NORTH HAWAII MOTOR VEHICLE FATALITY RESEARCH PROJECT

FINAL REPORT

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Andrew G. Ten Have, M.D., M.P.H.
Research Consultant
Honolulu Health Research
73-1261 Kaloko Dr., Kailua-Kona, HI 96740
Tel. & Fax: (808) 325-7264
E-mail: atenhave@hhrusa.com

Sharon Vitousek, M.D.
North Hawaii Outcomes Project, Director
65-1229 A Opelo Road, Hana Hou Cottage #6
Kamuela, HI 96743
Tel. (808) 887-1665 Fax (808) 887-1474
E-mail: vitousek@nhop.org

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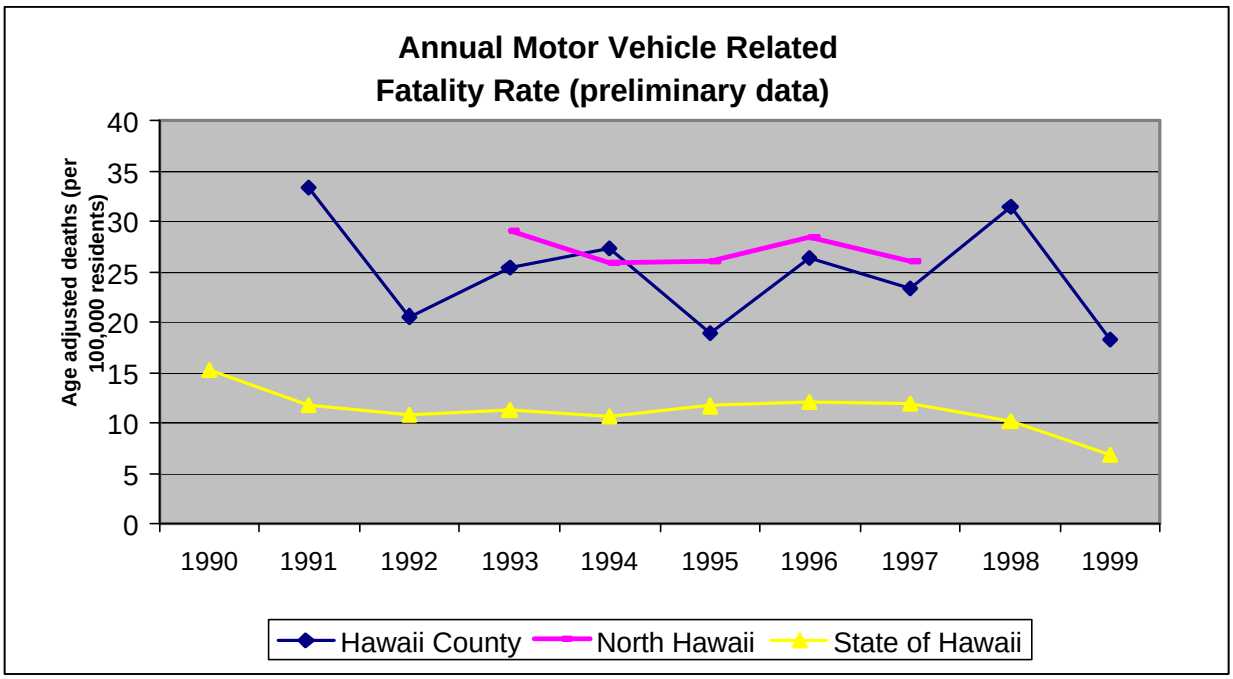
INTRODUCTION

This project was undertaken to further analyze what initially appeared to be a disproportionately high death rate from motor vehicle accidents for residents of Hawaii County and North Hawaii. The figure below shows preliminary data from the North Hawaii Outcomes Project. From 1993 to 1997, there were roughly 20 to 30 fatalities each year per 100,000 residents of North Hawaii; whereas, the Hawaii state average ranged between 10 to 15 during those same years. Fatality rates for residents of Hawaii County as a whole also appeared disproportionately elevated compared to the rest of the State.



Since the differences in motor vehicle related death rates were so dramatic, we undertook a detailed assessment on whether indeed there really is a problem for residents of Hawaii County and North Hawaii. In this project, we re-checked all the actual numbers and the methods used to calculate all ratios. We determined whether the differences in ratios were statistically significant. We also checked with all county and state groups currently working on traffic safety in Hawaii to verify possible disproportionate numbers or rates. Once we verified that the data was real and that the problem is important, we developed a strategy to work incrementally toward lowering the traffic fatality rate in Hawaii County and North Hawaii.

Awareness of the Problem

We were unable to find other organizations or individuals who have independently studied or confirmed a problem with high motor vehicle fatality rates in Hawaii County compared to the rest of the state. However, Hawaii State Department of Health (DOH) did confirm a problem with a significantly higher rate of fatal unintentional injuries from 1996 to 2000 in Hawaii County compared to rates in all other counties. Motor vehicle-related accidents are the major cause of fatal unintentional injuries, which also include falls, drowning and weapon-related injuries. DOH is also aware that motor vehicle fatality rates are

significantly higher in all neighbor islands than in the City and County of Honolulu (Oahu) (i.e., without specifically confirming a special problem in Hawaii County).

Public Awareness

Hawaii residents are very concerned about the safety of transportation within the state. In the summer of 2001 (before September 11, 2001), the Hawaii State Department of Transportation (DOT) surveyed residents as part of the Hawaii Statewide Transportation Plan, published and reported on, April 2002. In terms of planning Hawaii's future transportation needs, statewide residents place "safety and security" at the top of the priority list (91% of residents polled), far above other issues such as "transportation systems working together" (83%), "financing" (80%), "environment" (79%), "quality of life" (78%) and "mobility" (74%). The poll results included many comments, such as "Safety first, more traffic signals. More police on the roads to lessen accidents. More security or citizen watches."

Residents switched their priorities, however, when it came to asking how transportation money could help their own community. "Public transportation" became the number one priority, "access and mobility" was number two, and "safety" dropped to number three. It is not clear how the survey weighed the views of residents of neighbor islands.

Awareness at the National Level

There is a high level awareness of a problem with elevated motor vehicle fatality rates nationally, although we found no evidence that Hawaii is a specific source of concern for federal policy-makers. Elevated rates in both non-metropolitan (semi-rural) and rural regions are partly responsible for the high national average rate of 15 deaths per 100,000 residents in the 1996-1998 period. The U.S. Preventative Task Force and the CDC targets these semi-rural and rural regions in their efforts to lower the average national rate for all regions to 9.3 deaths/100,000 by 2010 (Healthy People 2010 Initiative).

METHODS

The Hawaii State Department of Health (DOH) Injury Control Office in Honolulu and the Hawaii County Police Department provided us with the data for this report. Dr. Dan Galanis, an epidemiologist with the DOH Injury Control Office, provided assistance on statistical issues and data presentation.

Data Extraction

Motor vehicle related fatalities are summarized by the residence census tract of the victim, not necessarily where the crash occurred. The latter approach would require a manual review of the location of injury field on the death certificate, and we do not have the time to do that at present. Data was extracted from death certificates archived over the 1996-2000 period. We counted total motor vehicle related fatalities, including occupants of cars, as well as motorcyclists, bicyclists, and pedestrians. This is the standard way of reporting this type of data.

District Definitions

Districts are composed by the aggregation of census tracts, which match districts outlined by the Department of Business, Economic Development and Tourism of the State of Hawaii. (See Appendix for a map of the district definitions.) For the purpose of this

analysis, the three districts of North Kohala, South Kohala, and Hamakua are grouped together into the region "North Hawaii."

Five-Year Rate Calculations

In order to improve the statistical reliability of differences between rates (i.e., to avoid the "small numbers" problem), fatalities from 1996 to 2000 are grouped together into five-year rates. However, even with this grouping, some five-year district rates are based on few deaths (~20 or fewer). These small number-based rates are statistically unreliable and should be interpreted with caution.

Annual Rate Calculations

At the county level, where there were a large number of deaths over five years, we divided rates by five to calculate an *estimated annual* motor vehicle fatality rate for each county. These estimated annual rates are reported in the 3rd figure of the Data Section below, simply in order to compare the county rates to national averages. In general, only the *five-year rates* should be quoted from this report.

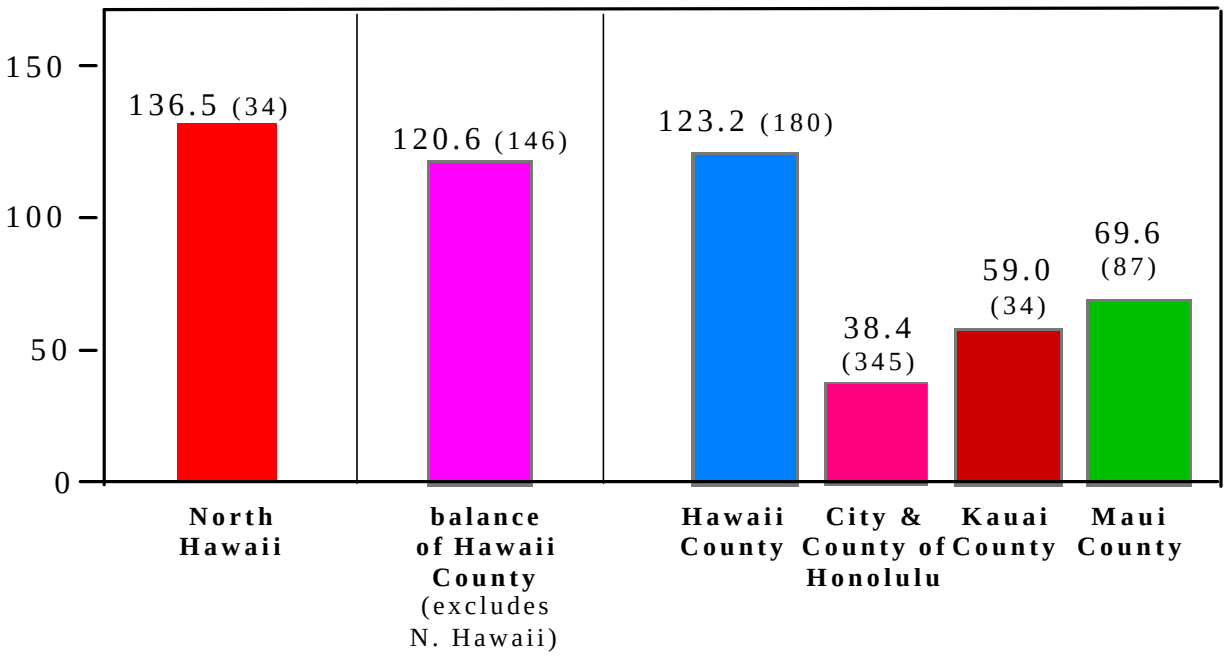
Statistical Analysis

Rates are computed using 2000 population estimates from the United States Bureau of the Census. All rates are standardized for age distribution using the US 2000 population as the reference. (See Appendix VI for further a discussion of the significance of age adjustment in this analysis.) We investigated the statistical significance of differences between five-year rates, comparing age-adjusted and crude rates, as well as different geographic regions, using the chi-square test. Age-specific raw data are not yet available from DOH for performing multi-variate (stratified or logistic) analysis.

DATA

Data are presented both as 5-year mortality rates (bar graphs) and as absolute number of deaths (in parenthesis) over the 1996 to 2000 period, summarized by resident county and district of the motor vehicle accident victim.

5-Year motor vehicle fatality rates (/100,000 residents)
by North Hawaii and county residence,
1996-2000, age-adjusted.
(Absolute number of deaths in parenthesis.)



County Comparisons

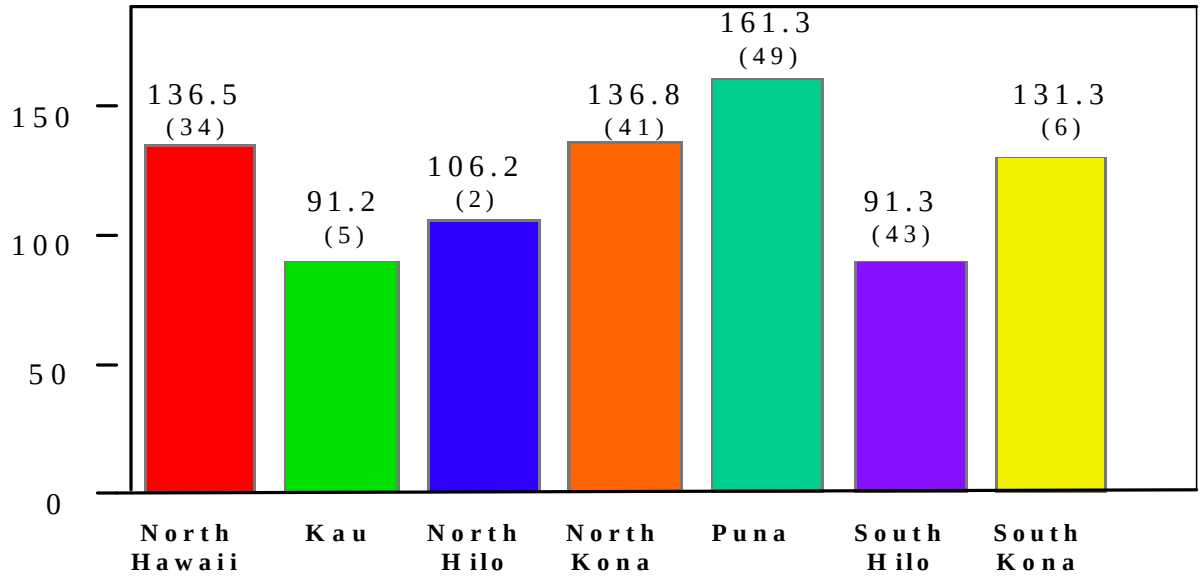
Clearly, Hawaii County and North Hawaii residents have the greatest risk of motor vehicle-related deaths, with five-year motor vehicle fatality rates almost two to three times that in all other counties. All differences between Hawaii County (or North Hawaii) rates and other county rates are statistically significant.

North Hawaii vs. Balance of Hawaii County

Although the five-year motor vehicle fatality rate appears elevated in North Hawaii (136.5) compared to the rate for the rest of Hawaii County (120.56), the difference is not statistically significant. Next we provide detailed district by district comparisons.

District Data

5-Year motor vehicle fatality rates (/100,000 residents)
by district residence within Hawaii County,
1996-2000, age-adjusted.
(Absolute number of deaths in parenthesis.)



North Hawaii vs. Other Districts

Within Hawaii County, rates among residents of North Hawaii were higher than three districts (Kau, N. Hilo and S. Hilo), approximately equal to two others (N. Kona and S. Kona), and less than that computed for Puna. None of these differences are statistically significant, however. It is not clear that higher numbers (cell counts) would make any of the above geographic comparisons statistically significant, so that the rates between North Hawaii and other Big Island geographic areas are quite possibly equal (from a statistical point of view). The one exception may be the difference between N. Hawaii and S. Hilo, which would probably be significant, given higher numbers, and which is consistent with the large fatality rate differences seen between rural and urban areas.

Elevated Rates in the Puna District

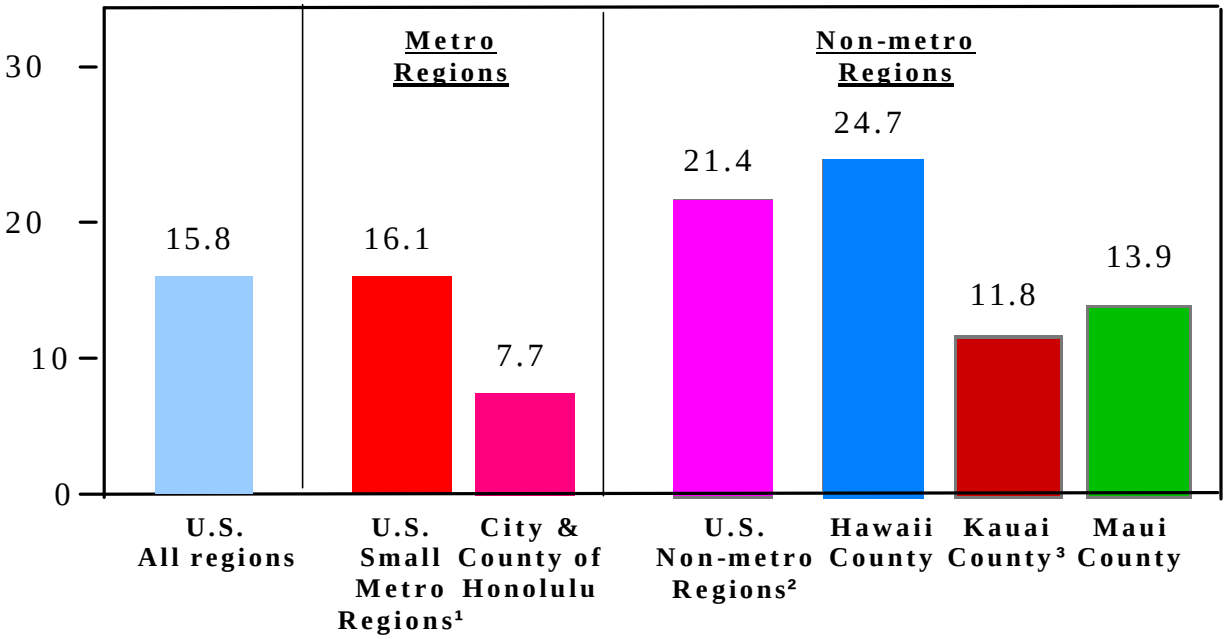
The Puna district stands out as having the highest five-year total motor vehicle fatality rate (161) of all Hawaii County districts. If fact, in district by district comparisons of total rates, only the difference between Puna and S. Hilo (161 vs. 91) was large enough (and in large enough base populations) to be statistically significant, although only marginally. Although Puna is less densely populated than Hilo, Census 2000 results indicate that Puna is one of the fastest growing districts on the Big Island. Fatality rates may be increasing in Puna despite a trend towards urbanization (which usually means lower rates) in the last decade.

National Comparisons using Annualized Data

The following is an annual and national view of the same five-year data presented above. To compare Hawaii County rates with national rates, we needed annual rates, so we divided the 1996-2000 Hawaii rates by five. The disadvantage of this procedure is that it prevents us from performing the chi-square test for statistical differences between the national rates and Hawaii rates you see below.

Additionally, because of the large variation in motor vehicle fatality rates with urbanization, it is helpful to compare Hawaii county rates with national rates in geographic areas with similar metropolitan characteristics. Therefore, the City and County of Honolulu (Oahu) rates are compared to U.S. rates for metro areas with similar populations (<1 million). Likewise, neighbor island rates are compared to non-metro areas with similar population densities (that is, non-urbanized, semi-rural).

Annual motor vehicle fatality rates (/100,000 residents) by residence in national regions comparable to Hawaii counties, average of 1996-2000 (1996-98 for U.S. data), age-adjusted.



¹U.S. small metro region is a county with a city of population greater than 50,000 but less than one million; only the City and County of Honolulu qualifies within the state of Hawaii.

²U.S. Non-metro region is a county with a city of population greater than 10,000 and less than 50,000.

³Kauai County is a U.S. Non-metro region without a city population >10,000 (extreme rural). Nationally, the rate for these regions was 28.3 (96-98). However, because of low absolute number of deaths, the Kauai annual rates are unreliable.

SUMMARY

Although motor vehicle fatality rates appear elevated among residents in North Hawaii, we were unable to confirm a statistically significant difference between rates in North Hawaii and rates in other areas of Hawaii County. The five-year motor vehicle fatality rate in Hawaii County (district average) is significantly elevated, however, compared to the rates in other Hawaii counties. For example, it is approximately two times the rate of Maui and Kauai counties, and three times the rate of the City and County of Honolulu.

Averaging over the five-year period from 1996 to 2000, the annual age-adjusted rate for Hawaii County is 25 fatalities per 100,000 residents. To put this in perspective, motor vehicle-related accidents rank 4th, below cardiovascular disease, stroke and cancer as a cause of death among residents of Hawaii County; whereas throughout the state, motor vehicle accidents rank 9th as a cause of death (using DOH vital statistics for the single year 2000).

In terms of national comparisons, the motor vehicle fatality rate for Hawaii County is higher (25 deaths/100,000) than the national rate for regions with similar metropolitan characteristics (21 deaths/100,000). However, it is unlikely that this difference is statistically significant, although both rates are significantly elevated over the national average (16 deaths/100,000).

Stunning three-fold Difference between Hawaii and City and County of Honolulu Rates

Nationwide, extremely rural counties have rates that are between two and three times the rate in central counties of large urban areas. Surprisingly, the Hawaii County rate is over three times the rate in the City and County of Honolulu. Is this consistent with rural vs. urban rate differences seen nationwide? The answer is probably not, for two reasons. First, Hawaii County does not actually qualify as an extreme rural county, which is defined as a non-metro (non-urban) area *without* a city of population>10,000. Rather Hawaii County is semi-rural, a non-metro area which includes cities with population greater than 10,000 and less than 50,000. Note that the nationwide fatality rate for extreme rural counties is 28, still higher than Hawaii County's rate of 24. Second, the difference in rates between Hawaii County and City and County of Honolulu is exaggerated because of the remarkably low fatality rate in Honolulu, which is half of the national average for areas with similar metropolitan characteristics.

DISCUSSION OF RISK FACTORS

A number of risk factors are associated with increased fatality rates in rural areas:

- Two-lane highways
- Narrow or non-existent shoulders
- Limited sight distance due to hills and curves
- Higher posted speed limits
- Lower rates of seat belt and child safety seat use
- Delays in discovery and extended Emergency Medical System (EMS) response times
- Lack of medical emergency and trauma care facilities

Risk factors unique to Hawaii County may also be at play, such as:

- More frequent alcohol and/or drug use and higher levels of intoxication
- Excess commuting distances, especially by workers holding down two or more jobs
- Larger proportion of light and heavy truck types
- Higher proportion of young male and elderly drivers, known high risk groups
- Driver competency and driver education issues
- More frequent and more severe crashes on gravel roads or off-road

Exposure as a Risk Factor: Vehicle Miles Traveled

There is a lot of controversy in the literature regarding the risks to drivers who put many miles on their vehicles; common sense tells us that rural residents drive more and are therefore more "exposed" to the dangers of vehicle crashes. Early studies found no evidence that the longer distances traveled per vehicle in rural areas (i.e., increased exposure) accounted for higher rural fatality rates; whereas later studies and authors write that approximately half of the increased risk in rural areas may be due to longer distances driven. Clearly, other factors are involved. Many researchers caution that calculating fatality rates in terms of number of deaths per vehicle-miles-traveled may be quite inaccurate and therefore prefer rates based on population data from the national census. (The Federal Highway Administration estimates vehicle-miles-traveled data using an algorithm that includes gas sales, vehicle registrations, vehicle fuel economy data, and other data from the Highway Performance Monitoring System.)

Medical Care as a Risk Factor

Surprisingly, no study has clearly shown that the small size of a hospital is an independent risk factor for increased fatality rates in rural areas, or that geographic variation in the quality of acute trauma care is a significant factor in regional variation in motor vehicle crash mortality. However, trauma center care does improve injury outcomes in hospitalized patients, when compared to care in non-trauma specialized hospitals.

Pre-hospital (i.e., paramedic) delays to the time of Emergency Department (ED) admission are longer in rural areas and this undoubtedly accounts partly for the higher risk of death in rural areas. Average pre-hospital times in urban areas are less than 30 minutes. Contrast this with 105 minutes in rural Vermont and 55 minutes in rural Northern California. Based on anecdotal reports, the average pre-hospital time in North Hawaii probably ranges from 30 to 60 minutes. Further research would clarify this.

Long Discovery Times

On the other hand, rural trauma experts write that most deaths occur at the site of the crash and that prolonged discovery times are problematic while EMS response and transport times are comparatively short. It is very likely that delay in discovery is a major factor in trauma-related death in rural areas.

RECOMMENDATIONS

"Statistics both highlight and obscure the problem they describe…every statistic has its beginning in a single event. And each event has its specific consequences for the victim, for family and friends, and for society at large."

--The National Committee for Injury Control and Prevention (1989)

In an average year the North Hawaii community loses seven people to motor vehicle injuries. Many more are severely injured and are left with long-term physical, psychological and social disabilities. If we could reduce the fatality rate by two people a year over a four-year period, we would save eight lives and untold millions of dollars in disability. The research presented in this report shows that the problem is not unique to North Hawaii. Other Hawaii Island communities face equally elevated traffic fatality rates, which are two to four times the rate on Oahu.

What can we do to prevent these injuries and deaths? By way of example, we now present four possible solutions to the problem, solutions that have been recommended by public health organizations in U.S. counties and other countries with similar problems. This list is by no means exhaustive, and we refer the reader to the bibliography for a more extensive review of the experience outside Hawaii.

1. Providing Public Transportation
   Given that up to half the risk of traffic-related fatalities in non-metropolitan areas is likely due to increased exposure (more vehicle miles traveled per person), we should work to increase the availability of convenient forms of public transportation on the island, such as mini-buses and vans. We could then require that new housing permits be designated only within a certain limited distance of public transportation pick-up and drop-off zones.

2. Increasing Awareness
   Another solution is to start a wide-ranging campaign aimed at increasing the level of awareness. Although motor vehicle injury and fatality rates are high in Hawaii County, the absolute incidence is low, and so there is not the awareness of it as a disease compared to urban areas. The lack of awareness includes public officials and this creates an obstacle to real change. Crash and injury prevention relies on a wide range of different actors: county and state health and transportation departments, law enforcement, communities, media, schools, employers, and healthcare providers. Raising the level of awareness within these organizations that motor vehicle injury is the 4th most deadly disease on Hawaii Island is a prerequisite to crash and injury prevention.

3. Using Scientific Evidence to Allocate Road Improvement Resources
   A third solution would be to work with the Hawaii County and DOT to set up an evidence- based or data driven process, such as the Haddon matrix approach discussed below, to help government allocate and prioritize resources to road infrastructure improvement projects. As the Hawaii County and DOT have already allocated resources and priorities to projects in the short-term, a data-driven process should be expected to deliver benefits in the long-term.

4. New Ways to Fight Drunk Driving
   A fourth example of a solution is to implement any one of a number of innovative approaches to the problem of driving while intoxicated. In Hawaii County, it is estimated that almost 50% of the fatally injured are legally intoxicated. This percentage is not unusual in other regions across the country. Innovative solutions tried in other states include the so-called "scarlet letter" marking of license plates of convicted driving under the influence offenders, lowering of legal blood alcohol limits, mock drunk driving crash drills, mass communication and advertising, designated driver programs, and vehicle confiscation.

First, Gather Better Information

We've provided some examples of solutions to show that realistic options are available for fighting the problem of motor vehicle fatalities in Hawaii County and North Hawaii. However, as we have mentioned previously in this report, before dedicating significant resources to specific interventions, we recommend gathering additional data on the problem in two possible ways; a detailed retrospective review of the data on past fatalities and/or a surveillance system to look at future fatalities.

A systematic, retrospective data review would look at police reports, DOH records, DOT records and possibly hospital records, documenting and describing in detail each of the fatal accidents in Hawaii County over the past several years. A surveillance system would gather much of the same information except in "real time," as injury or fatality events occur. It would be used to explore trends over time, to study the effects of our interventions, or to compare results to other regions. A countywide surveillance system would be more beneficial, but North Hawaii could develop a prototype.

Lessons to be Learned From Non-Fatal Crashes

Although the per-resident fatality rate is elevated in Hawaii County and North Hawaii, the absolute number fatalities is still quite low and prevents us from analyzing specific risk factors for severe crashes on the island. For that reason, and also because crash-related injuries cost millions of dollars in disability, we must also gather data on non-fatal crashes and the resulting injuries. Non-fatal crash data would help us generate reliable statistics on the role of seat belt use, speed, alcohol, etc. on crash outcomes. In this way, data from non-fatal crashes would significantly further our understanding.

Questions That Still Need Answering

These data gathering systems could be used to answer many important questions related to designing future interventions. Here are four examples:

1. **When and where do most fatalities occur?** With accurate and detailed data, we can compile statistics on the time, location and scene of every death. Using this information and working in conjunction with police department, we should develop a highway "black spot program," similar to practice on the mainland U.S. and in Australia, which identifies potentially dangerous locations and focuses surveillance activities and prevention efforts on those locations. Such a "black spot program" would augment current risk management efforts by the County and State, in which priorities for certain

types of highway infrastructure improvements are determined partly by recent traffic fatality locations.

2. **Are discovery times or transport times a problem?** Time, location, and scene of death data would enable us to learn the average times involved in getting trauma patients to the hospital in North Hawaii, for example, gathering statistics on total pre-hospital times, discovery times and transport times for North Hawaii trauma cases. We would then compare these to national, state and county averages. What strategies could be used to decrease transport time? For example, are we using helicopters to the best advantage here or are there changeable factors that now add to the delays between discovery times and transport times?

3. **Do paramedics need better support from physicians in the pre-hospital setting?** Further studies, as recommended above, may reveal that we need to improve access to ER physicians by paramedics needing support for pre-hospital medical decision-making, and that we also need to improve the continuity of care between pre-hospital and hospital levels of care.

4. **What is the role of aeromedical transport in North Hawaii and Hawaii County and can it be improved?** We also recommend studying the role of aeromedical transport in North Hawaii, as it involves two systems: one for transport from crash scene to North Hawaii Community Hospital (NHCH) Emergency Room for stabilization and a second trauma system for transport from NHCH to the trauma center at Queen's Hospital on the island of Oahu. We should understand better how the state justifies use of this dual system. We should look at transport times and fatality rates under the current dual system, and explore options for improving transport times of trauma patients in North Hawaii.

<u>Designing Interventions to Improve Road Safety in Hawaii County</u>

Interventions are generally aimed at three main areas: (1) vehicles and equipment, (2) the roads or (3) human factors. In addition, the time sequence of a crash can be divided into three phases, each offering an opportunity for intervention: (1) pre-crash, (2) crash and (3) post-crash phases. When safety planners apply this time sequence analysis to each of the three possible intervention areas (vehicles, roads, or human factors), they generate the nine possible options of the Haddon matrix (so-called by safety researchers). This matrix, along with some examples of factors known to be important in each cell, is shown in the following table:

Haddon Matrix: Basic road safety elements		FACTORS		
		Human Factors	**Vehicle**	**Road & Environment**
PHASES	**Pre-crash (crash prevention)**	Alcohol and drug intoxication; Public transport.	Roadworthiness (brakes, lights, etc)	Road design (divided highways)
	Crash (injury prevention)	Seatbelt and helmet use.	Crashworthiness (airbags, frame)	Protection (barriers, crosswalks)
	Post-crash (saving lives)	Vulnerability to hemorrhage; first-aid skill	Ease of emergency access; fire risk.	Emergency response system

By gathering more accurate and more detailed data on injuries and fatalities, and by answering some of the questions posed above, we can begin to create a Haddon matrix that is specific for Hawaii County (or North Hawaii). In this way, we can learn how risk factors relate according to their position in the matrix. This evidence-based Haddon matrix for Hawaii County can then be used to guide the design of Hawaii specific interventions.

Conclusion

In assessing public health responses, it is important to consider whether a particular response is appropriate for the community. Nationally, the main focus in recent years has been on behavioral changes, such as seat belt wearing and drunk driving. But further research in Hawaii County may reveal that making the traffic environment safer or improving the effectiveness of pre-hospital and trauma care may be equally important considerations and could yield greater results.

Furthermore, policy-makers can use the experience and knowledge of international, national, and local experts to develop a road safety strategy in Hawaii County. An effective strategy will address these three major gaps in road traffic injury prevention:

1) Inaccurate data on the magnitude of the problem, risk factors and economic consequences.

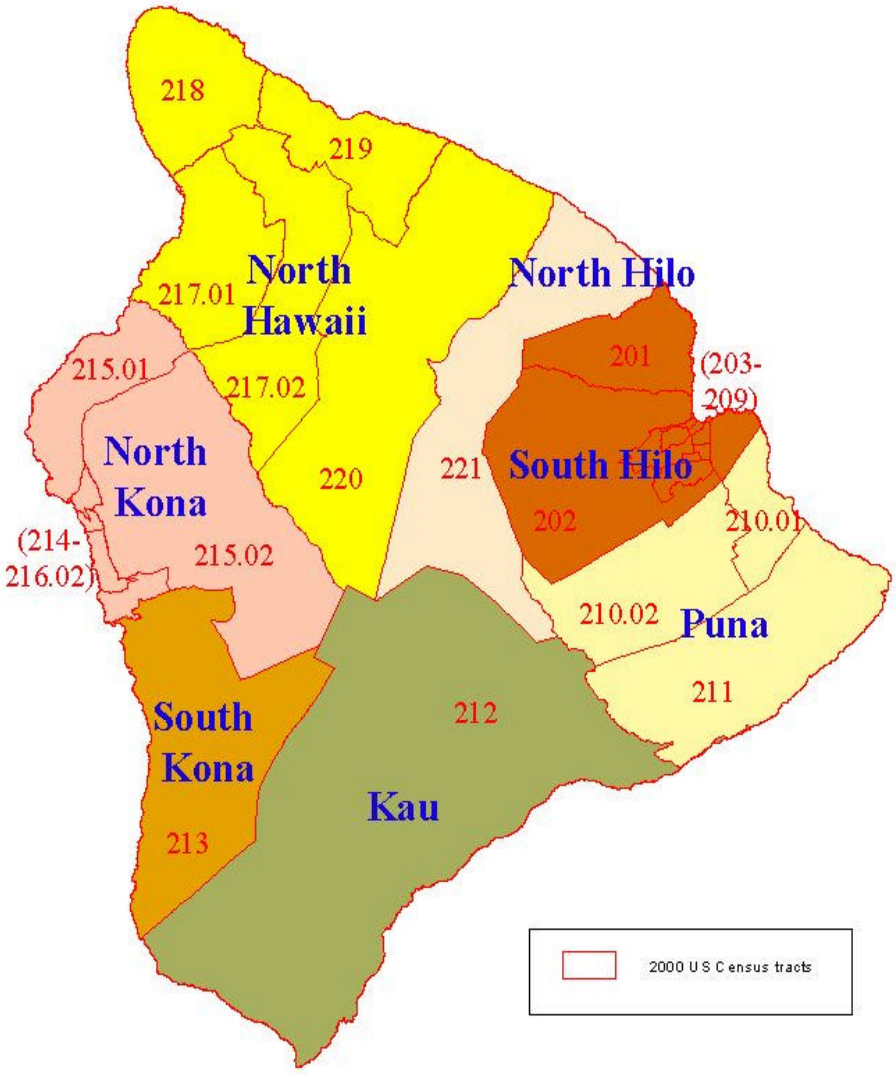
2) Inadequate evaluation of prevention efforts in high-risk (rural and semi-rural) communities.

3) Limited awareness of the problem, particularly among policy-makers and donors.

In this report, we've discussed a public health strategy for solving the problem, which includes strengthening capacity, collection of data, research, and the development of appropriate interventions. As opposed to a "quick-fix" intervention, a road safety strategy is sustainable and addresses long-term goals.

APPENDIX

I. DISTRICT DEFINITIONS



APPENDIX

II. CONTACTS

IIa. HAWAII ISLAND

Mayor's Office

Peter Young, Deputy Managing Director	329-5226

Police

Sgt. Randy Apele, Mgr., Traffic Enforcement Unit	961-2305
Sgt. Sam Jalsma, Traffic Enforcement Unit	935-2332
Buck Donham, Press Officer, County Police (very helpful)	961-8875 or 961-2349

County Traffic Safety Council

(Members in flux; contact Peter Young.)

Transportation

Stanley Tamura, Engineering Program Manager	933-8866

DOH - Hawaii District Health Office	974-6006
John Kaizuka, DOH Public Education Worker, Hilo Branch	933-0911
Carrie Tarumoto, DOH Public Education Worker, Kona Branch	322-4880

DOT Safe Community Program

Jan Yokoyama, R.N., Neighborhood Watch Program/Advocate	974-6025

IIb. STATE OF HAWAII

DOH Injury Control Program	586-5940
Eric Tash, Manager, DOH Injury Control Program	586-5942
Dan Galanis, Epidemiologist, DOH Injury Control Program	586-5943

DOH Office of Health Status Monitoring	586-4600
Alvin Onaka, Epidemiologist	
Brian Horiuchi, Research Statistician	586-4733

DOT Safe Community Program

Assists, sponsors and funds community level projects for improving traffic safety.

Sgt. Robert Lung, Honolulu Police Dept. (Community Liaison)	529-3497
Gordon Hong, HDOT, Program Administrator	587-6302

DOT State Transportation Planning Office

Dean Nakagawa, Project Manager	587-2362

DOT Motor Vehicle Safety Office – Handles requests for data.

Alvin Takashita, Manager	692-7684
Jan Hidake, Statistician/analyst	692-7685
(Also possibly Kenneth Miyazono for highway stats.)	587-1838

State Officers

Governor's Highway Safety Representative

Marilyn Kali –DOT Public Relations Officer	587-2160
Larry Hao - Motor Vehicle Safety Administrator	692-7650
Alex Kaonohi - Motor Carrier Safety Manager	692-7659

Federal DOT Office in Hawaii

Bureau of Motor Carrier Safety- Region IX, Honolulu	541-2700

IIc. UNIVERSITY OF HAWAII

Dept. of Urban and Regional Planning
Professor Karl Kim, Developer of Hawaii Crash Outcome Data Evaluation System (CODES), a federally funded program; data available prior to 1995 only.
Email: karlk@hawaii.edu

IId. FEDERAL

National Highway Traffic Safety Administration

Fatality Analysis Reporting System (FARS) ftp://ftp.nhtsa.dot.gov/FARS/	
National Center for Statistics and Analysis	202-366-4198 or 1-800-934-8517
For specific data requests, Marge Saccoccio	617-494-2640

U.S. Department of Transportation

Federal Highway Administration	www.fhwa.dot.gov
Office of Highway Information Management	
Office of Highway Policy Information (OHPI)	
Highway Statistics 2000	www.fhwa.dot.gov/ohim/ohimstat.htm
National Transportation Statistics 2000	www.bts.gov/btsprod/nts/

APPENDIX

III. RESOURCES

IIIa. HAWAII COUNTY

Buck Donham, Press Officer, County Police 961-8875 or 961-2349

For location-based fatality data in the form of police press releases.

Used to compile the preliminary results in Appendix IV.

IIIb. STATE OF HAWAII

Dept. of Transportation Safe Community Program

Provides funding for community-level research and interventions.
Gordon Hong, HDOT, Program Administrator 587-6302

Dan Galanis, Epidemiologist, DOH Injury Control Program 586-5943

Email: <djbalani@mail.health.state.hi.us>
Maintains a database of district-level fatality information, based on death certificates, age-adjusted, for years 1995-2000 (may be able to get other data for other years as well). Dan is fairly quick to turn around requests for data.
His colleague, Brian Horiuchi, can provide crude mortality data. 587-4733

Publication: Fatal Traffic Accidents, State of Hawaii, 1992
Dept. of Transportation Motor Vehicle Safety Office, June 1993
Available only at Hawaii Medical Library Reference Section
Call no: WA 900, AH3, F252, 1992.
This is the only known county by county analysis of motor vehicle fatalities. It also compares fatality data by accident, road, time and other characteristics. Unfortunately, the publication does not include census-based fatality rates or age adjustment.

Department of Transportation

Motor Vehicle Safety Office - Handles requests for data

Alvin Takashita, Manager 692-7684
Jan Hidake, Statistician/analyst 692-7685
State Transportation Planning Office, Dean Nakagawa, Project Manager 587-2362

IIIc. FEDERAL

CDC National Center for Injury Prevention and Control
The center provides on-line tools, such as WISQARS (Web-based Injury Statistics Query and Reporting System), an interactive database system that provides customized reports of injury-related data. "Injury Maps" allows you to create county-level and state-level maps of age-adjusted mortality rates for the entire United States and for individual states (however not working correctly at the time this was written).
http://www.cdc.gov/ncipc/osp/data.htm

CDC's Injury Center conducts and sponsors population-based epidemiologic, public health, behavioral, biomechanic, and trauma research to develop practical, community-based prevention strategies for motor vehicle–related injuries. For more information, go on-line at:
http://www.cdc.gov/ncipc/pub-res/research_agenda/06_transportation.htm

National Highway Traffic Safety Administration
Fatality Analysis Reporting System (FARS)
Police departments in all counties nationwide are required to load certain road fatality data onto the FARS database. This database is available on-line at: ftp://ftp.nhtsa.dot.gov/FARS/

U.S. Department of Transportation
Federal Highway Administration www.fhwa.dot.gov
Office of Highway Policy Information (OHPI)
For statistics on fatalities by vehicle type, highway type (urban vs. rural) and by vehicle-miles traveled, by state and possibly county (by request).
Highway Statistics 2000 www.fhwa.dot.gov/ohim/ohimstat.htm
(or National Transportation Statistics 2000 www.bts.gov/btsprod/nts/)

National Household Travel Survey (NHTS) 2001
Provides census-division level estimates of trips by travel mode, purpose, and other vital travel information. Results expected in late 2002. Community level data, though not reliable, may be available for download or by request.
http://www-cta.ornl.gov/npts/1995/doc/
State DOT contact: Kenneth Miyazono at 587-1838

Turner-Fairbank Highway Research Center
TFHRC is the home of the Federal Highway Administration's (FHWA's) Office of Research, Development, and Technology. http://www.tfhrc.gov/safety/safety.htm

APPENDIX

IV. LIMITATIONS OF THE DATA

Fatality counts based on the exact location of death are difficult to obtain in Hawaii, because they must come from either the county police departments or the State DOT office. On the other hand, fatality counts based on the location of the victim's residence are easily obtained from the DOH compilation of death certificate data. Because of privacy and liability concerns, both the county police and the State DOT seem unable to routinely release accident fatality data (even to the DOH). However, a subset of the location-based data is available in the form of police press releases.

Based on a preliminary analysis of police press releases, there were 42 fatalities as a result of accidents on North Hawaii roads and highways (rather than of residents of North Hawaii) during the 5-year period 1996-2000. Although this police data has not been analyzed in any detail, there is a suggestion that commuter deaths and/or visitor deaths may account for the difference between the fatality-by-location count (42) and the fatality-by-residence count (34). Another possible reason for the difference is that district definitions used by the police (essentially their 'police beat' boundaries) may be different than census-based district definitions (Appendix I).

The difference between counts (42 vs. 34) points to the following problems with motor vehicle fatality data:

1. Data-gathering organizations at the federal, state and county do not necessarily use the same (standard) regional boundary definitions.

   (In the above example, the county police use 'police beat' boundary definitions to define districts, while the DOH and the Department of Business, Economic Development and Tourism (DBEDT) use census-defined district definitions. The National Highway Traffic Safety Administration uses a 3rd area definition in their on-line crash fatality database (Fatality Analysis Reporting System (FARS) –see Appendix III- Resources)- the zip code of the victim's residence, rather than the resident's census district.)

2. As a result of undercounting visitors and residents who died while commuting outside their home district, county-level and district-level motor vehicle fatality rates may be underestimated.

APPENDIX

V. RELATIONSHIP BETWEEN POPULATION DENSITY AND FATALITY RATES

Within the State of Hawaii, urban vs. rural definitions (or metro vs. non-metro) may not explain the differences between neighbor island motor vehicle-related fatality rates. Differences in population density between islands may distinguish fatality rates better. This table compares the population densities and motor vehicle fatality rates of the four counties based on the 2000 Census results:

County	Population (2000)	Land Area (sq. miles)	Population Density (2000)	Motor Vehicle Fatality Rate (5-Year: '96-'00)
Hawaii	148,677	4028	36.9	123.3
City & County of Honolulu	876,156	599.7	1460.9	38.4
Kauai	58,463	622.4	93.9	59.0
Maui	128,094	1159	110.5	69.6

The pattern of differences between counties is consistent with a (non-linear) inverse relation between population density and motor vehicle fatality risk, which has been well-documented in previous mainland studies. For instance, the Hawaii County population density is 2.5% that of Honolulu, accounting for a three-fold increase in the fatality rate. It is 40% the density of Kauai County, corresponding to a two-fold increase in the fatality rate. Comparing Kauai to Maui Counties, while appearing different, the population densities are statistically equivalent and so are the fatality rates.

APPENDIX

VI. EFFECT OF AGE-ADJUSTMENT ON FATALITY RATES

The following table compares crude versus age-adjusted total motor vehicle fatality rates for each of the districts and counties. Note that for nearly every district, the rates are quite close. The one exception is S. Kona, where the age-adjusted rate (131) is very different than the crude rate (108). However, because of the small number of deaths (six), this difference is not statistically. None of the crude vs. adjusted differences below are statistically significant.

Five-Year Motor Vehicle Fatality Rates per 100,000 Residents (96-00)

Geographic Region	Number of Deaths	Crude Rate	Age-adjusted Rate
North Hawaii	34	134.5	136.5
Balance of Hawaii County	146	118.3	120.6
Kau	5	85.8	91.2
N. Hilo	2	116.3	106.18
N. Kona	41	130.0	136.8
Puna	49	156.4	161.3
S. Hilo	43	90.7	91.3
S. Kona	6	108.4	131.3
Hawaii County	180	121.1	123.3
City and County of Honolulu	345	39.4	38.4
Kauai County	34	58.2	59.0
Maui County	87	67.9	69.6

When the number of deaths is greater than 30, the near equivalence of the age-adjusted rates and crude rates suggests that the age distribution of the district sub-populations matches the age distribution in the standard population, from a nationwide sample (although there are other more unlikely explanations). More importantly, it gives us confidence that the crude chi-square analysis we used in this small study provides similar results that an age-stratified analysis would have provided (in terms of summary statistics). This in turn gives us confidence that we accurately assessed the statistical significance of differences in rates between various geographic regions.

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