAN**

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### **Abstract**

**Introduction:** In the future, detailed studies will need to be performed in Japan in order to devise more effective measures to prevent traffic accidents. Statistical approaches that are applicable not just to Japan but to other countries as well also need to be developed.

**Materials and Methods:** The occurrence of traffic accidents in Tokyo from 2010–2014 was studied based on a report from the Tokyo Metropolitan Police Department, and specific aspects of those accidents were examined. Those findings indicated important measures to prevent future traffic accidents in Tokyo. In addition, the use of this methodology in a study of traffic accidents in Kazakhstan and the use of the current findings to devise measures to prevent traffic accidents in that country have also been described.

**Results and Conclusion:** Over the 5 years studied, there were 233,144 traffic accidents in total. By day of the week, accidents occurred most often on Friday and least often on Sunday. A comparison of traffic accidents by time on weekdays (Mon.–Fri.) and weekends (Sat. & Sun.) indicated that accidents on weekdays occurred most often from 8–10 AM, followed by 4–6 PM. Accidents on weekends occurred most often from 4–6 PM, followed by 2–4 PM, then 12–2 PM, and finally 10–12 AM. In light of these findings, further enhancing preventive measures on weekdays and weekends and examining times when accidents occur are key to educational efforts to further reduce traffic accidents. We plan to

conduct a study to determine which measures will prove effective at preventing traffic accidents in Kazakhstan. The current methodology could be used to study traffic accidents in different countries, such as Kazakhstan.

**Keywords:** traffic accidents, day, time, Tokyo, Kazakhstan

#### Резюме

## **СТАТИСТИЧЕСКИЙ АНАЛИЗ ДОРОЖНО-ТРАНСПОРТНЫХ ПРОИСШЕСТВИЙ ПО ВРЕМЕНИ И ДНЮ НЕДЕЛИ: МЕТОДОЛОГИЯ ИССЛЕДОВАНИЯ В ТОКИО БУДЕТ СЛУЖИТЬ ПРОЕКТОМ ДЛЯ БУДУЩЕГО ИССЛЕДОВАНИЯ В КАЗАХСТАНЕ**

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**Введение:** Необходимо проведение детальных исследований с целью разработки мероприятий для предотвращения дорожно-транспортных происшествий в будущем. Так же, необходима разработка статистических методов, применимых не только в Японии, но и в других странах.

**Материалы и Методы:** Распространенность дорожно-транспортных происшествий в Токио в период с 2010-2014 гг. была исследована на основе доклада департамента столичной полиции. Так же, были изучены особенности этих происшествий. Полученные результаты выявили острую необходимость в разработке мер по предотвращению ДТП в Токио. Кроме того, использование этой методологии в исследовании дорожно-транспортных происшествий в Казахстане и использование текущих результатов были описаны для разработки мер по предотвращению дорожно-транспортных происшествий в этой стране.

**Результаты и Заключение:** За 5 лет, что были исследованы, произошло 233 144 дорожно-транспортных происшествий. Чаще всего ДТП происходили в пятницу, а реже всего в

воскресенье. Сравнивая распространенность ДТП между будними (пн.-пт.) и выходными (сб.-вс.) днями выяснилось, что в будние дни ДТП чаще всего случались в промежутке времени с 8-10 часов утра и с 16-18 часов вечера. ДТП в выходные дни чаще всего случались в промежутке времени с 16-18 часов вечера, затем с 12-2 часов ночи и, наконец, с 10-12 часов утра. С учётом полученных данных становится ясно, что последующее увеличение мер предотвращения и исследование времени, когда ДТП имеют место быть, являются своего рода ключом к снижению распространенности дорожно-транспортных происшествий. Мы планируем провести исследование, чтобы определить эффективные меры по предотвращению дорожно-транспортных происшествий и в Казахстане. Данная методология могла бы использоваться для исследования ДТП в различных странах, включая Казахстан.

**Ключевые слова:** дорожно-транспортные происшествия, дневное время, Токио, Казахстан.

Түйіндеме

## **УАҚЫТЫ ЖӘНЕ АПТА КҮНІ БОЙЫНША ЖОЛ-КӨЛІК АПАТТАРЫНЫҢ СТАТИСТИКАЛЫҚ ТАЛДАУЫ: ОСЫ ТОКИОДАҒЫ ЗЕРТТЕУ ҮШІН ҚАЗАҚСТАНДАҒЫ БОЛАШАҚ ЗЕРТТЕУЛЕР ҮШІН ЖОБА БОЛАТЫН МЕТОДОЛОГИЯ**

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**Кіріспе:** Келешекте жол-көлік оқиғалары алдын алу үшін іс – шаралар әдістеу мақсатында егжей-тегжейлі зерттеулер өткізу қажет болады. Сол сияқты Жапонияда ғана емес, сонымен қатар басқа мемлекеттерде қолданылатын статистикалық әдістерді әдістеу қажет.

**Материалдар және әдістер:** 2010-2014 жж. мерзімдегі Токиодағы жол-көлік оқиғаларының таралуы астаналық полиция департаменті баяндамасы негізінде зерттелген болатын. Сол сияқты, осы апаттар ерекшеліктері зерттелген болатын. алынған нәтижелер Токиодағы ЖКО алдын алу бойынша іс – шараларын әдістеуде жіті қажеттілікті анықтады. Содан басқа, Қазақстандағы жол-көлік оқиғаларының таралуын зерттеуде және осы методологияны

пайдалану және осы мемлекеттегі жол–көлік оқиғаларының алдын алу бойынша іс шараларды әдістеу үшін ағымдағы нәтижелерді пайдалану суреттелді.

**Нәтижелер және қорытындылар:** Зерттелген 5 жыл ішінде 233144 жол–көлік оқиғалары орын алды. ЖКО әдетте жұма күндері орын алған, ал жексенбіде сирек. ЖКО таралуын салыстыра отырып күнделікті (дүйс-жұма) және демалыс (сенбі – жекс.) арасында ЖКО күнделікті күндері 8-10 сағат таңертеңгі уақытта және 16-18 сағат кешкі уақытта болатыны анықталды. Демалыс күндері ЖКО 16-18 сағат кешкі уақытта, сосын 12-2 сағат түнгі уақытта жиі кездеседі, және 10-12 сағ. таңертеңгі уақытта болады. ЖКО болған жағдайда алдын алу шараларын көбейту және уақытты зерттеу үшін алынған мәліметтерді ескерумен анық болатын жол–көлік оқиғалары төмендеуінің таралуының кілті болып табылады. Біз Қазақстандағы жол–көлік оқиғаларының алдын алу бойынша тиімді іс - шараларды анықтау үшін зерттеуді өткізуді жоспарлауымыз. Осы методология әртүрлі мемлекеттерде, Қазақстанды қоса алғанда ЖКО зерттеу үшін пайдаланылуы мүмкін.

**Негізгі сөздер:** жол – көлік оқиғалары, күндізгі уақыт, Токио, Қазақстан.

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### Introduction

According to a report from the National Police Agency, there were 10,684 traffic fatalities in Japan in 1995 and over 10,000 annually in prior years. However, there were around 9,000 traffic fatalities annually from 1996–2000, around 8,000 annually from 2001–2002, around 7,000 annually from 2003–2004, around 6,000 annually from 2005–2006, around 5,000 annually from 2007–2008, and around 4,000 annually from 2009–2014 [1]. Efforts such as enforcing the wearing of seat belts and steep increases in fines, lowering the legal limit for driving under the influence, and ongoing campaigns have presumably resulted in the decrease in traffic fatalities [2,3,4]. Detailed studies of various aspects of traffic accidents will need to be conducted and measures will need to be devised based on the findings of those studies in order to determine more effective measures to

prevent traffic accidents in the future. In addition, a methodology that is not limited specifically to Japan but that is applicable to other countries as well needs to be developed.

### Methods

*Type of study.* This was a descriptive study.

*Methods of selection of study participants*

This study examined traffic accidents in Tokyo based on a report from the Tokyo Metropolitan Police Department [5]. This report publishes numerical data without information identifying individuals.

*Data collection*

This study examined traffic accidents by time and day of the week in Tokyo from 2010–2014 [5].

*Data presentation*

Traffic accidents at different times on different days were divided into accidents on weekdays

(Mon.–Fri.) and accidents on weekends (Sat. & Sun.).

#### Data analysis

Traffic accident trends on weekdays and weekends were compared. Those findings suggested specific measures that Tokyo needs to implement to prevent traffic accidents in the future. This study also examined whether the current methodology could be used to study traffic accidents in Kazakhstan and to devise measures to prevent traffic accidents in that country.

#### Ethical considerations

This report examined official data without information identifying individuals.

#### Results

The annual number of traffic accidents over the 5 years studied is shown in Figure 1. During that period, there were 233,144 traffic accidents in total, with an average of about 46,629 accidents annually. During that period, the most accidents (55,013) occurred in 2010 and the fewest occurred (37,184) occurred in 2014.

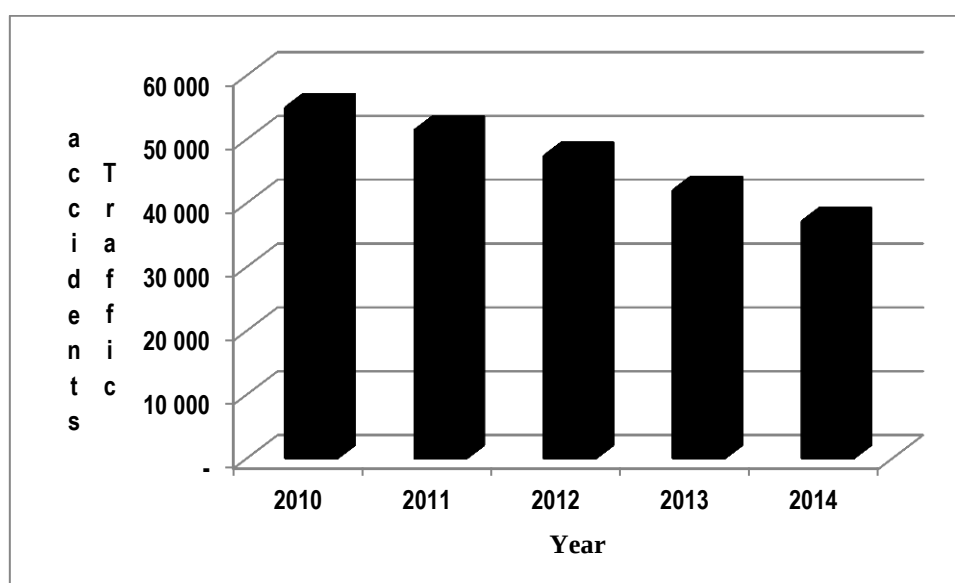


Figure 1. Traffic accidents in Tokyo from 2010–2014.

The number of traffic accidents by day of the week is shown in Figure 2. Accidents most often occurred on Friday (16.25%), followed by

Tuesday (15.00%), Thursday (14.95%), Wednesday (14.87%), Monday (14.64%), Saturday (14.27%), and then Sunday (10.01%).

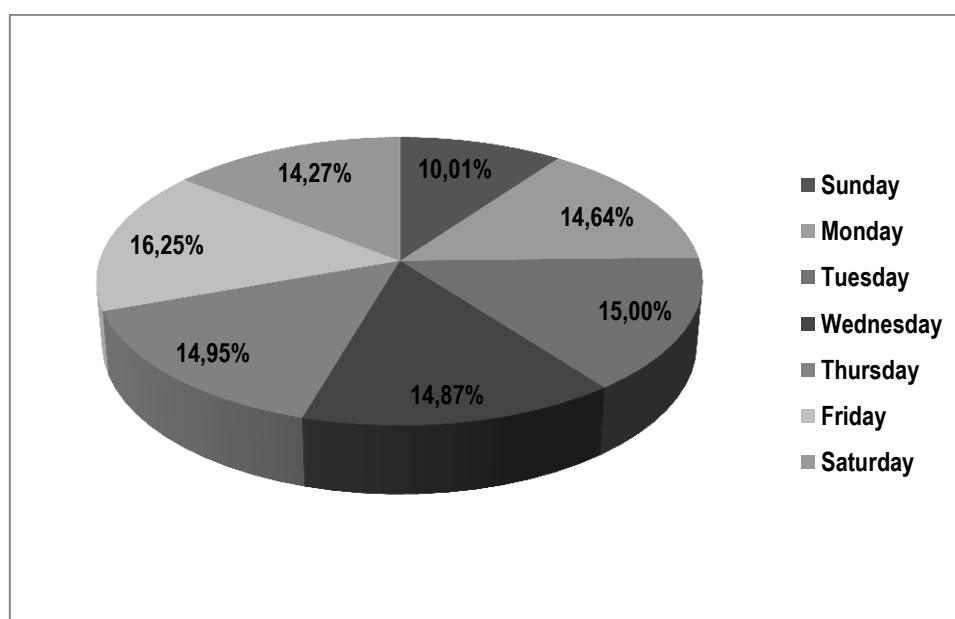


Figure 2. Traffic accidents by day of the week in Tokyo from 2010–2014.

The number of traffic accidents by time on weekdays and weekends is shown in Tables 1 and 2. Accidents on weekdays most often occurred from 8–10 AM (15.34%), followed by 4–

6 PM (13.92%). Accidents on weekends most often occurred from 4–6 PM (14.12%), followed by 2–4 PM (13.24%), 12–2 PM (13.03%), and then 10–12 AM (13.02%).

Table 1.

**Traffic accidents by time on weekdays in Tokyo from 2010–2014.**

|     | 2010     | 2011     | 2012     | 2013     | 2014     | Total    |
|-----|----------|----------|----------|----------|----------|----------|
| 1st | 8–10AM   | 8–10AM   | 8–10AM   | 8–10AM   | 8–10AM   | 8–10AM   |
|     | (15.48%) | (15.12%) | (15.69%) | (15.13%) | (15.20%) | (15.34%) |
| 2nd | 4–6PM    | 4–6PM    | 4–6PM    | 4–6PM    | 4–6PM    | 4–6PM    |
|     | (13.84%) | (13.93%) | (14.06%) | (13.82%) | (13.98%) | (13.92%) |
| 3rd | 2–4PM    | 10–12AM  | 10–12AM  | 10–12AM  | 10–12AM  | 10–12AM  |
|     | (12.17%) | (12.26%) | (12.09%) | (12.66%) | (12.38%) | (12.28%) |
| 4th | 10–12AM  | 2–4PM    | 2–4PM    | 2–4PM    | 2–4PM    | 2–4PM    |
|     | (12.12%) | (12.07%) | (11.81%) | (12.05%) | (12.05%) | (12.04%) |

Table 2.

**Traffic accidents by time on weekends in Tokyo from 2010–2014.**

|     | 2010     | 2011     | 2012     | 2013     | 2014     | Total    |
|-----|----------|----------|----------|----------|----------|----------|
| 1st | 4–6PM    | 4–6PM    | 4–6PM    | 4–6PM    | 4–6PM    | 4–6PM    |
|     | (14.28%) | (14.51%) | (13.67%) | (13.70%) | (14.43%) | (14.12%) |
| 2nd | 2–4PM    | 10–12AM  | 2–4PM    | 10–12AM  | 10–12AM  | 2–4PM    |
|     | (13.48%) | (13.26%) | (13.55%) | (13.15%) | (13.23%) | (13.24%) |
| 3rd | 12–2PM   | 2–4PM    | 12–2PM   | 2–4PM    | 12–2PM   | 12–2PM   |
|     | (13.01%) | (13.20%) | (13.50%) | (13.03%) | (13.14%) | (13.03%) |
| 4th | 10–12AM  | 12–2PM   | 10–12AM  | 12–2PM   | 2–4PM    | 10–12AM  |
|     | (12.75%) | (12.84%) | (12.78%) | (12.66%) | (12.74%) | (13.02%) |

## Discussion

Based on the current findings, preventive measures on weekdays and weekends probably need to be enhanced further and times when accidents occur probably need to be studied to target educational efforts to further reduce traffic accidents. In specific terms, further effort needs to be expended to reduce traffic accidents on weekdays and the public needs to be educated about preventing traffic accidents. The hours of 8–10 AM on weekdays are hours of travel to work or school and the hours of 4–6 PM are hours of travel from work or school or shopping, so educational efforts to prevent traffic accidents need to involve schools, workplaces, and the community. The times slightly prior to noon until early evening on weekends are hours when family trips take place, so educational efforts targeting families and the community should prove effective at preventing traffic accidents.

One limitation of this approach is that it focuses substantially on weekdays as commuting times to work or school and on weekends as holidays, though there are instances when this does not hold true.

Numerous studies in Japan have indicated that a focus on evidence-based preventive measures and educational efforts is effective when a rapid response to a social issue is required [6,7,8]. Studies overseas have examined various aspects of measures to prevent traffic accidents [9,10,11,12,13]. However, few studies have assembled data on aspects such as day and time from multiple years and few studies have indicated the importance of educating the public about preventive measures, as the current study has done. In the future, we are considering a study to determine which measures will prove effective at preventing traffic accidents in Kazakhstan. The current methodology could be

used to study traffic accidents in different countries, such as Kazakhstan.

### Conclusions

In conclusions, Tokyo must expend further effort to prevent traffic accidents on weekdays. Tokyo also needs to increase its educational efforts to prevent traffic accidents during hours of travel to work or school and hours of travel from work or school or shopping on weekdays and hours of family trips on weekends. A statistical study of traffic accidents by time and day of the week is a methodology that could be considered for use in studies in different countries, such as Kazakhstan.

### Conflict of interest: None

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