Pedestrian behavior related to accident involvement

Abdul-Rahman Mustafa Al-Kilani

Civil Engineering

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Abstract

It is important to study pedestrian behavior related to safety because as a road user group they are vulnerable in accidents.

The main goal of this research is to study pedestrian behavior and based upon the findings to recommend ways for improving pedestrian safety. The behavior of the pedestrians has been analyzed through interviews with pedestrians and through observance of behavior from video films taken at intersections.

The relationship between pedestrian behavior, knowledge and feelings with the socioeconomic background and regional characteristics (city size) has been analyzed using contingency tables, and the associated statistical tests.

Signal violation and jaywalk crossing were found to be main problem areas in pedestrian behavior. The majority of pedestrians believe that drivers have careless attitude toward pedestrians and do not trust them not to violate traffic signals. Study shows that whether the interviewed pedestrian is a driver or nondriver does not seem to have any effect on his behavior on the road. High school pedestrians had the highest percentage of non-checking traffic and improper crossing. It was found that there is not much difference in pedestrian behavior between nationalities among females. Finally some recommendations were made for improving the pedestrian safety.

Pedestrian Behavior Related to
Accident Involvement

by

Abdul-Rahman Mustafa Al-Kilani

A Thesis Presented to the

FACULTY OF THE COLLEGE OF GRADUATE STUDIES

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DHAHRAN, SAUDI ARABIA

In Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE

In

CIVIL ENGINEERING

June, 1989

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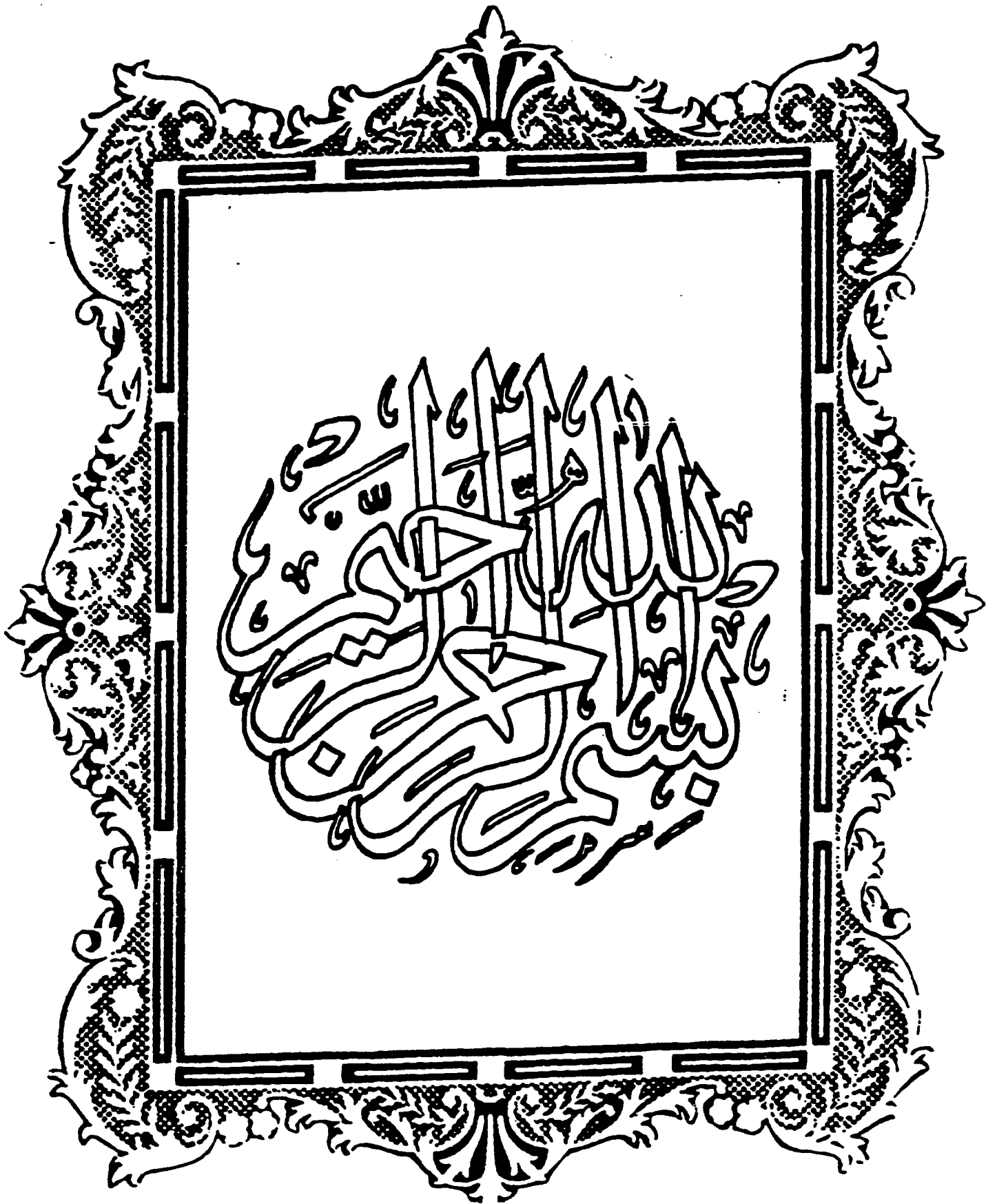
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KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DHAHRAN - SAUDI ARABIA.

COLLEGE OE GRADUATE STUDIES

This thesis, written by___Al-Kilani, Abdul-Rahman Mustafa___

under the direction of his Thesis Advisor and approved by

his Thesis Committee, has been presented to and accepted

by the Dean of the College of Graduate Studies, in partial

fulfillment of the requirements for the degree of MASTER

OF SCIENCE in TRANSPORTATION ENGINEERING.

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Dean, College of Graduate Studies

Date: _____

Dedicated to

MY PARENTS, WIFE and BROTHERS

PEDESTRIAN BEHAVIOR

Related to Accident Involvement

AKNOWLEDGEMENT

All praise to ALLAH who gave me the strength and courage to successfully complete this labourious and painstaking task.

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عنــوان الدراســـة :   تصرفات المشاة المتعلقة بالحوادث

التخصــــص :   هندسة مواصلات

تاريـــخ الشهـــــادة :   ١٩٨٩/٦/١٨م

من الضروري دراسة تصرفات المشاة المتعلقة بالسلامة لأنهم أثمن شئ يمكن أن تفقده الأمة في حالة الحوادث .

الهدف الأساسي لهذه الدراسه هو دراسة تصرفات المشاة وبناءً على النتائج وضعت الاقتراحات المناسبة لوسائل تطوير سلامة المشاة .

تم تجميع المعلومات عبر المقابلات الشخصيه واستخدام التصوير للتقاطعات بواسطة الكمرة المحمولة ولقد تمت محاولة ربط وتحليل تصرفات المشاة بالمستوى الثقافي والمشاعر مع حالة الاقتصاد الاجتماعي للمشاة وذلك تحت تأثير مواصفات المنطقة (حجم المدينه) وذلك باستخدام الاختبارات الاحصائيه .

أوجدت الدراسه أن العبور الخاطئ وقطع الاشارات يمثلان نقاط الضعف الأساسي في تصرفات المشاة،وغالبية المشاة يعتقدون بأن سائقي السيارات لايحترمون المشـــاة ولايعطونهم الاولويه في حالة كونها لهم ولاتختلف تصرفات المشاة في عبور التقاطعات سواءً أن كانوا ممن يحملون رخص قيادة أم من اللذين لايحملون رخص قيادة . وقد لوحظ أن طلاب الثانويه العامه هم من أكثر المشاة في العبور الخاطئ وفي عدم الالتفات قبل العبور ولوحظ أيضا بأن تصرفات النساء كمشاه في الشوارع لاتختلف باختلاف جنسيتهن واخيرا وضعت بعض التوجيهات لرفع مستوى سلامة المشاه .

درجة الماجستير في العلــوم

جامعة الملك فهد للبترول والمعادن
الظهران ، المملكة العربية السعودية

ABSTRACT

It is important to study pedestrian behavior related to safety because as a road user group they are vulnerable in accidents.

The main goal of this research is to study pedestrian behavior and based upon the findings to recommend ways for improving pedestrian safety. The behavior of the pedestrians have been analyzed through interviews with pedestrians and through observance of behavior from video films taken at intersections.

The relationship between pedestrian behavior, knowledge and feelings with the socioeconomic background and regional characteristics (city size) have been analyzed using contingency tables, and the associated statistical tests.

Signal violation and, jaywalk crossing were found to be main problem areas in pedestrian behavior. The majority of pedestrians believe that drivers have careless attitude toward pedestrians and do not trust them not to violate traffic signals. Study shows that whether the interviewed pedestrian is a driver or non-driver does not seem to have any effect on his behavior on the road. High school pedestrians had the highest percentage of non-checking traffic and improper crossing. It was found that there is not much difference in pedestrian behavior between nationalities among females. Finally some recommendations were made for improving the pedestrian safety.

CHAPTER 1

INTRODUCTION

It is important to pay a particular attention to pedestrians as a road user group because they are the most vulnerable in terms of accidents. Pedestrians have a higher accident and fatality rate than any other group (Firth,1982). To what extent behavior contributes to these accidents can be understood only by studying their behavior in detail and through this understanding an attempt can be made to improve pedestrian safety.

Pedestrian accidents are not only large in number, they also follow predictable patterns (Firth,1982). Some types of accidents are more frequent than others, certain areas of the road are more often the site of these accidents and specific groups of pedestrians are disproportionality represented in the accident statistics as compared with predictions from general population figures. It is the existence of these patterns which give pedestrian behavior research its impetus. Attempting to identify behavioral differences between groups of pedestrians and ascertaining their influence on accident causation is both a logical and important facet in explaining the accident patterns which do exist.

The second chapter gives problem definition and goals and objectives.

Literature review related to pedestrian behavior is given in the third chapter. Fourth chapter includes development of interview forms and the study of observable behavior through video films. the fifth chapter explains the data collection. In the sixth chapter the analysis of the collected data is presented. The last chapter contains conclusions and recommendations.

CHAPTER 2

PROBLEM STATEMENT

2.1. PROBLEM DEFINITION

A cursory look on the pedestrian safety statistics reveals the importance of the problem. The statistics of the General Traffic Police Department over the period from 1394 to 1406H reveal that the number of pedestrian accidents increased significantly as shown in Figure 2.1 . Part of this increase may be due to the increase in the growth of registered vehicles in the same period, as shown in Figure 2.2 .

Table 2.1 shows that pedestrian accidents constitute about one quarter of total urban accidents in Saudi Arabia which is higher than U.S. statistics. Pedestrian safety problems can be a result of deficiencies of various factors including planning of pedestrian facilities, low level of education of either pedestrians or drivers, improper control devices, lack of enforcement, etc. The solutions for this problem, thus depend on the type of problem which will dictate the appropriate countermeasures. In other words, it is important as a first step, to understand the characteristics of pedestrian accident problem of Saudi Arabia. After that solutions may be stated.

The various studies conducted internationally are unlikely to be applicable on a local side, simply because populations and environments are different.
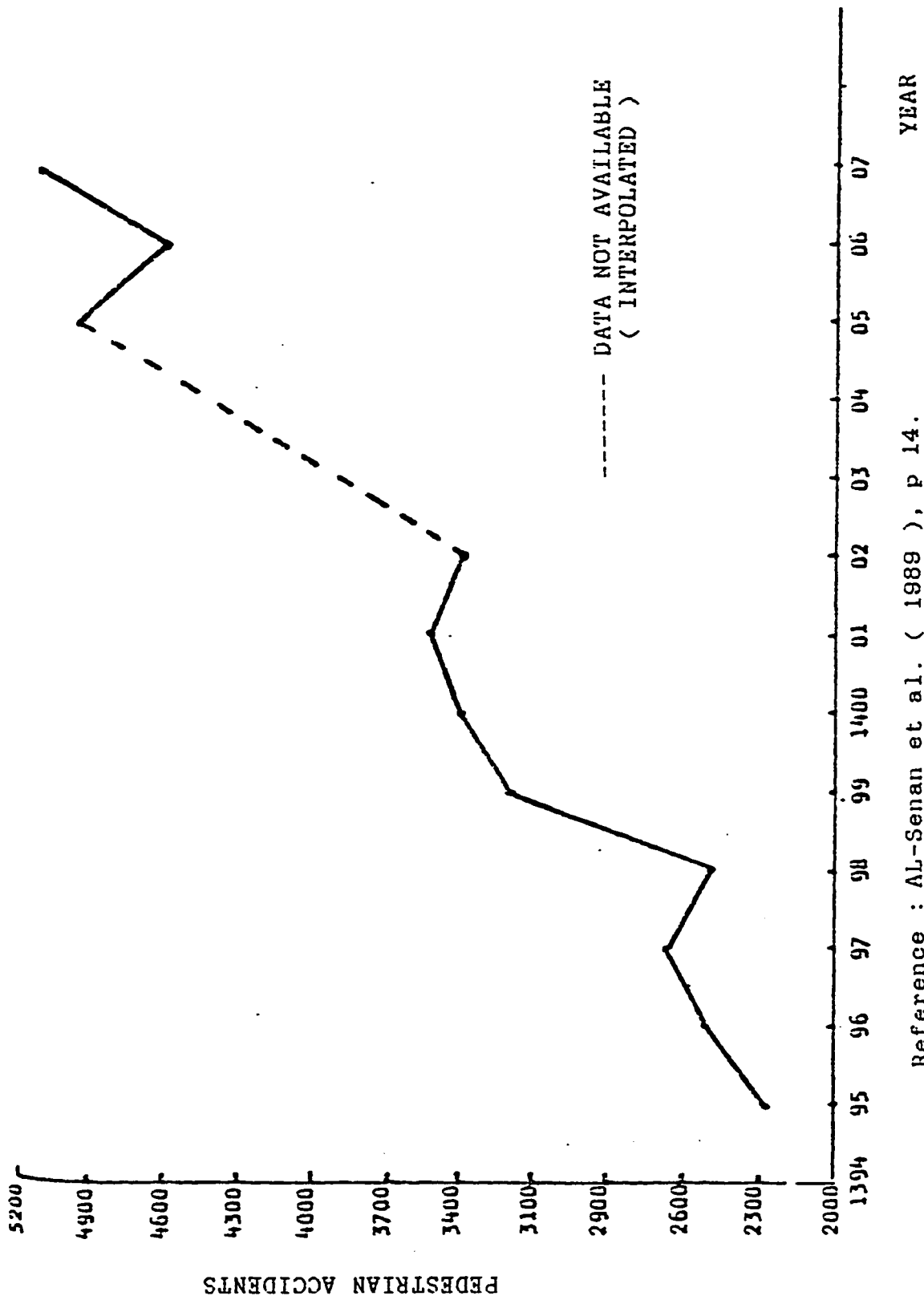
Reference : AL-Senan et al. (1989), p 14.

FIGURE 2.1 GROWTH OF PEDESTRIAN ACCIDENTS OVER THE PERIOD
1394 TILL 1406 .
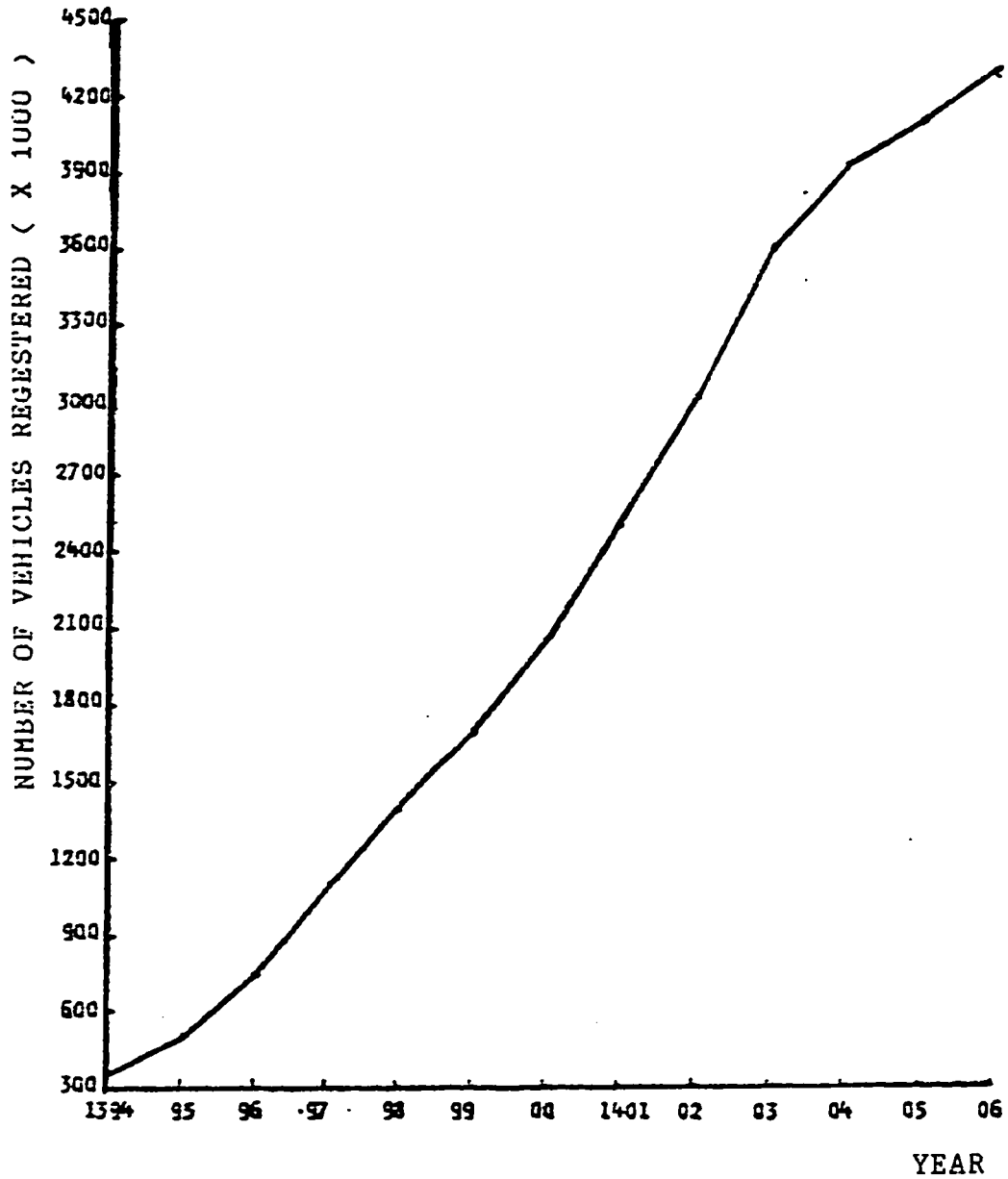
Reference : AL-Senan et al. (1989), p 15.

FIGURE 2.2 GROWTH IN NUMBER OF REGISTERED VEHICLES IN SAUDI
ARABIA OVER THE PERIOD 1394 TILL 1406 .

Year	Pedestrian Accidents	Urban Accidents	% Pedestrian Accidents or Urban Accidents
1394	2285	NA*	NA
1395	2478	NA	NA
1396	2640	11972	22.05
1397	2512	11826	21.24
1398	3166	12603	25.12
1399	3397	12514	27.15
1400	3511	13773	25.50
1401	3384	12735	26.58
1402	NA	NA	NA
1403	NA	NA	NA
1404	4946	20021	24.70
1405	4594	20852	22.03
1406	5101	23677	21.54

NA = Not Available

Reference : AL-Senan et al. (1989), p 16.
TABLE 2.1 TREND OF PEDESTRIAN AND URBAN ACCIDENTS IN THE
KINGDOM OF SAUDI ARABIA .

2.2. GOALS AND OBJECTIVES

The main goal of the research is to study pedestrian behavior and based upon this study to recommend methods for improving pedestrian safety. The specific objectives are as follows :

a. Analyze the behavioral attitudes of the pedestrians by field observations and interviews.

b. Study the level of knowledge of pedestrians about traffic rules, and pedestrian facilities related to their safety.

c. Study the relationship between the socioeconomic background (age, sex, education etc.), city size and behavioral attitudes and leve of knowledge.

d. Based upon the above analysis, prepare guidelines for the development of pedestrian safety awareness program.

CHAPTER 3

LITERATURE REVIEW

The social costs of pedestrian collision with motor vehicles are immense, contributing almost 20 percent of the fatalities attributed to motor vehicles. Many studies have been carried out in order to clarify the reasons causing pedestrian accidents

Jones (1970) believed that the lack of a criterion measure of pedestrian performance account for relative neglect of pedestrian safety. The paper described the development of an observational technique for pedestrian behavior, the reliability achieved, and, briefly, its use as a criterion of countermeasure effectiveness.

> "In large proportion of cases, the proximal causes of pedestrian accidents are the pedestrian's failure to search and detect and his or her sudden appearance, which implies running into the path of a vehicle and unexpectedness of location, or blocking of driver's or pedestrian's view." (p 1 Jones 1970)

Jones's study was based on the observation of pedestrian behavior in normal traffic. It was suggested that in order to focus observer's attention and avoid information overload, only those aspects of pedestrian behavior most likely be causally related to accidents must be selected for coding. These aspects were :

a. Search at the curb.

b. Stopping at the curb.

c. Position within or outside the crosswalk area.

d. Walking versus running.

e. Playing of any sort while crossing.

f. Walking on the street instead of the sidewalk.

g. Crossing two streets without gaining the curb in between them.

h. Crossing midblock.

The auther has come with the following conclusions related to data collection and the study of these data :

a. Since adding observational categories will overload the observers and destroy reliability, it is not recommended to add other special behaviors unless they are carefully studied.

b. Training of observers must be continued until the index of agreement (reliability) reaches a satisfactory level.

c. Although the data reported were obtained on children, adult behavior can be studied as easily.

d. Children's traffic behavior is extremely hazardous even under the best of circumstances.

e. It is important to stop at the curb before proceeding, since that gives time for detection by both pedestrian and driver.

f. Although the proportion of school children crossing uncautiously is large, the remarkable finding was that more are not hit. So Jones emphasized on what Reiss (1977) has suggested that tendency to walk in groups makes children more visible to drivers.

Knoblauch, Tobey, and Shunaman (1984) have carried research on what pedestrians do when they walk from place to place on public rights of way. The project had three major goals :

a. To identify pedestrian trip making characteristics and behavior.

b. To determine characterestics of pedestrian exposure.

c. To determine relative hazardousness of pedestrian behaviors, activities,

and various situational factors.

A large-scale field study was conducted in five standard metropolitan statistical areas (SMSAs). Three types of data were collected and analyzed : Pedestrian and vehicle exposure data, site-characteristics data, and accident data. However, for accident data to be meaningful, they were compared with the experience of the nonaccident population, or the population at risk. This information on the population at risk is called exposure data. Four different types of exposure data were collected : pedestrian volume and action data, vehicle volume and action data, pedestrian activity sample, and counts of special types. Pedestrian exposure is described in terms of the number of pedestrian-vehicle (PV) interactions.

Pedestrian characteristics were analyzed under four major headings :

a. Who walks (age and sex of the observed pedestrian population).

b. Where pedestrian walk (pedestrian activity in terms of adjoining land use and crossing behavior).

c. When pedestrian walk (pedestrian activity in terms of time of day, day of week, and crossing location; age and sex differences).

d. What pedestrian do (pedestrian activity in terms of crossing behavior, time spent in the roadway, mode (walking or running), accompaniment (alone or with others), signal compliance, and gap acceptace).

It was required that the paths of particular vehicles and pedestrians cross each other in order for those vehicles and pedestrians to enter the exposure count.

A total of six different types of conflict measures were collected and analyzed :

a. Pedestrian crossing midblock, vehicle proceeding straight ahead.

b. Pedestrian crossing at intersection, vehicle proceeding straight through the intersection.

c. Pedestrian crossing at intersection, vehicle concluding either a right or left turn (two types).

d. Pedestrian crossing at intersection, vehicle initiating either a right or left turn (two types).

Hazard scores were developed to analyze the relationship between the occurrence of certain factors in the accident population and their occurrence in the general population at risk. These hazard scores are the ratios obtained by dividing the percentage of occurrence of a characteristic in either the accident population or the exposure population by the percentage of occurrence in the other population. The hazard score is presented as a positive number if more hazard is associated with the characteristics. Figure 3.1 shows the relative hazard associated with some selected roadway and intersection characteristics. They came with the following conclusions :

a. By examining areas and locations where pedestrian exposure to vehicular traffic is most frequent, the efficiency and safety of the pedestrian environment can be improved.

b. The relative hazard identifies those places and persons most likely to have a pedestrian accident, based on exposure. This provides an effective way to target locations for safety improvements.

c. The hazard scores can be effectively used to target pedestrian safety

Roadway Characteristics	Percent of National Projection of:		PxV Hazard Score
	Accidents	PxV Exposure	Less Hazard ← → More Hazard 5 3 1 -1 -3 -5
Roadway Functional Classification			
Major Arterial	17.0	8.1	-2.1
Collector-Distributor	30.8	51.2	-2.0
Local Street	29.4	24.0	+1.6
Other	12.9	6.7	+1.9
Pedestrian Accommodations			
No Sidewalks or Pathways	23.2	10.7	+2.1
Sidewalk (one or both sides)	76.7	80.3	-1.2
Street Lighting			
None	14.5	1.2	12.1
Present	85.5	98.8	-1.2
Land Use			
100% Residential	21.7	6.5	-3.3
Commercial	47.7	71.8	-1.5
Mixed	30.6	21.6	+1.4
Lane Configuration			
2x2	48.7	29.0	+1.7
2x4	34.2	19.3	-1.8
4x4	17.0	51.7	-3.0
Signalization			
No Signalization	63.3	31.8	-2.0
Red, Green, Amber (RGA)	12.1	10.1	+1.2
RGA + Pedestrian Signal	24.7	58.2	-2.4
Crosswalks			
Not Marked	61.2	24.8	-2.5
Marked	38.8	75.2	-1.9

Reference : Knoblauch, Tobey and, Shunaman (1984), P 38·

FIGURE 3.1 RELATIVE HAZARD : Sellected Roadway and Intersection.

countermeasures. Since they provide an indication of the relative hazard associated with accident-precipitating pedestrian activities.

Reiss (1977 a) carried out study to develop guidelines for the protection of young pedestrians (ages 5 to 14) on their way to and from schools. These guidelines were based on field surveys of the young pedestrian and the driver regarding designated school zones and specific school crossing protective devices. A survey of primary and secondary school students was devised in an effort to provide some basic facts with respect to students' school walking trip behavior and knowledge related to school trip safety. The objectives of these surveys were to identify:

a. The student knowledge that needs modification.

b. The student behavior that needs modification.

c. The procedures for modification of knowledge and behavior.

The questions addressed by the student survey were :

a. What do student know about traffic control devices ?

b. What fears do students have in reference to traffic ?

c. How do students select their routes to school ?

d. How do students cross the street ?

These surveys have helped relating student's knowledge with their habits as pedestrians. By using accident and age distribution data collected by American Automobile Association, Reiss showed that

> "There is a near monotonic relationship between age and accident involvement rate for the (5 to 10) year old population." (p.41, Reiss)

The youngest students are considerably over represented in the school accident data, as illustrated in Figure 3.2. Reiss's study shows that, with an
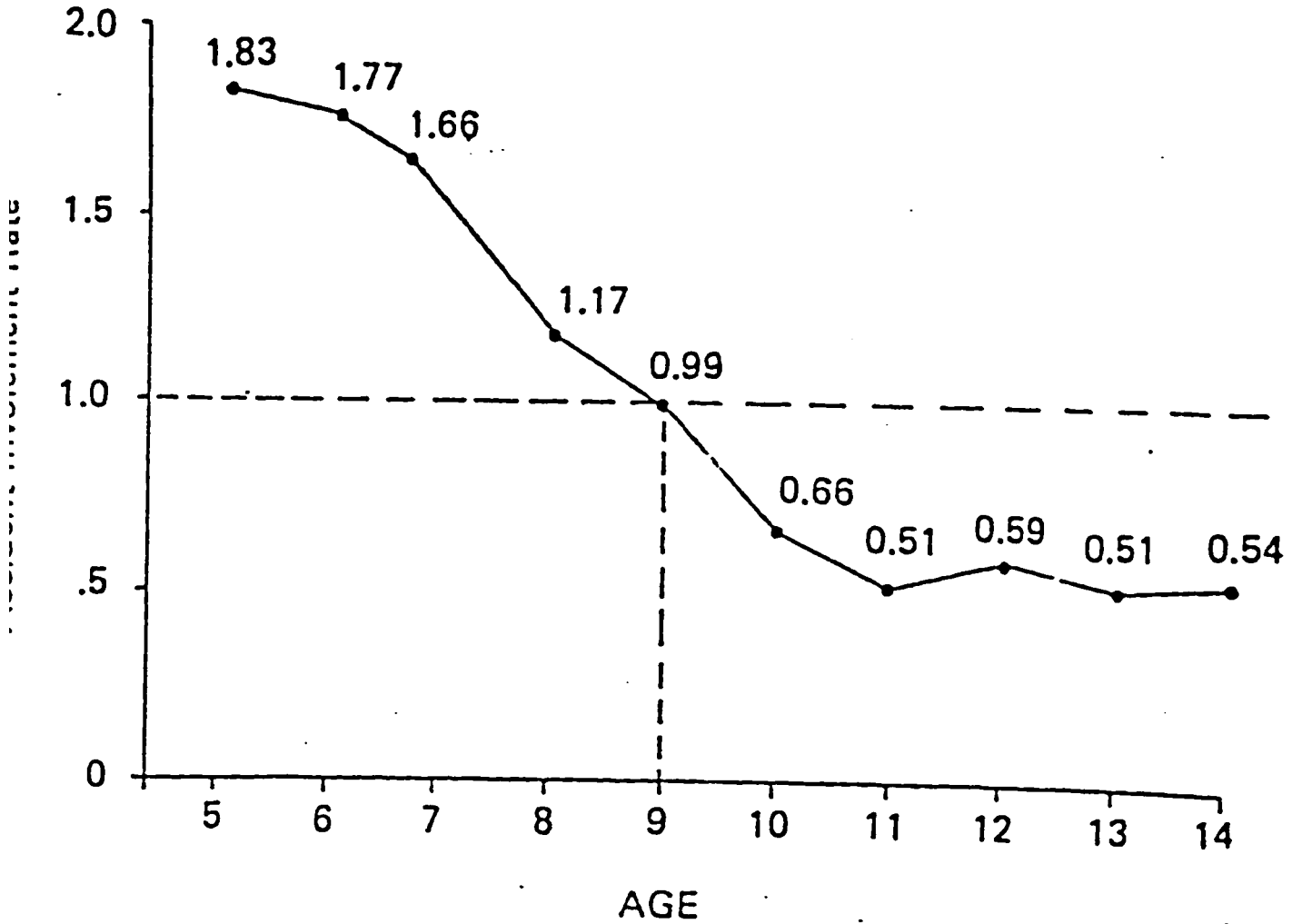
Reference : Reiss (1977), P 41·

FIGURE 3.2 SCHOOL TRIP PEDESTRIAN ACCIDENT INVOLVEMENT RATE OF
STUDENTS BY AGE .(Based on 1,910 Accidents).

increase in age, a greater proportion of the students will cross with the green signal. This increased knowledge of traffic control devices with student age closely matches the decreasing rate of student involvement in accidents. He has suggested that the youngest student's accident risk and lack of knowledge of traffic control devices should be considered in relation to how children choose their routes to school and who can influence their choices.

The survey responses to questions on route choice and route change indicate an increasing independence from parents and an increasing influence of peer group pressure.

Sterling (1974) attempted to analyze the reaction of pedestrian to the flashing WALK indication. Two measurable aspects of pedestrian behavior reflect reaction to the WALK indication :

a. Observation rate.

b. Conflict rate.

In general the pedestrian observation rate is simply the percentage of legal crossings. The conflict rate is the percentage of crossing occuring with specifically defined interruption. The quantification of those variables was used to draw background about pedestrian reaction to the flashing WALK indication with the steady WALK indication as a frame of reference. The types of crossing WALK classified into five categories :

a. Decision legal crossing; an individual waits until the WALK interval before crossing.

b. Nondecision legal crossing; an individual continues across the street without interruption during a WALK interval.

c. Flashing DON'T WALK crossing; an individual continues across the

street illegally during flashing DON'T WALK interval.

d. Decision illegal crossing; an individual waits during the steady DON'T WALK interval until an adequate gap appears in traffic and then crosses usually without conflict.

e. Arrival illegal crossing; an individual continues across the street during the steady DON'T WALK interval, usually by weaving through the vehicular traffic.

The conclusions drawn from this study are as follows :

a. A significantly higher percentage of both legal crossing and decision legal crossing occurred with the steady WALK than with the flashing WALK.

b. A significantly higher percentage of illegal conflict crossings occured with the flashing WALK than with the steady WALK.

This study points out the general misunderstanding of the flashing WALK (flashing GREEN MAN) indication as a warning to pedestrians to watch for turning vehicles.

Zegeer, Cynecki, and Opiela (1984) believe that one of the pedestrian safety problems in the United States is the ineffectiveness and confusion associated with pedestrian signal indications, so they have carried a study to develop and evaluate innovative pedestrian sign and signal alternatives. This study focused on two situations in which signal alternatives were considered most likely to be effective :

a. Pedestrian clearance : to replace or supplement the flashing DON'T WALK indication, and

b. Indication of potential conflicts : to replace or supplement the flashing

WALK indication.

A total of fourty one alternatives were developed, and the eight judged most promising were evaluated at several sites within five U.S. cities. The alternatives were evaluated using before-and-after studies of pedestrian violations and various types of pedestrian-vehicle conflicts. The statistical analysis consisted of a series of Z-tests for proportions to compare several Measures of Effectiveness (MOEs) such as the percentage of pedestrian violations and conflicts.

The followings are some of the recommendations they have developed based on the results of the analysis :

a. The option for flashing WALK display should be taken out of the Manual on Uniform Traffic Control Devices (MUTCD), because the flashing display offers no advantage over the steady WALK display and only serves to confuse pedestrians.

b. The signs WATCH FOR TURNING VEHICLES, and YIELD TO PEDESTRIANS WHEN TURNING should be added to the MUTCD as optional signs to be installed at sites where a particular problem exists with accidents or conflicts relative to turning vehicles.

c. The pedestrian signal explanation sign should be added to the MUTCD as information signs to inform pedestrians of the meaning of the existing signal messages.

d. The WALK WITH CARE signal display should be added to the MUTCD as a special device that can be used as an option at locations with an unusual problem of heavy vehicular turning maneuvers and modulate to high pedestrian volumes.

Khisty (1982) has described a study undertaken at Washington State University to examine the characteristics of pedestrian cross flows in corridors, passageways, and hallways and to determine the effect of one pedestrian flow crossing another. Statistical analysis was used to explain these characteristics and to establish a design criterion for facilities where such cross flows of pedestrians occur. This study was undertaken by using time-lapse photography to determine the effect of a minor pedestrian flow crossing a major pedestrian flow. Such cross flows of pedestrians are common in major activity centers and in special event transportation systems, such as universities, bus stations, art galleries, museums, and places of entertainment. The films yielded two sets of data : first, the flow (q)-density (k)-speed (v)-information for the major and minor streams of pedestrians who cross the study area, and second, the number of conflicts observed between pedestrians at different densities. The analysis of pedestrian collisions or near collisions (conflicts) shown in Figure 3.3 connects the density of pedestrians in the study area with the percentage of conflicting pedestrians. The results of this study were compared with those obtained from theoretical gap and collision analysis. The comparisons were found to match closely. A design criterion suggested is to limit the maximum density in such cross flows to 0.8 pedestrians per meter square.

Zegeer, Opiela, and Cyncki (1982) in their report have determined whether pedestrian accidents at signalized intersections are affected by different uses of pedestrian signals and signal-timing schemes. The evaluation approach selected for this research involved the use of pedestrian accident experience instead of pedestrian behavior, compliance measures, or other accident surrogates to determine the effect of pedestrian signals and timing of pedestrian safety. The two types of accident analysis considered were :
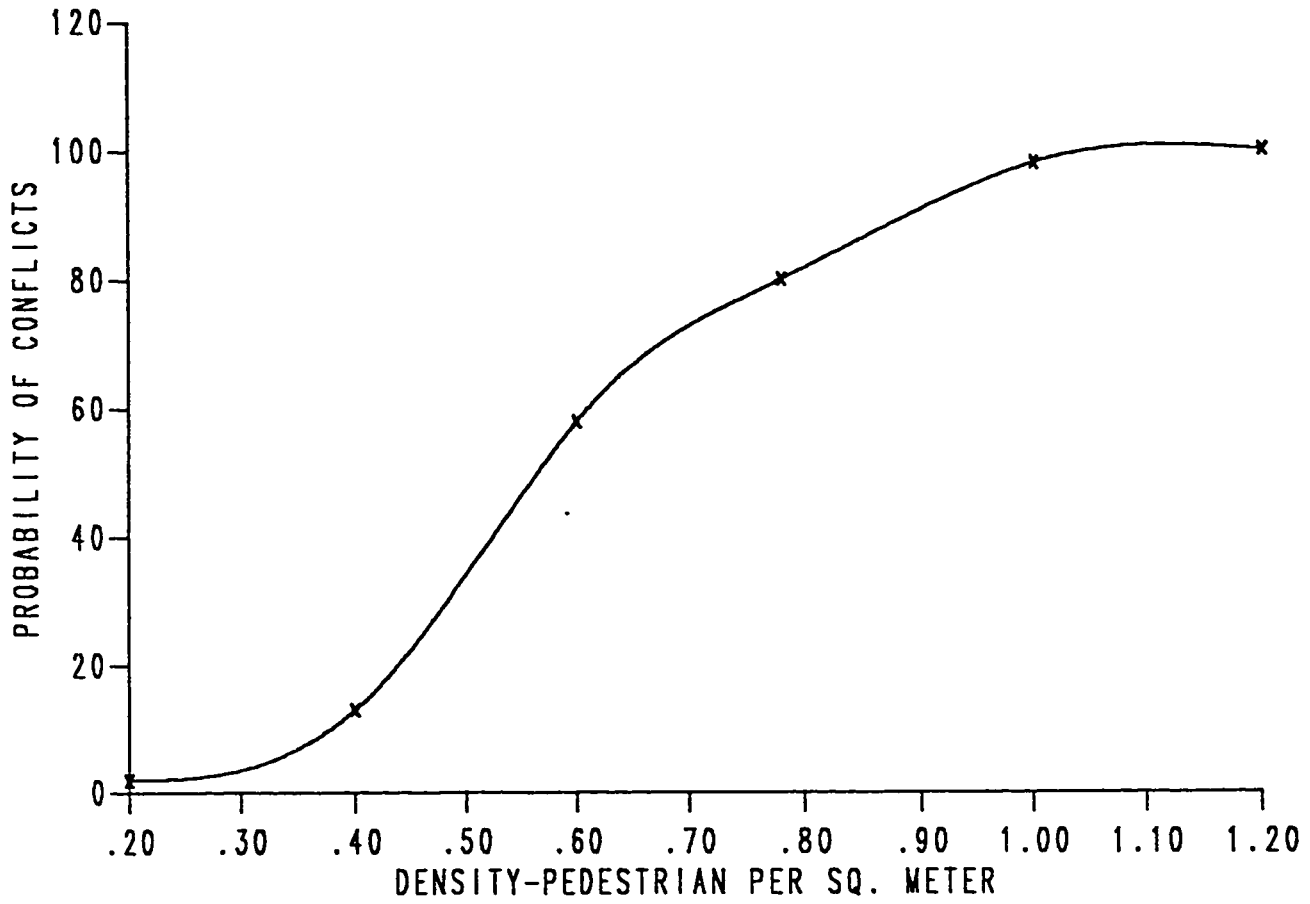
Reference : Khisty (1982), P 56·

FIGURE 3.3 CROSS-FLOW TRAFFIC CONFLICTS.

a. The analysis of pedestrian accident before and after the installation of pedestrian signal.

b. A comparative analysis of accidents at locations with and without pedestrian signals.

Data related to pedestrian accidents, intersection geometries, traffic and pedestrian volumes, roadway environment, and signal operation were collected for 1297 traffic-signalized intersections in fifteen cities throughout the United States. The data were analyzed by using various statistical tests, which included branching analysis, correlation analysis, chi-square analysis, and the analysis of variance and covariance. The use of concurrent-timed pedestrian signals was found to have no significant effect on pedestrian accident distributions (based on chi-square test) or pedestrian accident frequencies (analysis of variance and covariance) for a sample of more than 1100 locations that represented these two groups. The number of pedestrian accidents that involved turning-vehicles was found to be significantly higher for locations that had concurrent-timed pedestrian signals than for locations that did not have pedestrian signals when other important variables were controlled through the use of analysis of covariance.

CHAPTER 4

METHODOLOGY

The behavior of pedestrians was analyzed through interviews with pedestrians and through observance of behavior from video films taken at intersections. The latter study was particularly needed because interviews can not be made with females due to local social norms.

4.1. DEVELOPMENT OF INTERVIEW FORM

Interview form was developed to study the behavior of pedestrians, as shown in Figure 4.1. This form was pretested in ARAMCO and includes the modifications made on a previous form.

The questionnaire form has the following parts :

(a) Observation of Behavior :

This part is designed to record the observable behavior of the interviewed pedestrian. Three types of pedestrian behavior was observed in this part. These were :

1- Whether or not pedestrian checked the traffic before started crossing the street.

2- If the pedestrian crossed in the prohibited phase, permitted phase or pedestrian clearence phase in a signalized intersection.

3- If the pedestrian crossed improperly (i.e by emerging from between the cars) and/or jaywalking (crossing the intersection diagonally) or properly (i.e either on a cross-walk if it exist or in front of the stopped

PEDESTRIAN INTERVIEW

Location:_____ by _____ Intersection No._____ City:_____

Date:_____ Time:_____ Observer:_____

A. OBSERVATION:

1. Pedestrian   ☐ Checked Traffic   ☐ did not check traffic

2. Pedestrian crossed on   ☐ permitted phase   ☐ prohibited phase

     ☐ Clearance   ☐ Not applicable

3. Pedestrian crossed   ☐ Between Cars/Jaywalked   ☐ In front of queue/on X-walk

B. CONFLICTS:

4.
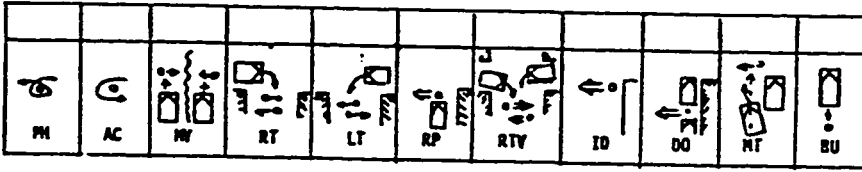
| PM | AC | MV | RT | LT | RP | RTV | ID | DO | MT | BU |

PM = Pedestrian hesitation   LT = Left turn   DO = hub out
AC = Aborted crossing   RP = hunting pedestrian to avoid possible collision   MT = Multiple thrust
MV = Moving vehicle   BU = Back up
RT = Right turn   RTV = Run from turning vehicle
ID = Intersectional due to traffic

C. INTERVIEW

                                                            Yes   No

5. Pedestrian safety has become a significant issue .... ☐   ☐

6. Drivers have careless attitude toward pedestrians .... ☐   ☐

7. You are totally responsible for own safety when crossing .... ☐   ☐

8. You trust drivers to stop for you when crossing at a crosswalk at an unsignalized intersection .... ☐   ☐

9. Drivers must stop for you when crossing on green (or pedestrian indication) at a crosswalk at a signalized intersection .... ☐   ☐

10. Match the followings in each column

       Green man   complete cross/do not start crossing

       Red man   Cross

       flashing green man   Stop

11. Have you experienced pedestrian safety problem ?

12. If yes   ☐ accident   ☐ Near miss

13.   ☐ as a driver   ☐ as a pedestrian

       Explain how?

_____

_____

14. Do you drive a motor vehicle   ☐ Yes   ☐ No

15. Age: ☐ Under 18   ☐ 18-25   ☐ 26-35   ☐ 36-45   ☐ Over 46

16. Nationality: ☐ Saudi   ☐ Non Saudi

17. Education   ☐ No education   ☐ below high school

               ☐ High school   ☐ University degree

18. Comment

FIGURE 4.1 PEDESTRIAN INTERVIEW FORM.

quee of cars and/or after the stop line).

(b) Conflicts :

If the pedestrian is involved in a conflict, this will be ticked in the appropriate box. Eleven types of conflicts were observed as follow :

1- Pedestrian hesitation (PH) : pedestrian momentarily reverses his direction of travel in the traffic lane, or the pedestrian hesitates in response to a vehicle in a traffic lane.

2- Aborted crossing (AC) : pedestrian stops off curb but later reverses direction back to the curb.

3- Moving vehicle (MV) : through traffic is moving through the crosswalk within twenty feet of a pedestrian in a traffic lane.

4- Right-turning vehicle (RT) interaction : pedestrian is in the path and within twenty feet of a right-turning vehicle.

5- Left-turning vehicle (LT) interaction : pedestrian is in the path and within twenty feet of a left-turning vehicle.

6- Running pedestrian conflict for through-vehicle (RP): pedestrian runs in a traffic lane in an effort to avoid possible collision with a vehicle.

7- Run from turning vehicle (RTV) : pedestrian runs in a traffic lane in response to a turning vehicle or potential turning vehicle.

8- Intersection Dash (ID) : pedestrian runs inattentively at intersection (no oncoming vehicles).

9- Dart out (DO) : pedestrian suddenly appears or runs between parked vehicles.

10- Multiple threat (MT) : one or more vehicles stops for the pedestrian. One or more vehicles on the other lanes don't stop and cause a conflict.

11- Back up (BU) : pedestrian with near collision with a backing vehicle.

(c) Interview :

This part includes questions about general feelings and knowledge related to pedestrian safety, past experience of any safety problem, and socioeconomic background.

4.2. STUDY OF OBSERVABLE BEHAVIOR THROUGH VIDEO FILMS

Because of the Saudi society customs, interviews can not performed with females. Therefore, video films were used to study female behaviors and conflicts. A form as shown in Figure 4.2 was developed for this. It should be noted that all these information were taken from video tapes by estimation (such as age), by some proxy measures (for instance Saudi's were assumed to be those who dressed up in local Saudi customs i.e black veil for women and thobe and qutra for males) or by direct observations (such as accompaniment, conflicts, etc.).

Intersection No.: _____   City: _____   Approach: _____ Bound

Location: _____   By: _____   Name of Observer: _____

Starting Time	Sex 1. Male Saudi 2. Fem. Saudi 3. Male Non-Saudi 4. Fem. Non-Saudi	Age 1. (5-10) 2. (11-15) 3. (16-20) 4. (21-60) 5. Over 60 Very old	Handicapped 1- Yes 2- No	Accompaniment 1- Alone 2- With others	Violations for Signals 1- Permitted phase 2- Prohibited phase	Violation of Crossing 1- Between cars/ Jaywalk 2- Proper (in front of queue or on x-walk)	Conflicts 1 = PII 2 = AC 3 = MV 4 = RT 5 = LT 6 = RP 7 = RIV 8 = ID 9 = DO 10 = MT 11 = BU 0 = None	Checking of Traffic 1- Checked 2- Not checked	Stopping at the curb 1- Stopped 2- Not stopped	Walk vs. Run 1- Walk 2- Run

FIGURE 4.2 STUDY OF OBSERVABLE BEHAVIOR THROUGH VIDEO FILMS.

CHAPTER 5
DATA COLLECTION

The study was carried at selected intersections in both a large and a small city. Dammam was selected as a large city and Qatif was selected as a small city, mainly because of proximity and convenience.

5.1. SELECTION OF THE STUDY SITES FOR INTERVIEWS

Interview intersections were selected using the following criteria :

1. The selected intersections should be representative of other typical intersections.

2. Intersections where there was constructions at its near vicinity were avoided.

3. Signalized intersections under traffic police control, were not selected since they will not represent a natural traffic flow.

4. Sites from uncontroled as well as signalized intersections were selected.

5. Sites should have moderate to high pedestrian activities.

A survey in both Dammam and Qatif cities was conducted. Seven intersections in Dammam and four intersections in Qatif meeting the criteria above were selected as study sites.

Systematic sampling method (i.e. selecting every nth pedestrian) was used to interview the pedestrians at randomly selected intersections. Sampling rate for each intersection was determined according to the pedestrian flow at that intersection.

5.2. SELECTION OF STUDY SITES FOR STUDY OF BEHAVIOR FROM VIDEO RECORDINGS

After conducting a survey in both Dammam and Qatif, and having a list of intersections meeting the criteria mentioned in the last section, another list was made to include signalized and unsignalized intersections only. Two signalized and two unsignalized intersections were randomly selected from this last list.

5.3. DATA CODING AND CHECKING

The first step in any analysis of data is coding. A coding manual was prepared for this purpose which is given in Appendix A. The data was coded according to this manual, thoroughly checked and put on the computer. Data checks included out of range checks, unlogical fields and shifts in data columns. All the errors were corrected, by refering to the original interview forms if necessary.

Coding manual form used for analyzing pedestrian behavior from video recordings is given in Appendix B. The data for this analysis was coded carefully, checked and corrected.

CHAPTER 6

ANALYSIS

The collected data are classified into two groups :

(1) Data obtained from interviews.

(2) Data obtained from video films.

The coded data were analyzed using the Statistical Analysis System (SAS)(1985).

Two types of analysis have been carried out :

1- Frequency distributions, bar charts, histograms, etc. were used to analyze the responses to each data item.

2- Cross tabulations and the associated test statistics were used to analyze the relationship between pedestrian behavior, the socioeconomic background, and other characteristics (such as city type).

Frequency tables show the distribution of variable values; for example, a variable A has six possible values. The frequency table for A shows how many observations in the data set have the first value of A, how many have the second value, and so on.

Crosstabulation tables show combined frequency distributions for two or more variables. For example, a crosstabulation table for the variables SEX and EMPLOYMENT shows the number of observations for working females, the number for non-working females, the number of working males, and the number for non-working males.

"A crosstabulation is a joint frequency distribution of cases according to two or more classificatory variables. The display of the distribution of cases by their position on two or more variables is the chief component of contingency table analysis and is indeed the most commonly used analytic method in the social sciences. These joint frequency distributions can be statistically analyzed by certain tests of significance, e.g., the chi-square statistic, to determine whether or not the variables are statistically independent; and these distributions can be summarized by a number of measures of association, such as the contingency coefficient, phi, tau, gamma, etc., which describe the degree to which the values of one variable predict or vary with those at another. Finally, partial gammas may be calculated, measuring the relationship between two variables controling for other variables." (p 223, SAS 1985)

Chi-Square and Cramer's v are the two main statistical tests used in this study. Chi-Square in a test of statistical significance helps to determine whether a systematic relation exists between two variables. This is done by computing the cell frequencies which would be expected if no relationship is present between the variables given the existing row and column totals. The expected cell frequencies are then compared to the actual values found in the table according to the following formula :

$$x^2 = \sum (f_o^i - f_e^i)^2 / f_e^i \qquad (6.1)$$

Where, f_o^i equals the observed frequency in each cell, and f_e^i equals the expected frequency calculated as :

$$f_e^i = (c_i r_i / N) \qquad (6.2)$$

Where c_i is the frequency in a respective column marginal, r_i is the frequency in a respective row marginal, and N stands for total number of valid cases. As can be seen, the greater the discrepancies between the expected and the actual frequencies, the larger Chi-Square becomes. Chi-Square helps only to decide whether variables are independent or related. It does not tell us how strongly they are related. In this study the marginal value of significance for Chi-Square

test was taken to be 0.1 or less. For checking the null hypothesis that the two variables are independent, that is to say if significance level is less than 0.10 than the null hypothesis that two variables are independent is rejected (with at least 90% confidence).

Cramer's v is a suitable measure of association, i.e., a measure of strength of relationship. It is used for tables for more than 2*2, and calculated using the following formula :

$$v = \{\frac{\varphi^2}{\min (r-1),(c-1)}\}^{1/2} \qquad (6.3)$$

v ranges from 0 to +1 when several nominal categories are involved. Thus, a larger value of v merely signifies that a high degree of association exists, without revealing the manner in which the variables are associated.

6.1. CHARACTERISTICS OF COLLECTED DATA

In order to get acquainted with the data and have a preliminary idea about it, various tables were obtained. These are given in Appendix C. A summary of the major characteristics are presented in Table 6.1. As can be seen from this table, the majority of pedestrians (40 %) are below high school, while about quarter of the pedestrians (26 %) are university degree educated people. About 90 % of pedestrians do check traffic before crossing. Fifty six percent of pedestrians cross on prohibited phase which indicates that more than half of the pedestrians do not pay attention to pedestrian signals. This high percent of violations might be a major factor affecting pedestrian accidents.

TABLE 6.1   SUMMARY OF CHARACTERISTICS OF THE INTERVIEW DATA

VARIABLE CATEGORY	PERCENTAGE
EDUCATION	
NO EDUCATION	16
BELOW HIGH SCHOOL	40
HIGH SCHOOL	18
UNIVERSITY DEGREE	26
CHECKED TRAFFIC	90
PROHIBITED PHASE CROSSING	56
JAYWALK CROSSING	22
HAD CONFLICT	16
AGE	
UNDER 18	8
18-25	28
26-35	37
36-45	19
OVER 45	8
SAUDI'S	48
HAD PEDESTRIAN SAFETY PROBLEM	20
DRIVERS	66
DON'T TRUST DRIVERS TO STOP FOR THEM WHILE THEY ARE CROSSING PROPERLY	73
BELIVE THAT DRIVERS HAVE CARELESS ATTITUDE TOWARDES PEDESTRIANS	50
WRONG ANSWER FOR THE MEANING OF FLASHING GREEN MAN	17

Twenty two percent of pedestrians made a jaywalk crossing which is also a high percent. These two types of behaviors (signal violations + jaywalk crossing) present the main problem areas in pedestrian behavior. In order to reduce their negative effects, the following suggestions might be followed :

1. Improve the level of traffic knowledge of pedestrians through educational programs.

2. Correct improperly working pedestrian traffic signals (during the study it was observed that many of the pedestrian signal faces were not working properly).

3. Correct pedestrian traffic violations, through enforcement .

A high percent of pedestrians (37 %) are in the 26-35 years old group, while about 8 % for both old people (over 46) and young people (under 18). Forty eight percent of the pedestrians are Saudi's. Twenty percent of them had experienced a pedestrian safety problem which is an indication of the seriousness of the problem. Sixty six percent of the interviewed pedestrians are motor vehicle drivers. Half of them believe that drivers have careless attitude toward pedestrians. This high percent reflects that drivers show careless actions toward pedestrians. Eighty nine percent think that pedestrian safety has become a significant issue in Saudi Arabia. Seventy three percent do not trust drivers to stop for them even while they are making a proper crossing (i.e. green man + in front of queue). Seventeen percent of pedestrian had a wrong answer for the meaning of flashing green man.

Before making any analysis related to cities, a comparison of characteristics between those interviewed is done. Table 6.2 shows that the only significant difference between Dammam and Qatif cities (big and small) is in the percentages of foreigners. Dammam has 61% Non-Saudi's while Qatif has 34%

Table 6.2 Comparison of Characteristics for
Interviewed Cities

| CHARACTERISTIC | C I T Y | | | | TESTS |
| | DAMMAM | | QATIF | | Significance/ |
	NO.	(%)	NO.	(%)	Cramer's ν
DO YOU DRIVE MOTOR VEHICLE?					
- YES	162	(66)	68	(72)	0.27/-0.06
- NO	83	(33)	26	(23)	
AGE					
$<$18	19	(8)	9	(10)	
18 - 25	62	(25)	31	(33)	
26 - 35	92	(38)	33	(35	0.33/0.11
36 - 45	55	(22)	14	(15)	
OVER 46	17	(7)	7	(7)	
NATIONALITY					
- SAUDI	93	(39)	62	(66)	0.00/-0.24
- NON-SAUDI	146	(61)	32	(34)	
EDUCATION					
- NO EDUCATION	37	(15)	12	(13)	
- BELOW HIGH SCHOOL	88	(36)	38	(40)	0.87/0.05
- HIGH SCHOOL	48	(20)	18	(19)	
- UNIVERSITY DEGREE	72	(29)	26	(28)	

only. This indicates that nationality groups might be a reason for the differences in pedestrian behavior between two cities.

Table 6.3 shows the different types of conflicts have been studied. It can be seen that moving vehicle (MV) conflict had the highest percent (5.4 %) among these conflicts. This problem might be due to the high frequency of pedestrian signal and crossing violations . The suggestions stated above for signal violations might reduce the percentage of moving vehicle conflicts.

6.2. ANALYSIS OF OBSERVED BEHAVIOR

In this section the analysis of observed behavior is presented. Observed behavior includes observations of eleven types of conflicts, pedestrian checking traffic, pedestrian violation of traffic signals, and pedestrian crossing (proper or jaywalking). The effects of nationality, driving motor vehicle, age, city type (big or small), and education on various categories of pedestrian behavior will be studied separately. •

Table 6.4 shows the effect of driving on observed behavior, one can notice that driving has no significant effect on observed behavior, since significance test has values ranging between (0.32-0.88), which implies that whether the interviewed pedestrian is a driver or non-driver has no direct effect on his behavior on the road.

Table 6.5 summarizes the effect of nationality groups on observed behavior It can be noticed that nationality has significant effects on certain types of observed behavior, such as crossing on permitted phase or prohibited phase, and crossing violations. Nationality had no significant effect on checking traffic, and conflicts. Significance test gave a value of 0.09, and Cramer's V came to be 0.12 in relating nationality by crossing phase. Figure 6.1 shows that 61% of Saudi

TABLE 6.3 PEDESTRIAN CONFLICTS

CONFLICT TYPE	PERCENT HAVING A CONFLICT
Pedestrian hesitation	2.1
Aborted crossing	0.7
Moving vehicle	5.4
Right turn	2.8
Left turn	1.2
Running pedestrian to avoid possible collision	1.2
Running from turning vehicle	0.5
Intersectional dash	1.4
Dash out	0.5
Multiple threat	0.5
Back up	0.0

Table 6.4   Effect of Driving on Observed Behaviour

DATA ITEM AND CODE	DO YOU DRIVE A MOTOR VEHICLE?				TESTS Significance/ Cramer's
	YES		NO		
	No.	(%)	No.	(%)	
CHECKING TRAFFIC					
- CHECKED	206	(90)	97	(90)	0.88/0.01
- NOT CHECKED	22	(10)	11	(10)	
CROSSING ON					
- PERMITTED PHASE	59	(43)	35	(50)	0.32/0.07
- PROHIBITED PHASE	79	(57)	35	(50)	
CROSSING VIOLATIONS					
- PROPER CROSS (IN FRONT OF QUEUE OR ON X-WALK)	73	(32)	31	(29)	0.54/0.03
- IMPROPER CROSS (BETWEEN CARS, JAYWALK)	153	(68)	76	(71)	
CONFLICTS					
- HAD CONFLICT	33	(14)	17	(16)	0.76/0.02
- NO CONFLICT	197	(86)	92	(84)	

Table 6.5 : Effect of Nationality on Observed Behaviour

DATA ITEM AND CODE	SAUDI		NON-SAUDI		COMBINED		TESTS Significance/ Cramer's
	No.	(%)	No.	(%)	No.	(%)	
CHECKING TRAFFIC							
- CHECKED	138	(90)	159	(90)	297	(90)	0.83/0.01
- NOT CHECKED	16	(10)	17	(10)	33	(10)	
CROSSING ON							
- PERMITTED PHASE	38	(39)	55	(51)	93	(45)	0.09/0.12
- PROHIBITED PHASE	60	(61)	53	(49)	113	(55)	
CROSSING VIOLATIONS							
- PROPER CROSS (IN FRONT OF QUEUE OR ON X-WALK)	96	(62)	129	(75)	225	(69)	0.02/0.13
- IMPROPER CROSS (BETWEEN CARS, JAYWALK)	58	(38)	44	(25)	102	(31)	
CONFLICTS							
- HAD CONFLICT	22	(14)	26	(15)	48	(14)	0.92/0.01
- NO CONFLICT	133	(86)	152	(85)	285	(86)	

FIGURE 6.1

EFFECT OF NATIONALITY ON OBSERVED BEHAVIOR

Legend: PROHIBITED PHASE, PERMITED PHASE

SAUDI: 61%, 39%
NON-SAUDI: 51%, 49%
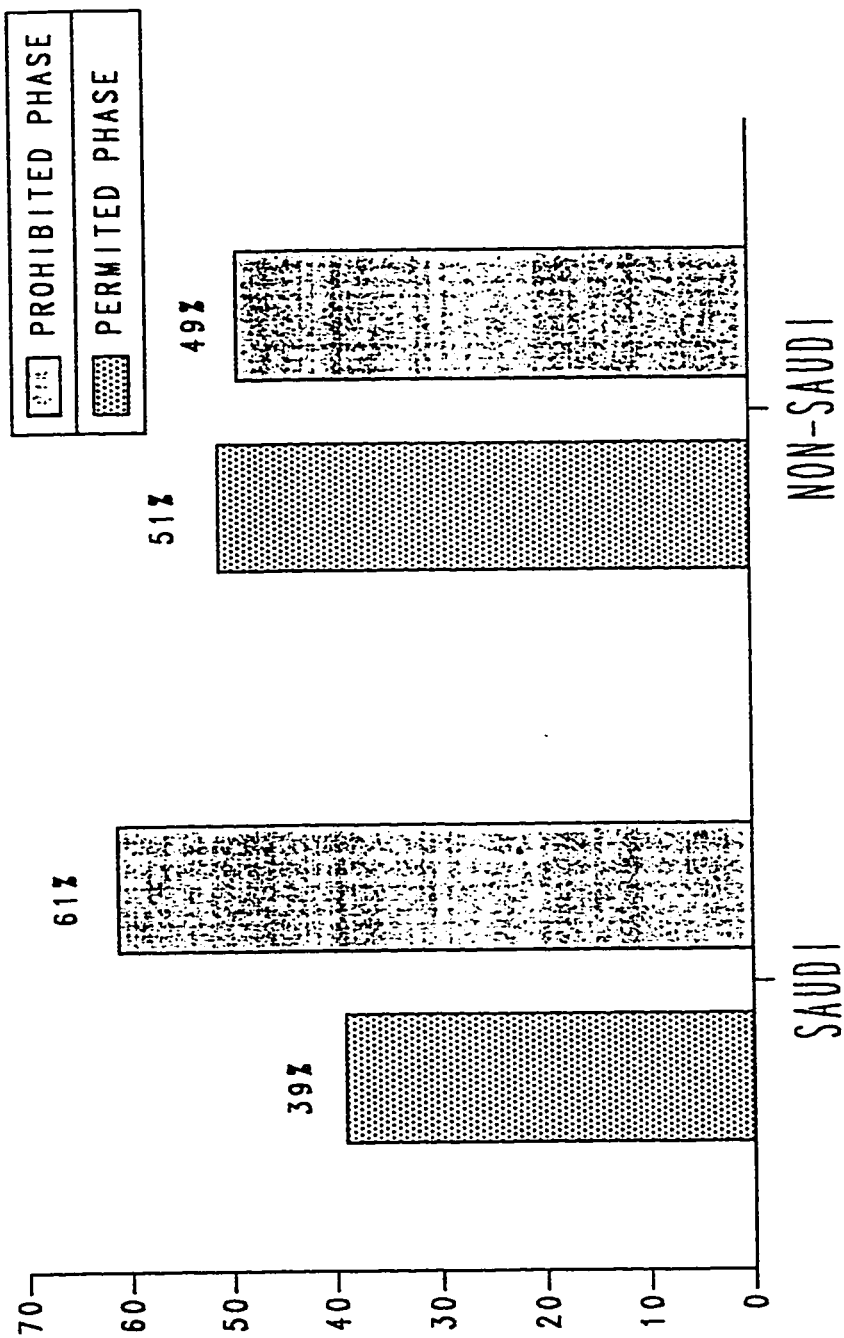
pedestrians are crossing on prohibited phase, while 49% of Non-Saudi pedestrians are crossing on prohibited phase. Nationality seems to have significant effect on crossing violations, since significance test came to be 0.02, and Cramer's V came to be 0.13. Figure 6.2 shows that 38% of the Saudi pedestrians had improper crossing, while 25% of the Non-Saudi pedestrians had improper crossing. However, these differences maybe because of the differences in education and age distribution between Saudi's and Non-Saudi's as shown in Figure 6.3 and 6.4.

As can be seen from these figures Non-Saudi's have high percentages for non-educated and university degree pedestrians. Therefore, to remove the effects of age and education the analysis was repeated for certain education and age groupes, as listed below :

    a) Non-educated people.

    b) University degree people.

    c) 26-35 years old people.

    d) 36-45 years old people.

Appendix D shows the computer results for these education controled groups (which had significant effect only). Summary of these analysis is presented in Table 6.6.

When the effects are analyzed for different education categories as shown in Table 6.6, it can be observed that Non-Educated Saudi's behaved better than Non-Educated Non-Saudi's both of the crossing behavior. However for university educated group this was exactly the opposite, i.e university educated Saudi's had more violations on both crossing behaviors than the university educated Non-Saudi's. However these differences would still be due to an uneven age distribution between education categories. For instance it is most

FIGURE 6.2

EFFECT OF NATIONALITY ON OBSERVED BEHAVIOR

Legend:
- ☐ IMPROPER CROSSING
- ▦ PROPER CROSSING

SAUDI: 62%, 38%

NON-SAUDI: 75%, 25%
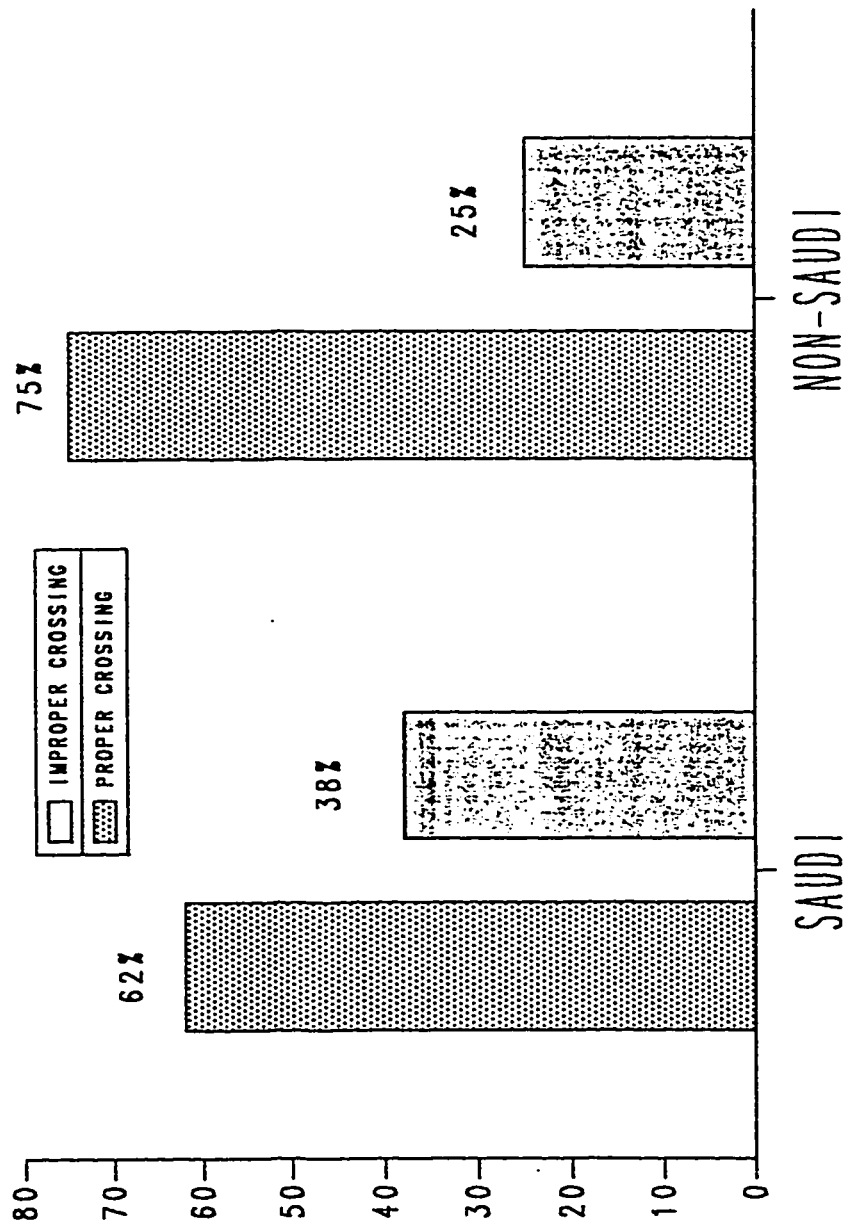
FIGURE 6.3
EDUCATION AND NATIONALITY
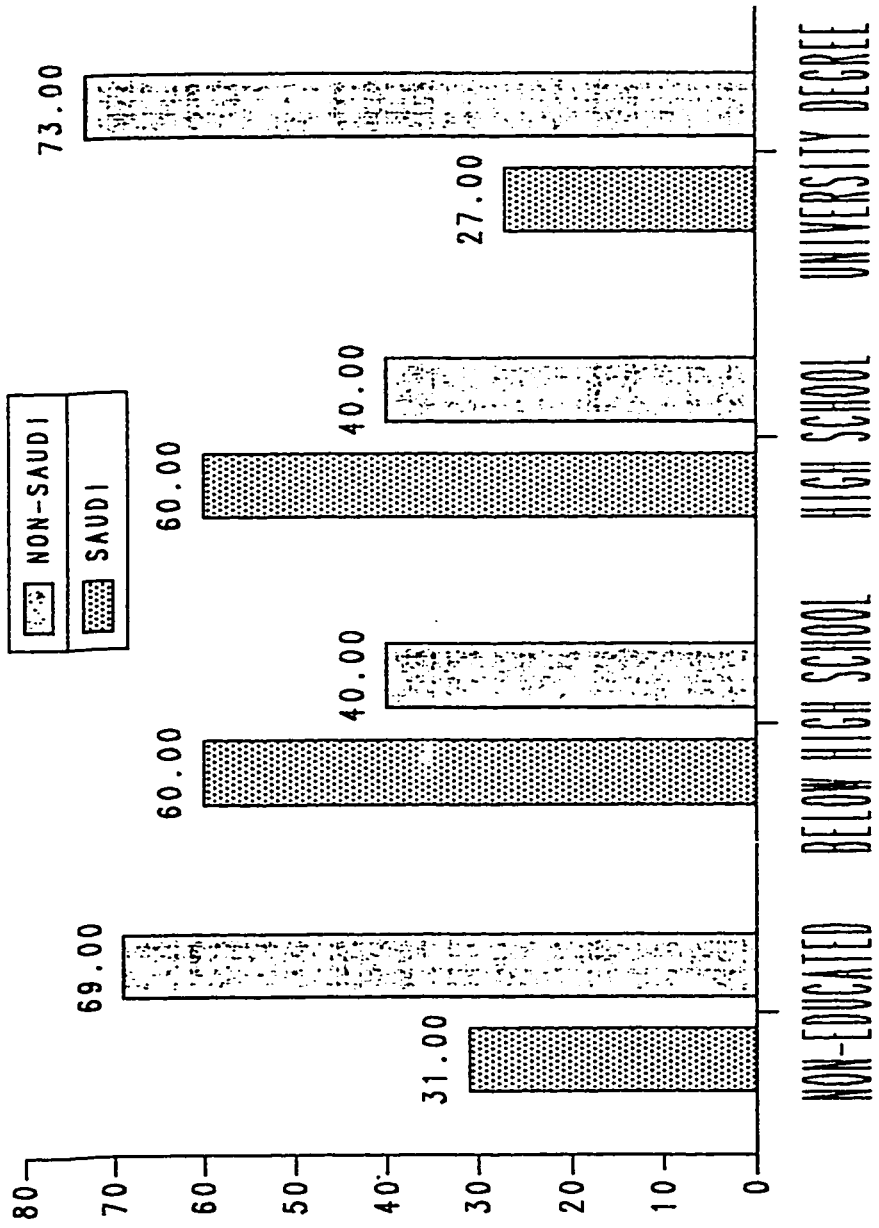
FIGURE 6.4

NATIONALITY AND AGE
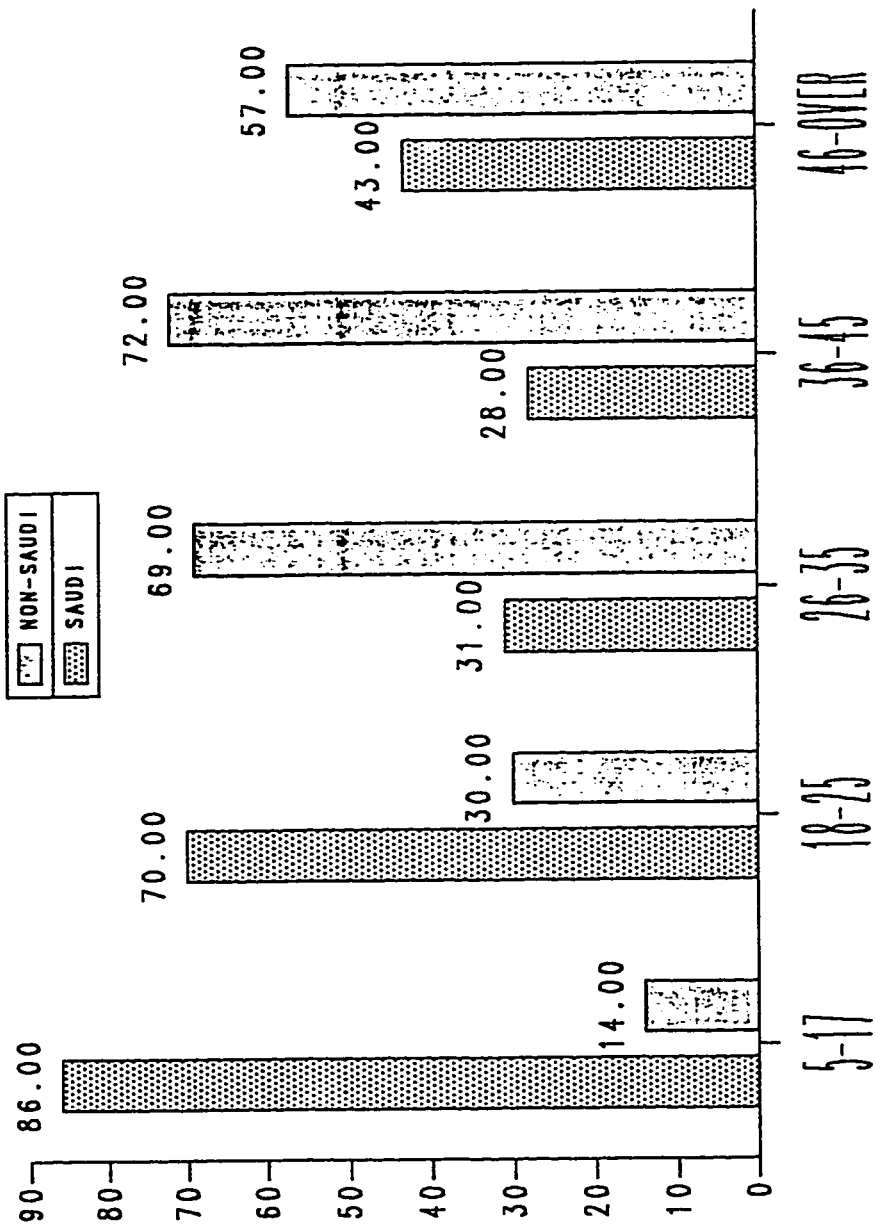
Table 6.6: Difference Between Nationalities for Observed Behavior of Specific Age and Education Categories.

ITEM	Total Population		Non-Educated People		University Degree		26-35 Years of Age		36-45 Years of Age	
	Saudi	Non-Saudi	Saudi	Non-Saudi	Saudi	Non-Saudi	Saudi	Non-Saudi	Saudi	Non-Saudi
1. Crossing on:										
Permitted Phase	38 (39)	55 (51)	11 (79)	9 (43)	1 (10)	22 (50)	9 (41)	23 (46)	7 (50)	12 (48)
Prohibited Phase	60 (61)	53 (49)	3 (21)	12 (57)	9 (90)	22 (50)	13 (59)	31 (54)	7 (50)	13 (52)
Significance/Cramer's V	0.09/0.12		0.04/0.35		0.02/-0.31		0.89/-0.02		0.91/0.02	
2. Crossing Violation:										
Proper Crossing	96 (62)	129 (75)	15 (100)	25 (76)	12 (46)	50 (75)	20 (53)	59 (70)	14 (74)	39 (80)
Improper Crossing	58 (38)	44 (25)	0 (0)	18 (24)	14 (54)	17 (25)	18 (47)	25 (30)	5 (26)	10 (20)
Significance/Cramer's V	0.002/0.13		0.04/-0.30		0.01/0.27		0.06/0.17		0.60/0.06	

likely that average age of Non-Educated Saudi category is higher than a Non-Educated Non-Saudi's. Similarly it can be expected that university educated Saudi's are younger than university educated Non-Saudi's .

When this analysis has been performed for age groups as presented in the last two columns of Table 6.6, the only significant difference was for crossing violation in 26-35 years age category, and on this item Saudi's again had more crossing violations than Non-Saudi's. This analysis shows that Saudi's might need more education about proper crossing.

Table 6.7 shows the effect of city type (big or small) on observed behavior. City type has a significant effect on crossing on prohibited phase and conflicts. Figure 6.5 shows that 51% of pedestrians in Dammam city are crossing on prohibited phase, while 65% of pedestrians in Qatif are crossing on prohibited phase. Figure 6.6 shows that 18% of Qatif pedestrians had conflict, while 10% only of Dammam pedestrians had conflicts. Dammam had better results for both conflict and crossing behavior. This might be because of behavioral differences or simply because Dammam might have better facilities (signalization, X-walks, etc...)

Table 6.8 shows the effect of age on observed behavior. Results showed that age has no direct effect on observed behavior.

Table 6.9 summarizes the effect of education on observed behavior. Education level had a significant effect on checking traffic percentages, since significance test had a value of 0.04, and Cramer's V came to be 0.16. Figure 6.7 shows that high school pedestrian had the highest percentage of non-checking traffic (18%), while non-educated pedestrians had 4%, and university

Table 6.7   Effect of City Type (Large and Small) on
Observed Behaviour.

DATA ITEM AND CODE	DAMMAM (LARGE CITY)		QATIF (SMALL CITY)		COMBINED		TESTS Significance/ Cramer's
	No.	(%)	No.	(%)	No.	(%)	
CHECKING TRAFFIC							
- CHECKED	273	(90)	103	(86)	376	(89)	0.21/0.6
- NOT CHECKED	30	(10)	17	(14)	47	(11)	
CROSSING ON							
- PERMITTED PHASE	86	(49)	34	(35)	120	(44)	0.02/0.14
- PROHIBITED PHASE	88	(51)	63	(65)	151	(56)	
CROSSING VIOLATIONS							
- PROPER CROSS (IN FRONT OF QUEUE OR ON X-WALK)	202	(67)	84	(70)	286	(68)	0.60/0.03
- IMPROPER CROSS (BETWEEN CARS, JAYWALK)	98	(33)	36	(30)	134	(32)	
CONFLICTS							
- HAD CONFLICT	56	(18)	12	(10)	68	(16)	0.04/-0.10
- NO CONFLICT	250	(82)	108	(90)	358	(84)	

FIGURE 6.5

EFFECT OF CITY TYPE ON OBSERVED BEHAVIOR
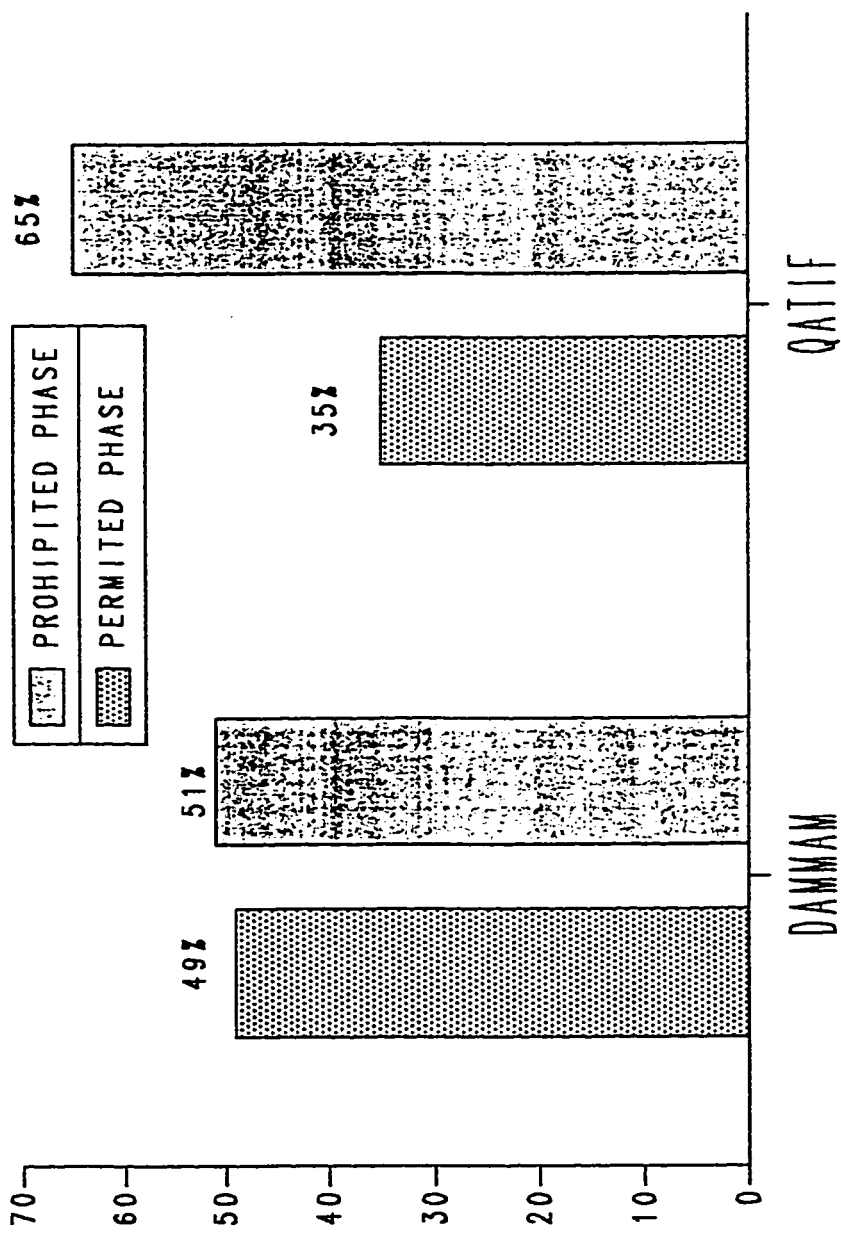
FIGURE 6.6

EFFECT OF CITY TYPE ON OBSERVED BEHAVIOR
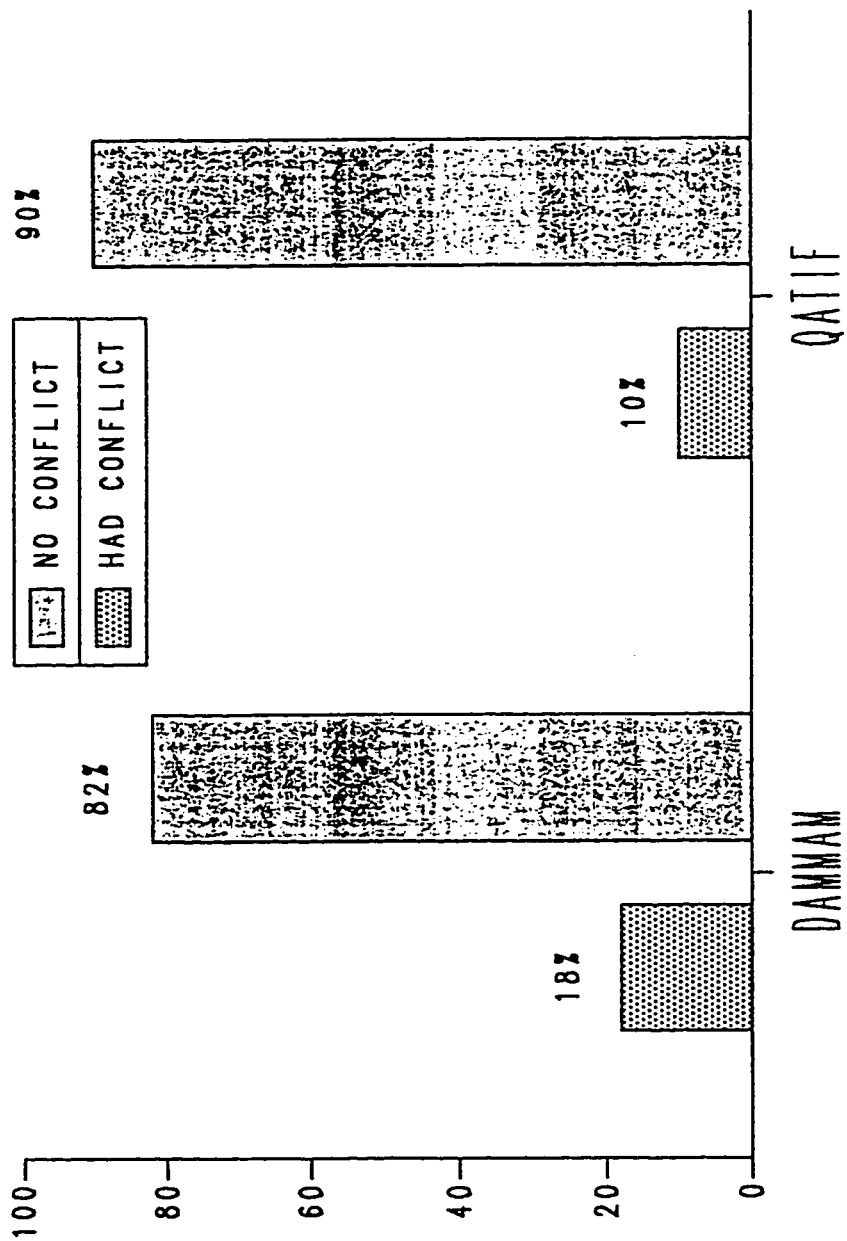
Table 6.8 Effect of Age on Observed Behaviour.

DATA ITEM AND CODE	A	G	E			TESTS SIGNIFICANCE/ CRAMER'S
	5-17 No.(%)	18-25 No. (%)	26-35 No. (%)	36-45 No. (%)	46- No. (%)	
CHECKING TRAFFIC						
- CHECKED	25 (89)	80 (89)	112 (90)	63 (91)	23 (96)	0.88/0.06
- NOT CHECKED	3 (11)	10 (11)	13 (10)	6 (9)	1 (4)	
CROSSING ON						
- PERMITTED PHASE	7 (44)	25 (44)	32 (42)	20 (50)	10 (66)	0.81/0.09
- PROHIBITED PHASE	9 (56)	32 (56)	45 (58)	20 (50)	8 (44)	
CROSSING VIOLATIONS						
- PROPER CROSS (IN FRONT OF QUEUE OR ON X-WALK)	19 (68)	58 (65)	80 (65)	54 (78)	18 (78)	0.24/0.12
- IMPROPER CROSS (BETWEEN CARS, JAYWALK)	9 (32)	31 (35)	44 (35)	15 (22)	5 (22)	
CONFLICTS						
- HAD CONFLICT	5 (18)	10 (11)	21 (17)	10 (14)	4 (17)	0.76/0.08
- NO CONFLICT	23 (82)	83 (89)	104 (83)	59 (86)	20 (83)	

Table 6.7   Effect of Education on Observed Behaviour

DATA ITEM AND CODE	NON-EDUCATED		BELOW HIGH SCHOOL		HIGH SCHOOL		UNIVERSITY DEGREE		TESTS Significance/ Cramer's
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
CHECKING TRAFFIC									
- CHECKED	47	(96)	111	(90)	54	(82)	91	(94)	0.04/0.16
- NOT CHECKED	2	(4)	13	(10)	12	(18)	6	(6)	
CROSSING ON									
- PERMITTED PHASE	20	(57)	37	(46)	13	(35)	24	(44)	0.31/0.13
- PROHIBITED PHASE	15	(43)	44	(54)	24	(65)	31	(56)	
CROSSING VIOLATIONS									
- PROPER CROSS (IN FRONT OF QUEUE OR ON X-WALK)	41	(84)	82	(66)	41	(64)	65	(68)	0.10/0.14
- IMPROPER CROSS (BETWEEN CARS, JAYWALK)	8	(16)	42	(34)	23	(36)	31	(32)	
CONFLICTS									
- HAD CONFLICT	7	(14)	16	(13)	8	(12)	19	(19)	0.48/0.09
- NO CONFLICT	42	(86)	110	(87)	58	(88)	79	(81)	

FIGURE 6.7

EFFECT OF EDUCATION ON OBSERVED BEHAVIOR
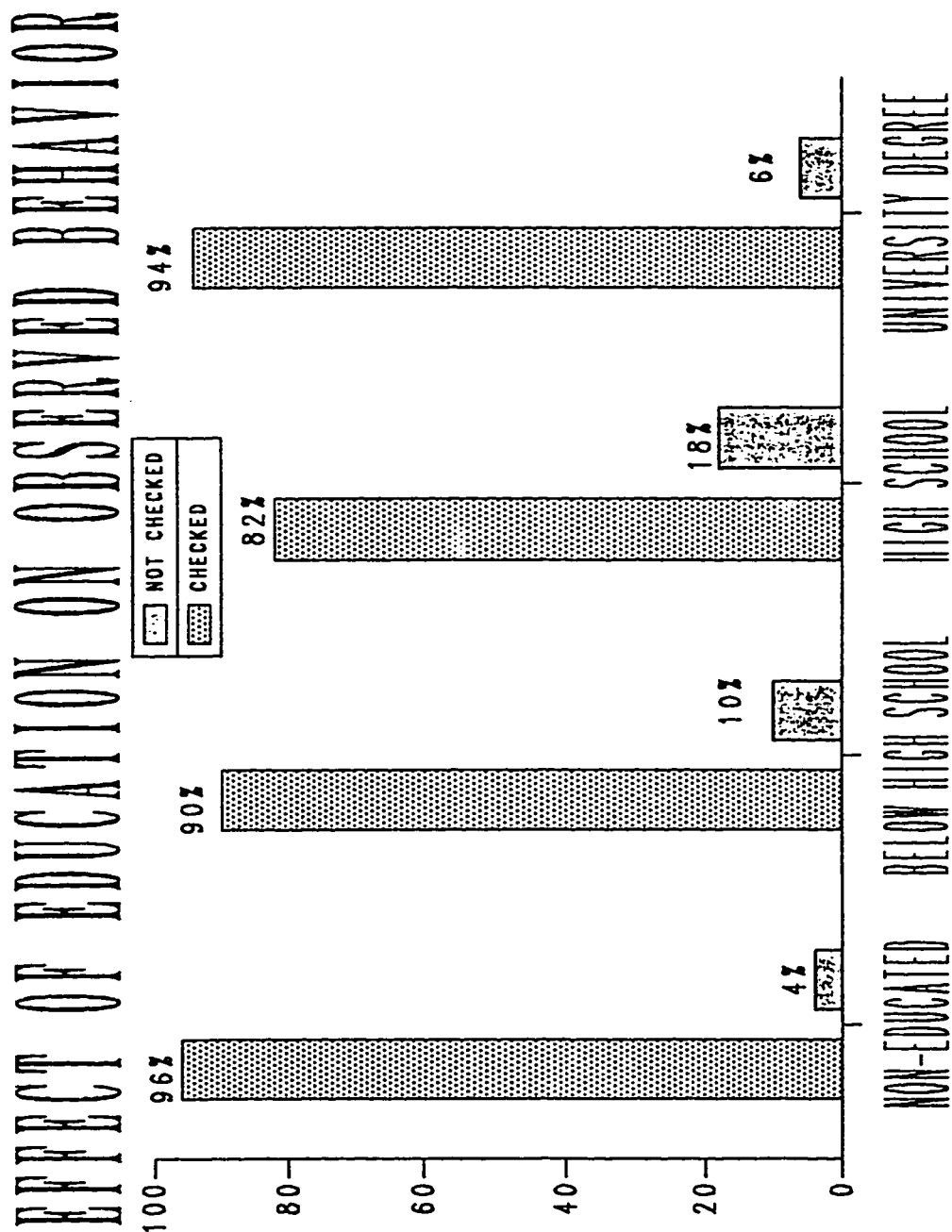
degree pedestrian had 6% only. The reason for this might be that the majority of high school pedestrians fall in the range of 18-25 years old, as shown in Figure 6.8, while the majority of non-educated pedestrians are in the range of 45-over. Generally, old people are more careful than young people.

Education level had a marginally significant effect on crossing violations, since significance test came to be 0.10 and Cramer's V came to be 0.14. Figure 6.9 shows that high school pedestrians had the highest percentage of improper crossing (36%), while non-educated pedestrians had 16% only, this is mostly because, in general, old people are more careful than young people.

6.3. ANALYSIS OF GENERAL FEELINGS, KNOWLEDGE RELATED TO PEDESTRIAN SAFETY, AND ACCIDENT EXPERIENCE.

In this section the analysis of feelings, knowledge related to pedestrian safety, accident experience, and socioeconomic background is presented. The comments will be made for significant effects only (i.e. significance test of 0.1 or less).

Table 6.10 gives a general summary of pedestrian feelings and knowledge. It can be seen that allthough 53 % of pedestrians believe that pedestrian safety has become a significant issue, , 60 % of them do not trust drivers to stop for them while they are crossing on green indication. This indicates that they do not trust drivers not violate traffic signals. On the other hand (80 %) do trust drivers to stop for them while they are crossing on a crosswalk, even at unsignalized intersections. This indicates that pedestrians believe that crossing on crosswalk is safer than crossing on permitted phase without a crosswalk.

FIGURE 6.8

AGE AND EDUCATION
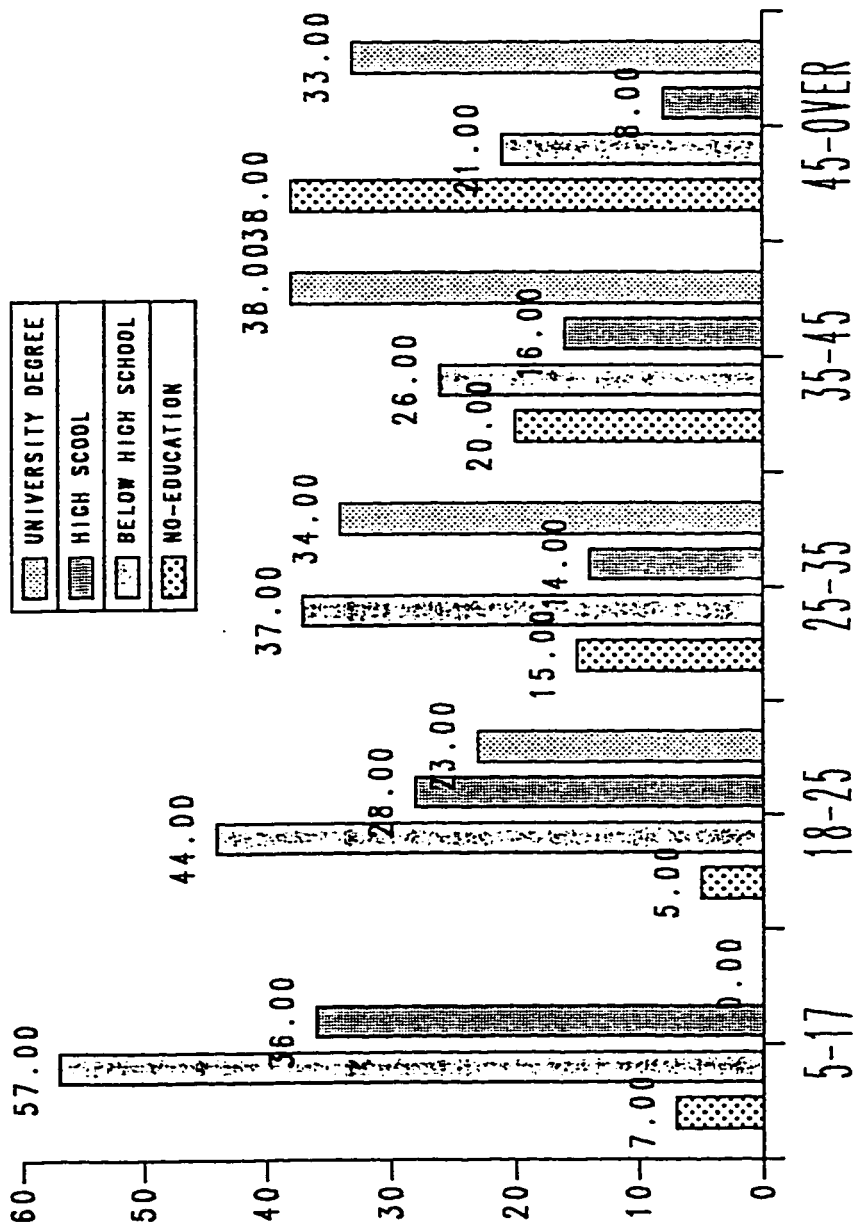
FIGURE 6.9

EFFECT OF EDUCATION ON OBSERVED BEHAVIOR

Legend:
- IMPROPER CROSSING
- PROPER CROSSING

Data:

Education Level	Proper Crossing	Improper Crossing
NON-EDUCATED	84%	16%
BELOW HIGH SCHOOL	66%	34%
HIGH SCHOOL	64%	36%
UNIVERSITY DEGREE	68%	32%
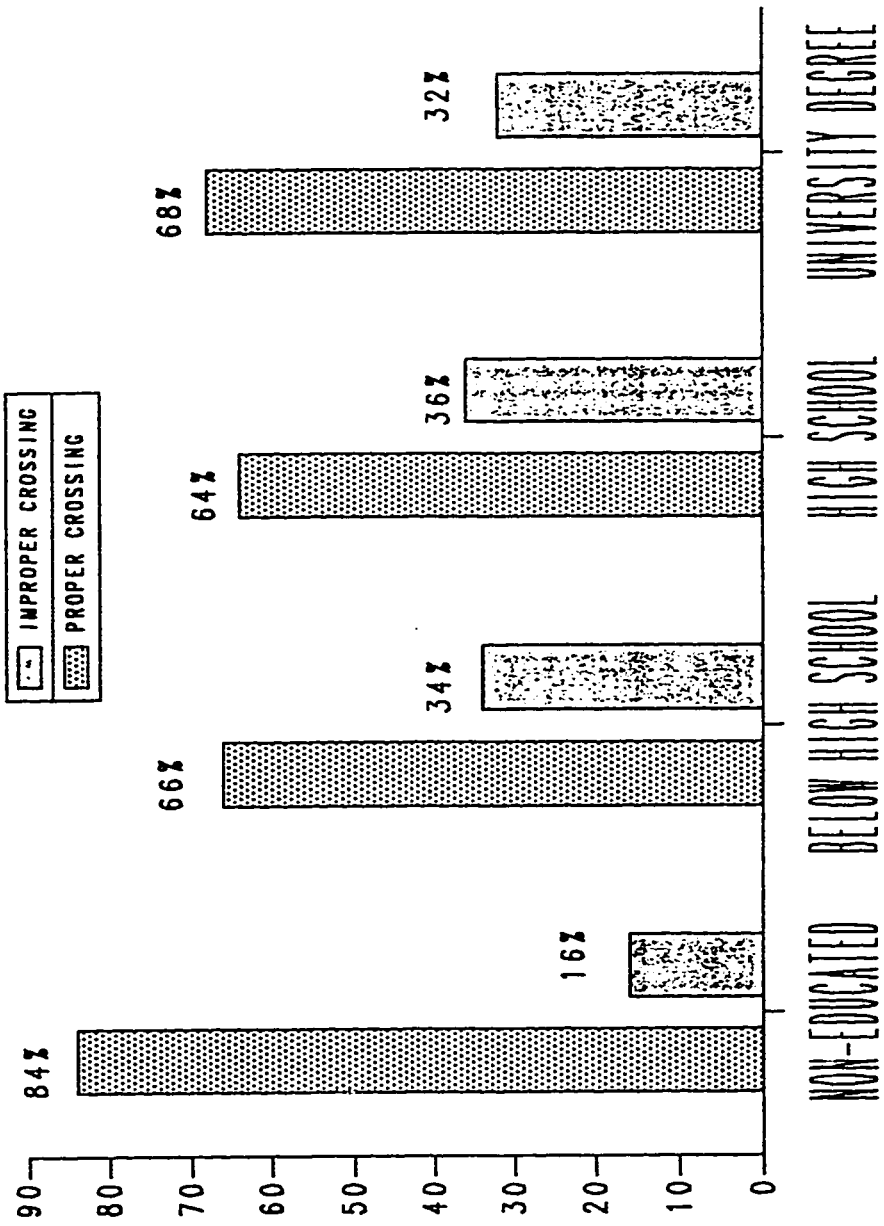
TABLE 6.10 SUMMARY OF FEELINGS AND KNOWLEDGE

VARIABLE CATEGORY	PERCENTAGE
Drives have careles attitude toward pedestrians	53
Pedestrian safety has become a significant issue	88
You trust drivers to stop for you, while you are crossing on green indication	60
You trust driver to stop for you, while you are crossing on cross-walk in an unsignalized intersection	80
Correct answer of meaning of green man	97
Correct answer of meaning of red man	97
Correct answer of meaning of flashing man	83

Seventeen percent of the pedestrians had a wrong answer for the meaning of flashing green man.

Table 6.11 shows the effect of driving on feeling, knowledge, and accident experience. The only significant difference between drivers and non-drivers is in pedestrian safety problem experience. Figure 6.10 show that 24% of drivers had pedestrian safety problems, while 16% of non-drivers had pedestrian safety problem, which indicates that drivers seem to be more subjected to pedestrian safety problems (both as a pedestrian and a driver).

Table 6.12 shows the effect of nationality grouping on feeling, knowledge, and accident experience. Figure 6.11 shows that 64% of Non-saudi's believe that drivers must stop for pedestrians when he is crossing on green pedestrian indication at a crosswalk, while only 55% of Saudi's believe in that. Figure 6.12 shows that 12% of Saudi pedestrians had a wrong answer for the meaning of flashing green man, on the other hand 21% of Non-Saudi's had that answer wrong. This indicates that Saudi pedestrians might have better knowledge related to pedestrian signals.

Figure 6.13 shows that 26% of Saudi pedestrians had a pedestrian safety problem experience, while 17% of Non-Saudi pedestrians had pedestrian safety problem experience.

Since both degree of education and age group distributions had high variation between Saudi's and Non-Saudi's as shown earlier in Figures 6.3 and 6.4, the analysis will be carried for certain education and age groups as follows :

        a. non-educated pedestrians.

        b. university degree pedestrians.

        c. 26-35 years old pedestrians.

Table 6.11 Effect of Driving on Feelings, Knowledge and
Accident Experience

| Data Item Codes | DO YOU DRIVE A MOTOR VEHICLE | | | | TESTS |
| | YES | | NO | | Significance/Cramer's V |
	No.	(%)	No.	(%)	
1. Pedestrian Safety has become a significant issue:					
- Yes	199	(87)	99	(90)	0.50/0.60
- No	29	(13)	10	(10)	
2. Drivers have careless attitude towards pedestrians:					
- Yes	125	(55)	54	(50)	0.50/0.38
- No	103	(45)	52	(50)	
3. You are totally responsible for your own safety when you are crossing at across walk at an unsignalized intersection:					
- Yes	186	(81)	85	(78)	0.71/0.05
- No	42	(19)	23	(22)	
4. Drivers must stop for you when crossing on green pedestrian indication at a cross walk at a signalized intersection.					
- Yes	133	(58)	70	(64)	0.38/0.08
- No	93	(42)	36	(36)	
5. Meaning of Green Man:					
- Wrong Answer	6	(3)	4	(4)	0.59/-0.03
- Correct Answer	224	(97)	105	(96)	
6. Meaning of Red Man:					
- Wrong Answer	8	(3)	4	(4)	0.59/-0.01
- Correct Answer	222	(97)	105	(96)	
7. Meaning of Flashing:					
- Wrong Answer	34	(15)	23	(21)	0.146/-0.08
- Correct Answer	196	(85)	86	(79)	
8. Have you Experienced Pedestrian Safety Problem:					
- Yes	55	(24)	17	(16)	0.08/0.09
- No	175	(76)	92	(84)	
9. Type of Pedestrian Problem:					
- None	198	(86)	97	(89)	
- Accident as a Driver	14	(6)	0	(0)	0.02/0.15
- Accident as a Pedestrian	18	(8)	12	(11)	

56

FIGURE 6.10

EFFECT OF DRIVING ON ACCIDENT EXPERIENCE

HAVE YOU EXPERIENCED PEDESTRIAN SAFETY PROBLEM
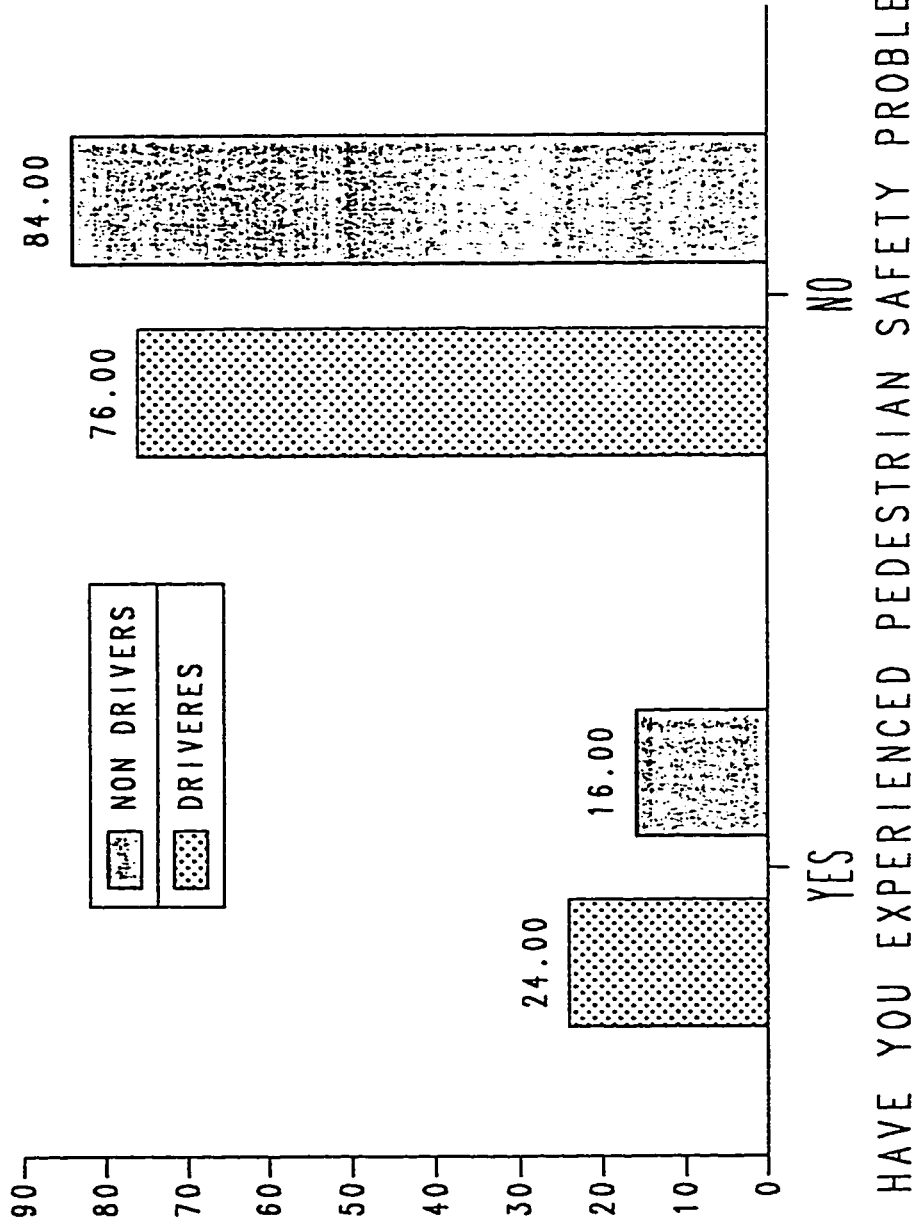
Table 6.12: Effect of Nationality on Feelings, Knowledge and Accident Experience.

Data Item Codes	Nationality				Significance/ Cramer's
	SAUDI		NON-SAUDI		
	No.	(%)	No.	(%)	
1. Pedestrian Safety has become a significant issue:					
- Yes	131	(85)	161	(91)	0.14/0.11
- No	23	(15)	16	(9)	
2. Drivers have careless attitude towards pedestrians:					
- Yes	87	(56)	87	(50)	0.45/0.07
- No	67	(44)	87	(50)	
3. You are totally responsible for your own safety when you are crossing at across walk at an unsignalized intersection:					
- Yes	125	(81)	140	(77)	0.83/0.03
- No	28	(19)	37	(23)	
4. Drivers must stop for you when crossing on green pedestrian indication at a cross walk at a signalized intersection.					
- Yes	85	(55)	113	(64)	0.03/0.14
- No	69	(45)	59	(36)	
5. Meaning of Green Man:					
- Wrong Answer	4	(3)	6	(3)	0.67/-0.02
- Correct Answer	151	(97)	172	(97)	
6. Meaning of Red Man:					
- Wrong Answer	4	(3)	8	(4)	0.35/-0.05
- Correct Answer	151	(97)	170	(96)	
7. Meaning of Flashing:					
- Wrong Answer	18	(12)	38	(21)	0.02/-0.14
- Correct Answer	137	(88)	140	(79)	
8. Have you Experienced Pedestrian Safety Problem:					
- Yes	41	(26)	30	(17)	0.03/0.12
- No	114	(74)	148	(83)	
9. Type of Pedestrian Problem:					
- None	132	(85)	157	(88)	0.16/0.11
- Accident as a Driver	10	(7)	4	(2)	
- Accident as a Pedestrian	13	(8)	17	(10)	

FIGURE 6.11

EFFECT OF NATIONALITY ON KNOWLEDGE

Legend: NO, YES

55%   45%   64%   36%

SAUDI   NON-SAUDI

DRIVER MUST STOP FOR YOU WHEN YOU CROSS ON GREEN
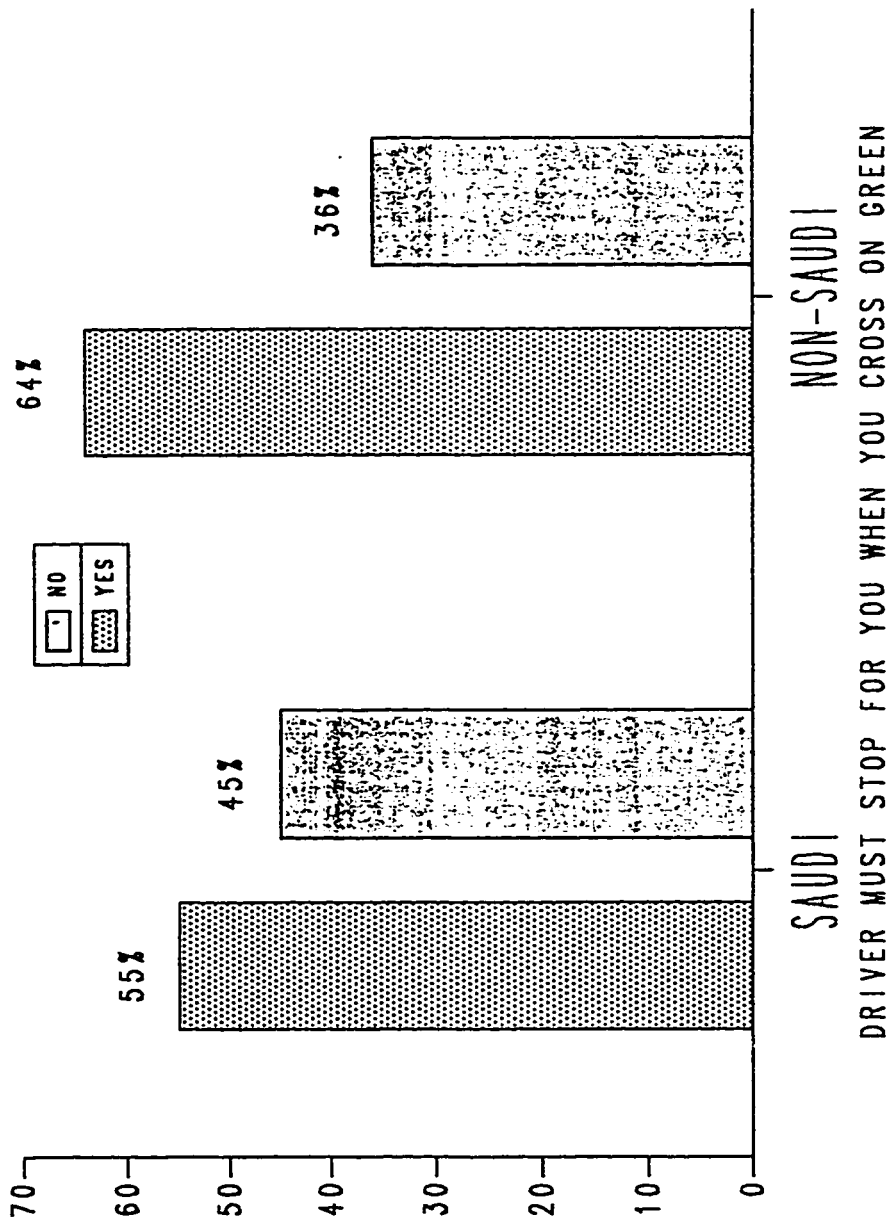
FIGURE 6.12

EFFECT OF NATIONALITY ON KNOWLEDGE
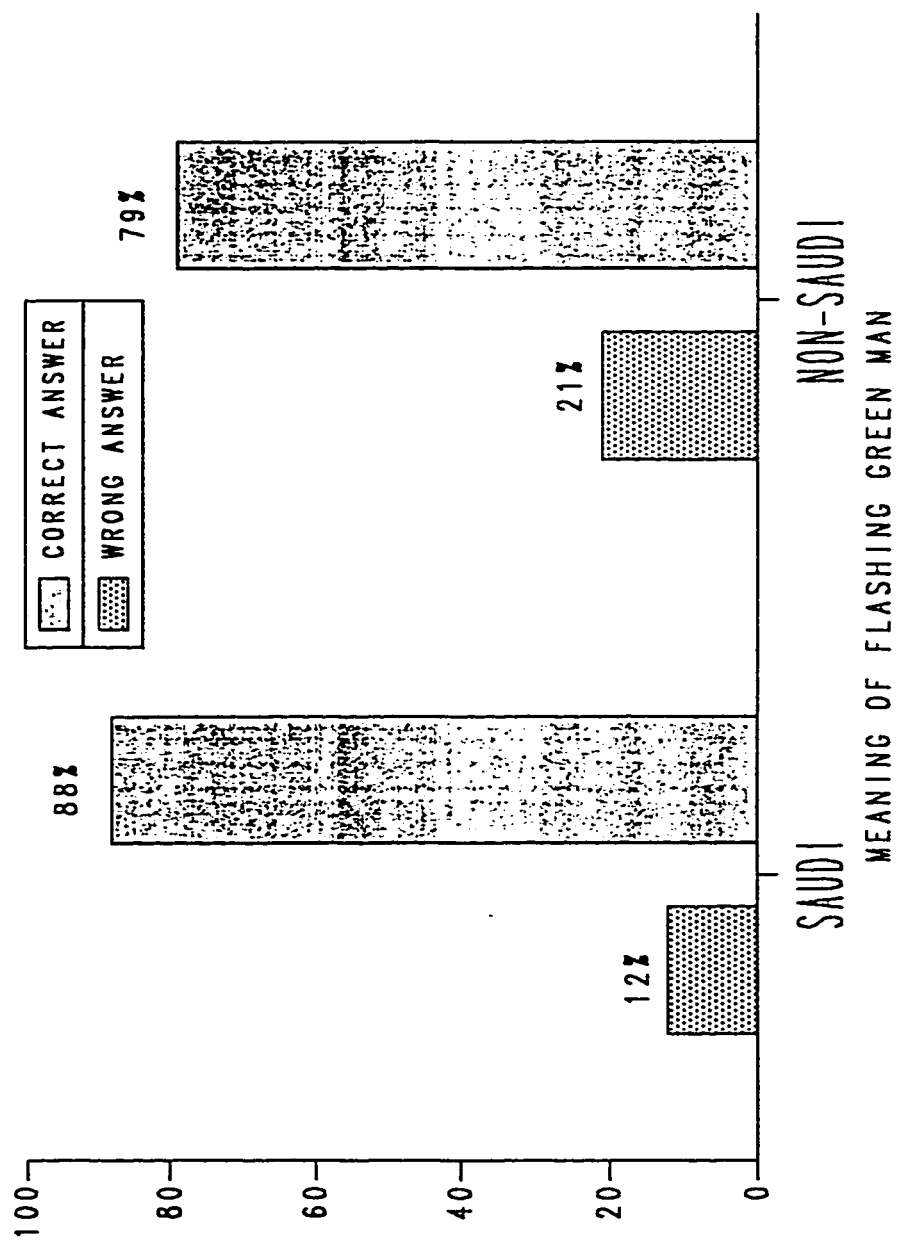
FIGURE 6.13

EFFECT OF NATIONALITY ON ACCIDENT EXPERIENCE

HAVE YOU EXPERIENCED PEDESTRIAN SAFETY PROBLEM
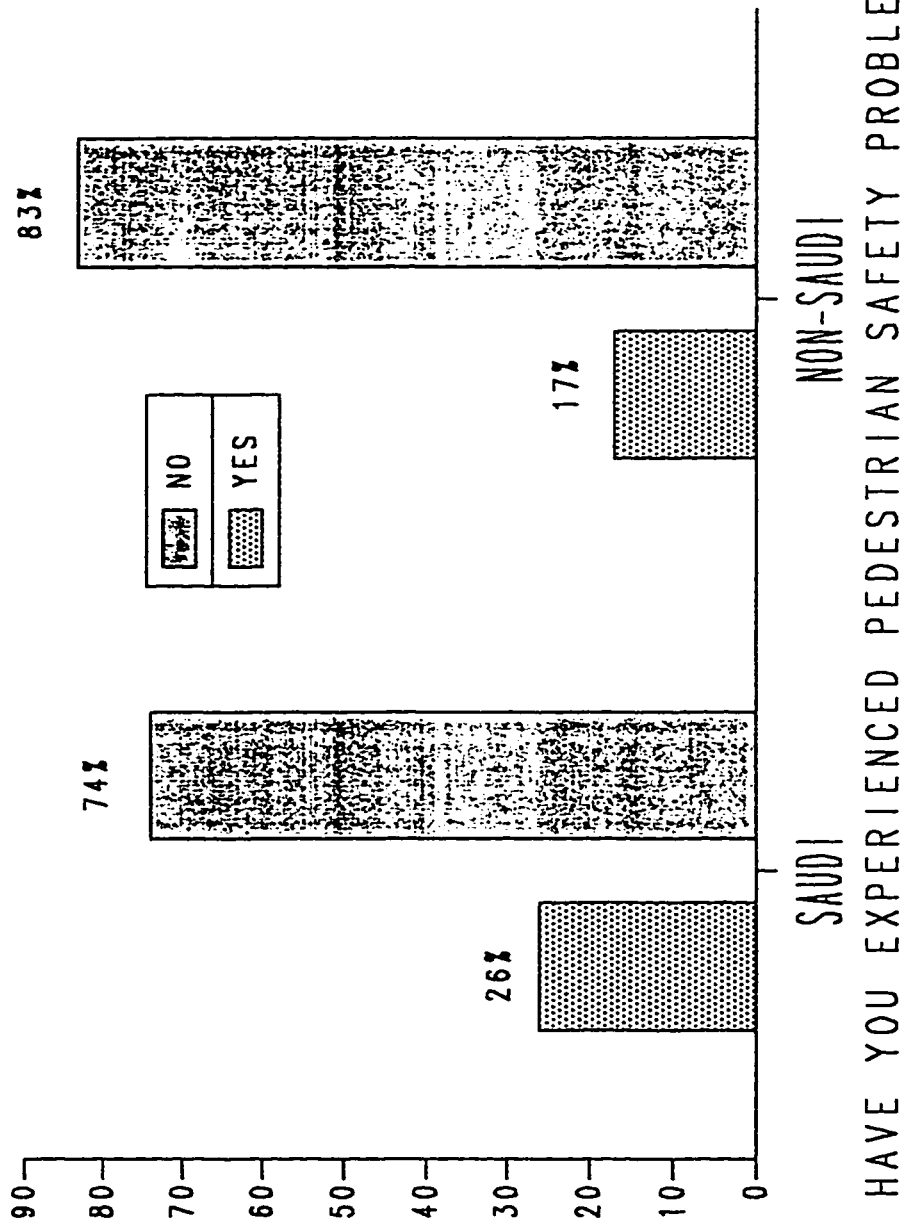
d. 36-45 years old pedestrians.

Appendix E shows the results for these controlled groupes. The results are summarized in Table 6.13.

If a control for non-educated people is carried, there remains no significant difference in feelings, knowledge, and accident experience between Saudi's and Non-Saudi's. The same result is obtained if the data is controlled for university degree pedestrians. For these levels of education there seems to be no difference in feelings and knowledge regardless of nationality.

By controling for 26-35 years old only, the significant differences between Saudi's and Non-Saudi's remain only in answering the question : Drivers must stop for you when crossing on green pedestrian indication at a crosswalk at a signalized intersection. Almost the same percentages recorded earliar (without age control) will be noticed here. The same applies for 36-45 years old control. This indicates that, even when controlled for age, there are differences between nationality for this question. It seems that differences between the nationality groups is because of differences in educational levels but not necessarily for differences in ages.

Table 6.14 shows the differences between cities in terms of feeling, knowledge, and accident experience. Figure 6.14 shows the difference in feelings towards drivers between Dammam and Qatif pedestrians. Fifty seven percent of Dammam pedestrians believe that drivers have careless attitude towards pedestrians, in contrast to 44% of Qatif pedestrians. This indicates that in general pedestrians in Dammam have less confidence for drivers than Qatif pedestrians.

Table 6.13: Differences Between Nationalities for Feeling, Knowledge and Experience of Specific Age and Education Categories.

ITEM	Total Population		Non-Educated People		University Degree		26-35 Years of Age		36-45 Years of Age	
	Saudi	Non-Saudi	Saudi	Non-Saudi	Saudi	Non-Saudi	Saudi	Non-Saudi	Saudi	Non-Saudi
1. Drivers must stop for you when crossing on green pedestrian indication at a signalized cross walk at a signalized intersection										
Yes	85 (55)	113 (64)	9 (60)	21 (65)	16 (62)	43 (63)	20 (53)	55 (67)	7 (37)	32 (65)
No	69 (45)	59 (36)	5 (40)	10 (35)	10 (38)	24 (37)	18 (47)	25 (33)	11 (63)	17 (35)
Significance/Cramer's V	0.03/0.14		0.97/0.035		0.66/0.09		0.07/0.21		0.04/0.30	
2. Meaning of Flashing Green Man										
- Wrong Answer	18 (12)	38 (21)	3 (20)	11 (33)	2 (8)	8 (12)	4 (11)	15 (18)	3 (16)	11 (22)
- Correct Answer	137 (88)	140 (79)	12 (80)	22 (67)	24 (92)	61 (88)	34 (89)	70 (82)	16 (84)	38 (78)
Significance/Cramer's V	0.02/-0.14		0.35/-0.14		0.58/-0.06		0.31/-0.09		0.54/-0.07	
3. How you experienced pedestrian safety problem										
Yes	41 (26)	30 (17)	2 (13)	6 (18)	8 (31)	12 (17)	8 (21)	14 (16)	7 (37)	9 (18)
No	114 (74)	148 (83)	13 (87)	27 (82)	18 (69)	57 (83)	30 (79)	71 (84)	12 (63)	40 (82)
Significance/Cramer's V	0.03/0.12		0.68/-0.06		0.16/0.15		0.54/0.06		0.11/0.20	

Table 6.14   Differences Between Cities in terms of Feelings, Knowledge and Accident Experience

Data Item Codes	DAMMAM		QATIF		X^2 Significance/Cramer's
	No.	(%)	No.	(%)	
1. Pedestrian Safety has become a significant issue:					
- Yes	219	(90)	79	(85)	0.128/0.110
- No	25	(10)	14	(15)	
2. Drivers have careless attitude towards pedestrians:					
- Yes	139	(57)	40	(44)	0.072/0.124
- No	103	(43)	51	(56)	
3. You are totally responsible for your own safety when you are crossing at across walk at an unsignalized intersection:					
- Yes	189	(77)	82	(89)	0.042/0.137
- No	55	(23)	10	(11)	
4. Drivers must stop for you when crossing on green pedestrian indication at a cross walk at a signalized intersection.					
- Yes	155	(64)	48	(52)	0.105/0.115
- No	86	(36)	43	(46)	
5. Meaning of Green Man:					
- Wrong Answer	10	(4)	0	(0)	0.047/0.108
- Correct Answer	235	(96)	94	(100)	
6. Meaning of Red Man:					
- Wrong Answer	10	(4)	2	(2)	0.383/0.047
- Correct Answer	235	(96)	92	(98)	
7. Meaning of Flashing:					
- Wrong Answer	47	(19)	10	(11)	0.060/0.102
- Correct Answer	198	(81)	84	(89)	
8. Have you Experienced Pedestrian Safety Problem:					
- Yes	50	(21)	22	(23)	0.546/-0.033
- No	195	(79)	72	(77)	
9. Type of Pedestrian Problem:					
- None	211	(86)	84	(89)	
- Accident as a Driver	10	(4)	4	(4)	0.612/0.054
- Accident as a Pedestrian	24	(10)	6	(7)	

FIGURE 6.14

DIFFERENCES BETWEEN CITIES IN TERMS OF FEELINGS
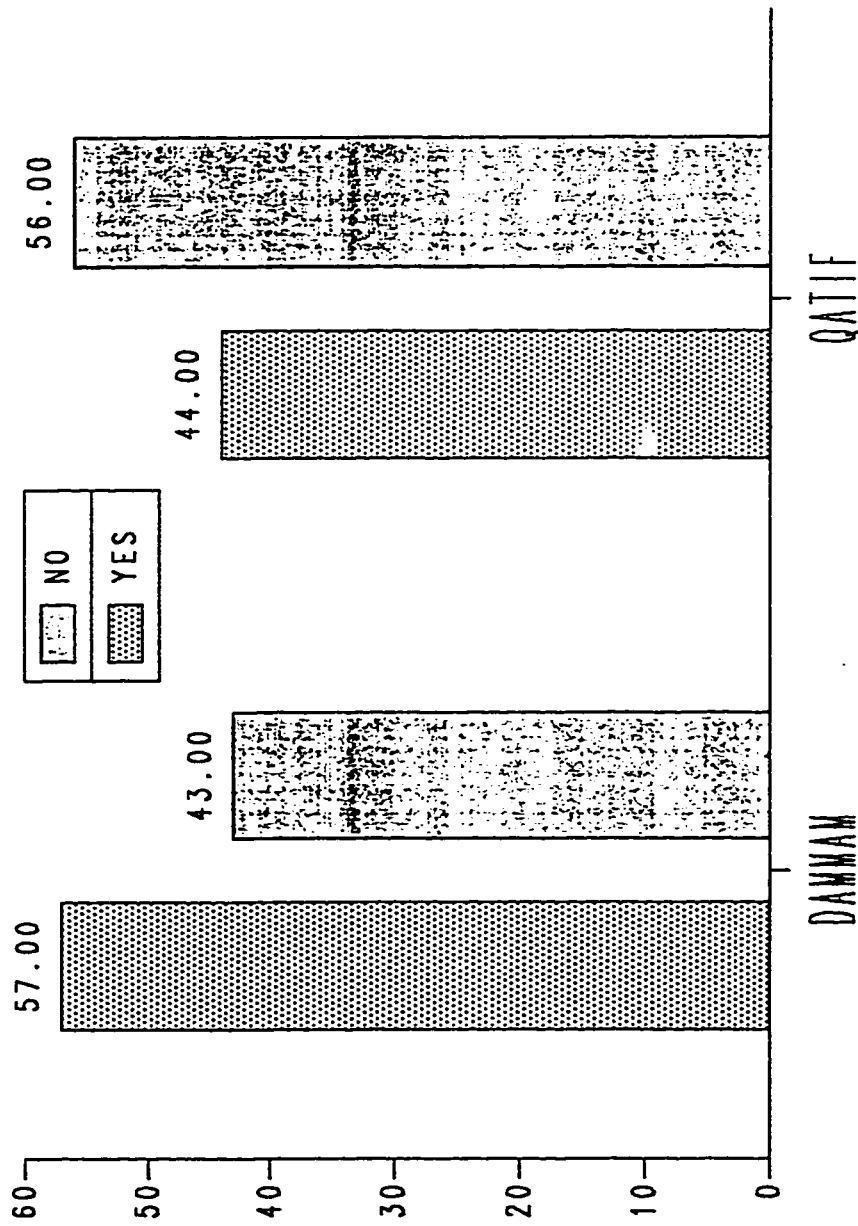
DRIVERS HAVE CARELESS ATTITUDE TOWARDS PEDESTRIANS

Table 6.14 and Figure 6.15 shows that 77% of Dammam and 89% of Qatif pedestrians believe that pedestrians are totally responsible for their own safety while crossing on a crosswalk at unsignalized intersection. This indicates that Qatif pedestrians might be more careful crossing unsignalized intersections.

Figure 6.16 shows that 96% of Dammam interviewed pedestrians had correct answer for the meaning of green man, while 100% of Qatif interviewed pedestrians had it correct. Figure 6.17 shows that 19% of Dammam pedestrians had a wrong answer for the meaning of flashing green man, while 11% only of Qatif pedestrians have got the answer wrong. This indicates that pedestrians in Qatif seem to have more knowledge about pedestrian facilities than Dammam pedestrians.

Table 6.15 shows the effect of age on feelings, knowledge, and accident experience. Age has a significant effect on pedestrian knowledge. Figure 6.18 shows that pedestrians of 35-45 years old group had the highest percentage 9% in answering the meaning of green man wrongly. Feeling and accident involvements are not found to be significantly related to age.

Table 6.16 shows the effect of education level on feelings, knowledge, and accident experience which shows that there is a significant difference only in the answer to the meaning of flashing green. Figure 6.19 shows that level of education is significantly related to knowledge about flashing green. From this figure it can be observed that as education improves knowledge on this item becomes better.

FIGURE 6.15

DIFFERENCES BETWEEN CITIES IN TERMS OF KNOWLEDGE
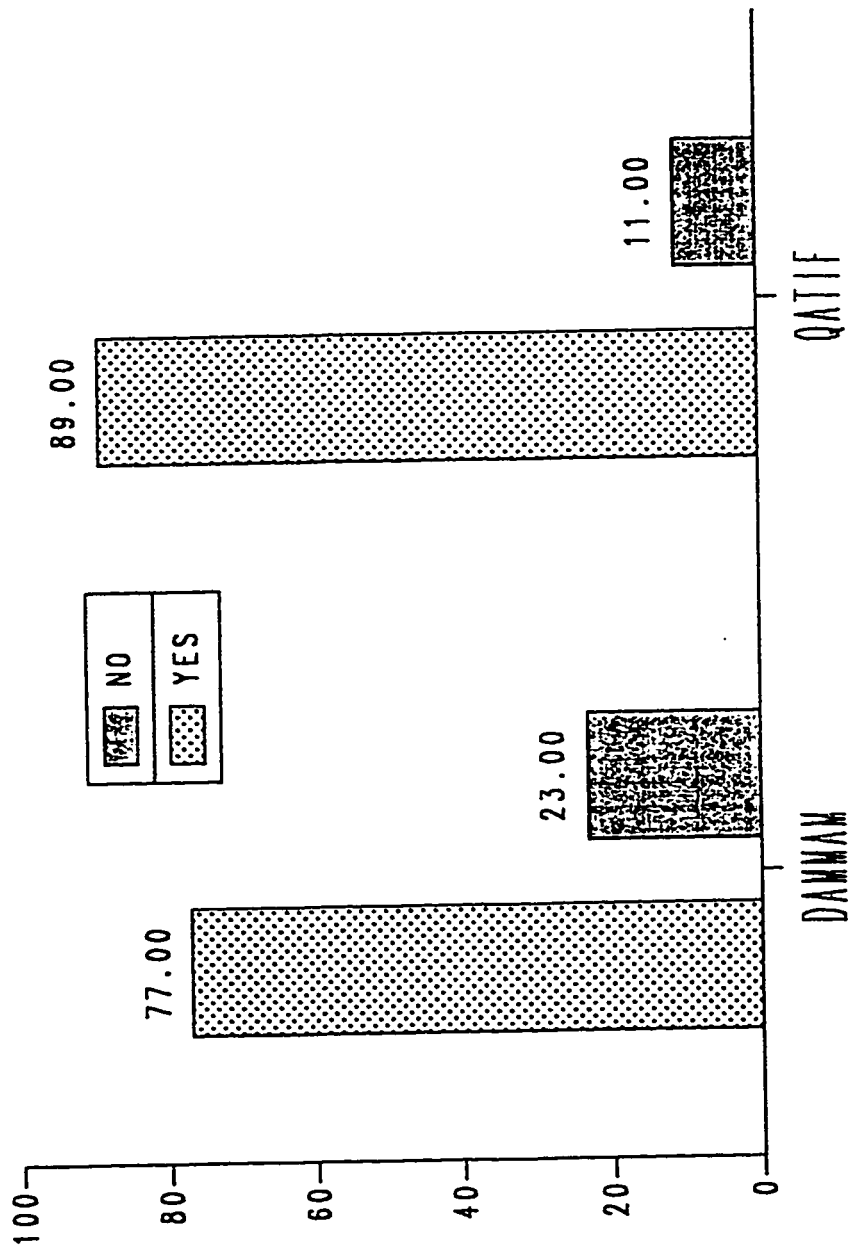
YOU ARE TOTALLY RESPONSIBLE FOR YOUR SAFETY

FIGURE 6.16

DIFFERENCES BETWEEN CITIES IN TERMS OF KNOWLEDGE
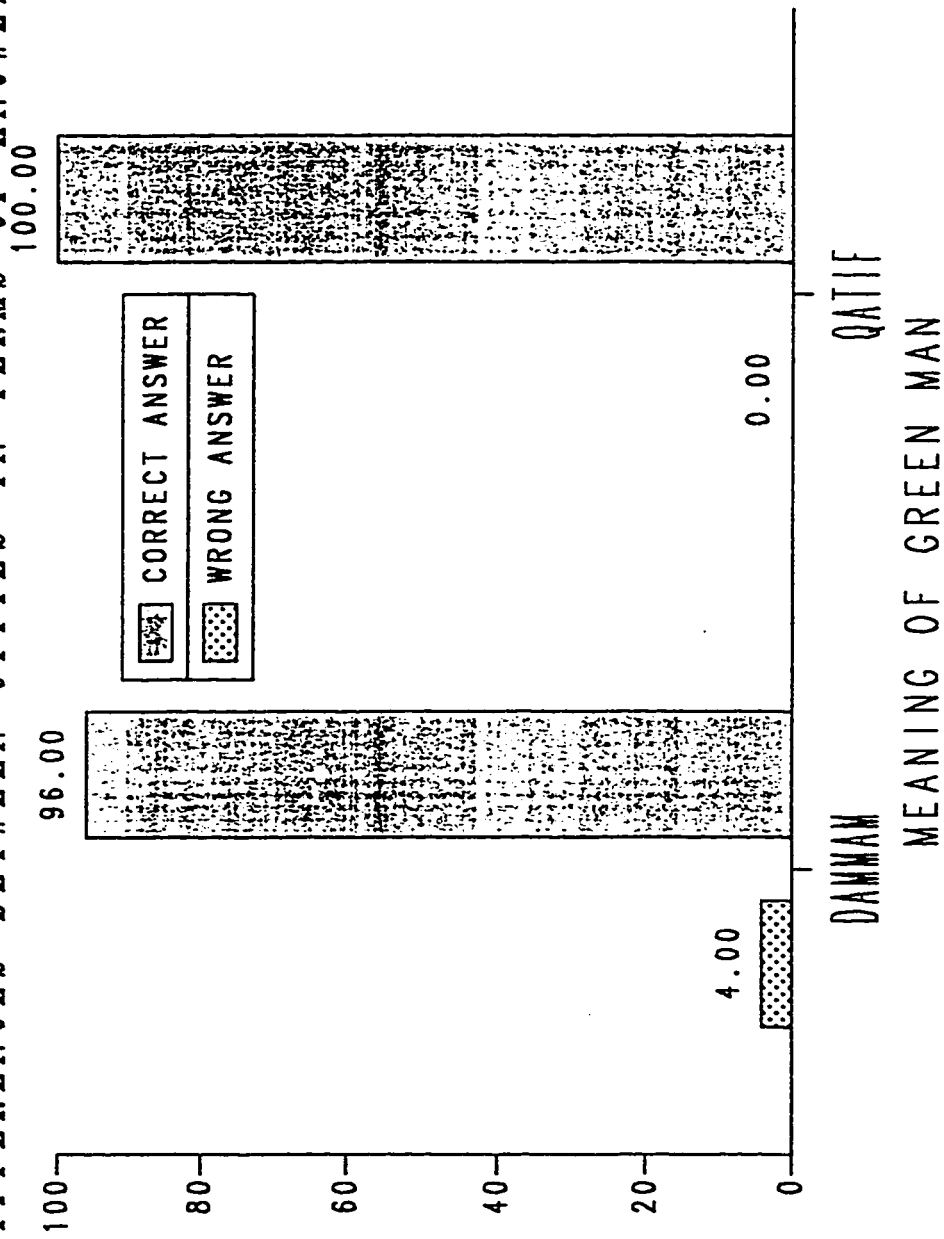
FIGURE 6.17

DIFFERENCES BETWEEN CITIES IN TERMS OF KNOWLEDGE

Legend:
- CORRECT ANSWER
- WRONG ANSWER

DAMMAM: 81.00 (correct), 19.00 (wrong)
QATIF: 89.00 (correct), 11.00 (wrong)

MEANING OF FLASHING GREEN MAN
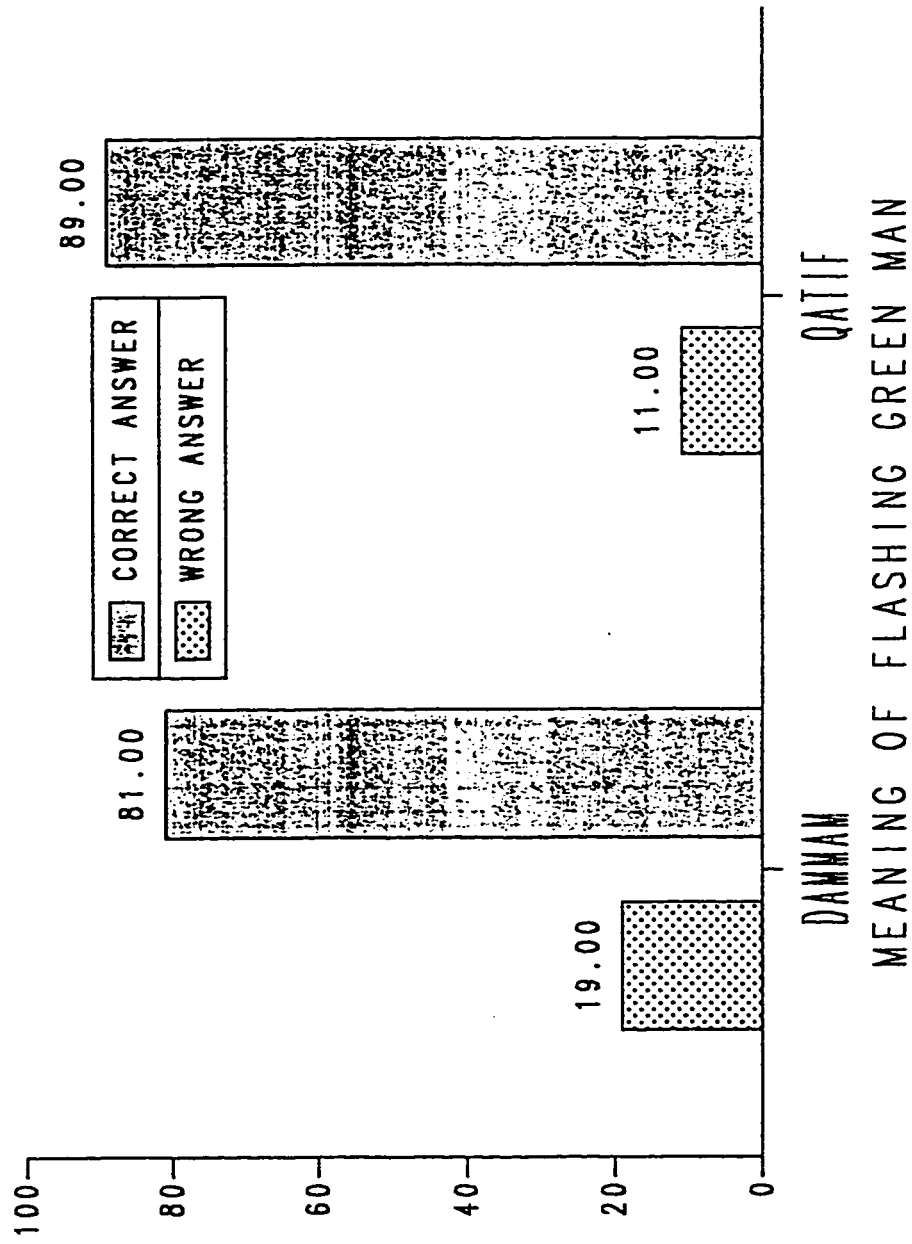
Table 6.15 Effect of Age on Feelings, Knowledge and Accident Involvement.

Data Item Codes	AGE					Significance/ Cramer's γ
	18	18-25	26-35	36-45	Over 46	
	No.(%)	No.(%)	No. (%)	No. (%)	No.(%)	
1. Pedestrian Safety has become a significant issue:						
- Yes	25 (89)	80 (86)	108 (87)	62 (90)	23 (96)	0.59/0.10
- No	3 (11)	13 (14)	16 (13)	6 (10)	1 (4)	
2. Drivers have careless attitude towards pedestrians:						
- Yes	14 (50)	52 (56)	67 (55)	33 (48)	13 (54)	0.91/0.07
- No	14 (50)	40 (44)	54 (45)	36 (52)	11 (46)	
3. You are totally responsible for your own safety when you are crossing at across walk at an unsignalized intersection:						
- Yes	24 (86)	70 (76)	95 (76)	60 (87)	22 (92)	0.28/0.12
- No	4 (14)	22 (24)	28 (24)	9 (13)	2 (8)	
4. Drivers must stop for you when crossing on green pedestrian indication at a cross walk at a signalized intersection.						
- Yes	17 (61)	56 (60)	76 (61)	40 (58)	14 (58)	0.81/0.08
- No	11 (39)	36 (40)	44 (39)	28 (42)	10 (42)	
5. Meaning of Green Man:						
- Wrong Answer	0 (0)	1 (1)	3 (2)	6 (9)	0 (0)	0.03/0.18
- Correct Answer	28(100)	92 (99)	122 (98)	63 (91)	24(100)	
6. Meaning of Red Man:						
- Wrong Answer	0 (0)	15 (16)	6 (5)	5 (7)	7 (0)	0.14/0.14
- Correct Answer	28(100)	78 (84)	119 (95)	64 (93)	24(100)	
7. Meaning of Flashing:						
- Wrong Answer	3 (11)	15 (16)	19 (15)	14 (20)	6 (25)	0.60/0.09
- Correct Answer	25 (89)	78 (84)	106 (85)	55 (80)	18 (75)	
8. Have you Experienced Pedestrian Safety Problem:						
- Yes	8 (29)	23 (25)	22 (18)	16 (23)	3 (13)	0.43/0.11
- No	20 (71)	70 (75)	103 (82)	53 (77)	21 (87)	
9. Type of Pedestrian Problem:						
- None	24 (86)	79 (85)	112 (90)	58 (84)	22 (92)	
- Accident as a Driver	0 (0)	7 (8)	3 (3)	4 (6)	0 (0)	0.46/0.11
- Accident as a Pedestrian	4 (14)	7 (7)	10 (8)	7 (10)	2 (8)	

FIGURE 6.18

EFFECT OF AGE ON KNOWLEDGE

MEANING OF GREEN MAN
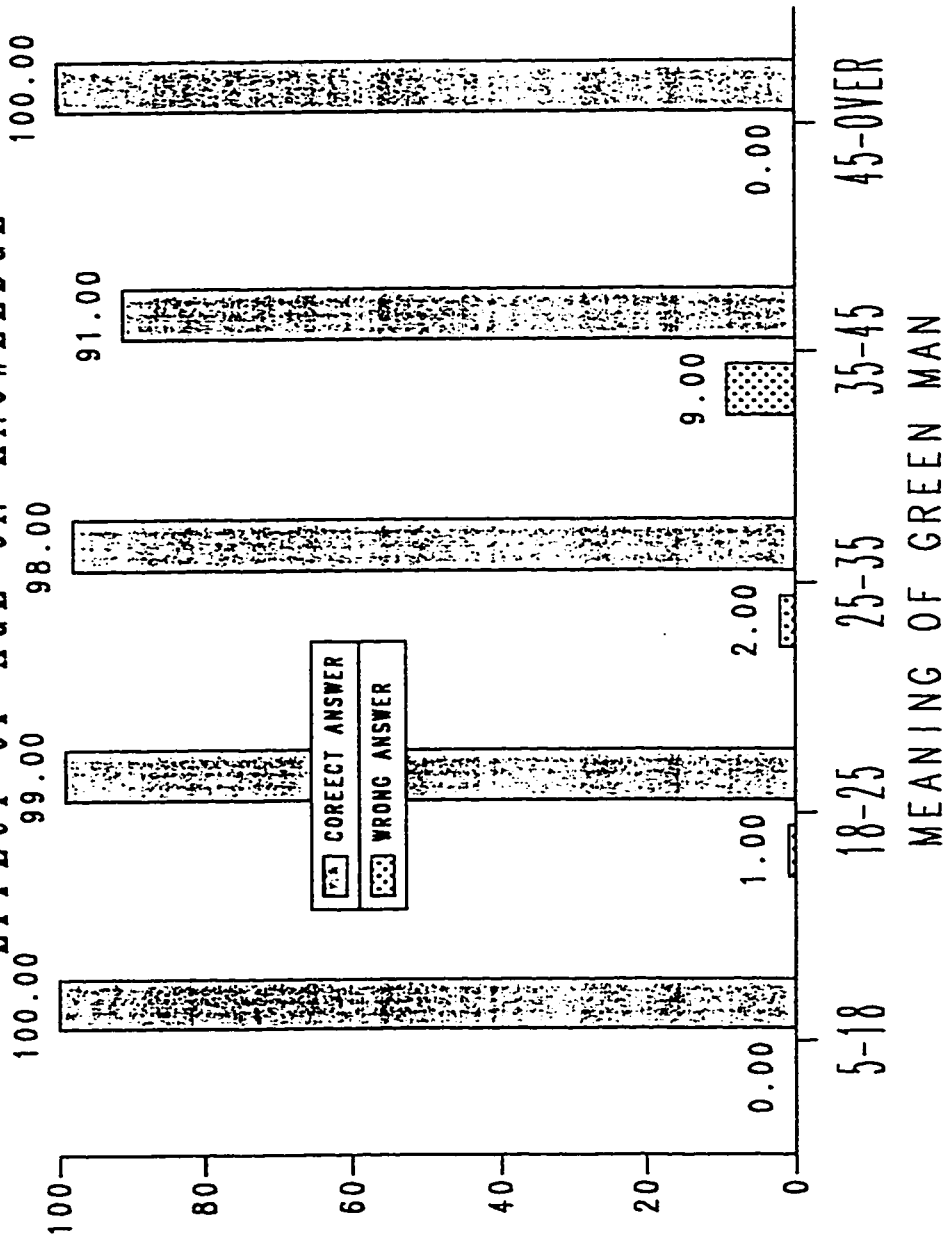
Table 6.16 : Effect of Education on Feelings, Knowledge and Accident Experience.

Data Item Codes	Non-Educated		Below High School		High School		Univ. Degree		Significance/ Cramer's
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
1. Pedestrian Safety has become a significant issue:									
- Yes	44	(92)	112	(89)	56	(85)	86	(88)	0.78/0.07
- No	4	(8)	13	(11)	10	(15)	12	(12)	
2. Drivers have careless attitude towards pedestrians:									
- Yes	23	(49)	73	(58)	32	(48)	51	(52)	0.68/C.08
- No	23	(51)	53	(42)	33	(52)	46	(48)	
3. You are totally responsible for your own safety when you are crossing at across walk at an unsignalized intersection:									
- Yes	32	(65)	103	(82)	54	(82)	82	(85)	0.12/0.12
- No	17	(35)	22	(18)	12	(18)	14	(15)	
4. Drivers must stop for you when crossing on green pedestrian indication at a cross walk at a signalized intersection.									
- Yes	31	(63)	74	(59)	37	(56)	61	(62)	0.29/0.10
- No	15	(37)	50	(40)	29	(44)	35	(56)	
5. Meaning of Green Man:									
- Wrong Answer	3	(6)	3	(2)	3	(5)	1	(1)	0.29/0.11
- Correct Answer	46	(94)	123	(98)	63	(95)	97	(99)	
6. Meaning of Red Man:									
- Wrong Answer	4	(8)	5	(4)	2	(3)	1	(1)	0.17/0.12
- Correct Answer	45	(92)	121	(96)	64	(97)	97	(99)	
7. Meaning of Flashing:									
- Wrong Answer	15	(31)	19	(15)	13	(20)	10	(10)	0.02/0.18
- Correct Answer	34	(69)	107	(85)	53	(80)	88	(90)	
8. Have you Experienced Pedestrian Safety Problem:									
- Yes	8	(16)	24	(19)	19	(29)	21	(21)	C.345/0.09
- No	41	(84)	102	(81)	47	(71)	77	(79)	
9. Type of Pedestrian Problem:									
- None	47	(96)	109	(87)	58	(88)	81	(83)	
- Accident as a Driver	0	(0)	6	(5)	2	(3)	6	(6)	0.44/0.09
- Accident as a Pedestrian	2	(4)	11	(8)	6	(9)	11	(11)	

FIGURE 6.19

EFFECT OF EDUCATION ON KNOWLEDGE

Legend:
- CORRECT ANSWER
- WRONG ANSWER

Values (CORRECT ANSWER): 69.00, 85.00, 80.00, 90.00
Values (WRONG ANSWER): 31.00, 15.00, 20.00, 10.00

Categories: NON-EDUCATED, BELOW HIGH SCHOOL, HIGH SCHOOL, UNIVERSITY DEGREE

MEANING OF FLASHING GREEN MAN
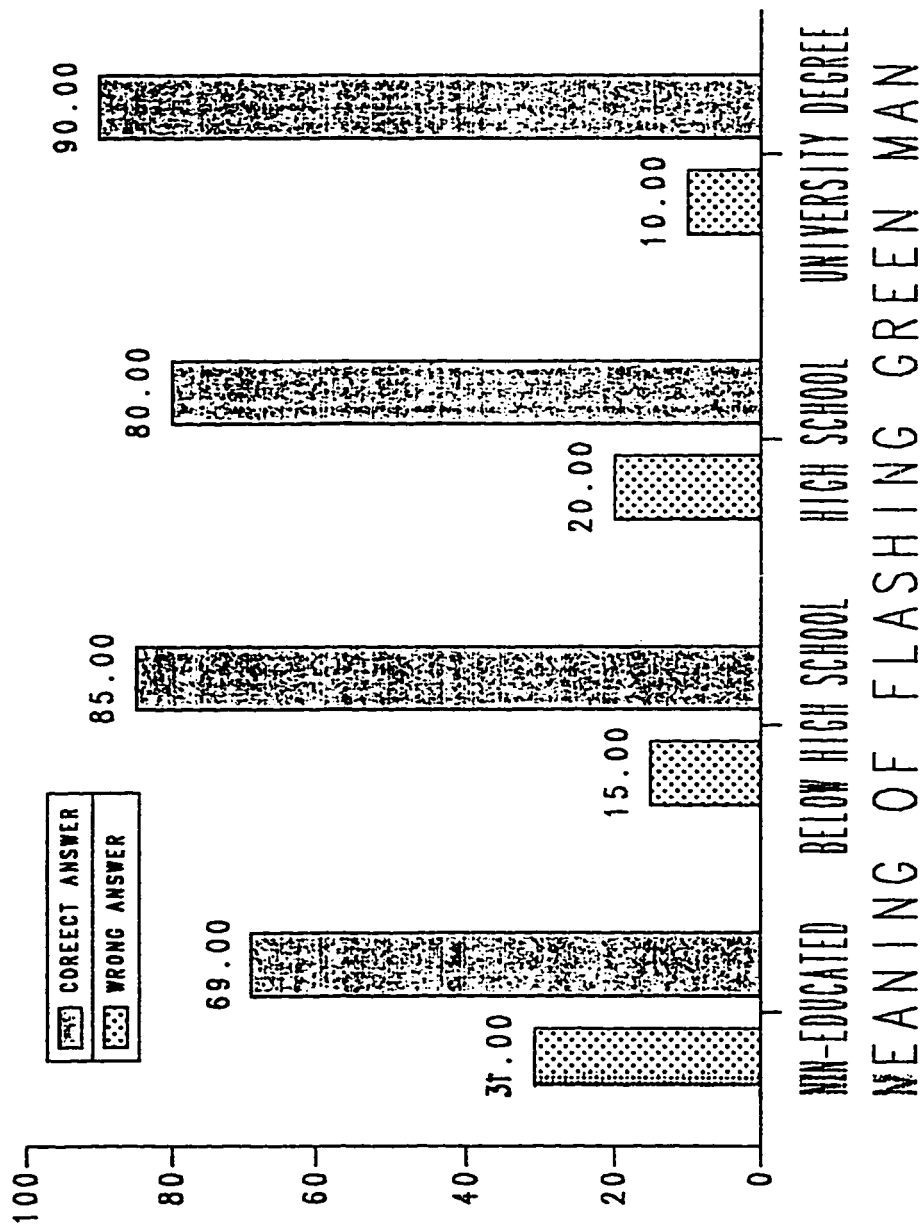
6.4. STUDY OF DIFFERENCES BETWEEN SEXES IN PEDESTRIAN BEHAVIOR FROM VIDEO FILMS

In this section the analysis of observed behavior data collected through video films for both sexes is presented. These data include sex and nationality, estimated age, handicaped or not handicaped, violations for signals, violations of crossing, conflicts, checking of traffic, and stopping at the curb.

The effects of sex and nationality on various categories of pedestrian behavior will be studied separately.

Table 6.17 and Figure 6.20 give general characteristics of the survey population. Age groups (26-35) and (36-45) are overrepresented and younger age categories, especially age group 5-18 is underrepresented. Obviously, for this group sample size is not sufficient to derive any reliable result. However the main objective of this part is to analyze differences between males and females of the adult category, therefore this is not a major problem.

Table 6.18 summarizes the data items related to stopping at the curb, accompaniment, and walk vs run which were all found to be significantly affected by sex and nationality. Figure 6.21 shows the effect of sex and nationality on stopping at the curb. Sixty six percent of Saudi females have stopped at the curb, and 64% of Non-Saudi females have stopped at the curb. This indicates that there is not much difference in behavior between nationalities among females. However the difference between nationalities among males is considerable since 59% of Non-Saudi males have stopped at the curb, while 46% percent of the Saudi males have stopped at the curb. As will be noticed from Table 6.18 and Figure 6.20 both Saudi and Non-Saudi females seem to be more cautious than males in general.

TABLE 6.17 GENERAL CHARACTERISTICS OF THE SURVEY POPULATION

AGE CATEGORY	5-18 NO	(%)	19-25 NO	(%)	26-35 NO	(%)	36-45 NO	(%)	46-OVER NO	(%)	TOTAL NO	(%)
1-Male Saudi	2	(17)	8	(13)	68	(15)	62	(18)	7	(47)	147	(17)
2-Male Non-Saudi	6	(50)	23	(38)	131	(28)	116	(34)	3	(20)	320	(36)
3-Female Saudi	3	(25)	24	(38)	183	(39)	106	(31)	4	(27)	279	(31)
4-Female Non-Saudi	1	(8)	6	(10)	82	(18)	54	(16)	1	(7)	144	(16)
	12	(1)	61	(7)	264	(52)	338	(38)	15	(2)		

Significance/Cramers'V   0.024/0.09

FIGURE 6.20

RELATION BETWEEN(AGE)AND(SEX AND NATIONALITY)

Legend:
- FEMALE NON-SAUDI
- MALE NON-SAUDI
- FEMALE SAUDI
- MALE SAUDI

Age group	Values
5-18	50.00, 25.00, 17.00, 8.00, 13.00
18-25	39.00, 40.00, 10.00, 15.00
25-35	39.00, 28.00, 18.00
35-45	34.00, 31.00, 18.00, 16.00
45-OVER	47.00, 27.00, 20.00, 7.00
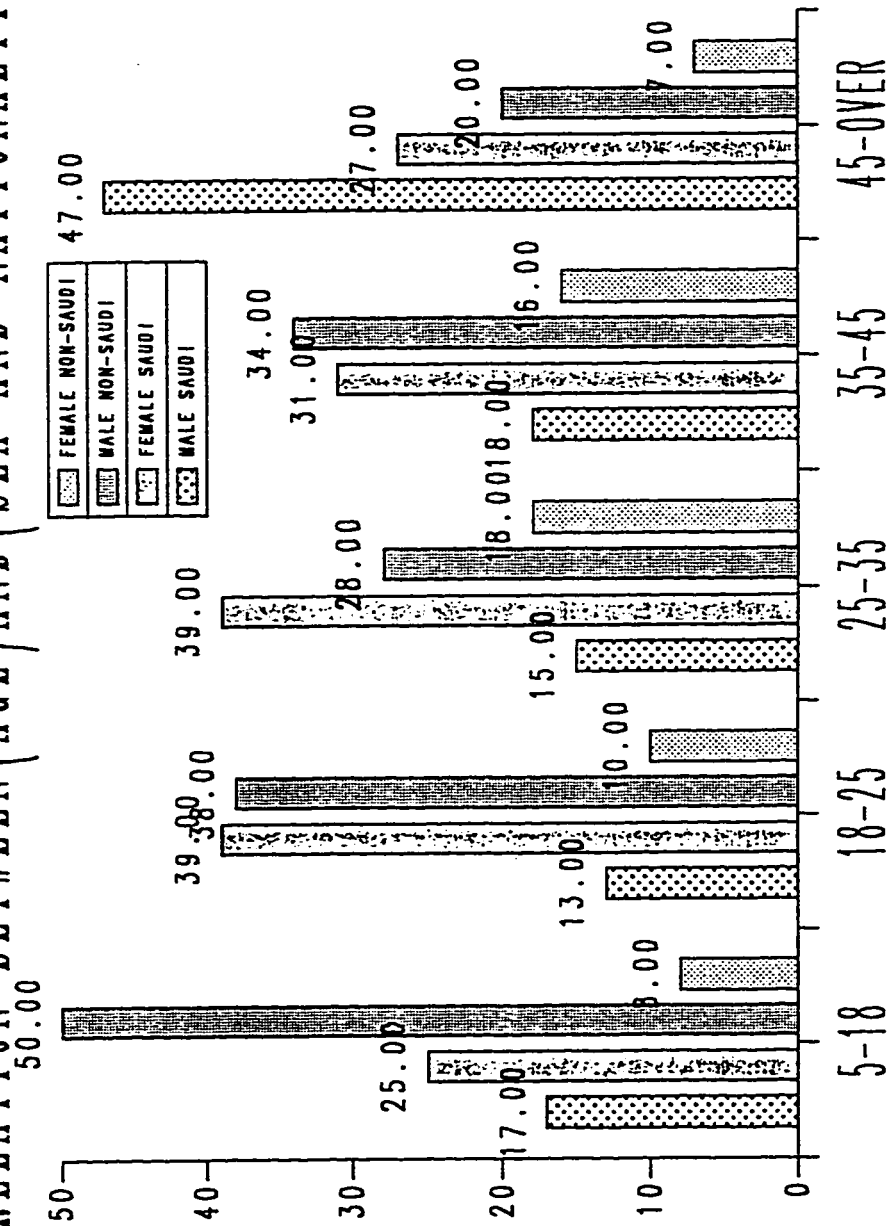
TABLE 6.18 SUMMARY OF PEDESTRIAN BEHAVIOR DATA THROUGH VIDEO

STOPPING AT THE CURB	STOPPED NO (%)	NOT-STOPPED NO (%)
1-Male Saudi 2-Male Non-Saudi 3-Female Saudi 4-Female Non-Saudi	68 (46) 164 (59) 212 (66) 92 (64)	79 (54) 115 (41) 108 (34) 52 (36)
Significance/Cramers'V	0.000/0.14	
ACCOMPANIMENT	ALONE NO (%)	WITH OTHERS NO (%)
1-Male Saudi 2-Male Non-Saudi 3-Female Saudi -female Non-Saudi	51 (35) 80 (29) 61 (26) 41 (28)	96 (65) 199 (71) 259 (74) 103 (72)
Significance/Cramers'V	0.002/0.13	
WALK vs RUN	WALK NO (%)	RUN NO (%)
1-Male Saudi 2-Male Non-Saudi 3-Female Saudi 4-Female Non-Saudi	144 (98) 266 (95) 316 (99) 138 (96)	3 (2) 13 (5) 4 (1) 6 (4)
Significance/Cramers'V	0.063/0.091	

FIGURE 6.21

STOPPING AT THE CURB BY SEX AND NATIONALITY
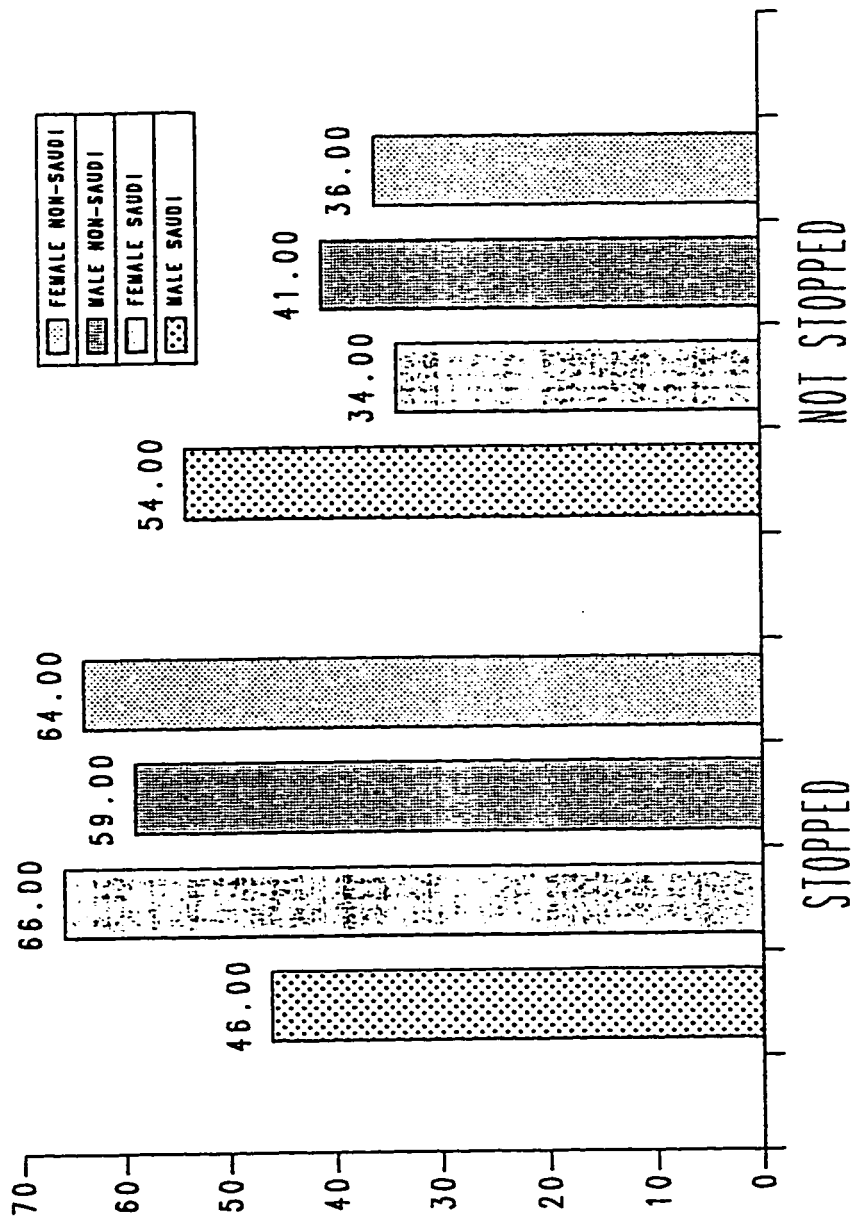
Figure 6.22 shows the effect of sex and nationality by accompaniment. 65% of Saudi males walk with other, while all other groups have around 70% for walking in groups. This indicates that Saudi males tend to go alone more than Non-Saudi males. The highest percent 74% of accompaniment is for female Saudi's. Since walking in groups make the pedestrian more visible to drivers this improves their crossing safety.

Figure 6.23 shows the effect of sex and nationality on walk vs run. Although there was a fairly long recording time, there was a very few runing pedestrians. It seems that a slightly higher percentage of male and female Non-Saudi's run while crossing.

FIGURE 6.22

ACCOMPANIMENT BY SEX AND NATIONALITY
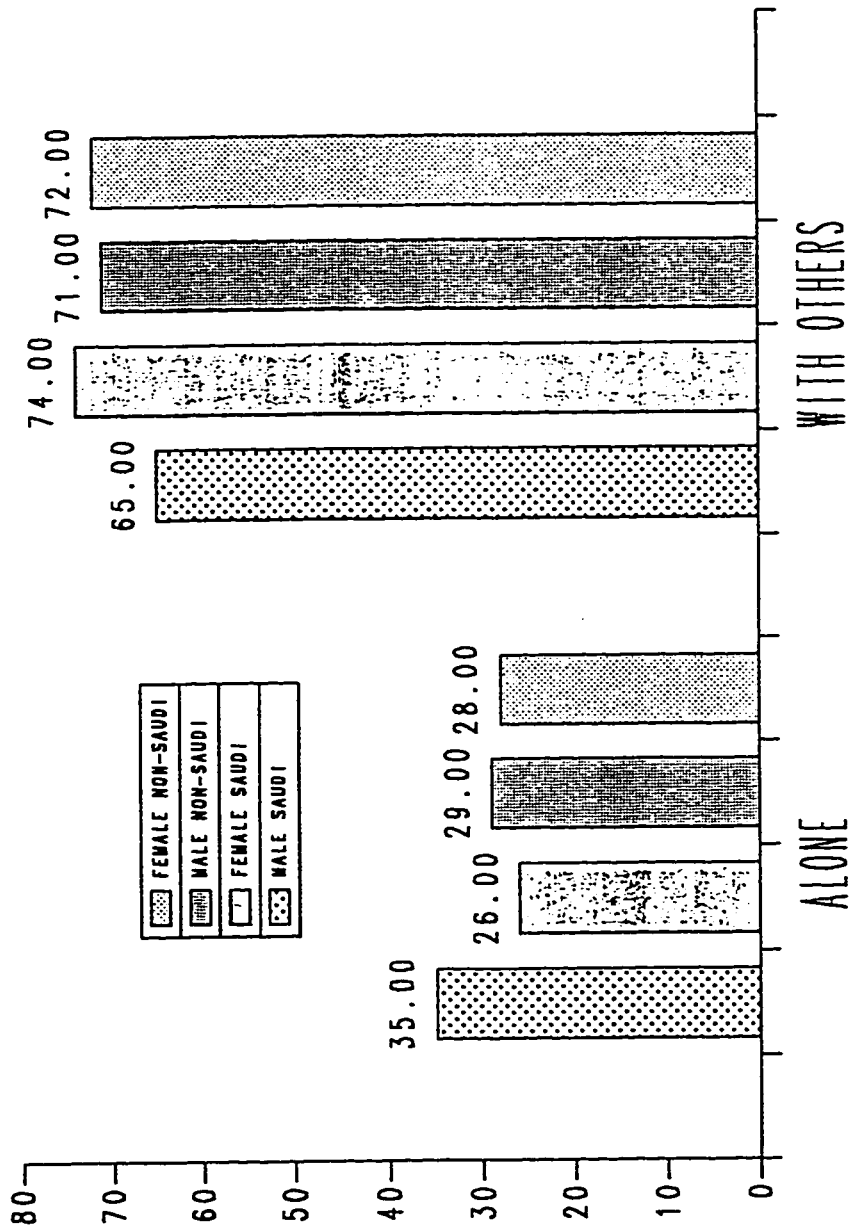
FIGURE 6.23

WALK VS RUN BY SEX AND NATIONALITY
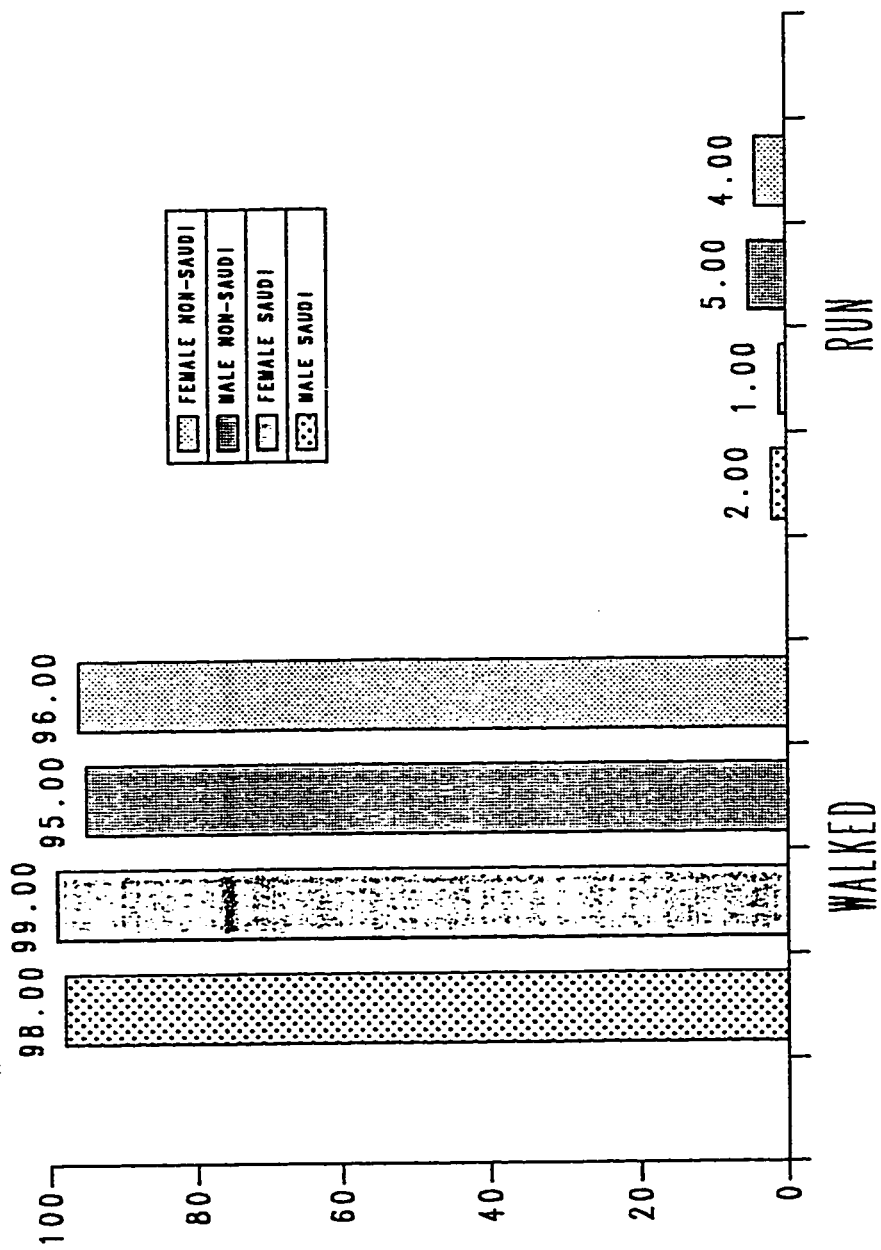
CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

1. More than half of the pedestrians did not pay attention to signals. There were two reasons for this violation. First, the pedestrian has to wait for three signal phases in order to have a chance to cross legally. Hence, it is recommended to have detailed study about signal phase design which reduce pedestrian delay and to introduce educational and enforcement programs to correct this behavior. Second, there is a lack of knowledge or disrespect of pedestrian rules.

2. Improper crossing (i.e between cars or jaywalking) presents one of the main problem areas in pedestrian behavior, which may be corrected through educational programs and enforcement.

3. Twenty percent of pedestrians experienced a pedesrtian safety problem which indicate the seriousness of the problem.

4. Majority of the pedestrians believed that drivers have careless attitude toward pedestrians, and did not trust them not to violate traffic signals. This reflects that drivers show careless actions toward pedestrians. These careless actions can be minimized through educational and enforcement programs directed toward drivers.

5. Moving vehicle conflict had the highest ferequency of occurrence. This may be direct result of improper crossing and signal violations or careless attitude of drivers.

6. Whether the interviewed pedestrian is a driver or non-driver dose not seem to have any effect on his behavior as a pedestrian on the road. This implies wrong behavior may be related to carelessness rather than knowing rules and / or that education related to pedestrianbehavior is equivalently lacking for both drivers and non-drivers.

7. One major limitation of the signals used is that both the right-turn and pedestrian cross signals become green at the same time. This leads to a high percentage of the right-turn conflict. As a solution to this problem, the right-turn signal may be canceled, at locations with high pedestrian activity. Zegeer et all (1984) showed that the use of "YIELD TO PEDESTRIAN WHEN TURNING"for drivers and "WATCH FOR TURNING VEHICLES" for pedestrians significantly reduces the turning conflicts. These signs can be employed at signalized intersections with heavy pedestrian flows.

8. Saudi's had more crossing violations than Non-Saudi's, which shows that Saudi's might need more education about proper crossing.

9. Dammam had better results for both conflict and crossing behavior than Qatif. This might be because of behavioral differences or simply because Dammam might have better facilities (signalization, X-walks,....etc.).

10. High school pedestrians had the highest percentage of non-checking traffic and improper crossing. The reason for this might be that the majority of high school pedestrians fall in the range of 5-17 years old, and generally young people are less careful than old people.

11. Majority of pedestrians believe that crossing on crosswalks at uncontrolled intersections is even safer than crossing on permitted phase at a signalized intersection without a crosswalk. It seems that the pedestrians nave an overtrust on crosswalks or a false sense of security and they become careless when crossing on crosswalks. They should be educated about the fact that even when crossing at crosswalks they should check the traffic.

12. Drivers seem to be more subjected to pedestrian safety problems (both as pedestrians and drivers) which is natural.

13. For the same level of education there seems to be no difference between

pedestrians in feelings and knowledge regardless of nationality grouping.

14. In general pedestrians in Dammam have less confidence for drivers than Qatif pedestrians. This might be a consequence of the strong social relations between people in Qatif, taking in consideration that Qatif is a small city and people do not like to disturb each other.

15. Qatif pedestrians seem to be more careful crossing unsignalized intersections.

16. Age has a significant effect on pedestrian knowledge, while feelings and accident involvements are not found to be significantly related to age (however the study did not have enuogh pedestrians in the young category).

17. As education level improves, knowledge on the meaning of flashing green man becomes better.

18. There is not much difference in behavior between nationalities among females.

19. Both Saudi and Non-Saudi females seem to be more cautious than males in general.

20. Saudi males tend to go alone more than Non-Saudi males, and since going in groups makes pedestrians more visible for drivers, this might improve Non-Saudi crossing safety.

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APPENDIX A

Pedestrian interview coding manual

CODING MANUAL OF DATA FOR
PEDESTRIAN INTERVIEWS

Column No.	Item Codes
1-3	Interview Numbers
4-5	Intersection Number
6	City ; 1 = Dammam , 2 = Qatif , 9 = Unknown
7-9	Date ⁻ ; 7 8 Day 9 Month
10-11	Time (hours) ; Military time.
12	Observer ; 1 = Al-Kilani 2 = Al-Darvish 3 = Nabhan
13	Pedestrian checking of traffic 1 = Checked 2 = Did not check 9 = Missing Data
14	Pedestrian crossed on:- 1 = Permitted phase 2 = Clearance interval 3 = Prohibited phase 4 = Not applicable 9 = Missing Data
15	Pedestrian Violation:- 1 = Between cars/Jaywalked 2 = In front of queue/on x-walk 9 = Missing Data CONFLICTS 0 = no conflict 1 = had conflict
16	PH = Pedestrian hesitation
17	AC = Aborted crossing
18	MV = Moving vehicle

Coding Manual (contd.)

Column No.	Item Codes
19	RT = Right turn
20	LT = Left turn
21	RP = Running pedestrian to avoid possible collision
22	RTV = Run from turning vehicle
23	ID = Intersectional dash
24	DO = Dash out
25	MT = Multiple threat
26	BU = Back up
	QUESTIONS 1 = Yes , 2 = Don't know , 3 = No 8 = Non-Response , 9 = Missing Data
27	Pedestrian Safety has become a significant issue.
28	Drivers have careless attitude toward pedestrians.
29	You are totally responsible for your own safety when crossing.
30	You trust drivers to stop for you when crossing at an unsignalized intersection.
31	Drivers must stop for you when crossing on green (or pedestrian indication) at a crosswalk at a signalized intersection.
32	Meaning of Green Man:- 1 = Complete cross/Do not start crossing 2 = Cross 3 = Stop 4 = Don't know 9 = Missing Data

Coding Manual (contd.)

Column No.	Item Codes
33	Meaning of Red Man:- 1 = Complete cross/Do not start crossing 2 = Cross 3 = Stop 4 = Don't know 9 = Missing Data
34	Meaning of flashing green man:- 1 = Complete cross/Do not start crossing 2 = Cross 3 = Stop 4 = Do not know 9 = Missing Data
35	Have you experienced Pedestrian Safety Problem 1 = Yes 2 = No 9 = Missing Data
36	Type of Pedestrian Safety Problem (Accident) 0 = None 1 = Accident as a driver 2 = Accident as a pedestrian 9 = Missing Data
37	Type of Pedestrian Safety Problem (Near Miss) 0 = None 1 = Accident as a driver 2 = Accident as a pedestrian 9 = Missing Data
38	Do you drive 1 = Yes 2 = No 9 = Missing Data

39	Age 1 = Under 18
	       2 = 18-25
	       3 = 26-35
	       4 = 36-45
	       5 = Over 46
	       6 = Missing Data

40	Nationality 1 = Saudi
	             2 = Non-Saudi
	             3 = Missing Data

41	Education 1 = No education
	           2 = Below high school
	           3 = High school
	           4 = University degree

APPENDIX B

Video filming coding manual

CODING FORM FOR
PEDESTRIAN BEHAVIOR FROM VIDEO RECORDINGS

Column No.	Item Codes
1-3	Intersection No.
5	Approach Leg No.　　1 = North　　2 = East　　3 = South 　　　　　　　　　　4 = West
7	Type of Traffic Control 　　　1- Uncontrolled 　　　2- Stop/Yield 　　　3- Signalized
9	Sex and Nationality 　　　1- Male Saudi 　　　2- Female Saudi 　　　3- Male Non-Saudi 　　　4- Female Non-Saudi
11	Age (Observed) 　　　1. 5-10 　　　2. 11-15 　　　3. 16-20 　　　4. 21-60 　　　5. Over 60 (very old) .
13	Handicapped　　　1 = Yes　　　2 = No
15	Accompaniment:　　　1 = Alone　　　2 = With Others
17	Violations for pedestrian signal at signalized intersections 　　　1. Permitted phase 　　　2. Prohibited phase 　　　3. Not applicable (Unsignalized)
19,	Violation of Crossing 　　　1. Crossed between cars or jaywalked 　　　2. Proper (in front of vehicle line or on X-walk)

Column No.	Item Codes

21-22	Conflict types
	   0 = No conflict
	   1 = PH
	   2 = AC
	   3 = MV
	   4 = RT
	   5 = LT
	   6 = RP
	   7 = RIV
	   8 = ID
	   9 = DO
	  10 = MT
	  11 = BU

24	Checking of traffic
	   1 = checked
	   2 = not checked

26	Stopping at the curb
	   1 = Stopped
	   2 = Not stopped

28	Walking vs Running while crossing
	   1 = Walked
	   2 = Run

30	Recording type
	   1 = Period recorded for all pedestrians
	   2 = Period recorded only for females

APPENDIX C

Preliminary characteristics of the collected data

DEGREE OF EDUCATION

EDUCATON	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
NO EDUCATION	35	16.7	35	16.7
BELOW HIGH SCHOO	83	39.5	118	56.2
HIGH SCHOOL	37	17.6	155	73.8
UNIVERSITY	55	26.2	210	100.0

PEDESTRIAN CHECKING OF TRAFFIC

PEDCHETR	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	2	.	.	.
CHECKED	243	89.7	243	89.7
DID NOT CHECK	28	10.3	271	100.0

PEDESTRIAN CROSSED ON

PEDCROSS	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	2	.	.	.
PERMITTED PHASE	120	44.3	120	44.3
PROHIBITED PHASE	151	55.7	271	100.0

PEDESTRIAN VIOLATION

PEDVIOLA	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	4	.	.	.
BETWEEN CARS	60	22.3	60	22.3
INFRONT OF QUEUE	209	77.7	269	100.0

CONFLECT

CONF	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
NO CONFLECT	230	84.2	230	84.2
HAD CONFLECT	43	15.8	273	100.0

AGE

AGE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
UNDER 18	16	7.6	16	7.6
18-25	59	28.1	75	35.7
26-35	77	36.7	152	72.4
36-45	40	19.0	192	91.4
OVER 46	18	8.6	210	100.0

NATIONALITY

NATIONAL	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	65	.	.	.
SAUDI	99	47.6	99	47.6
NON SAUDI	109	52.4	208	100.0

HAVE YOU EXPERIENCED PEDESTRIAN SAFETY P

HYEPSP	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
YES	43	20.5	43	20.5
NO	167	79.5	210	100.0

DO YOU DRIVE A MOTOR VEHICLE

DYDMV	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
YES	139	66.2	139	66.2
NO	71	33.8	210	100.0

PEDESTRIAN SAFETY HAS BECOME A SIGNIFICA

PSHBSI	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
YES	187	89.0	187	89.0
NO	23	11.0	210	100.0
1SAS				

DRIVERS HAVE CARELESS ATTITUDE TOWARD PE

DHCATP	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	64	.	.	.
YES	103	49.3	103	49.3
DO NOT KNOW	2	1.0	105	50.2
NO	104	49.8	209	100.0

YOU ARE TOTALLY RESPONSIBLE FOR YOUR OWN

YTRFYSWC	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	64	.	.	.
YES	173	82.8	173	82.8
DO NOT KNOW	2	1.0	175	83.7
NO	34	16.3	209	100.0

YOU TRUST DEIVERS TO STOP FOR YOU WHEN C

YTDSFYWC	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
YES	51	24.3	51	24.3
DO NOT KNOW	6	2.9	57	27.1
NO	153	72.9	210	100.0

DRIVERS MUST STOP FOR YOU WHEN CROSSING

DMSFYWCG	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
YES	124	59.0	124	59.0
DO NOT KNOW	6	2.9	130	61.9
NO	80	38.1	210	100.0

MEANING OF GREEN MAN

MOGM	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
WRONG ANSWER	5	2.4	5	2.4
WRIGHT ANSWER	205	97.6	210	100.0

1SAS

MEANING OF RED MAN

MORM	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
WRONG ANSWER	8	3.8	8	3.8
WRIGHT ANSWER	202	96.2	210	100.0

MEANING OF FALSHING GREEN MAN

MOFGM	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
WRONG ANSWER	35	16.7	35	16.7
WRIGHT ANSWER	175	83.3	210	100.0

TYPE OF PEDESTRIAN SAFETY PROBLEM ACCIDE

TOPSPACD	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
NON	192	91.4	192	91.4
ACCIDENT AS A DR	9	4.3	201	95.7
ACCIDENT AS A PE	9	4.3	210	100.0

TYPE OF PEDESTRIAN SAFETY PROBLEM NEAR M

TOPSPNMS	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	63	.	.	.
NON	185	88.1	185	88.1
ACCIDENT AS A DR	7	3.3	192	91.4
ACCIDENT AS A PE	18	8.6	210	100.0

TABLE OF CITY BY EDUCATON

CITY(CITY)   EDUCATON(DEGREE OF EDUCATION)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |NO EDUCA|BELOW HI|HIGH SCH|UNIVERSI|
         |TION    |GH SCHOO|OOL     |ITY     |  TOTAL
---------+--------+--------+--------+--------+
DAMMAM   |    23  |    50  |    22  |    36  |   131
         | 10.95  | 23.81  | 10.48  | 17.14  | 62.38
         | 17.56  | 38.17  | 16.79  | 27.48  |
         | 65.71  | 60.24  | 59.46  | 65.45  |
---------+--------+--------+--------+--------+
QATIF    |    12  |    33  |    15  |    19  |    79
         |  5.71  | 15.71  |  7.14  |  9.05  | 37.62
         | 15.19  | 41.77  | 18.99  | 24.05  |
         | 34.29  | 39.76  | 40.54  | 34.55  |
---------+--------+--------+--------+--------+
TOTAL         35       83       37       55      210
           16.67    39.52    17.62    26.19   100.00
```

STATISTICS FOR TABLE OF CITY BY EDUCATON

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	3	0.684	0.877
LIKELIHOOD RATIO CHI-SQUARE	3	0.686	0.877
MANTEL-HAENSZEL CHI-SQUARE	1	0.023	0.878
PHI		0.057	
CONTINGENCY COEFFICIENT		0.057	
CRAMER'S V		0.057	

TABLE OF CONF BY CITY

CONF(CONFLECT)   CITY(CITY)

```
FREQUENCY   |
 PERCENT    |
 ROW PCT    |
 COL PCT    |DAMMAM  |QATIF   |  TOTAL
------------+--------+--------+
NO CONFLECT |   145  |    85  |   230
            |  53.11 |  31.14 |  84.25
            |  63.04 |  36.96 |
            |  82.39 |  87.63 |
------------+--------+--------+
HAD CONFLECT|    31  |    12  |    43
            |  11.36 |   4.40 |  15.75
            |  72.09 |  27.91 |
            |  17.61 |  12.37 |
------------+--------+--------+
TOTAL           176       97      273
                64.47    35.53   100.00
```
1SAS

STATISTICS FOR TABLE OF CONF BY CITY

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	1.295	0.255
LIKELIHOOD RATIO CHI-SQUARE	1	1.336	0.248
CONTINUITY ADJ. CHI-SQUARE	1	0.930	0.335
MANTEL-HAENSZEL CHI-SQUARE	1	1.290	0.256
FISHER'S EXACT TEST (1-TAIL)			0.168
(2-TAIL)			0.300
PHI		-0.069	
CONTINGENCY COEFFICIENT		0.069	
CRAMER'S V		-0.069	

CITY(CITY)   PEDCROSS(PEDESTRIAN CROSSED ON)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |PERMITTE|PROHIBIT|
         |D PHASE |ED PHASE|  TOTAL
---------+--------+--------+
DAMMAM   |    86  |    88  |   174
         |  31.73 |  32.47 |  64.21
         |  49.43 |  50.57 |
         |  71.67 |  58.28 |
---------+--------+--------+
QATIF    |    34  |    63  |    97
         |  12.55 |  23.25 |  35.79
         |  35.05 |  64.95 |
         |  28.33 |  41.72 |
---------+--------+--------+
TOTAL         120      151     271
             44.28    55.72  100.00
```

FREQUENCY MISSING = 2
1SAS

STATISTICS FOR TABLE OF CITY BY PEDCROSS

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	5.215	0.022
LIKELIHOOD RATIO CHI-SQUARE	1	5.273	0.022
CONTINUITY ADJ. CHI-SQUARE	1	4.649	0.031
MANTEL-HAENSZEL CHI-SQUARE	1	5.196	0.023
FISHER'S EXACT TEST (1-TAIL)			0.015
(2-TAIL)			0.030
PHI		0.139	
CONTINGENCY COEFFICIENT		0.137	
CRAMER'S V		0.139	

TABLE OF EDUCATON BY PEDCHETR

EDUCATON(DEGREE OF EDUCATION)
PEDCHETR(PEDESTRIAN CHECKING OF TRAFFIC)

FREQUENCY PERCENT ROW PCT COL PCT	CHECKED	DID NOT CHECK	TOTAL
NO EDUCATION	33 15.87 94.29 17.65	2 0.96 5.71 9.52	35 16.83
BELOW HIGH SCHOO	74 35.58 91.36 39.57	7 3.37 8.64 33.33	81 38.94
HIGH SCHOOL	29 13.94 78.38 15.51	8 3.85 21.62 38.10	37 17.79
UNIVERSITY	51 24.52 92.73 27.27	4 1.92 7.27 19.05	55 26.44
TOTAL	187 89.90	21 10.10	208 100.00

FREQUENCY MISSING = 65
1SAS

STATISTICS FOR TABLE OF EDUCATON BY PEDCHETR

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	3	6.827	0.078
LIKELIHOOD RATIO CHI-SQUARE	3	5.819	0.121
MANTEL-HAENSZEL CHI-SQUARE	1	0.343	0.558
PHI		0.181	
CONTINGENCY COEFFICIENT		0.178	
CRAMER'S V		0.181	

TABLE OF EDUCATON BY PEDVIOLA

EDUCATON(DEGREE OF EDUCATION)
PEDVIOLA(PEDESTRIAN VIOLATION)

FREQUENCY PERCENT ROW PCT COL PCT	BETWEEN CARS	INFRONT OF QUEUE	TOTAL
NO EDUCATION	3 1.46 8.57 7.14	32 15.53 91.43 19.51	35 16.99
BELOW HIGH SCHOO	18 8.74 22.22 42.86	63 30.58 77.78 38.41	81 39.32
HIGH SCHOOL	8 3.88 22.22 19.05	28 13.59 77.78 17.07	36 17.48
UNIVERSITY	13 6.31 24.07 30.95	41 19.90 75.93 25.00	54 26.21
TOTAL	42 20.39	164 79.61	206 100.00

FREQUENCY MISSING = 67
1SAS

STATISTICS FOR TABLE OF EDUCATON BY PEDVIOLA

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	3	3.705	0.295
LIKELIHOOD RATIO CHI-SQUARE	3	4.329	0.228
MANTEL-HAENSZEL CHI-SQUARE	1	2.059	0.151
PHI		0.134	
CONTINGENCY COEFFICIENT		0.133	
CRAMER'S V		0.134	

TABLE OF NATIONAL BY PEDCROSS

NATIONAL(NATIONALITY)
          PEDCROSS(PEDESTRIAN CROSSED ON)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT  |PERMITTE|PROHIBIT|
           |D PHASE |ED PHASE|  TOTAL
----------+--------+--------+
SAUDI      |    38  |    60  |    98
           |  18.45 |  29.13 |  47.57
           |  38.78 |  61.22 |
           |  40.86 |  53.10 |
----------+--------+--------+
NON SAUDI  |    55  |    53  |   108
           |  26.70 |  25.73 |  52.43
           |  50.93 |  49.07 |
           |  59.14 |  46.90 |
----------+--------+--------+
TOTAL           93      113      206
             45.15    54.85   100.00
```

FREQUENCY MISSING = 67
1SAS

STATISTICS FOR TABLE OF NATIONAL BY PEDCROSS

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	3.063	0.080
LIKELIHOOD RATIO CHI-SQUARE	1	3.073	0.080
CONTINUITY ADJ. CHI-SQUARE	1	2.592	0.107
MANTEL-HAENSZEL CHI-SQUARE	1	3.048	0.081
FISHER'S EXACT TEST (1-TAIL)			0.054
(2-TAIL)			0.093
PHI		-0.122	
CONTINGENCY COEFFICIENT		0.121	
CRAMER'S V		-0.122	

TABLE OF NATIONAL BY PEDVIOLA

NATIONAL(NATIONALITY)
            PEDVIOLA(PEDESTRIAN VIOLATION)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |BETWEEN |INFRONT |
          |CARS    |OF QUEUE|  TOTAL
----------+--------+--------+
SAUDI     |    22  |    76  |    98
          |  10.78 |  37.25 |  48.04
          |  22.45 |  77.55 |
          |  53.66 |  46.63 |
----------+--------+--------+
NON SAUDI |    19  |    87  |   106
          |   9.31 |  42.65 |  51.96
          |  17.92 |  82.08 |
          |  46.34 |  53.37 |
----------+--------+--------+
TOTAL          41      163      204
             20.10    79.90   100.00
```

FREQUENCY MISSING = 69
1SAS

STATISTICS FOR TABLE OF NATIONAL BY PEDVIOLA

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	0.649	0.420
LIKELIHOOD RATIO CHI-SQUARE	1	0.649	0.421
CONTINUITY ADJ. CHI-SQUARE	1	0.398	0.528
MANTEL-HAENSZEL CHI-SQUARE	1	0.646	0.422
FISHER'S EXACT TEST (1-TAIL)			0.264
(2-TAIL)			0.486
PHI		0.056	
CONTINGENCY COEFFICIENT		0.056	
CRAMER'S V		0.056	

TABLE OF NATIONAL BY DMSFYWCG

NATIONAL(NATIONALITY)   DMSFYWCG(DRIVERS MUST STOP FOR YOU WHEN CROSSING)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |YES       |DO NOT K|NO       |
          |          |NOW     |         | TOTAL
----------+----------+--------+---------+
SAUDI     |      53 |      1 |     45 |    99
          |   25.48 |   0.48 |  21.63 | 47.60
          |   53.54 |   1.01 |  45.45 |
          |   43.44 |  16.67 |  56.25 |
----------+----------+--------+---------+
NON SAUDI |      69 |      5 |     35 |   109
          |   33.17 |   2.40 |  16.83 | 52.40
          |   63.30 |   4.59 |  32.11 |
          |   56.56 |  83.33 |  43.75 |
----------+----------+--------+---------+
TOTAL           122        6       80      208
              58.65     2.88    38.46   100.00
```

FREQUENCY MISSING = 65
1SAS

STATISTICS FOR TABLE OF NATIONAL BY DMSFYWCG

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	5.547	0.062
LIKELIHOOD RATIO CHI-SQUARE	2	5.788	0.055
MANTEL-HAENSZEL CHI-SQUARE	1	2.964	0.085
PHI		0.163	
CONTINGENCY COEFFICIENT		0.161	
CRAMER'S V		0.163	

NATIONAL(NATIONALITY)
          MOFGM(MEANING OF FALSHING GREEN MAN)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |WRONG AN|WRIGHT A|
          |SWER    |NSWER   |  TOTAL
----------+--------+--------+
SAUDI     |    13  |    86  |    99
          |  6.25  | 41.35  |  47.60
          | 13.13  | 86.87  |
          | 37.14  | 49.71  |
----------+--------+--------+
NON SAUDI |    22  |    87  |   109
          | 10.58  | 41.83  |  52.40
          | 20.18  | 79.82  |
          | 62.86  | 50.29  |
----------+--------+--------+
TOTAL          35       173     208
            16.83     83.17  100.00
```

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	1.844	0.175
LIKELIHOOD RATIO CHI-SQUARE	1	1.865	0.172
CONTINUITY ADJ. CHI-SQUARE	1	1.374	0.241
MANTEL-HAENSZEL CHI-SQUARE	1	1.835	0.176
FISHER'S EXACT TEST (1-TAIL)			0.120
(2-TAIL)			0.197
PHI		-0.094	
CONTINGENCY COEFFICIENT		0.094	
CRAMER'S V		-0.094	

TABLE OF NATIONAL BY HYEPSP

NATIONAL(NATIONALITY)
          HYEPSP(HAVE YOU EXPERIENCED PEDESTRIAN SAFETY P)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |YES      INO       |  TOTAL
----------+--------+--------+
SAUDI     |    25 |    74 |    99
          | 12.02 | 35.58 | 47.60
          | 25.25 | 74.75 |
          | 58.14 | 44.85 |
----------+--------+--------+
NON SAUDI |    18 |    91 |   109
          |  8.65 | 43.75 | 52.40
          | 16.51 | 83.49 |
          | 41.86 | 55.15 |
----------+--------+--------+
TOTAL         43      165      208
            20.67   79.33   100.00
```

STATISTICS FOR TABLE OF NATIONAL BY HYEPSP

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	2.416	0.120
LIKELIHOOD RATIO CHI-SQUARE	1	2.418	0.120
CONTINUITY ADJ. CHI-SQUARE	1	1.912	0.167
MANTEL-HAENSZEL CHI-SQUARE	1	2.404	0.121
FISHER'S EXACT TEST (1-TAIL)			0.083
(2-TAIL)			0.127
PHI		0.108	
CONTINGENCY COEFFICIENT		0.107	
CRAMER'S V		0.108	

EDUCATON(DEGREE OF EDUCATION)
MOFGM(MEANING OF FALSHING GREEN MAN)

FREQUENCY PERCENT ROW PCT COL PCT	WRONG AN SWER	WRIGHT A NSWER	TOTAL
NO EDUCATION	8 3.81 22.86 22.86	27 12.86 77.14 15.43	35 16.67
BELOW HIGH SCHOO	13 6.19 15.66 37.14	70 33.33 84.34 40.00	83 39.52
HIGH SCHOOL	7 3.33 18.92 20.00	30 14.29 81.08 17.14	37 17.62
UNIVERSITY	7 3.33 12.73 20.00	48 22.86 87.27 27.43	55 26.19
TOTAL	35 16.67	175 83.33	210 100.00

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF EDUCATON BY MOFGM

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	3	1.776	0.620
LIKELIHOOD RATIO CHI-SQUARE	3	1.736	0.629
MANTEL-HAENSZEL CHI-SQUARE	1	0.991	0.320
PHI		0.092	
CONTINGENCY COEFFICIENT		0.092	
CRAMER'S V		0.092	

TABLE OF CITY BY DIICATP

CITY(CITY)   DIICATP(DRIVERS HAVE CARELESS ATTITUDE TOWARD PE)

```
FREQUENCY|
  PERCENT |
  ROW PCT |
  COL PCT |YES      |DO NOT K|NO       |
          |         |NOW     |         |  TOTAL
----------+---------+--------+---------+
DAMMAM    |    71 |      1 |     59 |    131
          |  33.97 |  0.48 |  28.23 |  62.68
          |  54.20 |  0.76 |  45.04 |
          |  68.93 |  50.00 |  56.73 |
----------+---------+--------+---------+
QATIF     |    32 |      1 |     45 |     78
          |  15.31 |  0.48 |  21.53 |  37.32
          |  41.03 |  1.28 |  57.69 |
          |  31.07 |  50.00 |  43.27 |
----------+---------+--------+---------+
TOTAL         103         2       104       209
            49.28      0.96     49.76    100.00
```

STATISTICS FOR TABLE OF CITY BY DIICATP

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	3.432	0.180
LIKELIHOOD RATIO CHI-SQUARE	2	3.444	0.179
MANTEL-HAENSZEL CHI-SQUARE	1	3.277	0.070
PHI		0.128	
CONTINGENCY COEFFICIENT		0.127	
CRAMER'S V		0.128	

TABLE OF CITY BY YTRFYSWC

CITY(CITY)   YTRFYSWC(YOU ARE TOTALLY RESPONSIBLE FOR YOUR OWN)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |YES     |DO NOT K|NO      |
         |        |NOW     |        |        | TOTAL
---------+--------+--------+--------+--------+
DAMMAM   |   103  |    1   |   27   |   131
         |  49.28 |  0.48  | 12.92  | 62.68
         |  78.63 |  0.76  | 20.61  |
         |  59.54 | 50.00  | 79.41  |
---------+--------+--------+--------+
QATIF    |    70  |    1   |    7   |    78
         |  33.49 |  0.48  |  3.35  | 37.32
         |  89.74 |  1.28  |  8.97  |
         |  40.46 | 50.00  | 20.59  |
---------+--------+--------+--------+
TOTAL        173       2       34      209
            82.78    0.96    16.27   100.00
```

FREQUENCY MISSING = 64

1SAS

STATISTICS FOR TABLE OF CITY BY YTRFYSWC

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	4.937	0.085
LIKELIHOOD RATIO CHI-SQUARE	2	5.305	0.070
MANTEL-HAENSZEL CHI-SQUARE	1	4.596	0.032
PHI		0.154	
CONTINGENCY COEFFICIENT		0.152	
CRAMER'S V		0.154	

TABLE OF CITY BY YTDSFYWC

CITY(CITY)   YTDSFYWC(YOU TRUST DEIVERS TO STOP FOR YOU WHEN C)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |YES     |DO NOT K|NO      |
         |        |NOW     |        |  TOTAL
---------+--------+--------+--------+
DAMMAM   |    29 |     4 |    98 |    131
         | 13.81 |  1.90 | 46.67 |  62.38
         | 22.14 |  3.05 | 74.81 |
         | 56.86 | 66.67 | 64.05 |
---------+--------+--------+--------+
QATIF    |    22 |     2 |    55 |     79
         | 10.48 |  0.95 | 26.19 |  37.62
         | 27.85 |  2.53 | 69.62 |
         | 43.14 | 33.33 | 35.95 |
---------+--------+--------+--------+
TOTAL         51       6     153     210
            24.29    2.86   72.86  100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF CITY BY YTDSFYWC

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	0.891	0.641
LIKELIHOOD RATIO CHI-SQUARE	2	0.882	0.644
MANTEL-HAENSZEL CHI-SQUARE	1	0.792	0.373
PHI		0.065	
CONTINGENCY COEFFICIENT		0.065	
CRAMER'S V		0.065	

TABLE OF CITY BY DMSFYWCG

CITY(CITY)   DMSFYWCG(DRIVERS MUST STOP FOR YOU WHEN CROSSING)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |YES      |DO NOT K|NO      |
         |         |NOW     |        |        | TOTAL
---------+---------+--------+--------+
DAMMAM   |    84 | |      4 |     43 |    131
         | 40.00 | |   1.90 |  20.48 |  62.38
         | 64.12 | |   3.05 |  32.82 |
         | 67.74 | |  66.67 |  53.75 |
---------+---------+--------+--------+
QATIF    |    40 | |      2 |     37 |     79
         | 19.05 | |   0.95 |  17.62 |  37.62
         | 50.63 | |   2.53 |  46.84 |
         | 32.26 | |  33.33 |  46.25 |
---------+---------+--------+--------+
TOTAL         124         6        80       210
              59.05     2.86     38.10    100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF CITY BY DMSFYWCG

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	4.105	0.128
LIKELIHOOD RATIO CHI-SQUARE	2	4.077	0.130
MANTEL-HAENSZEL CHI-SQUARE	1	3.999	0.046
PHI		0.140	
CONTINGENCY COEFFICIENT		0.138	
CRAMER'S V		0.140	

TABLE OF CITY BY MOGM

CITY(CITY)   MOGM(MEANING OF GREEN MAN)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |WRONG AN|WRIGHT A|
         |SWER    |NSWER   |  TOTAL
---------+--------+--------+
DAMMAM   |     5  |   126  |   131
         |  2.38  |  60.00 |  62.38
         |  3.82  |  96.18 |
         |100.00  |  61.46 |
---------+--------+--------+
QATIF    |     0  |    79  |    79
         |  0.00  |  37.62 |  37.62
         |  0.00  | 100.00 |
         |  0.00  |  38.54 |
---------+--------+--------+
TOTAL          5      205      210
            2.38    97.62   100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF CITY BY MOGM

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	3.089	0.079
LIKELIHOOD RATIO CHI-SQUARE	1	4.792	0.029
CONTINUITY ADJ. CHI-SQUARE	1	1.665	0.197
MANTEL-HAENSZEL CHI-SQUARE	1	3.074	0.080
FISHER'S EXACT TEST (1-TAIL)			0.092
(2-TAIL)			0.159
PHI		0.121	
CONTINGENCY COEFFICIENT		0.120	
CRAMER'S V		0.121	

TABLE OF CITY BY MOFGM

CITY(CITY)   MOFGM(MEANING OF FALSHING GREEN MAN)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |WRONG AN|WRIGHT A|
         |SWER    |NSWER   |  TOTAL
---------+--------+--------+
DAMMAM   |     26 |    105 |    131
         |  12.38 |  50.00 |  62.38
         |  19.85 |  80.15 |
         |  74.29 |  60.00 |
---------+--------+--------+
QATIF    |      9 |     70 |     79
         |   4.29 |  33.33 |  37.62
         |  11.39 |  88.61 |
         |  25.71 |  40.00 |
---------+--------+--------+
TOTAL          35      175      210
               16.67    83.33   100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF CITY BY MOFGM

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	2.536	0.111
LIKELIHOOD RATIO CHI-SQUARE	1	2.653	0.103
CONTINUITY ADJ. CHI-SQUARE	1	1.964	0.161
MANTEL-HAENSZEL CHI-SQUARE	1	2.524	0.112
FISHER'S EXACT TEST (1-TAIL)			0.079
(2-TAIL)			0.129
PHI		0.110	
CONTINGENCY COEFFICIENT		0.109	
CRAMER'S V		0.110	

TABLE OF DYDMV BY HYEPSP

DYDMV(DO YOU DRIVE A MOTOR VEHICLE)
    HYEPSP(HAVE YOU EXPERIENCED PEDESTRIAN SAFETY P)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |YES      |NO       |  TOTAL
---------+---------+---------+
YES      |    30 I     109 |    139
         |  14.29 |   51.90 |  66.19
         |  21.58 |   78.42 |
         |  69.77 |   65.27 |
---------+---------+---------+
NO       |    13 I      58 |     71
         |   6.19 |   27.62 |  33.81
         |  18.31 |   81.69 |
         |  30.23 |   34.73 |
---------+---------+---------+
TOTAL         43       167      210
            20.48     79.52   100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF DYDMV BY HYEPSP

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	0.309	0.578
LIKELIHOOD RATIO CHI-SQUARE	1	0.313	0.576
CONTINUITY ADJ. CHI-SQUARE	1	0.141	0.707
MANTEL-HAENSZEL CHI-SQUARE	1	0.308	0.579
FISHER'S EXACT TEST (1-TAIL)			0.358
(2-TAIL)			0.718
PHI		0.038	
CONTINGENCY COEFFICIENT		0.038	
CRAMER'S V		0.038	

TABLE OF AGE BY MOGM

AGE(AGE)   MOGM(MEANING OF GREEN MAN)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |WRONG AN|WRIGHT A|
         |SWER    |NSWER   |  TOTAL
---------+--------+--------+
UNDER 18 |    0   |    16  |    16
         | 0.00   |  7.62  |   7.62
         | 0.00   |100.00  |
         | 0.00   |  7.80  |
---------+--------+--------+
18-25    |    0   |    59  |    59
         | 0.00   | 28.10  |  28.10
         | 0.00   |100.00  |
         | 0.00   | 28.78  |
---------+--------+--------+
26-35    |    1   |    76  |    77
         | 0.48   | 36.19  |  36.67
         | 1.30   | 98.70  |
         |20.00   | 37.07  |
---------+--------+--------+
36-45    |    4   |    36  |    40
         | 1.90   | 17.14  |  19.05
         |10.00   | 90.00  |
         |80.00   | 17.56  |
---------+--------+--------+
OVER 46  |    0   |    18  |    18
         | 0.00   |  8.57  |   8.57
         | 0.00   |100.00  |
         | 0.00   |  8.78  |
---------+--------+--------+
TOTAL         5       205      210
            2.38     97.62   100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF AGE BY MOGM

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	4	12.647	0.013
LIKELIHOOD RATIO CHI-SQUARE	4	10.575	0.032
MANTEL-HAENSZEL CHI-SQUARE	1	3.475	0.062
PHI		0.245	
CONTINGENCY COEFFICIENT		0.238	
CRAMER'S V		0.245	

TABLE OF DYDMV BY TOPSPNMS

DYDMV(DO YOU DRIVE A MOTOR VEHICLE)
          TOPSPNMS(TYPE OF PEDESTRIAN SAFETY PROBLEM NEAR M)

```
FREQUENCY|
  PERCENT |
  ROW PCT |
  COL PCT |NON      |ACCIDENT|ACCIDENT|
          |         | AS A DR| AS A PE|  TOTAL
----------+---------+--------+--------+
YES       |    123  |     7  |     9  |   139
          |  58.57  |  3.33  |  4.29  |  66.19
          |  88.49  |  5.04  |  6.47  |
          |  66.49  | 100.00 | 50.00  |
----------+---------+--------+--------+
NO        |     62  |     0  |     9  |    71
          |  29.52  |  0.00  |  4.29  |  33.81
          |  87.32  |  0.00  | 12.68  |
          |  33.51  |  0.00  | 50.00  |
----------+---------+--------+--------+
TOTAL          185        7       18      210
            88.10     3.33     8.57   100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF DYDMV BY TOPSPNMS

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	5.691	0.058
LIKELIHOOD RATIO CHI-SQUARE	2	7.778	0.020
MANTEL-HAENSZEL CHI-SQUARE	1	0.759	0.384
PHI		0.165	
CONTINGENCY COEFFICIENT		0.162	
CRAMER'S V		0.165	

TABLE OF CITY BY DYDMV

CITY(CITY)   DYDMV(DO YOU DRIVE A MOTOR VEHICLE)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |YES     |NO      |  TOTAL
---------+--------+--------+
DAMMAM   |     84 |     47 |    131
         |  40.00 |  22.38 |  62.38
         |  64.12 |  35.88 |
         |  60.43 |  66.20 |
---------+--------+--------+
QATIF    |     55 |     24 |     79
         |  26.19 |  11.43 |  37.62
         |  69.62 |  30.38 |
         |  39.57 |  33.80 |
---------+--------+--------+
TOTAL          139       71     210
             66.19    33.81  100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF CITY BY DYDMV

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	0.666	0.415
LIKELIHOOD RATIO CHI-SQUARE	1	0.671	0.413
CONTINUITY ADJ. CHI-SQUARE	1	0.443	0.506
MANTEL-HAENSZEL CHI-SQUARE	1	0.663	0.416
FISHER'S EXACT TEST (1-TAIL)			0.254
(2-TAIL)			0.454
PHI		-0.056	
CONTINGENCY COEFFICIENT		0.056	
CRAMER'S V		-0.056	

TABLE OF CITY BY AGE

CITY(CITY)   AGE(AGE)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |UNDER 18|18-25   |26-35   |36-45   |OVER 46 |  TOTAL
---------+--------+--------+--------+--------+--------+
DAMMAM   |     9 |     33 |     48 |     29 |     12 |    131
         |  4.29 |  15.71 |  22.86 |  13.81 |   5.71 |  62.38
         |  6.87 |  25.19 |  36.64 |  22.14 |   9.16 |
         | 56.25 |  55.93 |  62.34 |  72.50 |  66.67 |
---------+--------+--------+--------+--------+--------+
QATIF    |     7 |     26 |     29 |     11 |      6 |     79
         |  3.33 |  12.38 |  13.81 |   5.24 |   2.86 |  37.62
         |  8.86 |  32.91 |  36.71 |  13.92 |   7.59 |
         | 43.75 |  44.07 |  37.66 |  27.50 |  33.33 |
---------+--------+--------+--------+--------+--------+
TOTAL         16      59      77      40      18     210
            7.62   28.10   36.67   19.05    8.57  100.00
```

FREQUENCY MISSING = 63
1SAS

STATISTICS FOR TABLE OF CITY BY AGE

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	4	3.188	0.527
LIKELIHOOD RATIO CHI-SQUARE	4	3.246	0.518
MANTEL-HAENSZEL CHI-SQUARE	1	2.338	0.126
PHI		0.123	
CONTINGENCY COEFFICIENT		0.122	
CRAMER'S V		0.123	

TABLE OF CITY BY NATIONAL

CITY(CITY)   NATIONAL(NATIONALITY)

```
FREQUENCY|
 PERCENT |
 ROW PCT |
 COL PCT |SAUDI    |NON SAUD|
         |         |1       |  TOTAL
---------+---------+--------+
DAMMAM   |    48 I |    81 I |  129
         | 23.08 I | 38.94 I | 62.02
         | 37.21 I | 62.79 I |
         | 48.48 I | 74.31 I |
---------+---------+--------+
QATIF    |    51 I |    28 I |   79
         | 24.52 I | 13.46 I | 37.98
         | 64.56 I | 35.44 I |
         | 51.52 I | 25.69 I |
---------+---------+--------+
TOTAL         99        109      208
            47.60      52.40   100.00
```

FREQUENCY MISSING = 65
1SAS

STATISTICS FOR TABLE OF CITY BY NATIONAL

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	14.691	0.000
LIKELIHOOD RATIO CHI-SQUARE	1	14.850	0.000
CONTINUITY ADJ. CHI-SQUARE	1	13.615	0.000
MANTEL-HAENSZEL CHI-SQUARE	1	14.621	0.000
FISHER'S EXACT TEST (1-TAIL)			0.000
(2-TAIL)			0.000
PHI		-0.266	
CONTINGENCY COEFFICIENT		0.257	
CRAMER'S V		-0.266	

APPENDIX D

Computer results for education controled groupes

TABLE OF NATIONAL BY PEDCROSS

NATIONAL(NATIONALITY)
PEDCROSS(PEDESTRIAN CROSSED ON)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |PERMITTE|PROHIBIT|
          |D PHASE |ED PHASE|  TOTAL
----------+--------+--------+
SAUDI     |    11  |     3  |    14
          |  31.43 |   8.57 |  40.00
          |  78.57 |  21.43 |
          |  55.00 |  20.00 |
----------+--------+--------+
NON SAUDI |     9  |    12  |    21
          |  25.71 |  34.29 |  60.00
          |  42.86 |  57.14 |
          |  45.00 |  80.00 |
----------+--------+--------+
TOTAL          20       15       35
               57.14    42.86   100.00
```

FREQUENCY MISSING = 14
1SAS

STATISTICS FOR TABLE OF NATIONAL BY PEDCROSS

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	4.375	0.036
LIKELIHOOD RATIO CHI-SQUARE	1	4.573	0.032
CONTINUITY ADJ. CHI-SQUARE	1	3.038	0.081
MANTEL-HAENSZEL CHI-SQUARE	1	4.250	0.039
FISHER'S EXACT TEST (1-TAIL)			0.039
(2-TAIL)			0.046
PHI		0.354	
CONTINGENCY COEFFICIENT		0.333	
CRAMER'S V		0.354	

TABLE OF NATIONAL BY PEDVIOLA

NATIONAL(NATIONALITY)
                PEDVIOLA(PEDESTRIAN VIOLATION)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |BETWEEN ||NFRONT |
          |CARS    |OF QUEUE|  TOTAL
----------+--------+--------+
SAUDI     |    0 |     15 |     15
          |  0.00 |  31.25 |  31.25
          |  0.00 | 100.00 |
          |  0.00 |  37.50 |
----------+--------+--------+
NON SAUDI |    8 |     25 |     33
          | 16.67 |  52.08 |  68.75
          | 24.24 |  75.76 |
          |100.00 |  62.50 |
----------+--------+--------+
TOTAL          8       40      48
              16.67   83.33   100.00
```

FREQUENCY MISSING = 1
1SAS

STATISTICS FOR TABLE OF NATIONAL BY PEDVIOLA

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	4.364	0.037
LIKELIHOOD RATIO CHI-SQUARE	1	6.699	0.010
CONTINUITY ADJ. CHI-SQUARE	1	2.793	0.095
MANTEL-HAENSZEL CHI-SQUARE	1	4.273	0.039
FISHER'S EXACT TEST (1-TAIL)			0.037
(2-TAIL)			0.044
PHI		-0.302	
CONTINGENCY COEFFICIENT		0.289	
CRAMER'S V		-0.302	

TABLE OF NATIONAL BY YTRFYSWC

NATIONAL(NATIONALITY)
            YTRFYSWC(YOU ARE TOTALLY RESPONSIBLE FOR YOUR OWN)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |YES     |NO      |
          |        |        | TOTAL
----------+--------+--------+
SAUDI     |     7 |      8 |     15
          | 14.58 |  16.67 |  31.25
          | 46.67 |  53.33 |
          | 22.58 |  47.06 |
----------+--------+--------+
NON SAUDI |    24 |      9 |     33
          | 50.00 |  18.75 |  68.75
          | 72.73 |  27.27 |
          | 77.42 |  52.94 |
----------+--------+--------+
TOTAL          31       17       48
             64.58    35.42   100.00
```

FREQUENCY MISSING = 1
1SAS

STATISTICS FOR TABLE OF NATIONAL BY YTRFYSWC

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	3.062	0.080
LIKELIHOOD RATIO CHI-SQUARE	1	2.998	0.083
CONTINUITY ADJ. CHI-SQUARE	1	2.029	0.154
MANTEL-HAENSZEL CHI-SQUARE	1	2.998	0.083
FISHER'S EXACT TEST (1-TAIL)			0.078
(2-TAIL)			0.108
PHI		-0.253	
CONTINGENCY COEFFICIENT		0.245	
CRAMER'S V		-0.253	

TABLE OF NATIONAL BY PEDVIOLA

NATIONAL(NATIONALITY)
PEDVIOLA(PEDESTRIAN VIOLATION)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |BETWEEN |INFRONT |
          |CARS    |OF QUEUE|  TOTAL
----------+--------+--------+
SAUDI     |    14  |    12  |    26
          | 15.05  | 12.90  | 27.96
          | 53.85  | 46.15  |
          | 45.16  | 19.35  |
----------+--------+--------+
NON SAUDI |    17  |    50  |    67
          | 18.28  | 53.76  | 72.04
          | 25.37  | 74.63  |
          | 54.84  | 80.65  |
----------+--------+--------+
TOTAL          31       62       93
               33.33    66.67   100.00
```

FREQUENCY MISSING = 5
1SAS

STATISTICS FOR TABLE OF NATIONAL BY PEDVIOLA

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	6.834	0.009
LIKELIHOOD RATIO CHI-SQUARE	1	6.605	0.010
CONTINUITY ADJ. CHI-SQUARE	1	5.612	0.018
MANTEL-HAENSZEL CHI-SQUARE	1	6.760	0.009
FISHER'S EXACT TEST (1-TAIL)			0.010
(2-TAIL)			0.014
PHI		0.271	
CONTINGENCY COEFFICIENT		0.262	
CRAMER'S V		0.271	

TABLE OF NATIONAL BY PEDCROSS

NATIONAL(NATIONALITY)
PEDCROSS(PEDESTRIAN CROSSED ON)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |PERMITTE|PROHIBIT|
          |D PHASE |ED PHASE|  TOTAL
----------+--------+--------+
SAUDI     |     1  |     9  |    10
          |  1.85  | 16.67  | 18.52
          | 10.00  | 90.00  |
          |  4.35  | 29.03  |
----------+--------+--------+
NON SAUDI |    22  |    22  |    44
          | 40.74  | 40.74  | 81.48
          | 50.00  | 50.00  |
          | 95.65  | 70.97  |
----------+--------+--------+
TOTAL          23       31       54
             42.59    57.41   100.00
```

FREQUENCY MISSING = 44
1SAS

STATISTICS FOR TABLE OF NATIONAL BY PEDCROSS

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	5.332	0.021
LIKELIHOOD RATIO CHI-SQUARE	1	6.172	0.013
CONTINUITY ADJ. CHI-SQUARE	1	3.821	0.051
MANTEL-HAENSZEL CHI-SQUARE	1	5.233	0.022
FISHER'S EXACT TEST (1-TAIL)			0.021

TABLE OF NATIONAL BY YTDSFYWC

NATIONAL(NATIONALITY)   YTDSFYWC(YOU TRUST DEIVERS TO STOP FOR YOU WHEN C)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |YES      |DO NOT K|NO       |
          |         |NOW      |         | TOTAL
----------+---------+--------+---------+
SAUDI     |     3 |     0 |    23 |    26
          |  3.16 |  0.00 | 24.21 | 27.37
          | 11.54 |  0.00 | 88.46 |
          | 13.04 |  0.00 | 33.33 |
----------+---------+--------+---------+
NON SAUDI |    20 |     3 |    46 |    69
          | 21.05 |  3.16 | 48.42 | 72.63
          | 28.99 |  4.35 | 66.67 |
          | 86.96 |100.00 | 66.67 |
----------+---------+--------+---------+
TOTAL          23       3      69      95
            24.21    3.16   72.63  100.00
```

FREQUENCY MISSING = 3
1SAS

STATISTICS FOR TABLE OF NATIONAL BY YTDSFYWC

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	4.740	0.093
LIKELIHOOD RATIO CHI-SQUARE	2	5.858	0.053
MANTEL-HAENSZEL CHI-SQUARE	1	3.920	0.048
PHI		0.223	
CONTINGENCY COEFFICIENT		0.218	
CRAMER'S V		0.223	

TABLE OF NATIONAL BY TOPSPNMS

NATIONAL(NATIONALITY)   TOPSPNMS(TYPE OF PEDESTRIAN SAFETY PROBLEM NEAR M)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |NON     |ACCIDENT|ACCIDENT|
          |        | AS A DR| AS A PE|  TOTAL
----------+--------+--------+--------+
SAUDI     |    19 |     4 |      3 |    26
          | 20.00 |  4.21 |   3.16 | 27.37
          | 73.08 | 15.38 |  11.54 |
          | 24.36 | 66.67 |  27.27 |
----------+--------+--------+--------+
NON SAUDI |    59 |     2 |      8 |    69
          | 62.11 |  2.11 |   8.42 | 72.63
          | 85.51 |  2.90 |  11.59 |
          | 75.64 | 33.33 |  72.73 |
----------+--------+--------+--------+
TOTAL          78        6       11       95
            82.11     6.32    11.58   100.00
```

FREQUENCY MISSING = 3
1SAS

STATISTICS FOR TABLE OF NATIONAL BY TOPSPNMS

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	5.017	0.081
LIKELIHOOD RATIO CHI-SQUARE	2	4.371	0.112
MANTEL-HAENSZEL CHI-SQUARE	1	0.651	0.420
PHI		0.230	
CONTINGENCY COEFFICIENT		0.224	
CRAMER'S V		0.230	

APPENDIX E

The computer results for age controled groupes

TABLE OF NATIONAL BY DMSFYWCG

NATIONAL(NATIONALITY)   DMSFYWCG(DRIVERS MUST STOP FOR YOU WHEN CROSSING)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |YES      |DO NOT K|NO      |
          |         |NOW     |        |  TOTAL
----------+---------+--------+--------+
SAUDI     |      7  |     1  |    11  |     19
          |  10.29  |  1.47  |  16.18 |  27.94
          |  36.84  |  5.26  |  57.89 |
          |  17.95  | 100.00 |  39.29 |
----------+---------+--------+--------+
NON SAUDI |     32  |     0  |    17  |     49
          |  47.06  |  0.00  |  25.00 |  72.06
          |  65.31  |  0.00  |  34.69 |
          |  82.05  |  0.00  |  60.71 |
----------+---------+--------+--------+
TOTAL            39        1       28       68
              57.35     1.47    41.18   100.00
```

FREQUENCY MISSING = 1
1SAS

STATISTICS FOR TABLE OF NATIONAL BY DMSFYWCG

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	6.303	0.043
LIKELIHOOD RATIO CHI-SQUARE	2	6.338	0.042
MANTEL-HAENSZEL CHI-SQUARE	1	3.754	0.053
PHI		0.304	
CONTINGENCY COEFFICIENT		0.291	
CRAMER'S V		0.304	

TABLE OF NATIONAL BY YTDSFYWC

NATIONAL(NATIONALITY)   YTDSFYWC(YOU TRUST DEIVERS TO STOP FOR YOU WHEN C)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |YES      |DO NOT K|NO       |
          |         |NOW      |         | TOTAL
----------+---------+---------+---------+
SAUDI     |     1 |     1 |     17 |    19
          |  1.47 |  1.47 |  25.00 | 27.94
          |  5.26 |  5.26 |  89.47 |
          |  6.67 |100.00 |  32.69 |
----------+---------+---------+---------+
NON SAUDI |    14 |     0 |     35 |    49
          | 20.59 |  0.00 |  51.47 | 72.06
          | 28.57 |  0.00 |  71.43 |
          | 93.33 |  0.00 |  67.31 |
----------+---------+---------+---------+
TOTAL          15       1       52       68
            22.06    1.47   76.47   100.00
```

FREQUENCY MISSING = 1
1SAS

STATISTICS FOR TABLE OF NATIONAL BY YTDSFYWC

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	6.534	0.038
LIKELIHOOD RATIO CHI-SQUARE	2	7.492	0.024
MANTEL-HAENSZEL CHI-SQUARE	1	3.347	0.067
PHI		0.310	
CONTINGENCY COEFFICIENT		0.296	
CRAMER'S V		0.310	

TABLE OF NATIONAL BY MOGM

NATIONAL(NATIONALITY)
        MOGM(MEANING OF GREEN MAN)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT  |WRONG AN|WRIGHT A|
           |SWER    |NSWER   |  TOTAL
 ----------+--------+--------+
SAUDI      |      4 |     15 |     19
           |   5.88 |  22.06 |  27.94
           |  21.05 |  78.95 |
           |  66.67 |  24.19 |
 ----------+--------+--------+
NON SAUDI  |      2 |     47 |     49
           |   2.94 |  69.12 |  72.06
           |   4.08 |  95.92 |
           |  33.33 |  75.81 |
 ----------+--------+--------+
TOTAL             6       62        68
                8.82    91.18    100.00
```

FREQUENCY MISSING = 1
1SAS

STATISTICS FOR TABLE OF NATIONAL BY MOGM

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	4.902	0.027
LIKELIHOOD RATIO CHI-SQUARE	1	4.319	0.038
CONTINUITY ADJ. CHI-SQUARE	1	3.019	0.082
MANTEL-HAENSZEL CHI-SQUARE	1	4.829	0.028
FISHER'S EXACT TEST (1-TAIL)			0.047
(2-TAIL)			0.047
PHI		0.268	
CONTINGENCY COEFFICIENT		0.259	
CRAMER'S V		0.268	

TABLE OF NATIONAL BY MORM

NATIONAL(NATIONALITY)
               MORM(MEANING OF RED MAN)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |WRONG AN|WRIGHT A|
          |SWER    |NSWER   |  TOTAL
----------+--------+--------+
SAUDI     |     3  |    16  |    19
          |  4.41  | 23.53  | 27.94
          | 15.79  | 84.21  |
          | 60.00  | 25.40  |
----------+--------+--------+
NON SAUDI |     2  |    47  |    49
          |  2.94  | 69.12  | 72.06
          |  4.08  | 95.92  |
          | 40.00  | 74.60  |
----------+--------+--------+
TOTAL           5       63       68
              7.35    92.65   100.00
```

FREQUENCY MISSING = 1
1SAS

STATISTICS FOR TABLE OF NATIONAL BY MORM

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	2.755	0.097
LIKELIHOOD RATIO CHI-SQUARE	1	2.438	0.118
CONTINUITY ADJ. CHI-SQUARE	1	1.304	0.253
MANTEL-HAENSZEL CHI-SQUARE	1	2.714	0.099
FISHER'S EXACT TEST (1-TAIL)			0.129
(2-TAIL)			0.129
PHI		0.201	
CONTINGENCY COEFFICIENT		0.197	
CRAMER'S V		0.201	

TABLE OF NATIONAL BY HYEPSP

NATIONAL(NATIONALITY)
HYEPSP(HAVE YOU EXPERIENCED PEDESTRIAN SAFETY P)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |YES      |NO       | TOTAL
----------+---------+---------+
SAUDI     |    7 |      12 |    19
          | 10.29 | 17.65 | 27.94
          | 36.84 | 63.16 |
          | 43.75 | 23.08 |
----------+---------+---------+
NON SAUDI |    9 |      40 |    49
          | 13.24 | 58.82 | 72.06
          | 18.37 | 81.63 |
          | 56.25 | 76.92 |
----------+---------+---------+
TOTAL         16       52       68
              23.53    76.47   100.00
```

STATISTICS FOR TABLE OF NATIONAL BY HYEPSP

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	2.597	0.107
LIKELIHOOD RATIO CHI-SQUARE	1	2.455	0.117
CONTINUITY ADJ. CHI-SQUARE	1	1.672	0.196
MANTEL-HAENSZEL CHI-SQUARE	1	2.559	0.110
FISHER'S EXACT TEST (1-TAIL)			0.100
(2-TAIL)			0.123
PHI		0.195	
CONTINGENCY COEFFICIENT		0.192	
CRAMER'S V		0.195	

TABLE OF NATIONAL BY TOPSPNMS

NATIONAL(NATIONALITY)   TOPSPNMS(TYPE OF PEDESTRIAN SAFETY PROBLEM NEAR M)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |NON       |ACCIDENT|ACCIDENT|
          |          | AS A DR| AS A PE|  TOTAL
----------+--------+--------+--------+
SAUDI     |    13  |     3  |     3  |    19
          | 19.12  |  4.41  |  4.41  | 27.94
          | 68.42  | 15.79  | 15.79  |
          | 22.81  | 75.00  | 42.86  |
----------+--------+--------+--------+
NON SAUDI |    44  |     1  |     4  |    49
          | 64.71  |  1.47  |  5.88  | 72.06
          | 89.80  |  2.04  |  8.16  |
          | 77.19  | 25.00  | 57.14  |
----------+--------+--------+--------+
TOTAL          57        4        7        68
            83.82     5.88    10.29   100.00
```

STATISTICS FOR TABLE OF NATIONAL BY TOPSPNMS

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	5.919	0.052
LIKELIHOOD RATIO CHI-SQUARE	2	5.296	0.071
MANTEL-HAENSZEL CHI-SQUARE	1	2.833	0.092
PHI		0.295	
CONTINGENCY COEFFICIENT		0.283	
CRAMER'S V		0.295	

TABLE OF NATIONAL BY PEDVIOLA

NATIONAL(NATIONALITY)
          PEDVIOLA(PEDESTRIAN VIOLATION)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |BETWEEN |INFRONT |
          |CARS    |OF QUEUE|  TOTAL
----------+--------+--------+
SAUDI     |    18  |    20  |    38
          | 14.75  | 16.39  | 31.15
          | 47.37  | 52.63  |
          | 41.86  | 25.32  |
----------+--------+--------+
NON SAUDI |    25  |    59  |    84
          | 20.49  | 48.36  | 68.85
          | 29.76  | 70.24  |
          | 58.14  | 74.68  |
----------+--------+--------+
TOTAL          43       79      122
            35.25    64.75   100.00
```

FREQUENCY MISSING = 3
1SAS

STATISTICS FOR TABLE OF NATIONAL BY PEDVIOLA

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	3.554	0.059
LIKELIHOOD RATIO CHI-SQUARE	1	3.487	0.062
CONTINUITY ADJ. CHI-SQUARE	1	2.824	0.093
MANTEL-HAENSZEL CHI-SQUARE	1	3.525	0.060
FISHER'S EXACT TEST (1-TAIL)			0.047
(2-TAIL)			0.068
PHI		0.171	
CONTINGENCY COEFFICIENT		0.168	
CRAMER'S V		0.171	

NATIONAL(NATIONALITY)   YTRFYSWC(YOU ARE TOTALLY RESPONSIBLE FOR YOUR OWN)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |YES      |DO NOT K|NO      |
          |         |NOW      |        |  TOTAL
----------+---------+---------+--------+
SAUDI     |    33 |      1 |     4 |     38
          | 26.83 |  0.81 |  3.25 |  30.89
          | 86.84 |  2.63 | 10.53 |
          | 35.48 | 50.00 | 14.29 |
----------+---------+---------+--------+
NON SAUDI |    60 |      1 |    24 |     85
          | 48.78 |  0.81 | 19.51 |  69.11
          | 70.59 |  1.18 | 28.24 |
          | 64.52 | 50.00 | 85.71 |
----------+---------+---------+--------+
TOTAL          93        2       28      123
            75.61     1.63    22.76   100.00
```

FREQUENCY MISSING = 2
1SAS

STATISTICS FOR TABLE OF NATIONAL BY YTRFYSWC

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	4.877	0.087
LIKELIHOOD RATIO CHI-SQUARE	2	5.378	0.068
MANTEL-HAENSZEL CHI-SQUARE	1	4.265	0.039
PHI		0.199	
CONTINGENCY COEFFICIENT		0.195	
CRAMER'S V		0.199	

TABLE OF NATIONAL BY YTDSFYWC

NATIONAL(NATIONALITY)   YTDSFYWC(YOU TRUST DEIVERS TO STOP FOR YOU WHEN C)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |YES     |DO NOT K|NO      |
          |        |NOW     |        |  TOTAL
----------+--------+--------+--------+
SAUDI     |     3  |     1  |    34  |    38
          |  2.44  |  0.81  | 27.64  |  30.89
          |  7.89  |  2.63  | 89.47  |
          | 10.00  | 20.00  | 38.64  |
----------+--------+--------+--------+
NON SAUDI |    27  |     4  |    54  |    85
          | 21.95  |  3.25  | 43.90  |  69.11
          | 31.76  |  4.71  | 63.53  |
          | 90.00  | 80.00  | 61.36  |
----------+--------+--------+--------+
TOTAL          30       5       88      123
            24.39    4.07   71.54   100.00
```

STATISTICS FOR TABLE OF NATIONAL BY YTDSFYWC

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	8.883	0.012
LIKELIHOOD RATIO CHI-SQUARE	2	10.173	0.006
MANTEL-HAENSZEL CHI-SQUARE	1	8.770	0.003
PHI		0.269	
CONTINGENCY COEFFICIENT		0.260	
CRAMER'S V		0.269	

TABLE OF NATIONAL BY DMSFYWCG

NATIONAL(NATIONALITY)   DMSFYWCG(DRIVERS MUST STOP FOR YOU WHEN CROSSING)

```
FREQUENCY |
  PERCENT |
  ROW PCT |
  COL PCT |YES      |DO NOT K|NO       |
          |         |NOW      |         | TOTAL
----------+---------+---------+---------+
SAUDI     |    20 |      0 |     18 |     38
          |  16.26 |   0.00 |  14.63 |  30.89
          |  52.63 |   0.00 |  47.37 |
          |  26.67 |   0.00 |  41.86 |
----------+---------+---------+---------+
NON SAUDI |    55 |      5 |     25 |     85
          |  44.72 |   4.07 |  20.33 |  69.11
          |  64.71 |   5.88 |  29.41 |
          |  73.33 | 100.00 |  58.14 |
----------+---------+---------+---------+
TOTAL         75        5       43      123
            60.98     4.07    34.96   100.00
```

FREQUENCY MISSING = 2
1SAS

STATISTICS FOR TABLE OF NATIONAL BY DMSFYWCG

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	2	5.285	0.071
LIKELIHOOD RATIO CHI-SQUARE	2	6.637	0.036
MANTEL-HAENSZEL CHI-SQUARE	1	2.634	0.105
PHI		0.207	
CONTINGENCY COEFFICIENT		0.203	
CRAMER'S V		0.207	

TABLE OF NATIONAL BY MORM

NATIONAL(NATIONALITY)
        MORM(MEANING OF RED MAN)

```
FREQUENCY |
 PERCENT  |
 ROW PCT  |
 COL PCT  |WRONG AN|WRIGHT A|
          |SWER    |NSWER   |  TOTAL
----------+--------+--------+
SAUDI     |    0   |    38  |    38
          |  0.00  |  30.89 |  30.89
          |  0.00  | 100.00 |
          |  0.00  |  32.48 |
----------+--------+--------+
NON SAUDI |    6   |    79  |    85
          |  4.88  |  64.23 |  69.11
          |  7.06  |  92.94 |
          | 100.00 |  67.52 |
----------+--------+--------+
TOTAL          6        117     123
             4.88      95.12  100.00
```

FREQUENCY MISSING = 2
1SAS

STATISTICS FOR TABLE OF NATIONAL BY MORM

STATISTIC	DF	VALUE	PROB
CHI-SQUARE	1	2.820	0.093
LIKELIHOOD RATIO CHI-SQUARE	1	4.571	0.033
CONTINUITY ADJ. CHI-SQUARE	1	1.504	0.220
MANTEL-HAENSZEL CHI-SQUARE	1	2.797	0.094
FISHER'S EXACT TEST (1-TAIL)			0.103
(2-TAIL)			0.176
PHI		-0.151	
CONTINGENCY COEFFICIENT		0.150	
CRAMER'S V		-0.151	