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Position paper

Analyzing accidents and developing elderly driver-targeted measures based on accident and violation records

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ABSTRACT

For this study, we performed a variety of analyses using the Institute for Traffic Accident Research and Data Analysis' Integrated Driver Database with traffic accident and violation records. The database integrates driver management data and road traffic accident statistics data, making it possible to explore the relationships among driver attributes and road traffic accident characteristics in considerable detail.

By controlling our compilation conditions and refining our sets of driver attributes, our analysis showed that drivers who experience accidents drive more carefully immediately after an accident, revealed high accident rates among drivers who have experienced certain violations, and produced other findings that could constitute a foundation for developing individual driver-targeted measures. Our analysis of large age groups, meanwhile, showed that drivers with a history of numerous accidents or apprehensions/violations are more likely to cause accidents.

The Integrated Driver Database with traffic accident and violation records boasts an expansive scope, covering all of the 81 million licensed drivers in Japan, and features 200 variables pertaining to driver attributes, accidents, and violations. In addition to letting users refine their focuses by driver age, sex, and place of residence, the database also enables analyses that account for lifestyle-related variables like when drivers received their licenses and whether drivers have moved to new addresses. The sheer diversity of driver attributes in the database makes it a promising resource for formulating driver-targeted measures.

1. Introduction

A wide variety of traffic accident countermeasures has helped reduce the numbers of traffic accidents, traffic accident casualties, and traffic accident fatalities in recent years, but experts suggest that the government will need to make further efforts in order to meet its goal of bringing the number of traffic accident fatalities to 2500 or less by 2018. Human-targeted measures, especially driver-targeted measures like safety education programs, enforcement initiatives, and other non-structural measures, often defy systematic evaluation; compared to measures geared toward roads, road facilities, and vehicles, these people-oriented measures still have considerable room for improvement and exploration.

The general presumption is that most drivers try to improve on their past mistakes in order to avoid causing the same type of accident or committing the same type of violation again, but this assumption does not hold for all drivers: some demonstrate recurring accident or violation patterns. Devising effective driver-targeted measures that take specific aim at the characteristics of these recurring accidents and violations requires more than just analyses of individual accidents and violations–investigations need to focus on the accident and violation records of individual drivers.

Created in 1992, the Institute for Traffic Accident Research and Data Analysis has compiled road traffic accident statistics data and driver management data into an integrated database that allows users to examine the relationships among driver accident records, driver violation records, and the occurrence of accidents in both qualitative and quantitative terms.

This report presents examples of analyses that we performed using the Institute for Traffic Accident Research and Data Analysis's Integrated Driver Database with traffic accident and violation records, which combines road traffic accident statistics data and driver management data, and discusses approaches to using the database in developing measures that target elderly drivers and other members of the driving population.

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2. The need for integrated driver data with accident and violation records

2.1. Road traffic accident statistics data

The Japanese National Police Agency maintains data on hundreds of thousands of traffic accidents that have resulted in personal injury or death. This collection of road traffic accident statistics data includes over 100 variables, including basic characteristics of each accident (date/time, location, weather conditions, collision configuration, and cause, etc.), the attributes of the vehicle(s) involved (vehicle type and configuration), the attributes of the individuals involved (road user type, age, and sex), maneuver, damage, and the attributes of the road where the each accident occurred. Not only does this set of data serve as the basis for yearly reports and publicity materials from government agencies and other organizations, but it also provides specialists and other individuals with resources that they can use to evaluate traffic accident conditions, assess the effects of measures and policies, and research traffic safety measures.

Many countries around the world gather road traffic accident statistics data. Although the data format and the number of variables vary from country to country (Table 1), many variables–including accident date/time, weather conditions, victim age, victim sex, road usage conditions, vehicle type, road type, and road configuration–are core pieces of virtually every country's data tracking procedures. With efforts to define and standardize variables making continued progress, the OECD has begun to construct an integrated database of its member countries' variables in order to facilitate international comparisons of traffic accident conditions (http://www.internationaltransportforum.org/irtadpublic/about.html).

2.2. Limits on the analysis of road traffic accident statistics data

Countries often bring in data from other databases to enrich the data that they collect on road traffic accident statistics; Japan and the United States, for example, consult databases of driving records to incorporate information on any past accidents and apprehensions/violations in the records of the drivers involved. While augmenting road traffic accident data may allow users to bring new investigation items into analyses of accidents in general, there is only so much that these enhancements can do for analyses of the drivers involved.

Given the breadth of human diversity, accident driver analyses need to classify drivers not only by sex, age, and occupation but also according to accident records and violation records for various types of incidents. Traditional approaches have allowed for analyses of the drivers involved in accidents, but the lack of any information on the general statistical population (including those not involved in accidents) has hampered efforts to make quantitative assessments of driver attributes (diversity).

Integrating road traffic accident statistics data with driver management data that includes information on driver attributes thus makes it possible to obtain information on all drivers not involved in accidents—the general population that plays an integral role in any quantitative analysis.

2.3. Prior research: the usefulness of data in the Integrated Driver Database: analysis example 1 [3]

The Institute for Traffic Accident Research and Data Analysis began by extracting a set of drivers from the driver management file at an extraction rate of 0.1% to ensure that the data volume would not exceed the performance capacities of our computers and software. The Institute then used an integrated database of accident and violation records (hereinafter the "Mini Integrated Database") to compile the results.

Based on a subject population of 33,000 male drivers (excluding so-called "paper drivers" [people who have driver's licenses but never actually drive]) from the Mini Integrated Database, Fig. 1 plots the number of drivers (on the y axis) versus the number of rear-end B and broadside collisions that the drivers experienced over the last five years (2001–2005) to illustrate accident distribution.

Table 1
Comparisons of accident report forms in Japan, the United Kingdom, and the United States.

	Japan	Items	UK (STATA 20 [1])	Items	USA (FARS [2])	Items
Type of report form	Accident report form 1 (for 1st and 2nd parties) date, time, city, prefecture, grid reference, weather, light conditions, road surface conditions, road type, type of collision, vehicle type, maneuvers, age|sex|type of persons, helmet|seat belt use, injury severity of persons, and contribution factors.	114	Accident statistics date, time, town, county, grid reference, # of vehicles|casualties, road type, junction detail, weather, light conditions, and road surface conditions.	25	Crash level elements date, time, county, city, # of vehicle forms, # of MV occupant forms, roadway function, type of intersection, light conditions, and atmospheric conditions.	34
					Precrash level elements contributing circumstances| motor vehicle, and roadway surface type.	21 * n
			Vehicle record type of vehicle, hit and run, age|sex of driver, and maneuvers.	23*n	Vehicle level elements unit type, hit and run, and cargo body type.	33 * n
	Accident report form 2 (for other parties) age|sex|type of persons, injury severity, helmet|seat belt use, and seating position.	34*n	Casualty record age|sex of casualties, casualty class, seat belt use, and severity of casualty.	18*n	Driver level elements previous recorded crash, and condition (impairment) at time of crash.	22 * n
	Accident report form 3 (for expressways) vehicle maneuver details, collision details, and object impact details.	23	Contributory factors	6	Person level (MV Occupant) elements age, sex, person type, and injury severity.	24 * n
					Person level (not a MV occupant) elements age, sex, person type, and injury severity.	23 * n
Unique items	Distance from victim's house (for pedestrian/cyclist)		Direction of vehicle travel (N–E–S–W)		Height and weight of driver Emergency medical service	

FARS: Fatality Analysis Reporting System.
MV: moving vehicle.
*n: multiplied by number of vehicles|drivers|persons.