Programmatic Interventions with the Older Driver: A Conceptual Framework

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Chapter to appear in: K.W. Schaie, H.-W. Wahl, and H. Mollenkop (Eds.), *Aging in the Community: Living Arrangements and Mobility.* New York: Springer.

Introduction

This volume focuses on the dilemma facing the older driver in western society. The concerns are perhaps most acute in North America given the singular dependence on the auto for many aspects of daily living. The private auto remains the primary model of transportation in the U.S. with persons over age 65 making more than 90 percent of their trips by private vehicle (AARP, 1999). In 1983 a little over half of adults aged 65 and older were licensed drivers; now over three-quarters of elderly are licensed drivers. A recent survey in the U.S. found that almost three-quarters of elderly over the age of 75 still drive (AARP, 1997). Alarm has been expressed over emerging demographics suggesting the increasing magnitude of the problem in the near future as the baby boomers in the U.S. and in Europe approach old age and particularly old-old age (AARP, 1999; Schlag, 1993).

There is widespread recognition that major societal efforts to intervene into this phenomenon are required. Much debate is centered on intervening at the person versus environmental level (Schaie & Pietrucha, 2000). Government agencies are spending considerable effort at developing new, more appropriate tools for assessing older drivers - often with little forethought to what interventions are appropriate and feasible with older adults who are identified as having deficiencies when assessed with these new assessment tools. There is agreement that broad programmatic intervention efforts are needed. However, most current intervention efforts are quite small scale and are designed for specific limited geographical areas (Freund, 2000).

In this chapter a heuristic known as the lifespan intervention cube is presented to foster consideration of intervention efforts from a broad

programmatic perspective. Programmatic interventions are seen as multidimensional such that a number of dimensions must be considered in combination when planning and evaluating intervention efforts. The intervention cube also serves as a schema for examining the scope of current intervention programs and for identifying missing niches within current intervention efforts.

Lifespan Driving Intervention Cube

The driving intervention cube is shown in Figure 1. It is adapted from a model proposed by Brim and Phillips (1988). The cube indicates that at least three broad dimensions must be considered in conceptualizing programmatic interventions. The three dimensions of the cube are: a) Age, b) Target of the intervention, and c) Domain of intervention.

Age at Intervention

The age dimension focuses on the chronological age of the person or group targeted for the intervention. Intervention into driving is seen as a life-span phenomenon (Baltes & Danish, 1980). The age of the target may range from adolescence to old age. We have also included the category of nondriver, which is more likely to represent old-old adults but may be a status at any chronological age. Although the focus here is on the older adult driver, a lifespan perspective of intervention is required for several reasons. First, driving skills and attitudes are typically developed early in the lifespan, and the older driver's performance and judgements represent the accumulation of experiences over the entire adult life course (Evans, 1991). Second, similar

services and venues may be relevant for interventions with drivers of different ages, and hence a lifespan perspective is useful.

In many driving interventions the *level of functioning* of the target person or group may be a more appropriate indicator than chronological age per se (Fozard, 2000; Staplin, 2000). For example, a recent national survey in the U.S. focusing only on elderly over age 75, found that 73% of elders over the age of 75 still reported some driving activity - 89% of males and 64% of females (AARP, 1997). Given that such a large percentage of old-old continue to drive in the U.S., functional age rather than chronological age becomes increasingly important to consider, given the wide individual differences in functional competence within the old-old. When such a perspective is taken, this dimension represents functional age with respect to driving. Functional driving age may take into account factors such as cognitive skills related to driving, sensory limitations, mobility, and support systems (Fozard, 2000). Functional limitations such as hearing and visual impairment have been found to be important predictors of when older adults curtail driving (Ball & Owsley, 2000; Schlag, 1993). Functional competence rather than chronological age is also important in cases of cognitive impairment. In the U.S. Only 4% of those diagnosed with Alzheimer's are believed to continue to drive. However, these AD drivers are 2 to 4 times more likely to be in a crash than non demented elders.

Whether age is considered chronologically or functionally depends in part on the domain of the intervention. For example, many legal approaches to

intervention are based solely or primarily on chronological age - age of eligibility to drive and age or specific driver renewal criteria. Likewise, many social programs have chronological age eligibility criteria for certain services.

Target of Intervention

The second dimension of the cube focuses on the target of the intervention. The target of intervention may be at the individual/group level or at the environmental level. Interventions targeted at the individual/group level extend from the individual, to family/friends, to communities and society (Smyer & Gatz, 1987). In terms of the driving environment, the vehicle, the roadway, and the traffic control system can be targets of intervention (Hanowski & Dingus, 2000).

Interventions targeted at individual/group. Individual-level interventions typically focus on the psychological, physical health, economic or social functioning of the person (Smyer & Gatz, 1987). A key assumption is that the intervention is targeted primarily at the person, with little or no attempt to intervene into his/her primary social or physical context. In contrast, intervention at the level of family/friends focuses on the primary social context of the individual. Some community psychologists maintain that a family systems perspective is needed for responding to the individual's mobility needs and concerns; focusing solely on the individual outside of the social context may limit the scope or durability of the intervention (Gesten & Jason, 1987). Community and society-level interventions have as their desired outcomes improved functioning at the community or societal level. Community level

interventions would include van services, share-a-ride, and educational efforts to increase use of mass transportation options (Freund, 2000; Sterns & Sterns, 2000). Societal-level interventions include both citizen-initiated programs (e.g., MADD - Mothers against Drunk Driving) and government initiated efforts, such as the public information campaigns on seat belt usage. Societal level intervention may also involve social policy initiatives or enactment of laws and regulations.

Interventions targeted at the driving environment. The driving environment includes the vehicle, the roadway and traffic control systems (Hanowski & Dingus,2000). Vehicle-related interventions include devices, such as air bags, anti-lock braking and obstacle detection systems (Swigart, 2000). Interventions into the roadway that have been shown to be particularly relevant to older adults include traffic signage and markings, reflective pavement markings, traffic lanes, shoulder rumble strips, and left lane markings (Jovanis, 2000).

The distinction between targeting the individual driver versus groups of drivers for intervention is also relevant for intervention into the driving environment. Vehicle-related interventions are focused on the individual driver, while roadway and traffic control system interventions are targeted at large groups of drivers at the community or societal level. A recent national U.S. study found that at least thirty percent of older drivers reported feeling uncomfortable with specific physical design aspects of roadways or traffic situations that they routinely encountered (AARP, 1997). Over one third

reported changing their driving patterns to avoid certain roadway or traffic situations. Over fifty percent of older drivers report avoiding night driving and avoiding rush hour traffic.

Domain of Intervention

The third dimension of the driving intervention cube is concerned with the domain or mechanism of the intervention. Five broad intervention approaches are suggested.

Education. Educational programs have been one of the most common approaches to driving interventions. Educational interventions range from a) training on specific cognitive skills related to driving, to b) educational programs targeted at specific groups such as 55 Alive (AARP, 1999), to c) broad public service informationals alerting drivers to keep a certain distance from the car in front or to use seat belts.

Education-based driving interventions for older adults are generally provided by three sources: by nonprofit organizations or the private sector, by state driver education programs, and through self assessment materials. Most educational intervention have focused on disseminating *information*; far fewer programs have focused on actual training of a specific skill or driving ability (Ball & Owsley, 2000). The AARP 55 ALIVE/Mature Driving program is completed by 640,000 older drivers annually (AARP, 1999). A major incentive for attending driving renewal programs is that 34 states and the District of Columbia have laws that require insurance premium discounts or reductions in infraction points for older people who take an approved driving course such

as 55 ALIVE (AARP, 1999).

Social services. A second intervention approach has focused on the provision of services either to all citizens or to targeted groups, particularly groups of a certain age. Many of the traditional social services for the elderly have been targeted either at elders making the transition from driving to not driving or to frail elderly needing special assistance with transportation. These services include van services and share-a-ride (Freund, 2000; Sterns & Sterns, 2000), Also included are special incentives (fee reductions) for use of public transportation and devices such as wheel chair lifts to aid in use of public transportation,

While these types of interventions have traditionally been provided by community or governmental systems, the business/for-profit sector is becoming increasingly involved. Social or governmental agencies are either contracting with the for-profit sector to provide these services or business is providing alternatives to the increasingly limited options provided by social services. Similarly, business is also moving into educational interventions related to driving.

Public transit has been recently touted as an option for elderly in the U.S. (see Burkhardt, 2000, for alternative position). However, in the U.S. public transit accounts for only 3% of all trips taken by those aged 65 and over. Over 85% of nondrivers report that they do not use public transportation, citing lack of availability, inconvenience, and physical problems in usage. In a recent survey, 55% of nondrivers reported that a bus

stop was further than they could walk; however, 32 percent of the nondrivers who could not walk to an existing bus stop said that they would be able to walk if a bus stop was within 5 blocks of their residence (AARP, 1997).

Engineering and human factors . Instead of targeting the individual, most engineering and human factors interventions are focused on the vehicle or roadway (Hanowski & Dingus, 2000). The focus is on altering or intervening into the physical driving environment. These types of interventions are sometimes presented as requiring little initiative or effort on the part of the individual. However, as these interventions become more cognitively complex, the competence of the individual using them is becoming increasingly important (Willis, 2000). For example, navigational systems in cars require that the individual be cognitively able to program and then to interpret the information provided by the device.

Legal system. The legal system intervenes by regulating all phases of the driving experience - determining who is allowed to drive, when and where one is allowed to drive, one's conduct while driving, and under what conditions one's driving privileges are restricted or revoked (U.S. Roads-TranSafety, 2001).. Two types of legal actions are directly relevant to older drivers: Graduated licensing laws and age-based licensing laws (Insurance Institute for Highway Safety, 2001).

Graduated licensing laws have been enacted by approximately one-third of the states in the U. S. These laws enable the state to identify driving conditions under which a particular driver's privileges might be restricted, and

then to issue a graduated license that restricts the person from driving under those unsafe conditions. Holders of graduated licenses can be licensed to drive only under specific conditions relating, for example, to time of day, destination, or type of vehicle.

Age-based licensing laws vary from state to state, but often involve what is known as accelerated renewals (Insurance Institute for Highway Safety, 2001). These renewals require that above a certain chronological age individuals renew their licenses on a more frequent time interval than younger drivers. In addition, some states require special testing or personal appearances at the time of license renewal for older drivers. Accelerated renewal and testing may create a disincentive for older drivers to attempt to renew their license. At this time there has been limited research to determine whether age-based requirements result in removing unsafe older drivers or in simply reducing the number of older drivers whether they are safe drivers or not (AARP, 1999; U.S. Roads-TranSafety, 2001).

The particular intervention approach chosen often reflects basic assumptions regarding the primary causes of particular driving problems. These assumptions are often not explicitly stated. For example, many driving education programs, such as 55 Alive, are based on the largely untested assumption that *lack of information* regarding driving underlies the poor driving performance of elders. The instructional format for these educational interventions, furthermore, is based on the assumption that the needed information can be provided in lecture format in a group setting. In a related

manner, the legal system often appears to be operating under the assumption that punishment (financial, revoking license) of certain driving behaviors (e.g., speeding) is the most effective intervention to modify that behavior.

Driving Interventions: Combining Dimensions of the Cube

A particular driving intervention represents a combination of the above three dimensions of the cube. An intervention is typically focused on a certain age group. The target of the intervention can range from particular individuals to all drivers in a community, or may target the vehicle or road way. In addition, a particular intervention involves a certain intervention approach, such as education, provision of services, or a legal action. By examining the portion of the intervention cube enclosed by a particular intervention, we gain a better understanding of the extent to which interventions are programmatic in nature (Brim & Phillips, 1988). Interventions that cover all age groups of drivers versus those targeted at a particular age group can be examined. Considering various parts of the cube indicates how different approaches to interventions intersect with certain targets of intervention.

Cells, Plugs, Bars.

The smallest unit of intervention would be an *intervention cell*, focusing on one specific age group (e.g., old-old), one target of intervention (e.g., individual) and one domain of intervention (e.g., legal). An intervention representing only one cell in the cube is quite narrow or focused in the impact of the intervention. By mapping various existing programs or interventions onto the cube, different shapes appear - plugs, bars, slices, blocks, as well as

single cells. The shapes of the intervention units reflect how broad the age group or target is for the intervention, and what mechanism for intervening is most likely to be employed in relation to a particular driving concern or problem (Brim & Phillips, 1988). Different societies or countries may have very different shaped intervention units to deal with the same driving problem or concern. Also the shape of intervention units for the same driving problem may change over time. We will illustrate these issues with a few prototypical types of driving interventions.

1. Intervention Cell (Figure 1)

An example is *Age-based Licensing Laws.* Some states in the U.S. have special assessment and renewal procedures for drivers above a certain age. The intervention is focused on a particular, *narrow age group* (the old), The *legal* system is the domain or mechanism by which the intervention is administered. The *target* of the intervention is at the level of the *state*, indicated in the intervention cube as at the community or societal level. Such a narrowly targeted intervention would be represented by an intervention cell.

2. Intervention Plug. (Figure 2)

An example is *Driving in Hazardous Weather Conditions.* Many of the recent interventions dealing with driving during dangerous weather conditions have involved *engineering and human factor efforts* (domain). These have focused on interventions in the *vehicle and/or roadway* (target). These intervention efforts have typically not been specifically focused on a particular age group, but have been standard features of vehicles or roadways that affect

drivers of all ages. This type of intervention would thus represent a plug, extending across all ages, with the target of intervention being the vehicle or roadway and the intervention approach based on engineering or human factors.

Another example of a plug-shaped intervention is *Seat Belt Usage*, illustrated by *educational interventions* targeted at the *community or societal* level. These include public service educational initiatives to encourage seat belt usage or to keep a certain distance from the proceeding car while driving. These educational interventions are targeted at *all age groups* and are focused at the community or societal level.

3. Broken Bars (Figure 3)

We can alternatively think of combinations of interventions that are targeted at a special population group, such as the elderly. These represent broken bars within the intervention cube. For example, there are interventions focusing on the young-old and old-old that involve services at both the individual and community level. These may include education, social service and legal approaches to intervention. For example, services focusing on elderly with driving limitations might include driver education, alternative transportation services (social services), and legal restrictions on time of day driving is permitted.

Considerations related to the Point of Intervention

There are a number of additional issues related to programmatic driving interventions that merit further discussion.

Target of Intervention: Active or Passive

The dimensions of the cube related to target and domain may be reconceptualized in terms of the extent to which the intervention represents a continuum from active to passive decision making (Evans, 1991). Active versus passive interventions are conceptualized in terms of the *number of decision makers* and the extent to which the intervention reflects *volitional actions* at the level of the individual. Targeting the intervention at the level of the individual suggests a form of intervention that involves volitional acts on the part of many decision makers - the most *active* form of intervention. Interventions targeted at the individual, such as driver education or seat belt usage, require many decision makers making volitional acts to implement the intervention.

In contrast, targeting interventions at the level of the vehicle or roadway typically involves interventions in which there are fewer decision makers and may require fewer volitional acts on the part of the individual - thus characterized as a more *passive* form of intervention. Passive interventions involving the vehicle or roadway include air bags or anti-lock braking in vehicles, and roadway designs that are imposed on all drivers.

Voluntary versus involuntary. A related dichotomy is voluntary, individually-based interventions vs involuntary, legislative-based interventions. Voluntary individual-based interventions may be of two types. First, voluntary interventions may take the form of self regulation (Dobbs, 2000; Evans, 1991). Three forms of self regulation are: compensation, avoidance, and cessation. For example, individuals decides to self regulate their driving behavior by

avoiding driving while drinking, or *ceasing* night driving, or *compensating* for possible deficits by involving a co-pilot. The second form of voluntary, individual-based interventions focuses on educational efforts, such as 55 ALIVE.

With regard to self regulation, Evans (1991) has suggested that one of the limitations to interventions based on self regulation is that individual drivers may not be able to identify major driving risks from their own direct driving experience. There is often a sparsity of useful personal feedback available to the driver to use in making a judgement regarding self regulation. Given the low incidence of serious auto crashes, the individual driver has little information on which of his driving behaviors might double or triple his likelihood of being involved in a serious crash.

It has been argued that passive or involuntary interventions with few decision makers are likely to have the most wide-spread effects on road safety. It is asserted that such interventions may be much more efficient to implement in the society as a whole. There are, however, limitations on the types of driving problems that can be easily resolved using solely passive type interventions. For example, there are limitations to passive interventions for driving situations that required complex decision making, such as safely executing a left-hand turn. It may be argued that as the complexity of the driving situation increases, the difficulty will increase in devising a completely passive, non-volitional intervention to deal with the situation. Some form of conscious action on the part of the driver will often be needed.

Timing of the Intervention: Primary, secondary, or tertiary.

A key issue in prevention intervention research has focused on the timing of the intervention (Smyer & Gatz, 1987). *Primary prevention* is defined as occurring before the problem arises. In terms of driving interventions this would include crash avoidance interventions. *Secondary* prevention occurs after the initial identification of the problem but before serious harm has arisen. Secondary prevention efforts involve prompt treatment of identified problems. Secondary prevention efforts may be particularly important in terms of intervention efforts with the elderly. Secondary interventions might be initiated after a fender bender in which no one was injured, after a driving assessment, or after a "near miss." Although secondary interventions are often implemented at a different time in the etiology of the problem, many of the interventions may be similar to those included as primary interventions. *Tertiary* interventions occur after substantial problems have arisen. In terms of driving, this would include crash protection interventions, or withdrawal of driving privileges after an accident.

A complete model of driving interventions must consider the range of interventions from those to avoid crashes (primary prevention) to interventions to protect during a crash (tertiary intervention). Most interventions focus on primary prevention or crash avoidance (Evans, 1991). However, a number of the engineering and human factors approaches targeted at the vehicle, in particular are aimed at protection during a crash. These include air bags, seat belt restraints, and materials (shatter proof glass, padded dash boards) to

reduce the likelihood of injury during a crash. Many of these interventions aimed at protecting during a crash can be labeled as passive, rather than active.

Interventions focused on crash avoidance include both passive and active interventions. Many of the same types of intervention may be involved in primary prevention and secondary prevention efforts. Active crash avoidant interventions include education, possible use of co-piloting, and driving restrictions for time of day or certain types of roadways. Passive crash avoidant interventions include road construction and vehicle equipment such as obstacle detector systems and anti-lock braking, Although crash avoidant interventions are more frequent and have been given greater attention, they are often much more difficult to evaluate. Part of the difficulty in evaluating crash avoidance interventions is in documenting and counting the incidents of crash avoidance. Active crash avoidance interventions are particularly difficult to evaluate. In contrast, crash protective interventions, implemented during a crash, and particularly those which are passive, are considered the easiest to evaluate.

Research shows that public attitudes toward interventions are influenced by the evidence demonstrating an identifiable survivor or beneficiary of an intervention (Evans, 1991). It has been much easier to document survivors or beneficiaries of crash protective interventions, particularly of the passive type, than beneficiaries of crash avoidance interventions. This characteristic of public attitudes toward interventions may contribute to the difficulty in

obtaining public support for and adherence to certain types of crash avoidant interventions.

Summary

In this chapter we have discussed issues related to programmatic interventions with the older driver. We have argued that programmatic interventions need to be conceptualized as multidimensional. We have presented an intervention cube as one schema for thinking about programmatic interventions into driving. The three dimensions of the cube included: the age group, the target of the intervention (individual, community, vehicle or roadway), and the domain or mechanism for administering the intervention. Common intervention mechanisms include education, provision of services, human factors and engineering, and legal actions.

Each intervention mechanism is based on assumptions that are rarely articulated fully. For example educational interventions assume that the driver's deficit is due to a lack of knowledge. Current educational interventions focus on dissemination of factual information with much less focus on developing skills and enhancing actual driving performance. Legal-based interventions often assume that chronological age rather than functional age is an appropriate criterion for determining the group to be the target of the intervention (fozard, 2000).

By considering various existing interventions with respect to the intervention cube, we can begin to determine what types of programmatic interventions represent certain cells, plugs or blocks of the entire cube. We

suggest the cube has heuristic value for examining what aspects of the cube characterize existing interventions and what future interventions might be needed to involve other dimensions of the cube.

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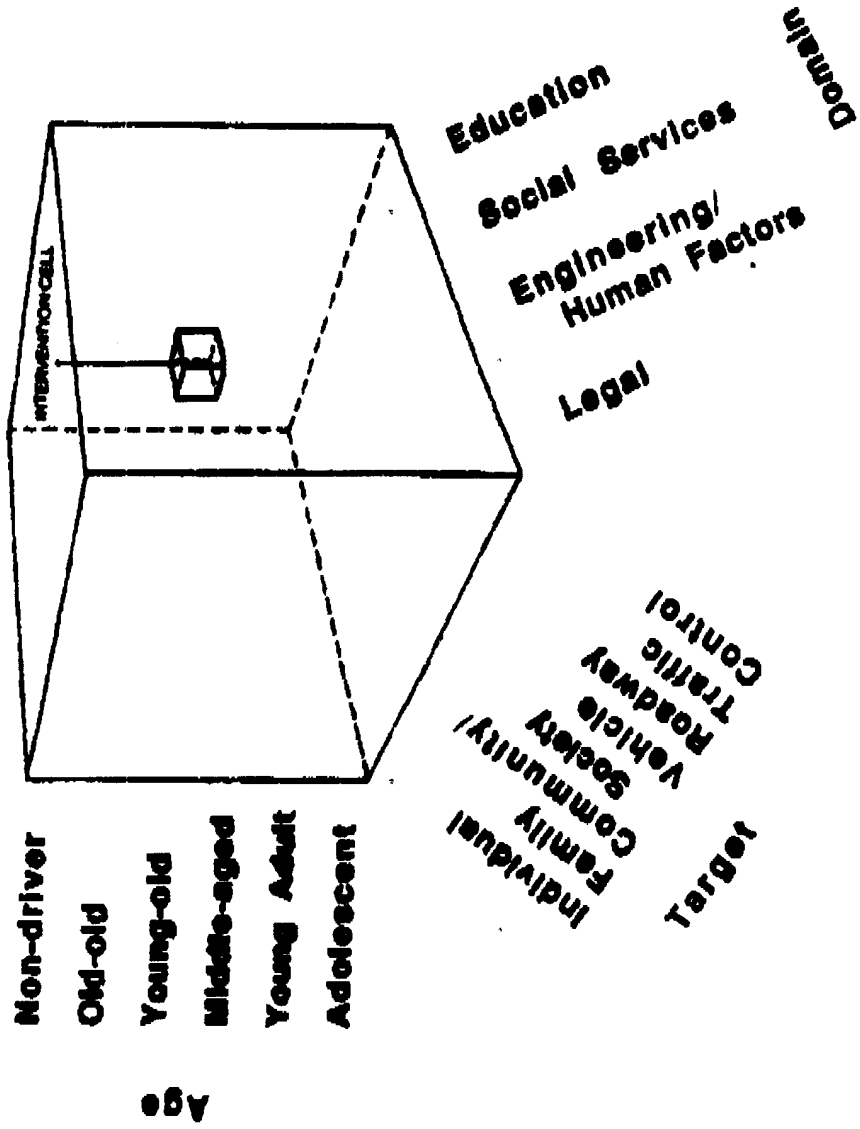
Figure 1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INTERSECTION CELL

Figure 2

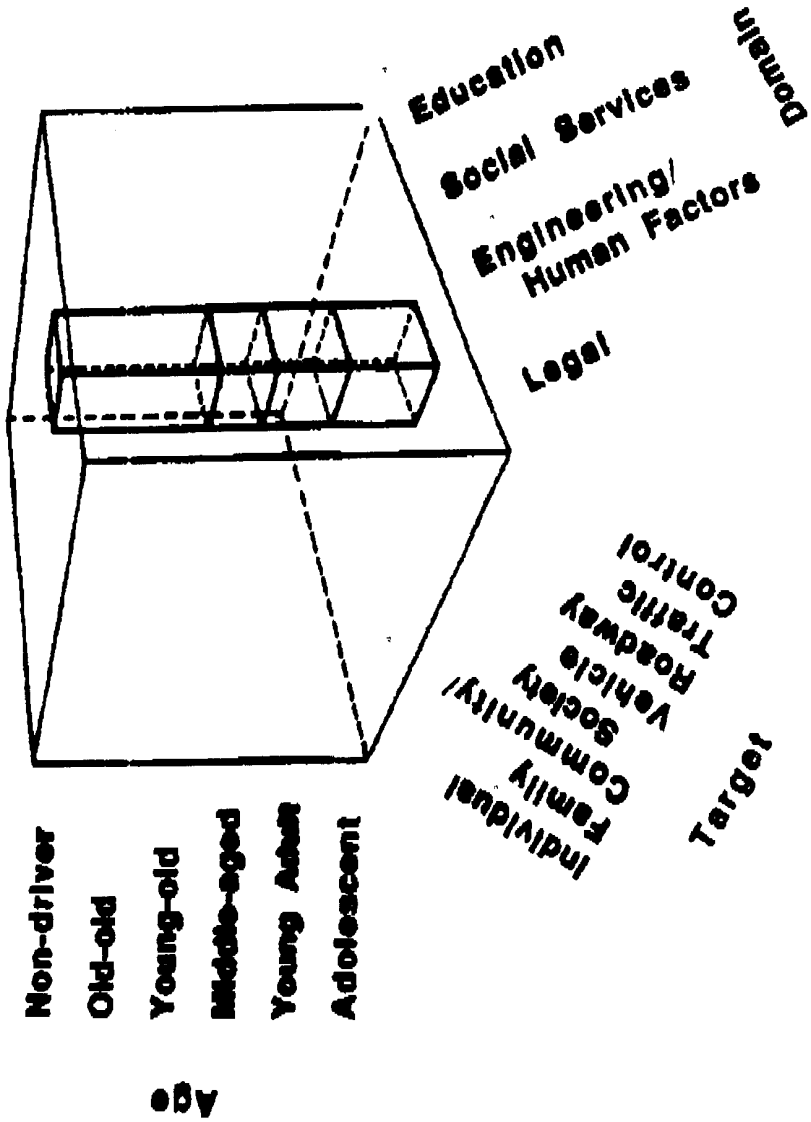
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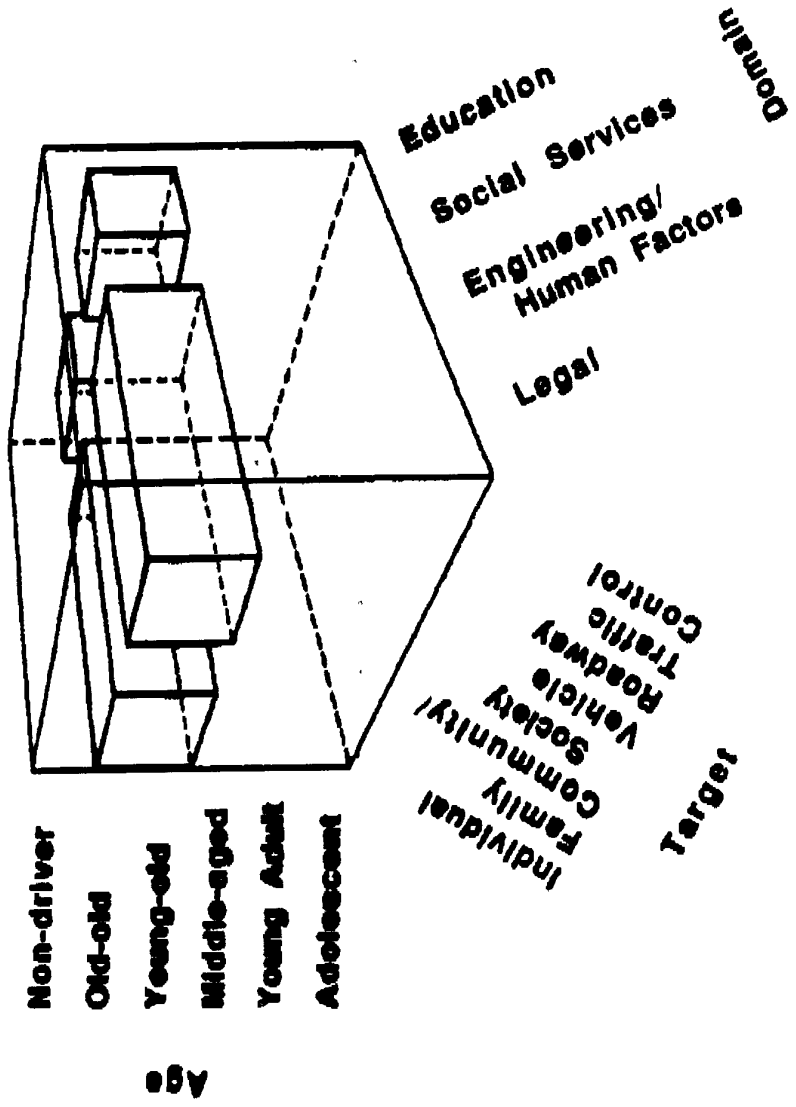
Figure 3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