1) Describe road accident?

Ans) →Fatal traffic accident is one which involves a person who dies as a result of an injury sustained in the accident (usually within 30 days); it excludes confirmed suicides

→ Serious accident involves a person who is detained in hospital as an in-patient, or who suffers any of the following injuries: fractures, concussion, internal injuries, crushings, severe cuts and lacerations, or severe general shock, that require medical treatment

→Slight accident is one involving a person who is only slightly injured, e.g. a person who sustains a sprain, bruise or cut, which is not judged (by the police) to be severe, or slight shock requiring only roadside attention

→Damage-only accident does not involve people who sustain personal injuries.

2) List the causes of road accident.

Ans)

1. Distracted Driving
2. Drunk Driving
3. Speeding
4. Reckless Driving
5. Rain
6. Running Red Lights
7. Night Driving
8. Design Defects
9. Tailgating
10. Wrong-Way Driving/ Improper Turns
11. Teenage Drivers
12. Drugs
13. Potholes
14. Tire Blowouts
15. Animal Crossings
16. Construction Sites

3) Write the short notes on scientific investigation.

Ans)

- scientific investigation of accidents - branch of forensic science.
- Forensic scientists / Accident Investigators will carefully examine the scene of a crime for physical evidence
- Outcome of such analyses may assist the Court to determine guilt, innocence, fault or liability.

- In road traffic accidents the primary physical evidence lies in the
- site details,
- conditions which prevailed at the time of the accident,
- state of the road,
- marks and debris on the road,
- physical characteristics of the vehicles involved,
- damage sustained by the vehicles,
- injuries sustained by persons involved in the accident,
- police plan,police measurements, police photographs, police video and
- laws of physics which determine the movement of vehicles, cyclists and pedestrians before, during and after an accident.
- Secondary physical evidence comes from the statements of witnesses when they refer to times,distances, speeds and locations. However, the validity and interpretation of such statements are matters for the Court to determine.

4) Write the short notes on accident data collection.

Ans)

<u>Accident data collection</u>

→accident data collection is the first step in the accident study.

→primarily done by the police.

→secondary data

→which are filed by motorists themselves -Motorist accident reports

<u>Accident data collection includes : -</u>

General - Date, time, person involved in accident, classification of accident like fatal, serious, minor

Location -Description and detail of location of accident

Details of vehicle involved -Registration number, description of vehicle, loading detail, vehicular defects

Nature of accident -Details of collision, damages, injury and casualty

Road and traffic condition - Details of road geometry, surface characteristics, type of traffic, traffic density etc.

Primary causes of accident -Details of various possible cases which are the main causes of accident.

Accident cost - Financial losses incurred due to property damage, personal injury and casualty

5) Explain empirical Bayesmethod.
Ans) The empirical Bayes method assumptions are (1) a Poisson distribution for the accidents,

and (2) a Gamma distribution for the distribution of the averages in the population of systems.

With these two assumptions, the number of systems with k accidents must obey the negative binomial distribution. The expected number of accidents, a'k, in the after period on a system that had k accidents in the before period is

$$a'k = (k+1) * N'(k + 1)/N'k$$

6) Write about road safety engineering.

Ans) The road safety engineering (RSE) function has the overarching aim of reducing the risk of collisions on the road network by implementing a range of low-cost improvements.

Road traffic safety refers to the methods and measures used to prevent road users from being killed or seriously injured. Typical road users include: pedestrians, cyclists, motorists, vehicle passengers and passengers of on-road public transport (mainly buses and trams).

7) Discuss about drunk and drive.

Ans) Drunk driving is one of the most dangerous causes of accidents in the U.S. and is the most deadly.

If you have had anything to drink, take a taxi or give your keys to a sober friend. It is not worth the risk.

8) Discuss about running red light.

Ans) It may seem obvious, but it bears repeating. Red always means stop. Even if it seems like

no other carsare coming, you can cause a serious accident by running a red light and you will be breaking the law.

We've heard several excuses from busy entrepreneurs trying to run through red lights while thinking about work, from those legal contracts to investor relations, and at the same time literally trying to

answer to work emails. Understand that life is more important than all these issues combined and it's

best to be safe than sorry.

9) List safety performance function.

Ans) <u>Safety Performance Function:-</u>

→SPF is an equation used to predict the average number of crashes per year

at a location as a function of exposure and, in some cases, roadway or intersection characteristics

(e.g., number of lanes, traffic control, or median type) (1). For highway segments, exposure is represented by the segment length and annual average daily traffic (AADT) associated with the study section

→Application: SPFs are used to predict crash frequency for a given set of site conditions.

Thepredicted crashes from the SPF can be used alone or in combination with the site

specific crashhistory (i.e., Empirical Bayes method) to compare the safety performance of a specific site under various conditions.

The Empirical Bayes method is used to estimate the expected long-term crash experience, which is a weighted average of the observed crashes at the site of interest and the predicted crashes from an SPF.

10) Define accident rate per kilometer?

Ans) Number of accidents of all types per km of each highway and street classification.

R = A/L

R = total accident rate per km for one year,

A = total number of accident occurring in one year,

L = length of control section in km

Death rate based on population

number of traffic fatalities per 100,000 populations.

R = (B × 100000)/ P

R -death rate per 100,000 population,

B = total number of traffic death in one year and

P = population of area

11) Describe accident reconstruction.

Ans) Representing the accidents occurred in schematic diagram to determine the pre collision speed. Helps in regulating or enforcing rules to control or check movement of vehicles on road at high speed.
collision of two vehicles is shown that occur during turning movements.
collision diagram.
Each collision is represented by a set of arrows to show the direction of before and after movement
provides a powerful visual record of accident occurrence over a significant period of time.

Types:-
collinear impact

Rear end collision
Head-on collision.
angular collision.

12) Write about scientific investigation.

Ans)

Scientific Investigation:-

→ scientific investigation of accidents - branch of forensic science.

→ Forensic scientists / Accident Investigators will carefully examine the scene of a crime for physical evidence

→ Outcome of such analyses may assist the Court to determine guilt, innocence, fault or liability.

→ In road traffic accidents the primary physical evidence lies in the

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→ physical characteristics of the vehicles involved,

→ damage sustained by the vehicles,

→ injuries sustained by persons involved in the accident,

→ police plan,police measurements, police photographs, police video and laws of physics which determine the movement of vehicles, cyclists and pedestrians before,during and after an accident.

→Secondary physical evidence comes from the statements of witnesses when they refer to times,distances, speeds and locations. However, the validity and interpretation of such statements are matters for the Court to determin.

13) Write short note about regression method.

Ans) The **regression** model is developed for predicting accident and fatalities, considering factors contributing to occurrence of accidents as independent variables and accident as dependent variable using **regression** equation. ... x=factor contributing to occurrence of accident.

14) Write short notes about APK of computer analysis of accident data.

Ans) TEAAS-Traffic Engineering Accident Analysis System: a Software used to analyze the accident data (North Carolina)

→FARS (Fatality Analysis Reporting System) and GES (General Estimates System) UK

→ Road Accident Data Management System (RADMS) India

Long answer question:-

1. What is road safety engineering? Describe accident.

Ans)

Road safety engineering

The road safety engineering (RSE) function has the overarching aim of reducing the risk of collisions on the road network by implementing a range of low-cost improvements.

Road traffic safety refers to the methods and measures used to prevent road users from being killed or seriously injured. Typical road users include: pedestrians, cyclists, motorists, vehicle passengers and passengers of on-road public transport (mainly buses and trams).

Road accidents:-

- _ Fatal traffic accident is one which involves a person who dies as a result of an injury sustained in the accident (usually within 30 days); it excludes confirmed suicides
- Serious accident involves a person who is detained in hospital as an in-patient, or who suffers any of the following injuries: fractures, concussion, internal injuries, crushings, severe cuts and lacerations, or severe general shock, that require medical treatment
- Slight accident is one involving a person who is only slightly injured, e.g. a person who sustains a sprain, bruise or cut, which is not judged (by the police) to be severe, or slight shock requiring only roadside attention
- Damage-only accident does not involve people who sustain personal injuries.

Explain briefly about causes of road accident.

Ans)

Causes of road accident:-

1. Distracted Driving

Distracted driving becomes a larger threat every year and has been the leading cause of car accidents for the past decades. Please pay attention to the road while you are driving. That means no calls, no texting, no eating, no reading, no grooming or application of makeup, and talking while behind the wheel.

2. Drunk Driving

Drunk driving is one of the most dangerous causes of accidents in the U.S. and is the most deadly. If you have had anything to drink, take a taxi or give your keys to a sober friend. It is not worth the risk.

3. Speeding
Although it can be tempting to push the speed limit when you are running late, speeding is the second most common cause of accidents, so you should resist the urge and stay within the legal limits.

4. Reckless Driving
Changing lanes too quickly, speeding well over the limit, and acting aggressive on the roads can lead to horrible accidents. It is important to take your time and remain calm while driving to avoid needless accidents caused by simple carelessness.

5. Rain
While you can't always avoid driving in the rain, the slippery, treacherous road conditions caused by heavy rains should be avoided when at all possible. If visibility is too low to drive or the roads seem particularly slick, you should pull over and wait until the storm passes.

6. Running Red Lights
It may seem obvious, but it bears repeating. Red always means stop. Even if it seems like no other cars are coming, you can cause a serious accident by running a red light and you will be breaking the law.
We've heard several excuses from busy entrepreneurs trying to run through red lights while thinking about work, from those legal contracts to investor relations, and at the same time literally trying to answer to work emails. Understand that life is more important than all these issues combined and it's best to be safe than sorry.

7. Night Driving
Lack of visibility makes hazards more difficult to see at night. Make sure that you are extra alert on the road at night, and use your full lights when on an abandoned road without streetlights.

8. Design Defects
Sometimes accidents are caused by flaws in the car itself. While you cannot always avoid this, make sure to take note of any recalls in the news and take your car in for regular maintenance.

9. Tailgating
There is never an excuse to get too close to the car in front of you, no matter how frustratingly slow they seem to be going. Keep a safe distance from other cars so that you will have time to react to sudden turns or uses of brakes.

10. Wrong-Way Driving/ Improper Turns

Everyone makes mistakes, but lapses in judgement while driving a car can cause horrible accidents. Be aware of street signs warning of one-way streets or other irregularities, especially in unfamiliar areas.
When people don't get in the proper lane to make a turn, use signals properly, or follow traffic signals, accidents happen. Always look out for traffic signs and obey the proper right-of-way when you make a turn.

10. Teenage Drivers
Teens don't have the experience to know what to do in unsafe conditions and that naïveté causes accidents. If you have teenagers, make sure that they have had a defensive driving course, do not permit cell phone use while driving, and limit the passengers they can take with them in the car.

11. Drugs:
While alcohol is the culprit we usually associate with DUIs, drugs, including marijuana, prescription pills and other illegal drugs also cause terrible accidents. Never drive if you are under the influence of any drug, prescribed or not.

12. Potholes:
Potholes are very frustrating for drivers because sometimes they can't be avoided. Try to drive around potholes to avoid damaging your car, when you can, but do not swerve into another lane if cars are coming. Despite the fact that there are some laws that could work in your favor, don't take chances, especially with the heartbreaking car accident statistics from previous cases.

13. Tire Blowouts
If you get a flat while driving, it can cause you to swerve unexpectedly. Try to stay calm and keep control of the wheel while pulling over as soon as it is safe. Call for help if you cannot change the tire yourself safely.

14. Animal Crossings
Anyone who has ever heard someone tell about hitting a deer knows that this is a big danger. For this reason, take extra caution when you see an animal crossing sign and always use your high beams when travelling in rural, woody areas where wild animals are common.

15. Construction Sites
Sometimes the way a construction zone is set up can be confusing. Follow the cones as well as possible and be aware of other drivers who may be confused. It is especially important to drive slowly in these areas to avoid even the smallest accidents from occuring.

3. Explain in detail the statistic methods of analysis of accident data.

Ans) One of the basic aims of data analysis is to identify the main problems in the field of road safety. The efficiency of accident prevention depends significantly on the reliability of the collected and estimated data and the appropriateness of the used methods. To develop information such as:

- purpose -to find the possible causes of accident related to driver, vehicle, and roadway.
- Driver and Pedestrian -Accident occurrence by age groups and relationships of accidents to physical capacities and to psychological test results.
- Vehicle - characteristic of vehicle, severity, location and extent of damage etc.
- Roadway conditions -characteristics of the roadway and roadway condition etc.

Accident Rate per Kilometer:

number of accidents of all types per km of each highway and street classification.

R = A/L

R = total accident rate per km for one year,

A = total number of accident occurring in one year,

L = length of control section in km

Death rate based on population:

Number of traffic fatalities per 100,000 populations.

R = (B × 100000)/ P

R -death rate per 100,000 population,

B = total number of traffic death in one year and

P = population of area

Death rate based on registration:

Number of traffic fatalities per 10,000 vehicles registered.

R = (B × 10000) / M

R -death rate per 10,000 vehicles registered,

B -total number of traffic death in one year

M -number of motor vehicles registered in the area

Accident involvement Rate:

Numbers of drivers of vehicles with certain characteristics who were involved in accidents per 100

million vehicle-kms of travel.

R = (N × 100000000)/V

R -accident involvement per 100 million vehicle-kms of travel,

N -total number of drivers of vehicles involved in accidents during the period of investigation

V -vehicle-kms of travel on road section during the period of investigation.

Accident Rate based on vehicle-kms of travel:

Number of accidents per 100 million vehicle km of travel.

R = (C × 100000000)/V

R = accident rate per 100 million vehicle kms of travel,

C = number of total accidents in one year and

V = vehicle kms of travel in one year

4. Explain accident data collection.

Ans)

Accident data collection:

- ➔ Accident data collection is the first step in the accident study.
- ➔ primarily done by the police.
- ➔ secondary data
- ➔ Which are filed by motorists themselves -Motorist accident reports

Accident data collection includes:

General - Date, time, person involved in accident, classification of accident like fatal, serious, minor

Location -Description and detail of location of accident

Details of vehicle involved -Registration number, description of vehicle, loading detail, vehicular defects

Nature of accident -Details of collision, damages, injury and casualty

Road and traffic condition - Details of road geometry, surface characteristics, type of traffic, traffic density etc.

Primary causes of accident -Details of various possible cases which are the main causes of accident.

Accident cost - Financial losses incurred due to property damage, personal injury and casualty

Data collected need proper storing and retrieving. Why?

- Identification of location of points at which unusually high number of accident occur.
- Identify the causes of accidents.
- Development of procedure that allows identification of hazards before large number of accidents occurs.
- Development of different statistical measures of various accident related factors to give insight into general trends, common casual factors, driver profiles, etc.

5. Explain the function of safety performance.

Ans)

Safety performance function SPF is an equation used to predict the average number of crashes per year at a location as a function of exposure and, in some cases, roadway or intersection characteristics (e.g., number of lanes, traffic control, or median type) (1). For highway segments, exposure is represented by the segment length and annual average daily traffic (AADT) associated with the study section.

Application: SPFs are used to predict crash frequency for a given set of site conditions. The predicted crashes from the SPF can be used alone or in combination with the site-specific crash history (i.e., Empirical Bayes method) to compare the safety performance of a specific site under various conditions.

The Empirical Bayes method is used to estimate the expected long-term crash experience, which is a weighted average of the observed crashes at the site of interest and the predicted crashes from an SPF.

Empirical Bayes Method

The empirical Bayes method assumptions are (1) a Poisson distribution for the accidents, and (2) a Gamma distribution for the distribution of the averages in the population of systems.

6. detail about accident investigation.

Ans) Accident analysis is carried out in order to determine the cause or causes of an accident (that can result in single or multiple outcomes) so as to prevent further accidents of a similar kind. It is part of accident investigation or incident investigation. These analyses may be performed Explain in by a range of experts, including forensic scientists, forensic engineers or health and safety advisers. Accident investigators, particularly those in the aircraft industry, are colloquially known as "tin-kickers".[1] Health and safety and patient safety professionals prefer using the term "incident" in place of the term "accident". Its retrospective nature means that accident analysis is primarily an exercise of directed explanation; conducted using the theories or methods the analyst has to hand, which directs the way in which the events, aspects, or features of accident phenomena are highlighted and explained.

Sequence

Accident analysis is performed in four steps:

1. Fact gathering: After an accident, a forensic process is started to gather all possibly relevant facts that may contribute to understanding the accident.
2. Fact Analysis: After the forensic process has been completed or at least delivered some results, the facts are put together to give a "big picture." The history of the accident is reconstructed and checked for consistency and plausibility.
3. Conclusion Drawing: If the accident history is sufficiently informative, conclusions can be drawn about causation and contributing factors.
4. Counter-measures: In some cases, the development of counter-measures or recommendations are made to prevent further accidents of the same kind.

Methods

There exist numerous forms of Accident Analysis methods. These can be divided into three categories:

1. Causal Analysis (Root cause analysis) uses the principle of causality to determine the course of events. Though people casually speak of a "chain of events", results from Causal Analysis usually have the form of directed a-cyclic graphs – the nodes being events and the edges the cause-effect relations. Methods of Causal Analysis differ in their respective notion of causation.
2. Expert Analysis relies on the knowledge and experience of field experts. This form of analysis usually lacks a rigorous (formal/semiformal) methodological approach. This usually affects falsifiability and objectivity of analyses. This is of importance when conclusions are heavily disputed among experts.
3. Organizational Analysis relies on systemic theories of organization. Most theories imply that if a system's behaviour stayed within the bounds of the ideal organization then no accidents can occur. Organizational Analysis can be falsified and results from analyses can be checked for objectivity. Choosing an organizational theory for accident analysis comes from the assumption that the system to be analysed conforms to that theory.

Models

Many models have been described to characterise and analyse accidents. The book Enhancing Occupational Safety and Health is one source of further details on the different types of models used in accident analysis.

Using photographs to extract evidence

See also: Forensic photography

Once all available data has been collected by accident scene investigators and law enforcement officers, camera matching, photogrammetry or rectification can be used to determine the exact location of physical evidence shown in the accident scene photos.

1. Camera matching: Camera matching uses accident scene photos that show various points of evidence. The technique uses CAD software to create a 3-dimensional model of the accident site and roadway surface. All survey data and photos are then imported into a three dimensional software package like 3D Studio Max. A virtual camera can be then be positioned relative to the 3D roadway surface. Physical evidence is then mapped from the photos onto the 3D roadway to create a three dimensional accident scene drawing.
2. Photogrammetry: Photogrammetry is used to determine the three-dimensional geometry of an object on the accident scene from the original two dimensional photos. The photographs can be used to extract evidence that may be lost after the accident is cleared. Photographs from several viewpoints are imported into software like PhotoModeler. The forensic engineer can then choose points common to each photo. The software will calculate the location of each point in a three dimensional coordinate system.
3. Rectification: Photographic rectification is also used to analyze evidence that may not have been measured at the accident scene. Two dimensional rectification transforms a single photograph into a top-down view. Software like PC-Rect can be used to rectify a digital photograph.

14. Write short note about regression method.

Ans. : whether each vehicle has a traffic accident in each section can be regarded as a Bernoulli test. The probability of the incident is usually very small. If the number of vehicles entering the section within a certain statistical period is large enough , and the product of the number of vehicles and the event probability is moderate, the distribution of traffic accidents on each road segment can be described by Poisson distribution. Therefore, Poisson regression model is introduced for the prediction of traffic accident number. The probability distribution of the Poisson regression model is as follows:

is the number of traffic accidents per unit time on the i-th road section; 丨 is the expected number of traffic accidents per unit time on the i-th road section (Yulong Pei,2003). Below we establish the Poisson regression of road traffic accidents. Here logarithmic connection function is used to realize the Poisson regression fit between the number of traffic accidents and various influencing factors. After repeated model screening through the back method, the model with the highest goodness of fit includes four influencing variables: AVGTRUCK, NOLANE0, AADT and SLENGTH. Here by offset function to handle AADT and SLENGTH two exposure variables. It can be seen from the model that NOLANE0 has the greatest impact on the number of traffic accidents.

15. Write short notes about APK of computer analysis of accident data.

Ans. :

Long answer question:

1. What is road safety engineering? Describe accident.

Ans. : The road safety engineering (RSE) function has the overarching aim of reducing the risk of collisions on the road network by implementing a range of low-cost improvements.

Road traffic safety refers to the methods and measures used to prevent road users from being killed or seriously injured. Typical road users include: pedestrians, cyclists, motorists, vehicle passengers and passengers of on-road public transport (mainly buses and trams).

ROAD ACCIDENTS

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Causes of Road Accidents :

1. Distracted Driving

Distracted driving becomes a larger threat every year and has been the leading cause of car accidents for the past decades. Please pay attention to the road while you are driving. That means no calls, no texting, no eating, no reading, no grooming or application of makeup, and talking while behind the wheel.

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While you can't always avoid driving in the rain, the slippery, treacherous road conditions caused by heavy rains should be avoided when at all possible. If visibility is too low to drive or the roads seem particularly slick, you should pull over and wait until the storm passes.

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Potholes are very frustrating for drivers because sometimes they can't be avoided. Try to drive around potholes to avoid damaging your car, when you can, but do not swerve into another lane if cars are coming. Despite the fact that there are some laws that could work in your favor, don't take chances, especially with the heartbreaking car accident statistics from previous cases.

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Anyone who has ever heard someone tell about hitting a deer knows that this is a big danger. For this reason, take extra caution when you see an animal crossing sign and always use your high beams when travelling in rural, woody areas where wild animals are common.

15. Construction Sites

Sometimes the way a construction zone is set up can be confusing. Follow the cones as well as possible and be aware of other drivers who may be confused. It is especially important to drive slowly in these areas to avoid even the smallest accidents from occuring.

2. Explain in detail the statistic methods of analysis of accident data.

Ans. : It is very important to analyze the law and influence mechanism of traffic accident by studying the effect of each influencing factor on traffic accidents and establishing a forecasting model of road traffic accidents so as to put forward corresponding improvement measures and preventive measures. Firstly, we analyze the correlation between the number of traffic accidents and various influencing factors. By comparing the correlation coefficients, we select the factors that have a significant impact on the number of road traffic accidents. There are 200 available data.

Table 1: Variable name and description.

Labels	Definition
Response variables	
Count	Number of total accidents
Continuous explanatory variables	
SLENGTH	Segment length
AADT	Annual average daily traffic (AADT)× $\mathbf{10^{-4}}$
PSR	Pavement condition rating
AVGTRUCK	Average truck volume percentage
Labels	Definition
Categorical explanatory variables	
NOLANE0	Number of through lanes less than or equal to two
NOLANE1	Number of through lanes greater than two
RURAL0	Rural road
RURAL1	Urban road

Through the cross-linked list of factors, the correlation between the number of traffic accidents and various influencing factors is: AADT>NOLANE0>SLENGTH>AVGTRUCK>RU RAL0>PSR. The scattergrams of seven variables, Count, SLENGTH, AADT, NOLANE0, RURAL0, PSR and AVGTRUCK, are respectively obtained. The results are as follows ：

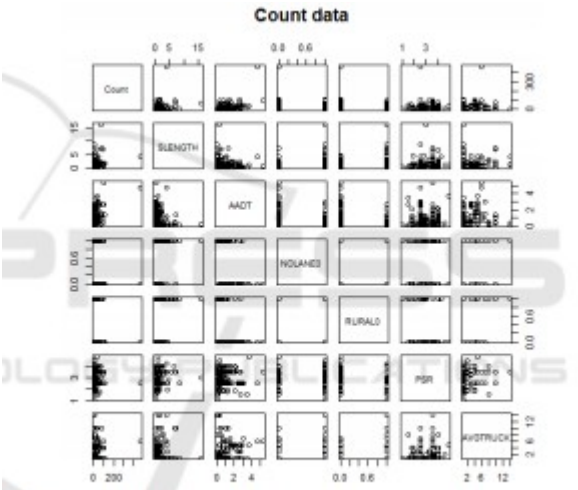


Figure 1: Scatter plot between the Count and the various factors

As can be seen from Figure 1, there is no obvious linear relationship between Count and each factor. There is a relatively weak linear relationship between SLENGTH and AADT and the number of traffic accidents. With the increase of AADT, the increase of Count is more obvious than that of SLENGTH. The number of traffic accidents with NOLANE0 of 1was significantly greater than that of NOLANE0 with 0 .

3. Explain accident data collection.

Ans. : ACCIDENT DATA COLLECTION

The report briefly describes the processing, analysis, usage, and distribution of road accident and traffic control device data carried out by the Main Roads Department of Western Australia over the 1978/79 financial year. The objective of the project was to provide up to date information on road accidents and traffic control devices for the purpose of road planning, road design, traffic management, Australian road needs surveys, and compiling programme submissions to the commonwealth government. Accident data is obtained from the road traffic authority and control device data from departmental field surveys. Data is coded and entered onto a computerised data base which is maintained and operated by the department. A number of different types of reports are produced and distributed. In addition a number of accident studies were undertaken during the year. (TRRL)

The preceding chapters of this book have focused on how accidents due to human error can be prevented at source. These preventive measures include systematic design strategies, techniques to identify potential errors with serious consequences, and audits of performance-influencing factors in existing systems to specify opportunities for improvements. To complement these proactive strategies, it is important to have feedback systems in place so that lessons can be learnt effectively from minor incidents, near-misses and from major accident investigations. This chapter describes a range of techniques and systems to achieve these objectives. To most plant managers, the term data collection, at least in the context of safety, refers to the collection of statistical data in areas such as lost-time accidents and other reportable injuries. Because such data are required by law, and because they are perceived to have a major impact on accident prevention via their motivational effects, considerable resources are expended every year to produce these data. They constitute the "bottom line" that will be used to justify the safety

performance of the organization to the public, the regulators, and to its shareholders. Although the central importance of this aspect of data collection is acknowledged, this chapter will describe a much wider range of data collection activities that need to be carried out in order to maximize the effectiveness of error reduction programs in organizations. Another publication produced by the Center for Chemical Process Safety, Guidelines for Investigating Chemical Process Incidents (CCPS, 1992d), is directed at achieving similar objectives but from a differing perspective and with differing emphasis. Both sources of information can be used in a complementary manner to improve the quality of data collection and incident analysis in the CPI.

4. Explain the function of safety performance.

Ans. : The primary measure of success for the 10-year strategy will be the actual reduction in the numbers of deaths and serious injuries from road crashes. Intermediate progress is assessed annually using the high level outcome indicators established when the current strategy commenced, as well as the safety performance indicators (SPIs) that have been developed for detailed progress monitoring. Development of additional SPIs and associated data collection arrangements is ongoing.

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) maintains the National Crash Database for the purpose of monitoring progress under the strategy. The BITRE provides a range of other road safety statistical information, including the Australian Road Deaths Database, and the Road Deaths Australia Monthly Bulletins and Road Trauma Australia—Annual Summaries, which draw on this data.

- Safety performance indicators
- Road deaths trend
- Road deaths by jurisdiction
- Road deaths by road user
- Road deaths by age group
- Serious injuries

Safety performance indicators:

Baseline figures are rounded to whole numbers. Calculations have been made prior to rounding for accurate recording.

- Australia
- New South Wales
- Victoria
- Queensland
- South Australia
- Western Australia
- Tasmania
- Northern Territory
- Australian Capital Territory

5. Explain in detail about accident investigation.

Ans. Accident investigation is the process of determining the root causes of accidents, on-the-job injuries, property damage, and close calls in order to prevent them from occurring again.

→Accident investigation will lead you to the real cause of why something happened, and armed with that knowledge, you can take affirmative steps to prevent future accidents from occurring.

REQUIRED:

• Develop an accident investigation process that focuses on: o fact finding, not fault finding o determining the root causes of why the event occurred o making changes so the event does not happen again. • Set a policy that accidents and close calls (large and small) will be investigated with equal vigor. • Provide training and tools to staff conducting accident investigations. • Audit completed investigations to ensure they are being completed on a timely basis with an adequate level of detail.

Background investigation :

• Review the employment and injury records of any injured employee(s) and/or others whose actions contributed to the accident.

• Review reports of any injuries and/or damage to equipment, machines, building, or property. • Compile a list of witnesses to the accident.

• Gather information about normal conditions and/or operations of the area. Information would include maps, floor plans, wiring diagrams, and any other piping or architectural drawings or operational guidelines.

• Meet with supervisors and other employees responsible for the affected area and employees of the affected area to outline the purpose and goals of the investigation. Ensure that there is a basic understanding of the materials, equipment, operation, or process involved.

Site investigation:

• Arrive at the scene of the accident as soon as possible after the incident has occurred.

• Restrict the accident scene to authorized persons during the site investigation.

• Ensure that movable evidence is secured to prevent tampering or other changes.

• Determine what physical changes may have occurred following the accident. Changes could be attributed to clean-up, weather, maintenance, and normal usage.

• Tour the entire area and record pertinent initial perceptions of the status and condition of building, grounds, equipment, lighting, and ventilation.

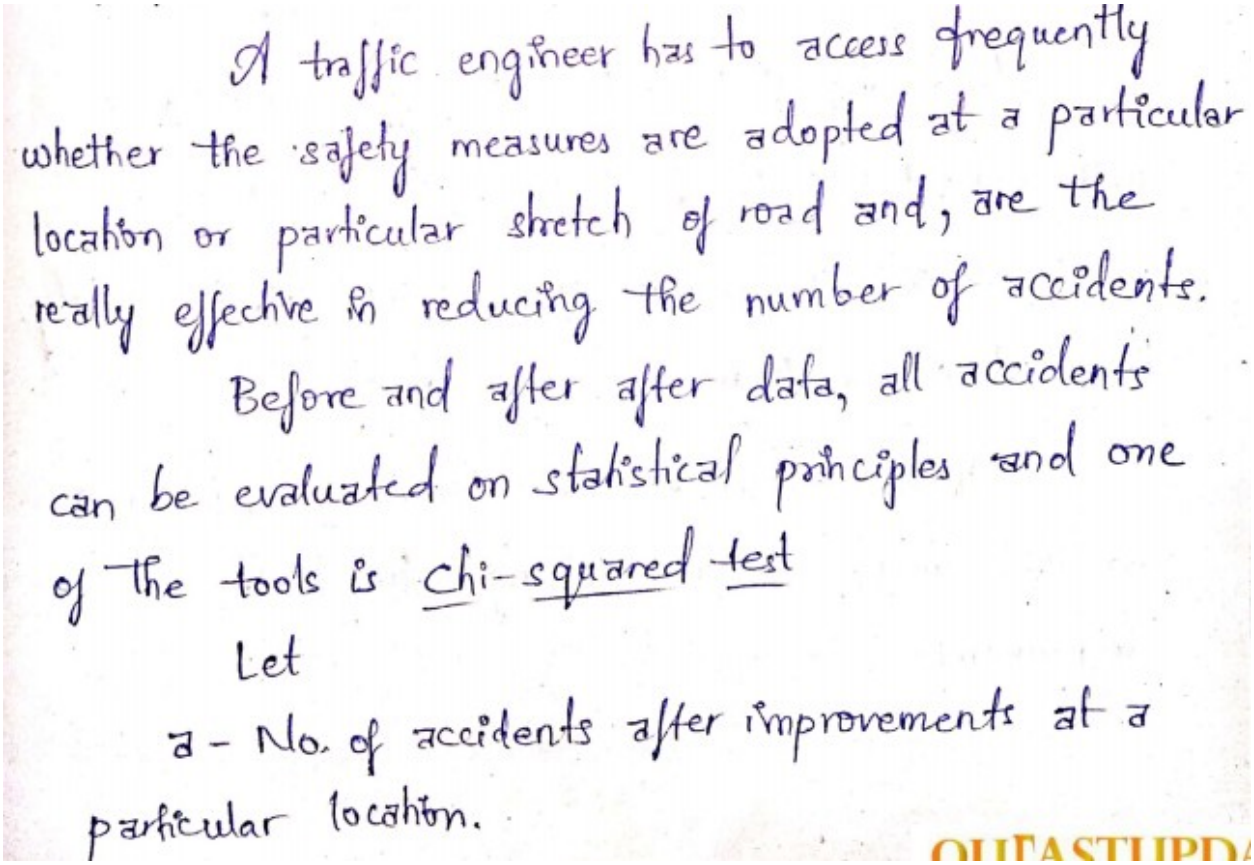
• Sketch or draw parts of the accident scene where equipment or machinery involved in the accident is located or where actions that contributed to the accident occurred. Use the following guidelines when sketching or drawing an accident scene: o Use squared (graph) paper. If distance or size is important determine the value for each square and note this at the bottom of each sketch. o Orient each sketch with an arrow pointing north. o Label all objects. o Use arrows to indicate paths of travel of individuals and/or vehicles. o Indicate the distance of movable objects from two fixed locations. o Note the location of witnesses present at the time of the accident.

• Take photographs of the overall scene, damaged areas, and pertinent machinery and/or equipment. Photographs should be made before any adjustments occur to the scene of the accident. o Prior to taking photographs, determine if the area has been altered. If items have been moved or changed, do not move them back for photographs. Photograph items as found, yet document the change and the individual responsible or knowledgeable of the change. o For close-ups, use reference items such as a ruler or level measurer to indicate size or slope of the items photographed. For each close-up, photograph the same item from a distance to provide a reference. Photograph the area where the injured worker(s) were found, using reference marks to indicate individuals' placement.

6. Accident record for three consecutive years at an uncontrolled junction in decade the following number of accident. Calculate the probability of an accidents occurring per year at the site.

Year	No. Of accidents
1972	3
1973	6
1974	9

7. Chi-squad distribution for comparing accident frequency.



A traffic engineer has to access frequently whether the safety measures are adopted at a particular location or particular stretch of road and, are the really effective in reducing the number of accidents.

Before and after after data, all accidents can be evaluated on statistical principles and one of the tools is Chi-squared test

Let

a - No. of accidents after improvements at a particular location.

b- No. of accidents before improvements at a particular location.

Assuming that the improvements have no effect and the accident number is expected to increase due to the changes in traffic and weather conditions.

Let

c - No. of accidents expected if no improvements have been carried out., the factor 'c' called the Control ratio, then the value of chi-square is

$$\chi^2 = \frac{(a-bc)^2}{(a+b)c}$$

The null hypothesis H_0 stimulates that there is no real change due to the improvements.

Assuming # 5%, the level of significance with one degree of freedom., $\chi^2 = 3.841$

If $\chi^2 > 3.841$, we observe that H_0 is unlikely to be true and there is a real change.

If $\chi^2 < 3.841$, we conclude that H_0 is true and that there is no real change due to the improvements.