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The Demographics of Drivers and Victims Involved in Traffic Accidents.

by

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Summary

This staff paper develops a study approach to identify the demographics of drivers and victims involved in traffic accidents. Such an identification assists in directing safety campaigns at those specific demographic groups which are most likely involved in traffic accidents, and, in the most serious accidents.

The proposed study consists of three tasks:

Task A: Definition to the Subpopulations with the Highest Incident of Traffic Accidents. This task analyzes the 1979 National Health Interview Survey tape. This tape contains the survey results of some 110,000 persons of whom 2,300 had a traffic injury. The survey includes data on the person, the household in which the person resides, and the region in which the household is located. The analyses are directed toward defining subpopulations by their personal, household and/or regional variables, in order to determine the subpopulations with high incidence rates of traffic injuries.

The method used for the analysis is a step sequenced evaluation of the variables. The analysis will be performed on TSC's DEC-10 computer by means of the CROSSTAB programs of the Statistical Package for the Social Sciences (SPSS).

Task B: Severity of Injury as a Function of Subpopulation. This task also utilizes the 1979 National Health Interview Survey tape. Though the survey contains no direct measure of severity, as for instance the Abbreviated Injury Scale (AIS), one can use, with certain limitations, the time elapsed since the onset of the disabling condition as a proxy for severity. This task develops an algorithm through which the time elapsed since onset can be used as a proxy for severity.

The algorithm is then applied to each subpopulation identified in Task I, to estimate the average injury severity for these subpopulations.

Task C: Conditions Determining Likelihood of Disability Given An Injury. Starting from a preliminary working model, which is stipulated in this staff paper, this task develops a working model of the conditions determining the likelihood of a disability due to an automobile accident injury. The methodology for deriving the working model is an reiterative analysis of the theories of trauma sequelae and the approaches to trauma sequelae, and a repeated recasting, refining and verifying of the stipulated preliminary model until a functional working model has been developed.

The Demographics of Drivers and Victims Involved in Traffic Accidents

Safety campaigns, whenever possible, should be directed toward the population at risk. There is relative little benefit to be gained from addressing a safety belt usage campaign to those who do not travel in motor vehicles, or, to those who wear safety belts. One wants rather to address those who drive and do not wear safety belts, and, particularly those who drive in a manner that increases the likelihood of their being involved in an accident and become injured.

Our major problem in targeting "likely" candidates is the fact that injury from motor vehicle accidents is a relative rare event. There is about one traffic injury for every 300,000 vehicle miles. The "average" person will have one injury every fifty years. (1) Obviously, the likelihood of being injured increases dramatically for specific subpopulations. It is the object of the research to define these sub-groups in demographic terms, which go beyond the two well-known descriptors of sex and age. Furthermore, the research will attempt to define the conditions within a subpopulation which will increase the likelihood of a disability given an injury.

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*These data are based on the 1979 National Health Interview Survey, and FHWA's 1979 estimate of vehicle miles travelled.

The study will consist of three seperate tasks:

Task A Definition of the subpopulation with the highest incident of traffic injuries.

Task B Severity of injury as a function of subpopulation.

Task C Conditions determining likelihood of disability given an injury.

The Approach

Task A: Definition of the Subpopulations

This task will use as its date input the 1979 National Health Interview Survey.

A.I The National Health Interview Survey (NHIS).

This an annual survey by the National Center for Health Statistics of about 40,000 households with about 110,000 persons. The interviews are conducted during every week of the year and obtain data on health conditions during the past two weeks.

A.I.1 Injuries Due to Motor Vehicle Accidents

In the case of a health conditions due to an injury, the survey obtains the class of accident, for instance "moving motor vehicle", which caused the injury. The survey also contains data on the days of restricted activity which the accident generated. An "injury" to fall within the scope of the survey must generate at least one full day of restricted activity, or, have received medical attention.

With respect to injuries resulting from motor vehicle accidents the following information is obtained.

(a) Type of Injury

- o Fracture and dislocation
- o Sprains and strains
- o Open wound and lacerations
- o contusion and superficial injury
- o Other

(b) Part of Body Affected

- o Head
- o Back/spine/vertebra
- o Ear or eye
- o Arm
- o Leg

(c) restricted days during past two weeks

(d) days in bed during past two weeks

(e) days kept from work and/or school past two weeks

(f) days in hospital during past twelve months

(g) when did accident happen?

- o Last week
- o Week before
- o 2 weeks to 3 months
- o 3 to 12 month
- o 1 to 2 years
- o Before 2 years

(h) Was person at his job or business at time of accident?

(i) Was more than one vehicle involved?

(j) Was it (either one) moving at the time?

Since the survey includes only <u>living</u> persons and their injuries, the survey contains no data on motor vehicle fatalities, unless the injury occured during the interview weeks and the fatality subsequent to the interview weeks.

A.1.2. Demographic Data

The demographic data collected about every person in the survey includes the following items.

(a) Persons age at last birthday

(b) Sex

(c) Race

(d) Relationship to head of household

(e) Persons's weight

(f) Persons's height

(g) Highest grade attended in school

(h) Served in Armed Forces

(i) Currently employed

(j) Worked last two weeks

(k) Type of work

(l) Weeks worked last 12 months

(m) Total family income

(n) Welfare income (yes/no)

(o) Retirement income (yes/no)

(p) Type of living quarters (housing unit, other)

(q) Farm/non-farm

(r) Location SMSA/non-SMSA, also by four regions

(s) Total number of rooms, bedrooms

(t) Household size

(u) Adults in household

A.1.3. Reason for Selecting the 1979 Survey

The 1979 survey was selected in preference over later surveys due to its availability and size.

1981 Survey: Public use tape and documentation available in Spring 1984.

1980 Survey: Public use tape available in early 1983. Though this availability may not cause any undue delays in the study, the overall size of this survey is about 8% smaller than the 1979 survey, and contains about 2,000 motor vehicle injuries versus 2,300 motor vehicle injuries on the 1979 survey. The benefits of the larger 1979 survey, especially with respect to motor vehicle accident cases, outweighs in a methodological study the fact that it is a slightly older survey.

A.1.4. Limitation of NHIS Data

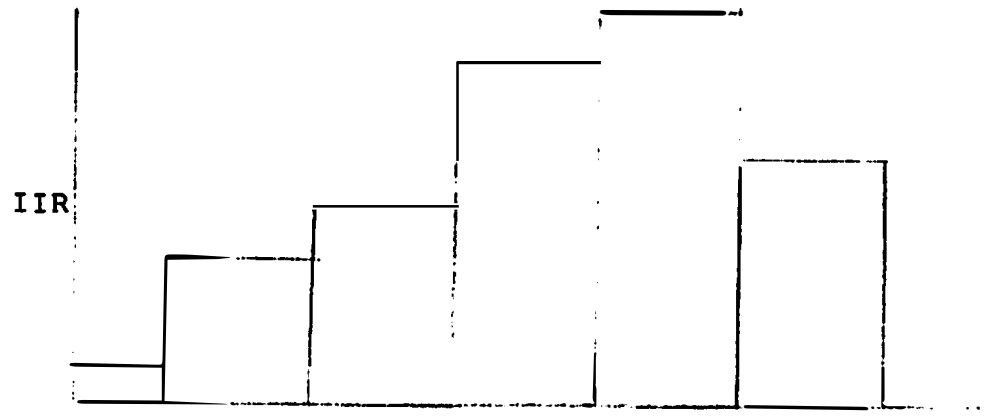
For the proposed study the most severe limitation of the NHIS are its lack of data on the role of the injured person in the motor vehicle accident. Was the person the driver or the passenger? Was the person responsible for the accident? To a degree these difference can be overcome by linking NHIS data to NASS data. The linkage would be age, sex, weight and height. These four variable are available in both surveys, thus to the extent that people can be classified by these four variables the two data bases can be linked. An evaluation of the significance of this linkage will be part of the analysis.

A.2. Analysis

The analysis is directed toward defining subpopulation with high incidents of traffic injury.

A.2.1. General Approach

The general approach to the analysis is a contextually grounded stepwise segmentation of the population to arrive at subpopulations with high incident rates of traffic injury. The general procedure will be to classify the NHIS person records by motor vehicle traffic injury (yes, no) and some other variable (A), for instance age. Since age is recorded by age at last birthday, that is some ninety categories, there will be relative few observations per each individual age (about 700 observation per age with an average of 10-20 traffic injuries). Adjoining individual ages will then be grouped into age groups, so that there is a significant difference in the traffic injury incidents rate (IIR) between adjoining age groups. Results of this exercise can be presented as a histogram.



If this exercise yields a uni-modal distribution, the subpopulation (SP_{A_i}) with the maximum IIR ($SP_{A_i}^{IIR\ max}$) will be examined by variable B, using identical procedures, to yield a subpopulation ($SP_{A_i B_j}^{IRR}$). The procedure will be repeated until the addition of a variable fails to yield a statistical significant increase in IIR. This will occur when the subpopulation ($SP_{A_i B_j \cdots m-1}^{IIR\ max}$) has become so small that its increase in IIR is statistically insignificant from the IIR of ($SP_{A_i B_j \cdots m}^{IIR\ max}$). However, substituting variable n for m+1, may yield a higher value for IIR which is statistically significant.

In the case of bi-modal distributions, each modal value is examined and positioned separately, and the analysis will yield two or more non-overlapping populations with local maximum IIR values.

The analysis of the NHIS data will be performed on the DEC-10 computer at TSC by means of the CROSSTABS programs of the Statistical Package for the Social Sciences (SPSS).

A.2.2 Sequencing the Variables

The target populations (high IIR values) which are identified by the above stepwise procedure are a function of the sequence with which the independent variables are examined. TSC will use at least three distinct sequences sets for arriving at target population. These are (A) Personal variable sequence (B)

Household variable sequence, and (C) Regional variable sequence.

A.2.2.1 Personal Variable Sequence

The personal variables in the NHIS include race, sex, age, height and weight, education, marital status. The analysis by the National Center of Health Statistics of NHIS shows that both sex and age can be discriminating variables between IIRs (NCHS: Current estimates from the National Health Interview Survey, United States 1979. April 1981. pp. 21 and 48). To arrive at (SP IIR may), the TSC analysis will use the two variables followed by height and weight, either separately or in conjunction with one another.

Marital status, education, and race as further subpopulation discriminators, will be tested in this order. The analysis of the personal variables should indicate the individuals which have the highest IIR, regardless of the type of household they live in, or, the region of the country in which they reside.

A.2.2.2. Household Variable Sequence

This analysis attempts to show if it is possible to describe motor vehicle injury incidents by the households, or, socio-economic environment in which the victims live, without first considering the victim's sex, or, age.

The variables this analysis will consider are:

- Family income

- o Welfare income
- o Retirement income
- o Number of rooms in household
- o Number of bedrooms in household
- o Type of living quarter (house unit/others)
- o Household size (numbers of persons, total)
- o Adults (17 and over) in household

Since there exists only very limited prior research with these variables, and their impact on motor vehicle accidents or injury, each factor will be examined seperately. Depending on the results of this analysis, the feasibility of performing a sequential analysis will be determined.

A.2.2.3. Regional Variable Sequence

This analysis determines if broad geographic variables impact motor vehicle injury incidents. The variable which are considered are: SMAS/Non-SMSA; the Four Census Regions: Northeast, North Central, South and West, and Farm/Non-Farm.

The three variables will be examined independently and if any subsamples have statistically significantly higher IIRs, sequential analyses with the other two variable will be performed.

A.2.2.4. Sequencing Between Persons, Household and Regional Variable

If the analyses performed in the previous three sections suggest that sequencing between personal, household and regional variables can yield subpopulations with statistically significantly larger IIRs, then such sequences will be examined.

Task B Severity of Injury

Within the NHIS data base, the measure that comes closest to injury severity is the time elapsed since the accident occured. NHIS measures "incidence of acute condition", that is the number of persons who during the past two weeks had an acute condition "a departure from a state of physical or mental well being." A person who had an injury caused by a motor vehicle accident three months ago will report this injury only if the injury causes him (or her) to have during the past two weeks "a departure from a state of physical or mental well being."

Though the injuries that occur in the past two weeks as a class are less severe injuries than those reported to have occured 2 years ago, the class of recent injuries will contain incidents sufficiently severe to cause an acute condition two years hence.

Let us assume, that we have an accident injury rate per 100 persons as follows.

Date of Accident	
last two weeks	1.2
2 weeks to 3 mo.	.5
3 to 12 mo.	.3
1 to 2 yrs.	.2
Before 2 yrs.	.1
Total	2.3

If one classifies accident severity as the time duration of the acute conditons, then the relative frequency of the acute conditions will be the injury incident rate in (IIR) in a time interval less the IIR that persevere into the subsequent time interval.

$$S_t = IIR_t - IIR_{t+1}$$

where S_t = injury rate of severity t, where t is the length of time the injury causes an acute condition.

IIR_t = the injury incident rate of accidents that occured in time interval t, and IIR_{t+1} = the injury incident rate of accidents that occured in the previous time interval.

For our example the relative frequency of severity of injuries will be.

	S	%
Severity I: (acute condition taking less than two weeks)	.7	59%
Severity II: (2 weeks to 3 months)	.2	17%
Severity III: (3 months to 12 months)	.1	8%
Severity IV: (1 to 2 years)	.1	8%
Severity V: (2 years)	.1	8%
	1.2%	100%

By this measure the NHIS greatly over samples severe injuries. For the IIR of 2.3 will contain the following implicit injury severities.

	S	%
Severity I:	.7	31%
Severity II:	.4	17%
Severity III:	.3	13%
Severity IV:	.4	17%
Severity V	.5	22%
	2.3	100%

In this example we have assumed that the data is free of sampling error. This is not realistic. Thus, it maybe more difficult to establish the relative frequency of severity of injury from the actual data base.

The NHIS also associates with each injury the part of the body affected by the injury and the type of injury (fracture, sprain, open wound, contusion, etc). To the extent the data base permits, severity of injury will be associated with part of body affected and then with type of injury.

The theoretical approach to this analysis will be the following: First to classify all injuries occuring more than two years ago and analyzing these by part of body and types of injury. These injuries by definition will be injuries of Severity V.

Next, one proceeds to the injuries occuring 1 to 2 years ago. However, from the matrix representing part of body and type of injury, one must now deduct the Severity V injuries to obtain the Severity IV injuries.

One proceeds then to the injuries occuring 3 to 12 months ago, and so forth. Clearly with sampling errors, those procedures becomes more questionable with each subsequent time interval. No ready made solution to the problem is apparent. However, on hand of the actual data, a procedure can probably be devized which shrinks the matrix to arrive at some meaningful relationship between severity, part of body and type of injury, at least for two or three levels of severity.

The end product of this assignment procedure will be a part of body/type of injury matrix in which each cell is assigned a severity rating. Or, if this appears to be too arbitrary, two severity ratings, such that each incident $I_{m,n}$ (where m= part of body, and n= type of injury) is assigned the probability P to belong to severity rating A and (1-p) to belong to severity rating A+1.

With this matrix one can then assign to each injury incident in NHIS a severity rating (or two severity ratings) regardless of the time which has elapsed since the accident.

After this assignment has been performed for each of the 2300 injury incidents one can then regress the injury severity scale against the independent person, household and regional variables and determine if the severity of injury is determined by any one, or combination, of these demographic variables.

C. CONDITIONS DETERMINING LIKELIHOOD OF DISABILITY DUE TO AN AUTOMOBILE ACCIDENT INJURY

This task develops a model of the likelihood of a disability due to an automobile accident injury. The general approach to the task is (a) the development of a preliminary working model and then (b) through a reiterative analysis of the theories and approaches used to explain psychic and behavoral disorders that follow from injury (trauma sequlae) to (c) a recasting, refining and verifying of the preliminary model until a functional working model has been developed.

The subsequent sections stipulate and describe the preliminary model that will be used to evolve the functional working model, the references identified to date that will be used in the development of the functional model through the reiterative analysis, and a brief review of some of the current theories for understanding trauma sequelae that will be considered in the analysis.

C.1. A Preliminary Working Model

Physical injury in itself does not necessarily determine the extent of the disability subsequently experienced by the victim. The career of Franklin D. Roosevelt is a prime example; after being crippled by polio, he was a four-term President of the United States. The October 26, 1982 New York Times described a person who had developed a successful adaption to a severe

injury:

> "Schafer Capital Management Company handles $360 million for pension fund accounts. David Schafer made that record virtually without assistance. He hired a securities analyst to help him a few weeks ago, but managed only with secretarial help before that. Mr. Schafer, who is 43, has been a paraplegic since college when he was injured in an automobile accident." (Market Place column by Robert Metz, page D6.)

Injury in itself does not equate with disability. Yet there are many people with physical limitations similar to Roosevelt's and Schafer's who experience a lifetime of disability and restricted activity.

Why does one person with a physical injury start a major financial concern while another spends the remainder of his lifetime living on a disability income? To understand the impacts of injury due to automobile accidents, it is necessary to examine how physical injuries are reinforced or overcome.

A researcher familiar with workmen's compensation disability programs states an injured person becomes disabled as a function of the type of injury, the reinforcers present in the situation and the time involved (Martin, 1975, P. 62).* Recognizing the contribution of factors in addition to the injury, it is necessary to unravel the "reinforcing factors" and to define the important dimension of time.

*Martin creates vectors of the three factors leading to disability and is able to quantify the amount of disability claimed. This type of analysis is required for the workmen's compensation claim process.

To develop a working model of the consequences of automobile accident injury, an initial set of references on trauma sequelae were reviewed. Preliminary analysis suggests that most current theories predicting the magnitude and type of trauma sequelae provide only partial approaches to the understanding of trauma sequelae (Section C3 discusses current theories). Many theories refer to the individual's response to an injury.
Combining theories, a working model of the Conditions Determining the Likelihood of a Disability Due to an Automobile Accident Injury, was developed, shown as Figure 1. This model is inclusive and contains appropriate causal and iterative sequences as suggested by the initial literature review.

The design of Figure 1 emphasizes that reciprocal influences determine trauma sequelae. For example, although family composition and strength determine how upsetting an injury to a family member will be, the family's response or supportiveness is a function of the family's personal, social, interactional, and financial resources prior to the injury. For example, the positive contributions of a strong family are described in Kaufman and Bilge's (1982) report on the Lambert family and their teenage son's serious spinal cord and head injuries. Despite major injuries with long term consequences, there was a fairly sucessfully adaptation using assistance from a large family, strong community response and provision of family financial counseling. However the positive adaptation by the injured party can not ignore the impacts the injury had on other family members.

Figure1- Preliminary Model of Conditions Determining Likelihood of a Disability Due to Automobile Accident Injury.

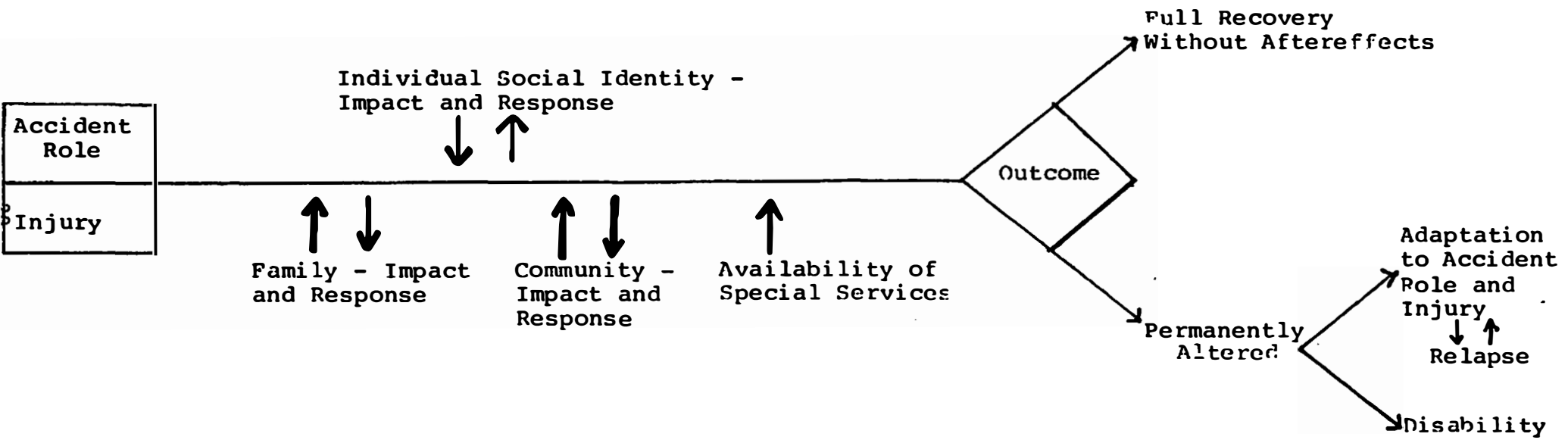


FIGURE 1

DEFINITION OF TERMS

Accident Role - Driver or passenger.

Injury - Medical diagnosis.

Impact on Individual Social Identity - A combination of personality, mode of reaction to prior crises, work satisfaction, religion, life cycle stage or age, etc.

Response of Individual Social Identity - Change in the individual social identity due to accident role or injury.

Impact on Family - Determined by family role of injured person, duration of recuperation, severity of injury.

Response of Family - Availability of family support networks.

Impact on Community - Determined by severity of injury and prior contributions of injured person.

Response of Community - Availability of facilities for temporarily and permanently handicapped people; reaction to disfigurement, altered behavior, or accident role.

Availability of Special Services - Certain injuries require intensive retraining of the individual, i.e., spinal cord injuries. Geographic areas have more or better programs; entrance is often selective. Therapeutic and counseling services are also differentially available depending on location and injury.

Outcome - Time required to stabilize the injury or be discharged from rehabilitation, and to end and psychological or legal impacts due to role in accident.

Full Recovery Without Aftereffects - Able to resume all activities participated in prior to accident.

Permanently Altered - Not able to resume all activities participated in prior to accident.

Adaptation of Accident Role and Injury - Able to undertake activities, care for self in terms of medical, psychological, and social needs, and to undertake vocational and avocational activities.

Relapse - Because injury has weakened the body, relapse may occur due

to stressors, either emotional or heightened vulnerability to infection.

Disability - Unable to care for self or find substitute activities.

An individual's social identity influences how the injury is perceived and handled. Social identity refers to a complex package of characteristics including prior health, age, work history and satisfaction, sex, religion, race, marital status, personality, reaction to previous crises. These characteristics have been cited in the literature as contributing to outcome of injury. Additional literature review will add to and clarify the relative significance of different individual social characteristics for recovery from injury.

Community is related to an individual's recovery from illness in several ways. The community response refers to the ways a community can facilitate or hamper recovery. Romano in Porter and Dell Orto (eds.) (1981) noted that people with severe head injuries and consequent inappropriate behavior experienced exclusion by the community people. People with disfiguring injuries experience similar reaction. Communities may impact injured people's recoveries to the extent that they provide special access to facilities, whether in terms of door widths and ramps, homemakers or transportation to providers of rehabilitation services.*

*In the Kaufman and Bilge (1982) set of case studies, there are repeated references to blocked or restricted recovery processes due to lack of community response (see Brody, Blair case studies).

A more complete examination of the literature will show how the type and composition of a community can affect the recovery process. For example, communities vary in their degree of integration; some communities have strong patterns of social relationship based on ethnic, religious, and kin ties. These social networks can be an important support for an injured person trying to achieve recovery.

Availability of special services is another dimension of the model hypothesized to affect the outcome of injury. This category of influences includes counseling services, group or individual, as well as specialized rehabilitative services to learn personal care and job skills.

The literature suggests that post-trauma counseling services, whether individual or group, are often not available. For example, victims of many of the major life threatening and burdensome illnesses have access to well-established self-help programs, i.e., Alcoholics Anonymous, Mended Hearts (open heart surgery) and Omega. There is nothing available for post-trauma victims. Research indicates that self-help groups provide a unique therapy; the greater the participation, the greater the help received.

There are specialized rehabilitation programs available for spinal cord injuries and closed head injuries, but they have limited availability due to cost and the difficulty of succeeding with rehabilitation.

These programs are available in certain locations and are oversubscribed. Bray in Porter and Dell Orto (eds.) (1981) reports that even with specialized spinal cord rehabilitation programs, only approximately 50 percent of the cases are sucessfully rehabilitated. Interestingly, Bray's research suggests that timing of entry into a program can be a critical factor in determining success; people receiving with a spinal cord injury more than one year earlier were more likely to be successfully rehabilitated. Sufficient time had passed for the individual to respond to the emotional issues, thus freeing emotional energy to focus on learning rehabilitation techniques. Further examination of the literature will establish rehabilitation success rates and document the time sequences necessary to achieve rehabilitation.

As a result of the influence of a myriad of individual, familial, community, and rehabilitative forces, an outcome is reached after the passage of time. Literature suggests that it takes two years to reach an outcome from a serious injury. The outcome is necessarily a function of time and is the equilibrium the individual reaches with his injury and its constraints.

The outcome itself is conceptualized as occurring on several levels. Optimum outcome is full recovery without effects. The individual is now able, after the passage of time, to resume the life lived prior to the injury. The victim is able to participate in all former activities.

If the injury permanently alters an individual's functioning, the outcome can be a positive adaptation to the limitations or a disability where the individual is unable to care for himself or find satisfactory substitute activities. For example, the spinal cord injured individual is considered successfully adapted if he meets the following criteria; can perform activities of daily living, has and maintains social contacts, has avocational activities, and is able to return to employment.

People whose injuries are so severe that their optimal outcome is an adaptive one, are particularly at risk for a relapse. Their body has been so weakened that ordinary infections and injuries can threaten their health and may precipitate a relapse to their earlier condition. Bray (1981) calls relapses a "reflux" and suggests they constitute another stage in the outcome process; Figure 1 has a causal loop indicating the relapse possibility.

A person with a disability outcome is someone who is not able to develop adaptations allowing performance of any of the four major life activities, i.e., activities of daily life, maintenance of social contacts, participation in avocational activities, and holding down employment. Such a person typically depends on the Social Security system's and/or insurance companies' programs for disability incomes.

C.2. REFERENCES SUPPORTING DEVELOPMENT OF MODEL

References identified to date are arranged according to the portion of the model of Conditions Determining the Likelihood of a Disability Due to Automobile Accident Injury to which they pertain. In most cases, this is appropriate because most theories are partial and limited to one element of the process generating trauma sequelae.

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C.3. PRELIMINARY REVIEW OF APPROACHES TO TRAUMA SEQUELAE.

An initial review of the literature suggests that the available approaches to understanding trauma sequelae can be categorized as follows:

a. Psychological responses. This approach focuses on the individual's emotional response and adjustment to injury. There are many variants in the literature; however, Elizabeth Kubler-Ross's model of the stages of grief and mourning and insistence on the necessity of passing through all the stages for full recovery underlies the many psychological approaches. While the individual must confront the stages, the other people in the environment should be aware of the widely ranging emotional tones likely to be expressed by the victim.

   Implicit in these approaches is the concept of sequencing of stages through time; the process cannot be short-circuited. As a result, counseling or therapy are often strongly recommended to ensure stages are faced up to and accomplished.

b. The "self-help groups" or crisis intervention approaches. This approach focuses on affected individuals and encourages them, through sharing, to

define their experiences and collectively develop resolutions. This concept arrives from social work practice and focuses on how to support the victim through the crisis experienced until the victim can establish a new equilibrium or level of functioning.

Self-help groups have been widely employed to facilitate adjustment to alcoholism, heart disease, cancer, colostrmies, etc. Research on these groups suggests that those who benefit most are those who participant most actively. The benefits of self-help groups lie in developing a sense of control, being able to take action and participating in developing personalized strategies for recovery.

c. Social networks. This approach recognizes that people live within frameworks of reciprocal social contacts. These contacts can be based on kin, neighborhood, workplace, religious ties; persons may participate in multiple and overlapping social networks. Social networks supply information, provide care, run errands, share materials, etc.

It has been documented that, in a crisis situation, that social networks are the most efficient and successful source of aide. For example, in a fire or disaster, the Red Cross usually houses and feeds those lacking

sufficient social networks to be cared for elsewhere. People vary in the number of networks in which they participate and their integratedness within them. This variation is one factor predicting how successfully an individual is able to respond to and overcome a crisis.

d. Individual attributes. Researchers have focused on the individual and his characteristics as a key to successful reponse to trauma. People with more education, better jobs, and more income cope better with crises.

Martin (1975) documents how a physical trauma and its sequelae may actually provide compensation to a person possessing few of the valued attributes in society, i.e., education, work prestige, income. For these individuals, the attention and the justification for a diminished existence provided by a physical injury may actually be rewarding. There may be more psychological gain associated with a disability identification than with trying to maintain a marginal employment and income history.

e. Social setting. The pre-existing social situation in which an injury occurs may predict trauma sequelae. The social stress scale (Holmes and Rahe) quantifies how much stress an individual or family has experienced in a

given time frame. High scale ratings suggest the individual and family is prone to more difficulty in the future due to necessary but unrealized adjustments required by prior events. Adding a physical injury to a high stress situation guarantees that there will be more difficulty recovering from the injury than the injury alone would predict.

f. Disability quantification. Because workmen's compensation programs make payments based on the degree of disability, the workmen's compensation literature offers ways to quantify a disability relative to an invididual's potential to perform work to which he is suited. (Martin 1975) The magnitude of the disability caused by a given injury is thus estimated for an individual. However, this approach is only partial because therre is no assessment of the impacts of the injury on the individual's personality, family, and community.

g. Comprehensive approaches. The most comprehensive approaches to understanding trauma sequelae located to date are written by Powers and Dell Orto (1981), Bray and Romano (in Powers and Dell Orto, 1981). These approaches are comprehensive because they include at least the following areas: the individual's personality and emotional adjustment, characteristics of the injury, family reaction, life cycle stage or age of victim, availability of special facilities or therapeutic intervention. In addition, Powers and Dell Orto suggest reactions to previous crises and work history are important factors in evaluating how severe the trauma sequelae will be. It is interesting that Romano, who investigated trauma sequelae of severe closed head injury (victims were young people who had had automobile accidents) added community response to his approach because his subjects experienced exclusion and social avoidance due to inappropriate behavior.

The Drivers/Passenger Differation

The NHIS data base and the trauma analysis does not distinguish between accident victims who are drivers, passenger and pedestrians. Yet, one would expect that the demographic profiles of driver-victims differs from the profile of passenger-victims and pedestrian victims. For instance victims under 16 years are nearly always passengers and pedestrians, and a victim, male, 45 years of age is probably more likely a driver than a 45 year old female victim, though in this example the differences are less pronounced than in the former.

NASS is the only major accident injury data base that distinguishes between drivers, passengers and pedestrians. The two data bases can be linked demographically through age, sex, height and weight. To the extent that in NASS one can establish stable demographic matrix-cell relationships for the driver and non-driver population, this relationships can then be superimposed on the NHIS data base and the trauma analysis.

The feasibility of this approach to obtain driver/non-driver differentiation will be tested in the proposed study.

Driver Performance by Zip Code

The California Department of Insurance has made a study of California Driving Performance by Zip Codes. This study covers the years 1973 to 78 and categorizes by zip codes:

(1) number of licensed drivers;

(2) average years of driving exposure;

(3) number of drivers currently under suspension or revocation;

(4) number of drivers involved in personal injury;

(5) number of drivers involved in all reported accidents and the number of those accidents;

(6) number of drivers with major traffic violations convictions and the number of those convictions;

(7) number of drivers with moving traffic violation convictions and the number of those convictions;

(8) number of drivers with non-moving traffic violation convictions and the number of those convictions;

(9) total number of drivers with traffic violation convictions and the number of those convictions;

(10) the number of drivers with "failure to appear" convictions and the number of those convictions

This data base when merged with Bureau of the Census 1970 and 1980 Zip Code data basis can yield rather detailed data on the socio-economic environment of drivers involved in accidents that cause injuries, thus strengthing the analysis under Task A with regional and household variables.

Any decision on the usefulness of an analysis of this zip code data base should await the completion of the analysis with the NHIS data base.