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EFFECTS OF TOURISM ON RATES OF SERIOUS CRIME IN HAWAI`I

Prepared for Use of the Hawai`i State Department of the Attorney General, Crime Prevention and Justice Assistance Division

(Portion of a report originally prepared for the Project, " Planning for Sustainable Tourism in Hawai`i," under the auspices of the Hawai`i State Department of Business, Economic Development & Tourism)

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INTRODUCTORY COMMENT

This study was originally one chapter in a larger report entitled "*Socio-Cultural Impacts of Tourism in Hawai`i: Impacts on the General Population*." That report was Volume II of the Public Input and Socio-Cultural Component for the Project "Planning for Sustainable Tourism in Hawai`i," sponsored by the Hawai`i State Department of Business, Economic Development, & Tourism (DBEDT). The original report was completed in 2003.

Because of frequent requests about the effects of tourism on crime in Hawai`i, the Crime Prevention and Justice Assistance Division of the Department of the Attorney General asked if it could be repackaged as a "stand-alone" report for their use and distribution.

This stand-alone version has been *somewhat* updated. That is, the original contained information about crime, tourism, and most other topics from 1975 through 2001. We are now able to report figures for crime and most other topics through 2002. However, we were unable to obtain information for Sentenced Prison Admissions past 2000. Therefore, correlations and the multiple regression analysis are still based on original figures (i.e., through 2000 only).

ADDITIONAL OBSERVATION REGARDING 2002 DATA

As shown in Appendix A charts, Hawai`i property crime rates have again been increasing since 1999, and took a particular jump in 2002. U.S. crime rates continued to decline, so Hawai`i's property crime rates, at least when expressed as a percentage of national rates, reached record or near-record levels in 2002. Neither tourism nor other possible crime predictors examined in this report changed in 2002 (or the previous year) to anywhere near the extent that property crime did. Obviously, there are many possible determinants of crime that we have not identified. Some, like drug use, may not be directly measurable in a valid and reliable way.

ACKNOWLEDGEMENTS

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SUMMARY

This study involved both a review of the literature about tourism-crime links (in Hawai`i and elsewhere), and also original analysis of Hawai`i crime data.

Our analysis and most of the literature focuses on "serious" crime. These are the seven offenses designated by national Uniform Crime Reporting (UCR) procedures – larceny-theft, burglary, auto theft, robbery, aggravated assault, rape, and murder – for which fairly reliable data are kept by law enforcement agencies. While tourism may well be linked with problems like drugs and prostitution, solid data are just not available for these types of crimes.

We found that past statistics-based studies almost always turned up *some* relationship between crime and tourism, but that the exact nature of the relationship varied from time to time or place to place. For example, one study would find a link between tourism and, say, robbery, but no link with larceny. Another study – in a different time or place – would find a link between tourism and larceny, but no link with robbery. This was also generally true for the limited number of past Hawai`i studies, though there was some tendency in previous Hawai`i research to find links with burglary and (to a lesser extent) rape.

There are many ways to research possible relationships between crime and tourism. One way is to see if visitors are more likely to be victimized than are residents. Some past studies and one effort of our own suggested this is probably the case in Hawai`i, though more for larceny-theft ("rip-offs" at the beach or from cars) than any other crime. However, these studies do not indicate whether such a difference is large enough to make a real dent in crime statistics.

Our major analysis involved looking at 28 crime rate trends (seven "serious" crimes in Hawai`i's four different counties) and comparing these trends to changes in visitors as a percentage of overall population, for the period from 1975 to 2002. We found very little match between the overall long-term crime trends and the overall long-term visitor population trends.

In fact, for 14 of the 28 comparisons, the correlation was moderately or strongly *negative* – crime rates tended to be decreasing while visitor rates were increasing.[*] This does not prove that tourism decreases crime, but it is hardly consistent with the idea that tourism is a major contributor to increases in crime.

To the extent that data permitted, we looked at other possible explanations for crime – demographics, unemployment, law enforcement effectiveness – and

[*] In fact, the only tourism-crime relationships that were consistent over all four counties were *negative* relationships with murder and with the crime that had been the most consistently linked with tourism in earlier Hawai`i studies – burglary.

found these were almost always more powerful predictors than tourism. Thus, while visitors probably get victimized more than residents, over time this effect is "drowned out" by more powerful forces. Tourism's effect on crime appears to be a matter of circumstance, not an inevitable outcome. It makes great sense to continue current efforts to control crimes against tourists – volunteer patrols, witness return programs, actions to reimburse victims – but probably more because crime has a negative effect on tourism than the other way around.

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TOURISM AND CRIME IN HAWAI`I

A. Introduction and Conclusions

In recent surveys sponsored by the State government, roughly half of Hawai`i residents have said they believe tourism makes crime "worse."[1] The purpose of this part of the study is to review available evidence about the extent to which this is actually true. We will both examine past studies and also present some original analysis based on annual "serious crime" data – i.e., government-defined "Index Offenses" – since 1975. (We cannot analyze effects on relatively "minor" crimes such as prostitution and drugs, though these may well be tourism-linked.)

Since our procedure involves looking at a variety of data and studies, our conclusions cannot be a simple "yes" or "no." Rather, this study will show that:

- The relationship between serious crime and tourism varies from place to place and time to time. It is a matter of local circumstances.

- Past studies – in Hawai`i and elsewhere – have usually found *some* link between *some* type/definition of "crime" (e.g., change in larceny rates) and *some* type/definition of "tourism" (e.g., change in numbers of tourists) … but not between others (e.g., no relationship to violent crime, or no relationship when "tourism" is defined in terms of rooms or jobs).

- The past studies we reviewed usually found that tourism was more statistically linked to certain *property* crimes than to *violent* crimes. However, there was no universal crime-tourism relationship that always held true in every place at every time.

- Some Hawai`i studies, backed up by new analysis in this report based on crime victimization surveys, suggest tourists are more likely than residents to report being the victims of some crimes – particularly *larceny-theft* (e.g., thefts from parked cars or valuables left in public places). Compared to other states, Hawai`i has a very high larceny rate.

- However, changes in various county crime rates from 1975 to 2002 do not usually seem to relate in any clear and consistent way with changes in tourism during the same period. An apparent link between crime and tourism in one county was often not apparent in others.

[1] Percentages saying tourism makes crime "worse" were 44% in 1999, 63% in 2001, and 41% in 2002. (In 2002, only 8% said tourism makes the crime situation "better.") Market Trends Pacific, Inc. and John M. Knox & Associates, Inc., "2002 Survey on Resident Sentiments on Tourism in Hawai`i." Prepared for DBEDT and the Hawai`i Tourism Authority. Honolulu. 2003.

- In many cases, certain crime rates (e.g., Burglary and Murder) generally went *down* while tourism generally went *up*. This is the opposite of public expectations. It does not necessarily prove that "tourism makes crime better," but it would be consistent with, say, the idea that tourism helps the economy, which in turn dampens the crime rate.

- We tried a more sophisticated statistical approach to find out if tourism has a greater effect on crime than other measurable factors (such as unemployment or demographic changes). The results were again mixed, possibly due to some limitations in the data. There was a moderate positive link between Aggravated Assault and tourism on O`ahu, countered by negative links between tourism and various other crimes on Maui. But there were no consistent *overall* tourism-crime linkages.

"Bottom Line:" Tourism can generate crime, but it doesn't have to. Sometimes it may even have the opposite effect. And in the period of Hawai`i's history from 1975 to 2002, it seems to have had no *major* statistical link with Hawai`i crime rates. Tourists may be more likely to get "ripped off" than are locals, but this seems to have less effect on overall crime rates than things like demographics, unemployment, and the effectiveness of the law enforcement system.

B. The Nature of Crime Statistics

There are many ways to measure crime, including data on things like arrests, juvenile crime, etc. However, most studies look at one or both of two types of crime statistics:

1. Victimization surveys, in which random samples are asked if they have been victims of any crimes (and/or particular crimes) during a recent specified period of time. The Hawai`i Attorney General's office conducted a series of such surveys in the 1990s, now discontinued, for residents only.

2. Official police data on reported crime, which, under the FBI's "Uniform Crime Reporting" (UCR) system, in turn consist of two categories:

    - *"Index Offenses"* (formerly called "Part 1" crimes), consisting of seven serious crimes which are believed to be reported in a fairly consistent way over different times and places – Murder, Rape, Robbery, and Aggravated Assaults (sometimes added together as a *"Total Violent Crime"* index), plus Vehicle Theft, Burglary, and Larceny-Theft (sometimes added together as a *"Total Property Crime"* index).

    - *"Other Offenses"* (formerly called "Part 2" crimes), consisting of everything else. The most important reason these are not included with the "Index Offenses" is that they are far more subject to changes over

time and place in regard to (a) public likelihood of reporting, and/or (b) local law enforcement policies about recording and enforcement.

Following a literature review, this study will primarily focus on Index Offenses and, secondarily, some limited information from victimization surveys. The Index Offenses are considered the most reliable and valid type of crime data.

The exclusion of "Other Offenses" (the old "Part 2" category) means we will pay relatively little attention to other crimes often believed to be associated with tourism – including *prostitution* and *drugs*.[2] The problem is that data for such things are generally confined to arrests rather than reported criminal activities, and changes in arrest data over time may have far less to do with "real" changes in the prevalence of criminal or immoral activity than with changes in law enforcement practices, or other conditions. For example, drug arrests are heavily dependent on the availability of police resources, so that new federal grants (or new airport security systems implemented after the Sept. 11 terrorist attacks) can result in a sudden spike in arrests. These should not be interpreted as a "real" increase in actual drug activity.

Index Offenses can be either:

- *Raw numbers* – the simple count of reports for various types of crime, or
- *Crime rates* – the number of crimes per 100,000 population.

Rates are generally preferred, because they make it possible to compare the extent of crime as the population in one place changes over time, or to compare two places with very different populations (e.g., O`ahu vs. Kaua`i). However, this leads to the question of what type of "population" will be used to calculate rates:

- *Full-time resident population* – this is the standard basis used by the FBI for comparing one state's crime rate to another, or to the national figures.
- *"De facto" population (including visitors)* – calculated as number of residents, minus estimated number of residents temporarily away on an average day, plus estimated average daily visitor census. This approach is rarely if ever used by national crime statisticians, but makes sense for Hawai`i because of the high visitor count here.

[2] We will, however, include some survey data showing that solicitation by drug dealers is the most frequently type of crime or "safety problem" actually reported by Hawai`i visitors, with solicitation by prostitutes not far behind. Simple observation and anecdotal evidence strongly suggest that prostitution and drug sales are common in more urban tourist areas such as Waikīkī, though it is less certain whether they are as prevalent in more rural Neighbor Island resort areas.

C. Hawai`i Vs. National Crime Statistics: Quick Overview

This study's Appendix A contains eight charts (Exhibits A-1 to A-8) comparing Hawai`i crime rates (calculated both ways, by resident population and by "de facto" population, including tourists) with national rates[3] for the period from 1975 through 2002. The charts are based on Index Offenses – "Total Crime," plus each of the seven individual types typically compiled by the FBI.

An examination of those charts makes several things apparent:

1. Hawai`i's reputation as a "high-crime" state is due strictly to our high rates of Larceny. We are actually a *low-crime* state in regard to violence. Of the seven Index Offenses, Larceny is the only one in which Hawai`i has consistently had a higher crime rate than the nation as a whole since 1975. Our Burglary and Auto Theft rates have sometimes been higher, sometimes lower than the national average. But our rates of Murder, Rape, Robbery, and Aggravated Assault are all dramatically lower than the national rate, and have remained that way for many years – something of importance for tourism.

2. *All* of Hawai`i's crime rates are overstated because of standard procedures excluding visitor population from the calculations. Of all the people present in Hawai`i on any given day (i.e., the "*de facto*" population), about 12% are now tourists. It may reasonably be argued that Hawai`i's "real" crime rate today (based on de facto population) is only about 89% of the "official" crime rate (based on resident population). The overstatement of crime rates is even more dramatic for some Neighbor Island counties – especially Kaua`i and Maui counties, where visitors make up about 24% of the de facto population.

3. For studies like this, it does not always make sense to calculate "Total Crime," because most reported crime is of one type – Larceny. Larceny is theft without the use of threat or force (that's "Robbery," considered a violent crime) or without breaking into a structure (that's "Burglary"). A theft of valuables left on the beach while swimming, or from a parked car, would be Larceny. In recent years, about 60% of U.S. "Total Crime" has consisted of Larceny, and in Hawai`i about 70% of "Total Crime" has been Larceny.

4. In fact, it often makes more sense to look at each Index Offense separately, rather than any type of "Total." Just as Larceny dominates "Total Crime," it dominates "Total Property Crime" (the sum of Larceny, Burglary, and Vehicle Theft) even more. For "Total Violent Crime," Aggravated Assault and Robbery

[3] Technically, it is not appropriate to compare Hawai`i crime rates based on de facto population with national crime rates based on resident population only. But at a national level, the difference between foreign visitors present and American citizens temporarily out of the country is probably much, much closer to "a wash" than is the case for Hawai`i.

far outweigh Murder or Rape – so it is better to look at them individually rather than in combination.

The charts in Appendix A Exhibits A-1 to A-8 show this difference for "Total Crime" and each of the seven individual types. The part of the initial exhibit for "Total Crime" – i.e., the upper part, based just on resident population – shows total Hawai`i crime rate to be higher than the national rate for each and every year from 1975 through 2002. But when Hawai`i's crime rate is based on de facto population, for the period from the mid 1980s through the early 1990s our rate was actually slightly *below* the national average for that timeframe.

5. Since 1975, some types of crime seem to be cyclical, while others are generally rising or falling. Larceny, Vehicle Theft, and Robbery have risen and fallen several times in a cyclical or wave-like fashion, both nationally and in Hawai`i. By contrast, Murder and Burglary has generally been falling over time since 1975, albeit with a disturbing recent upturn for Burglary in Hawai`i. Aggravated Assault (at least in Hawai`i) tends to increase on average. Most, though not all, crimes seem to have strong underlying patterns over time.

D. Results of Past Studies on Crime and Tourism

Our "review of the literature" for this report cannot be as extensive as might be done for an academic journal article, but we believe we have examined most of the more important source materials from (1) academic journals, and (2) other published Hawai`i information, including victimization surveys.

1. Academic Literature

Exhibit 1 summarizes key studies conducted in Hawai`i and elsewhere. The Hawai`i studies are now somewhat dated. Several articles by University of Hawai`i economist James Mak and colleagues used data from the 1960s and early 1970s. UH Sociologist Meda Chesney-Lind and her colleague Ian Lind used police data from the late 1970s and early 1980s. Most of the studies conducted outside Hawai`i also go back to the 1970s and early 1980s.

Academic literature tends to focus on underlying theories about crime and tourism. The most common theory is that tourism can increase crime because of opportunistic factors – i.e., tourists are often careless with property and/or are available "easy marks." This suggests that tourism would tend to generate some or all forms of *property* crimes, but not necessarily *violent crimes* (with the possible exception of Rape). An alternative but more infrequent hypothesis is that tourism contributes to substantial social disruption (e.g., political resentments), which would also suggest increases in violent crime.

Exhibit 1: Summary of Academic Studies on Tourism-Crime Linkages

Study/Location	Method	Definitions	Total Part I Crime	Total or Individual "Violent" Crime(s)	Total or Individual "Property" Crime(s)
Fujii, Mak, and Nishimura 1978, 1980; Hawai`i Statewide	Time-series multiple regression, 15-year period, 1961-75	"Tourism" = ratio tourist to resident population "Crime" = rates per de facto population (including tourists)	N/A	Did not address Total. Found slight to moderate relationships with murder, rape, robbery (but not assault)	Did not address Total. Found fairly strong relationship with burglary (but not larceny or auto theft)
Fujii, Mak, and Nishimura 1978, 1980; O`ahu only	Cross-sectional 2-stage least squares multiple regression, 1975	[Same as above]	Positive, moderate	Didn't address Total, but found relationships of varying levels with rape, robbery, assault (but not murder)	Didn't address Total, but found strong relationship with burglary (but not larceny or auto theft)
Fujii and Mak, 1979; Hawai`i Statewide	Time-series multiple regression, 15 year period, 1961-75	"Tourism" = proportion jobs in hotels "Crime" = rate per resident population	N/A	Didn't address Total, but found some relationship with rape (not robbery, murder or assault)	Didn't address Total, but fairly strong burglary, slight larceny (not auto theft)
Fujii and Mak, 1979; O`ahu only	Cross-sectional 2-stage least squares multiple regression	[Same as above]	N/A	Didn't address Total; slight relationship with rape (but not robbery, murder or assault)	Didn't address Total; strong relationship w/ burglary (but not larceny or auto theft)
Chesney-Lind and Lind, 1986; O`ahu	(Comparison of crime rates for victim populations: residents vs. visitor)		Tourists somewhat higher	Tourists slightly higher (mostly due to higher robbery rates; tourists actually lower for murder, assault)	Tourists moderately higher rates (particularly for burglary and somewhat for larceny)
Chesney-Lind and Lind, 1986; Kaua`i	(Comparison of crime rates for victim populations: residents vs. visitor)		No difference between tourist and resident rates	Tourists slightly lower (due to very low murder & assault – actually higher rape, robbery)	No difference for Total (but tourists had lower burglary & auto theft rates; higher larceny rates)
Pizam, 1982; Total U.S.A.	Cross-Sectional multiple regression analysis of 50 states	"Tourism" = tourist expenditures in dollars "Crime" = rate per resident population	N/A	Zero with Total, though slight relationships with robbery, rape, assault (not murder)	Slight positive with Total, but zero with individual crimes (e.g., larceny or burglary)

Exhibit 1: Summary of Academic Studies on Tourism-Crime Linkages

Study/Location	Method	Definitions	Total Part I Crime	Total or Individual "Violent" Crime(s)	Total or Individual "Property" Crime(s)
Jud, 1975; Total Mexico	Cross-sectional regression analysis of 32 states	"Tourism" = no. of int'l level hotel rooms per capita resident population "Crime" = rate per resident population	Positive, moderate (but only for crimes by males)	Strong with robbery, slight with rape (but zero for murder or assault)	Moderate relationship with larceny
McPheters and Strong, 1974; Miami, Florida	Time-series simple regression for months of one year featuring seasonal fluctuation	"Tourism" = employment in eating and drinking places "Crime"= numbers of reported offenses	Positive, slight/moderate	Moderate positive relationship for robbery only (but not murder, rape, or assault)	Strong to moderate with burglary and larceny (but not auto theft)
Schiebler, Crotts, and Hollinger, 1996; ten "most visited counties" in Florida	Simple correlation between reported tourist victimization rates and various possible predictors, including annual number of visitors	"Tourist" = Non-resident of Florida "Crimes against Tourists" = total number of crimes (Part I) divided by estimated total number of visitors without regard to length of stay, victimization rate	Tourist crime rates were higher in areas with higher rates of poverty and minority populations.	*Study did not address crimes below "Total Part 1" level. This was really not so much a study of whether tourism is associated with more crime as it was a study of where crimes against tourists are more likely to occur. The conclusion was that areas with conditions conducive to high level of criminality will result in more crimes against tourists, even if more police or security personnel are present.*	
Albuquerque and McElroy, 1999; Barbados	Comparison of crime rates for victim populations: residents vs. visitor for three years	"Tourism" = total # of stayover tourists in day x avg. length of stay + daily arrival on cruise ships "Crime" = serious offenses (violent/property) committed against tourists/residents	Tourists higher victimization rates overall (because crime is mostly property).	Tourists much lower for murder and "major wounding," though higher for robbery; rape varies by year	Tourists significantly higher for Total and various specific types of larceny and burglary
Walmsey, Boskovic, and Pigram, 1983; Tweed Heads, Ballina, and Port Macquarie (coastal resorts) Australia	Comparison of the percentage distribution of types of crimes ("tourist towns" vs. control areas), for one year	"Tourism" = Coastal resort areas "Crime" = indicator based on police work loads	More crime in non-tourist areas than tourist areas, crime rate activities in tourist areas coincide with "tourist seasons"	On percentage basis, fewer sexual assaults in non-tourist locations	More drug offenses and "day-time crime" in non-tourist locations

Note: See Appendix C for full citations for studies referenced in this exhibit.

Major conclusions from the studies in the summary table:

- Most studies – including the Hawai`i ones – find relationships between tourism and *some types* of crime.

- However, the relationships vary depending on how "tourism" is defined and how "crime" is defined (or on *which types* of crime are considered). There seems to be no universal or inevitable crime consequence from tourism.

- Studies that were able to calculate "tourist crime rates" vs. "resident crime rates" tended to suggest higher overall victimization rates for tourists – though, again, this depended on *types* of crime. For some types of crime, tourists generally had lower, not higher, rates.

- Despite substantial variation in specific crimes, the overall pattern in the literature tends to bear out the theory that tourism can generate crime because of opportunistic factors, more so than the theory that it generates resentment and aggression. That is, such crime-tourism relationships as could be identified were usually stronger for property crimes (especially Burglary and Larceny) than for violent crimes.[4]

- Time and place matter. Pizam's 1982 study of national U.S. data found little or only very weak tourism-crime relationships. But Jud's similar 1975 study of national Mexican data found stronger links with certain crimes (particularly Robbery and Larceny).

- In Hawai`i, the property crime data from the 1960s through the early 1980s generally found linkages with Burglary – more so than with Larceny, and not at all with Vehicle Theft. However, while tourists on O`ahu had higher Burglary rates, tourists on Kaua`i had lower Burglary rates than residents. Again, time and place matter.

- In Hawai`i, the type of violent crime most frequently (although not always) linked with tourism in this crime period was Rape – but the statistical association was generally weak to moderate.

- The 1996 Florida study (Schiebler, Crotts, and Hollinger) makes the point that places already conducive to crime – e.g., urban areas with low-income populations – seem to generate more crime against tourists than other tourist settings. Although this is perhaps a common-sense

[4] Several of the studies did find a link with Robbery, and authors suggested it may be more appropriate to think of Robbery as at least partly a "property" crime, or at least property-motivated, rather than as a "violent" crime in the same sense as Murder or Assault. There were also some studies finding a link with Rape, but this was sporadic and inconsistent.

conclusion, it argues against "statewide" analysis of Hawai`i tourism-crime data, since O`ahu and Neighbor Island conditions differ greatly.

2. Other Published Information from Hawai`i

Analyses of Tourism-Crime Links at Local Levels: During the resort development boom of the 1980s, a few Environmental Impact Statements for proposed new or expanded resorts were able to track changes in local-area crime (below the county level) associated with tourism growth. This was possible because the State government at that time published annual estimates of resident population – needed to calculate crime rates – for specific judicial districts such as North Kona or Ko`olau Loa. (No such estimates have been published since the early 1990s.)

Community Resources, Inc.[5] provided the following summary of changes in estimated de facto population and crime rates in West Hawai`i (defined as North Kohala, South Kohala, North Kona, and South Kona):

Exhibit 2: West Hawai`i Crime Rates, 1970-89

Year	Estimated Average Visitor Count	Estimated De Facto Population*	Total Index Offense Crime Rate Per 100,000 De Facto Population	Total Violent Crime Rate Per 100,000 De Facto Population	Total Larceny Crime Rate Per 100,000 De Facto Population
1970	2,015	16,487	3,979	8,490	2,020
1980	4,853	32,371	6,258	8,800	3,511
1984	6,221	39,906	5,343	9,850	3,312
1985	6,554	41,215	5,884	1,114	3,387
1986	7,961	43,505	5,894	1,255	3,211
1987	8,232	45,352	4,969	1,028	2,849
1988	9,001	47,934	5,610	1,110	3,250
1989	14,834	56,593	5,214	1,124	3,103
1970-80 % Increase:	141%	96%	57%	4%	74%
1980-89 % Increase:	206%	75%	-17%	28%	-12%

* Estimates based on Average Visitor Census calculated from Hawai`i Visitors Bureau data (on visitor units, occupancies, and party sizes) and on resident population estimates for 1984-89 from State government. The 1970 and 1980 resident population data came from the U.S. Census.

Conclusions from this table:

[5] Community Resources, Inc. *Socio-Economic Impact Assessment of the Proposed Sale and Development of Hāmākua Sugar Co. Lands Near Kukuihaele, Hāmākua, County of Hawai`i.* Prepared for Hāmākua Sugar Co. and Belt Collins & Associates. April 1991. (Note: Community Resources, Inc. was the former name of John M. Knox & Associates, Inc.)

- In the 1980s, a major resort construction period, West Hawai`i's visitor population increased more than it did during the 1970s. Conversely, resident population had a higher growth rate in the 1970s than in the 1980s. That is, the 1970s were a period of relatively higher *resident* population growth, while the 1980s comprised a time of relatively higher *tourist* population growth.

- Therefore, if tourists produce more crime than residents, the crime rate should have increased *more* in the 1980s than it did in the 1970s. But for overall crime and its largest component, Larceny, this was *not* true – the West Hawai`i crime rates increased *less* in the 1980s than in the 1970s. In fact, these rates actually *de*creased from 1980 to 1989, despite a huge growth in visitor population.

- Violent crime did increase somewhat more in the 1980s. Community Resources, Inc. reported that a more detailed examination found that the increase was only in Assaults – not in Rape, Robbery, or Murder.

This sort of analysis does not establish cause and effect, just statistical association. But if increased tourism does generate more crime, then the overall pattern of the West Hawai`i data would have been very different.

It is still possible that *initial* tourism development in rural areas generates increases in crime, but that subsequent increases in tourism have little or no additional effect. The figures in Exhibit 2 do not "prove" this for West Hawai`i, but would at least be consistent with that possibility. Along those lines, the same Community Resources study briefly noted that Kā`u District crime data from the early 1970s (when the Punalu`u Resort first opened) showed a temporary increase, followed by a plateau and then a decrease in the early 1980s:

> "The overall conclusion from Big Island crime data, then, is that new resort development sometimes (although not always) is associated with a spurt in crime. However, over time, the crime situation stabilizes and/or subsides to an extent." (p. 10-26)

Victimization Surveys of Hawai`i Residents vs. Tourists: Victimization surveys are often believed to overstate crime, because victims are more likely to agree to participate in the study. On the other hand, not all crime is reported to police, so official crime reports may be an understatement, with the truth "somewhere in the middle".

No true "victimization survey" is conducted among visitors to Hawai`i, but the State's periodic "Visitor Satisfaction Survey" (conducted through the late 1990s by the Hawai`i Visitors and Convention Bureau, and now carried out by the DBEDT Tourism Research Branch) has included a series of questions asking visitors if they experienced various "safety" problems while in Hawai`i.

In the 1990s, the Hawai`i State Department of Attorney General conducted a series of household surveys about attitudes toward crime, including victimization questions. Data were collected covering reported crime victimization experiences for each year from 1993 through 1997.

The top half of Exhibit 3 shows results of the visitor questions for 1996 vs. 2001. (In 2001, DBEDT added several items about solicitation by prostitutes or drug dealers, and also included an analysis of how many people had experienced none of the "safety" problems at all.) This top part indicates:

- Among Japanese visitors, reported crime victimization percentages increased in all categories from 1996 to 2001. The figures for U.S. visitors did not change so clearly or consistently.

- In 2001, the most frequently reported "safety" issue was solicitation by drug dealers. Japanese visitors also had a relatively high rate of reported solicitation by prostitutes, more so than U.S. visitors.

The bottom half of Exhibit 3 provides a *rough* comparison of crime victimization rates for tourists vs. residents in 1996, the last year in which data are available for both groups.[6] The questions and methods are not the same in the two surveys, and so caution should be exercised in drawing conclusions. Also, the visitor figures have been annualized, to make them more comparable to the resident figures. That is, if 1% of a group of tourists report a particular crime, and if this group happens to stay in Hawai`i for an average of one week, we would assume the "annualized" figure for a full 52-week year would grow to 52%.

Key results from this comparison would be:

- As of 1996, resident and annualized tourist victimization rates were very similar for *violent crimes* and for *burglary* ("room break-ins" for tourists). The U.S. tourist room break-in rate was on the high side, but given sampling error and the rough nature of the comparison, the numbers are still in the "same ballpark."[7]

[6] This year, 1996, happened to be a peak year for international (mostly Japanese) visitors to Hawai`i. It was also a peak year for reported crime victimization among Hawai`i residents for the 1993-97 surveys. However, as will be seen shortly, official data for crime reported to police put the previous year, 1995, as the peak for the last several decades.

[7] However, if the 2001 tourist percentages were annualized in the same way, they would have been much higher than the 1996 resident figures both for violence and for room break-in/burglary. It is hard to know what to make of that, because we do not know what residents would have said in 2001. Given media attention to high crime rates in Hawai`i the past few years, it is arguable that reported resident crime on surveys would have been higher, too.

Exhibit IV-3: Hawaii Tourist and Resident Crime Victimization Survey Results

Survey Results for Period Visitors Actually in Hawaii (1996)		
	U.S.	**Japan**
(Sample Size:)	*(1319)*	*(1181)*
No Problems (Crime, Drug, Etc.	N/A	N/A
At Least One Problem Below	N/A	N/A
Safety Issues:		
Solicited by drug dealers	N/A	N/A
Solicited by prostitutes	N/A	N/A
Wallet/purse/valuable stolen	2.2%	2.2%
Room vandalized/robbed	0.5%	0.2%
Car vandalized/robbed	2.1%	0.3%
Physical violence/harm	0.3%	0.2%
Other Nuisance/Parking Tickets	2.2%	0.3%

Survey Results for Period Visitors Actually in Hawaii (2001)		
	U.S.	**Japan**
(Sample Size:)	*(3284)*	*(1161)*
No Problems (Crime, Drug, Etc.	92.0%	93.2%
At Least One Problem Below	8.0%	6.8%
Safety Issues:		
Solicited by drug dealers	5.4%	4.7%
Solicited by prostitutes	1.7%	3.0%
Wallet/purse/valuable stolen	1.9%	3.7%
Room vandalized/robbed	1.1%	2.3%
Car vandalized/robbed	1.8%	2.1%
Physical violence/harm	0.9%	1.7%
Other Nuisance/Parking Tickets	1.7%	2.5%
Column totals may exceed 100% due to multiple answers		

Theoretical Annualized (Full Year) Visitor Figures (1996)		
Average Length of Stay (ALS)*	9.97	5.76
Multiplier (365 days / ALS)	36.61	63.37
	U.S.	**Japan**
(Sample Size:)	*(1319)*	*(1181)*
No Problems (Crime, Drug, Etc.	N/A	N/A
At Least One Problem Below	N/A	N/A
Safety Issues:		
Room vandalized/robbed	18.3%	12.7%
Wallet/purse/valuable stolen	80.5%	100%+
Car vandalized/robbed	76.9%	19.0%
Physical violence/harm	11.0%	12.7%
Other Nuisance/Parking Tickets	80.5%	19.0%
* Estimates provided by DBEDT Tourism Research Branch		

Hawaii Resident Victimization Rates 1996	
	Residents
	(784)
No Serious Crime	48.0%
At Least One Problem Below	54.5%
UCR Property Crimes, at least one	49.4%
Burglary	11.2%
"Other Theft" (Larceny-Theft)	15.0%
Theft from Motor Vehicle (also Larceny)	26.7%
Vehicle Break-Ins But No Theft	14.7%
UCR Violent Crimes, at least one	12.5%
Column totals may exceed 100% due to multiple answers	

Sources: Hawaii Visitors and Convention Bureau, unpublished data from 1996 *Visitor Satisfaction Survey*; DBEDT Tourism Research Branch, data due to be published in upcoming *2001 Visitor Satisfaction Survey*; Hawaii State Department of Attorney General, *1997 Hawaii Household Survey Report* - applies to 1996 experience

- However, the tourist larceny (approximated as "wallet/purse/valuables stolen") numbers were dramatically higher than those for residents. Theoretically, tourists who remained a full year in 1996 would have had an 80% chance of experiencing theft if they were from the U.S. and a 100% chance if they were from Japan.

- Theft from cars is a form of larceny, and the surveys ask about this issues in differing ways that somewhat interfere with comparison. However, it is apparent that car thefts/break-ins are among the most frequently reported problems for *both* residents and visitors.

So larceny – the most common type of "serious" crime – emerges as the source of the clearest distinction between visitor and resident self-reported crime on crime victimization surveys. Hawai`i's high larceny rates, it may be recalled, comprise the one consistent difference between this state's official reported crime numbers and average national figures over the past quarter-century.

However, the question remains whether more "objective" data – i.e., official police reports – will also show any association between tourism and larceny, or tourism and any other crime. That is the focus of the remaining parts of this study.

E. Official Hawai`i Crime Reports Vs. Tourism, 1975-2002

Original analysis for this study is presented in this and the following section. This Section E contains simpler information that requires relatively less knowledge of statistics, while the following Section F is more complex and requires relatively more statistical knowledge on the part of the reader.

1. Description of Data, Study Design, and Rationale

The basic approach used in this analysis was to gather annual information for the period 1975-2002 for crime, for tourism, and for other things besides tourism that might affect crime in Hawai`i. We defined all our final variables in terms of *rates* (e.g., crime rates rather than raw numbers of crimes) or *percentages* (e.g., defining "tourism" as the percent of total de facto population consisting of tourists). However, before explaining this approach further, it may be useful to note some other possible study designs that we decided *not* to use.

Approaches Considered but Not Used: As evident from the foregoing review of literature, conclusions about crime-tourism links can depend on the design of the analysis and the choice of what to measure to represent "crime" or "tourism."

We looked at, but rejected, several alternative approaches to study design and/or definition of "tourism:"

1. Cross-Sectional (Geographical) Analysis: Instead of looking at trends over time, we might have taken data for one particular year; calculated the number of various crime reports in particular geographical areas ("tourist areas" vs. other); divided by population to come up with crime rates; and determined whether crime is higher in "tourist areas" than in others. A few of the previous studies mentioned in Exhibit 1 used this approach. The definition of "tourism" here would of course be geographical in nature.

   We rejected this approach for two reasons: (a) difficulties in coming up with good criteria for identifying "tourist areas" – e.g., O`ahu tourists often spend time outside Waikīkī and may have cars broken into at coastal or other sites all over the island; and (b) even, more importantly, we have no solid way to determine local-area de facto population outside hotel areas, and that is needed to convert crime counts into actual crime *rates*.

2. Victim Identification Data in Police Reports: The Chesney-Lind and Lind (1986) study mentioned in Exhibit 1 used this approach with older O`ahu and Kaua`i data – using police reports to determine whether tourists report crime victimization more than residents do. This would have led to an analysis much like the one just done in Exhibit 3, except using complete data for actual reports to police rather than a victimization survey based just on a sample that might or might not be truly representative. The definition of "tourism" here would be (comparative) reported visitor experience with crime.

   This approach proved impractical because the Honolulu Police Department (which has perhaps the best-developed computerized database) advised us that special permission from the Chief would be needed, and manpower shortages in the research department would assure the request would be given low priority. So unlike the possible cross-sectional approach above, we had no conceptual or methodological objection to this approach; we just couldn't readily do it.

3. Using Simple Number of Tourists Over Time as a Measure of "Tourism": We did not do this because increases in the simple number of living human bodies in Hawai`i will always generate both more crime victims and more crime perpetrators. The question is whether "tourist bodies" produce more crime than "resident bodies."[8] So we used tourists as a percentage of total.

4. Using "Visitor Units" as a Measure of "Tourism" in a Time-Series Analysis: We decided to attempt an analysis based on changes over time, much like that done in Hawai`i by Fujii, Mak, and Nishimura in the late 1970s (see Exhibit

[8] And if crime is defined as a rate rather than just total crime numbers, then the number of tourists appears on both sides of the potential equation, since it would be part of the de facto population used in calculating rates. The "tourism" measure needs to be on just one side.

1).[9] Their definition of "tourism" in that study was actually the one we have chosen for this – visitors as percentage of de facto population. However, we did look at an available option: Number of visitor *units* (rooms in hotels, condos, known vacation rentals, etc.) per resident population. Changes over time in this ratio might arguably generate stress and disruption in the resident socio-economic fabric, especially during times of rapid construction outpacing labor supply and thus producing housing shortages.

We ran preliminary time-series analyses using both possible definitions of "tourism" – based on visitors and based on visitor units. In almost every case, such relationships as were found were stronger between crime and tourists than they were between crime and visitor units.[10] Therefore, we decided to look only at the previously-stated definition of "tourism" – visitors as a percent of total de facto population (see further discussion immediately below).

Definitions Used for "Crime" and "Tourism:" We chose to examine –

- A *definition of "tourism"* that consists of *percentage of total de facto population comprised of visitors.* The logic here is that, if tourists generate significantly more crime of some type, then in years when the population composition shifts to having a higher proportion of visitors relative to residents, those crime rates should go up. That was the same logic used by Fujii, Mak, and Nishimura when they did find a relationship between tourism and some types of Hawai`i crime based on 1961-75 data.

- Separate data for each of the seven "Index Offenses" rather than summary "Total Crime" or "Total Property Crime" indices, for reasons explained at the beginning of this study.

- Crime rates calculated on a *de facto* population basis (i.e., including visitors) rather than a resident-only population basis, also for reasons explained at the beginning of this study.

- Separate data for each of Hawai`i's four counties, because tourism and other socio-economic conditions potentially related to crime vary greatly, particularly between O`ahu and the Neighbor Islands but also to some extent among the three Neighbor Island counties.

Having worked through this logic and set of decisions, we gathered the raw data shown in Appendix B Exhibits B-1 to B-4 for each county, and thereafter calculated county-specific crime rates for the seven UCR Index Offenses and

[9] They used statewide data, which consists primarily of O`ahu information. So, as previously noted, we thought it better to look separately at results for each county.

[10] The only exception out of 28 pairs of correlations examined was Rape, only on O`ahu. One out of 28 suggests a chance relationship, an accidental and not truly meaningful relationship.

county-specific data on "visitors as percent of de facto population" for the 1975-2002 period.[11]

Definitions Used for Other Possible Predictors of Crime: Based on the Fujii, Mak, and Nishimura study design, on other crime literature, and on the availability of data, we decided to include the following other possible predictors of crime in the analysis:

1. Percent of Resident Population Comprised of Young Males (Aged 15-24): This is the classic "high-crime cohort," the portion of the population most likely to commit crimes. If it expands or shrinks, there is a good chance the crime rate will grow or decline. The U.S. Census actually counts people by age and gender during decennial Census years (e.g., 1990 and 2000), and it publishes estimates during the intercensal years.[12]

2. Unemployment Rate: Many types of crimes (especially property crimes) are believed to be at least partly "economic" in nature. While no single available variable can be said to be a perfect measure of "The Economy," unemployment rates published by the Hawai`i State Department of Labor and Industrial Relations are generally considered the best sole indicator.

3. Sentenced Prison Admissions Per Adult Resident Population: An effective law enforcement system is often presumed to have a deterrent effect on crime. The question is what variable best measures the "effectiveness" of the law enforcement system.[13] After discovering the local judicial and prosecutorial systems have no such indicators they consider valid and reliable over time, we looked at three possibilities, all based on unpublished data provided by the Hawai`i State Department of Public Safety:

    - *Total new prison admissions per 100,000 adult residents aged 20+:*[14] This includes both people arrested while awaiting trial, those actually beginning sentences, and others such as probation violators.

[11] Although earlier studies in Exhibit 1 used crime and tourism data going back to 1961, the 1975 – 2002 data are what the State Attorney General's office currently has available in published form. Also, it would have been difficult to gather pre-1975 figures for some of the alternative predictors discussed on this page.

[12] Exhibits in this section will show a suspicious sudden upswing in the percentages for Hawai`i and Kaua`i Counties in 2000. However, such underestimates for a few years would have only a minor effect on our calculations. *(Note: At the time of the original 2003 analysis, data for this and other population variables were available only April 2000. We now can show figures from July 2000 through 2002 in the following charts [although the new 2000-02 data represent estimates from the Centers for Disease Control rather than from the U.S. Census Bureau, so there is a risk of discontinuity in the data source]. However, because we cannot update all other variables through 2002, correlations are still based on 1975-2000.)*

[13] Fujii, Mak, and Nishimura – in their several studies looking at 1961-75 Hawai`i data – used the ratio of police to population. However, they concluded this ratio was more a response to past crime than an inhibiting determinant of future crime.

[14] We used "20+" rather than "18+" as our definition of "adult" simply because the latter population figure was not available from the U.S. Census for intercensal years.

- *New prison admissions based on sentenced offenders only:* This would be a sub-set of the above, focusing just on those actually given prison sentences.

- *Sentenced offenders as percent of total admissions:* This presumably reflects the odds that somebody arrested is actually both convicted and given prison sentences rather than other punishment.

We found all three numbers had increased sharply over time in all counties,[15] meaning the data were quite inter-correlated and so it made sense to choose just one. We again looked at the simple correlations with different crimes in different counties. Although the choice was a little less clear-cut than with the different definitions of "tourism," the best option in terms of relatively strong correlations seemed to be the "Sentenced Admissions," which also captured the deterrence effect of actual prison sentences and not just arrests.

It should be noted that the State data for this variable was available only from 1977 – 2000 (and, on Kaua`i, only from 1979 – 2000), with 1991 data missing due to a change in record-keeping system.

4. Military Population as Percent of De Facto Population: We follow Fujii, Mak, and Nishimura in including this variable. However, because military population is negligible on the Neighbor Islands, this was considered only for O`ahu. There are a number of slightly differing sources of information about military population. We selected data from the U.S. Dept. of Defense website: http://web1.whs.osd.mil/mmid/military/history/309hist.htm .

Again, we first gathered the raw data – which is also included in Appendix B Exhibits B-1 to B-4 – and thereafter calculated appropriate rates and percentages for these four variables.

2. Results for Long-Term Trends

How Results Are Presented: The first step in a time-series analysis – and probably the one most understandable to non-statisticians – is just to look at the "pictures" of trends over the entire time period for which data are available. Exhibits 4 to 11 provide those pictures for each county.[16] These exhibits also provide simple correlations over time.

To make it easier to see how the long-term trend lines for crime rates compare to tourism or other possible predictors, each graph in these exhibits contains:

[15] Our understanding is that these increases reflect stricter arrest and punishment policies, particularly for drug-related offenses.

[16] Separate data for the different islands of Maui County were not available because de facto population estimates are no longer published for intercensal years since the early 1990s.

- Years in which "peaks" or "spikes" are apparent, so one can see if various crime spikes tend to occur in the same year as – or just after – spikes in tourism or other possible predictors of crime.

- Trend lines (shown as dashed lines) which show either the straight line ("linear") or curved line ("polynomial") representing a mathematical equation that gives the "best fit" with actual observed data.[17] Each graph includes a note about the type of line that proved the best fit, as well as the R^2 value showing whether the fit was fairly good (a higher R^2, closer to the upper bound of 1.0) or very poor (low R^2, closer to 0.0).

  These trend lines – if they are good fits (higher R^2 values) – help to smooth out the "noise" in the charts and make it more obvious whether any two charts are similar in appearance.

What the Pictorial Results Say: For each county, the "picture" of change over time in Tourism ("Visitors as % of De Facto Pop.") does not match well with any of the seven crime "pictures."

The crime peak years rarely match the tourism peak years. And the overall shapes of the four county tourism trend line "pictures" bear little resemblance to the shapes of the trend line "pictures" for the crime rates in the same counties. The only faint exceptions are some vague resemblances between underlying trend lines for O`ahu Tourism and O`ahu Aggravated Assault (and possibly O`ahu Larceny) and between Maui Tourism and Maui Aggravated Assault. But for other counties, the shape of the trend lines for none of the crimes – including Aggravated Assault and Larceny – are a good match with Tourism trend lines.

By contrast, some of the pictures for alternative crime predictors – Percent of Young Males in Population, Unemployment, etc. – are a much better match for at least a few of the crime variables in the preceding exhibits. For example, O`ahu's Burglary rate has dropped fairly steady since 1975, closely matching similar declines in the percentages of population comprised by Young Males and/or Military.

Another result from the graphs is that crime data are generally more erratic (present a less clear "picture," both visually and as shown by low R^2 values) for Kaua`i and Hawai`i Counties. This will have implications for subsequent analyses in Section F.

What the Correlation Results Say: Exhibits 5, 7, 9, and 11 present simple correlation coefficients for these data over time. Correlation coefficients are a statistical measure of the degree of "match" between two charts such as

[17] In the original 2003 study, we did not attempt to fit anything higher than a 4th-order polynomial (i.e., M- or W-shaped curve), but this year observed some patterns that clearly called for 5th-order polynomial "best-fit." We also checked for other possibilities, such as logarithmic or power curves.

Exhibit 4: Trends for Tourism Vs. Index Offense Crimes, 1975-2002 – O`AHU

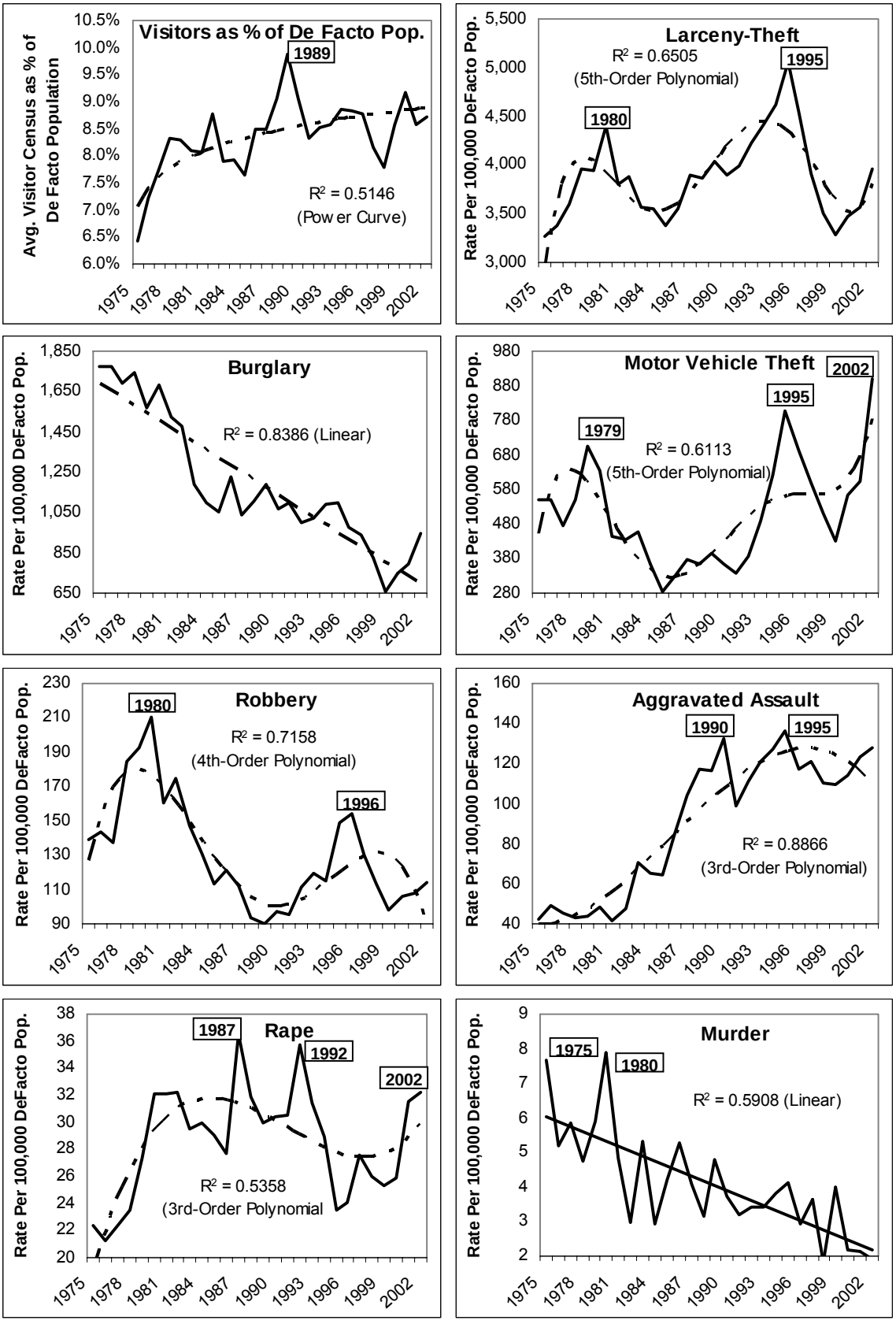
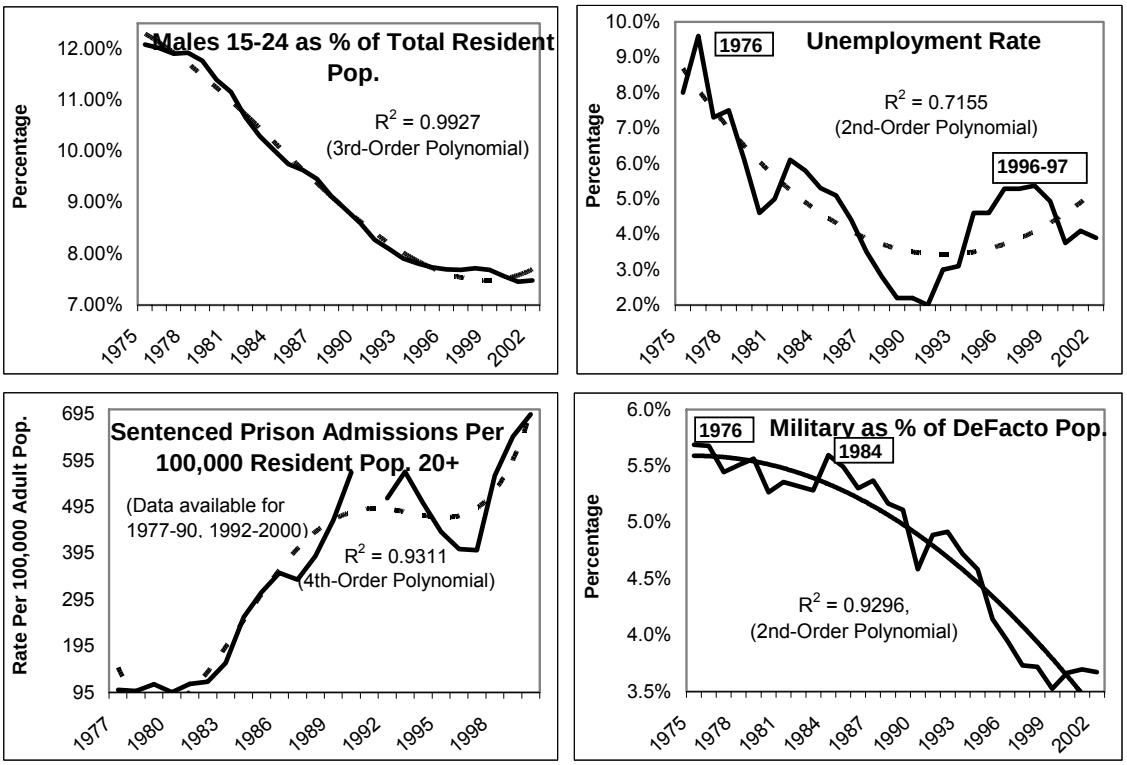


Exhibit 5: Other Possible Predictors and Correlations with Crime Rates – O`AHU



Simple zero-order Pearson correlation coefficients for Oahu, 1975-2000:

Crime Rates	Visitors as % of DeFacto Pop.	Males 15-24 as % of Total Resident Pop.	Unemployment Rate	Sentenced Prison Admissions per 100,000 Adults*	Military as % of DeFacto Pop.
Murder	-0.47	**0.73**	0.42	-0.63	0.57
Rape	0.37	-0.20	**-0.68**	-0.03	0.16
Robbery	-0.31	0.64	0.57	**-0.78**	0.35
Ag. Assault	0.64	**-0.93**	-0.69	0.88	-0.74
Burglary	-0.48	**0.93**	0.63	-0.88	0.76
Larceny	**0.49**	-0.35	-0.36	0.04	-0.21
Vehicle Theft	-0.03	0.01	**0.37**	-0.06	-0.31
Inter-Correlations					
Males 15-24	-0.57				
Unemploy.	-0.72	0.67			
Sent. Prison*	0.49	-0.92	-0.64		
Military	-0.39	0.83	0.32	-0.76	

* Correlations based on 1977-2000, excl. 1991

Exhibit 6: Trends for Tourism Vs. Index Offense Crimes, 1975-2002 – HAWAI`I COUNTY

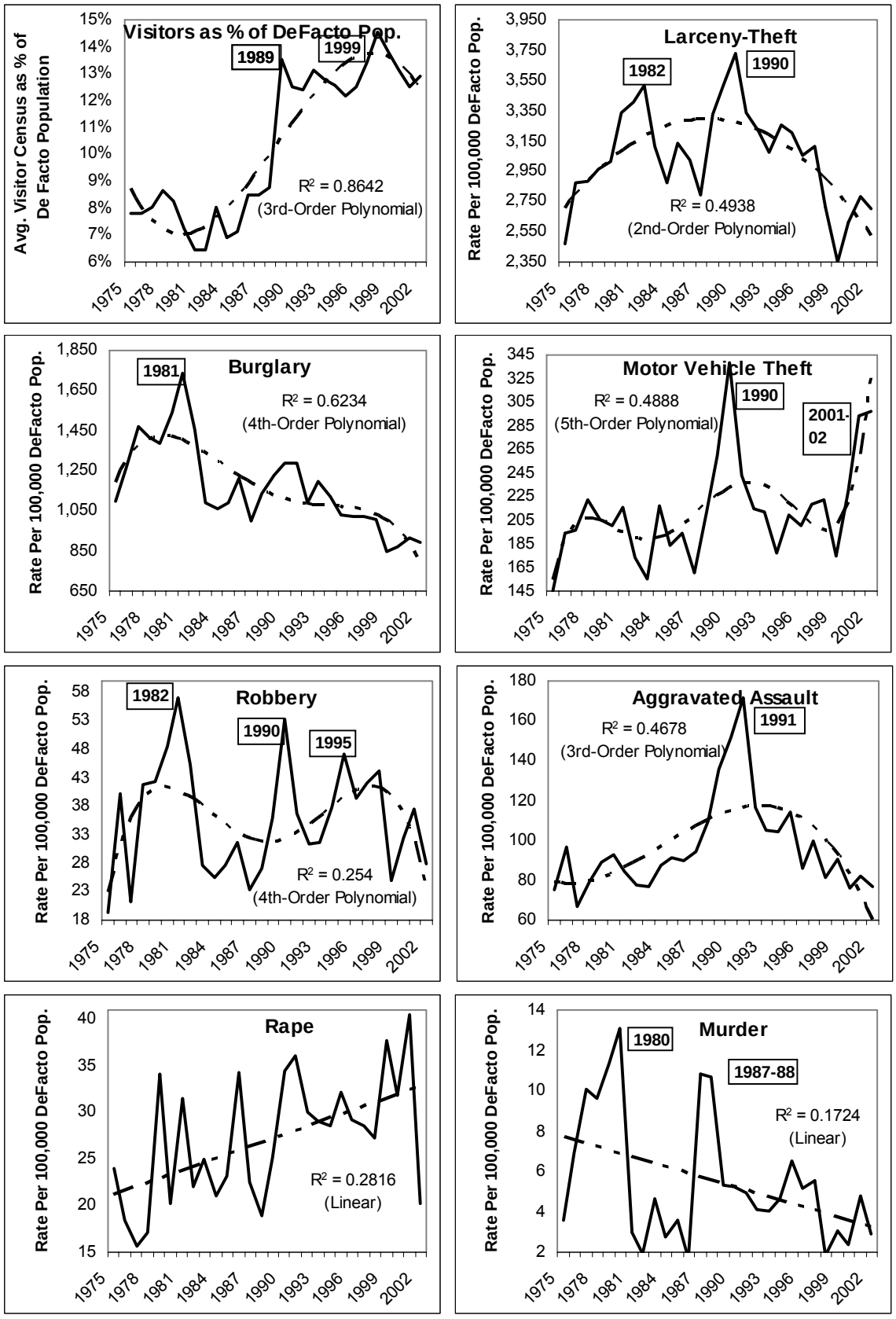
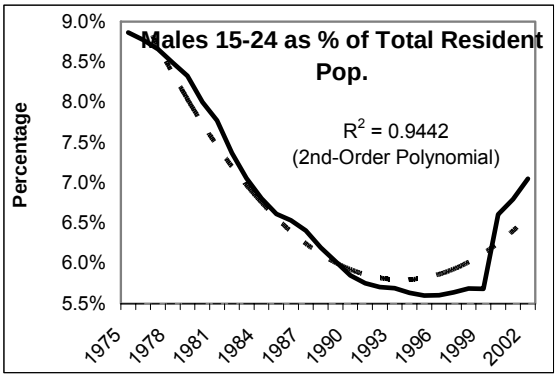
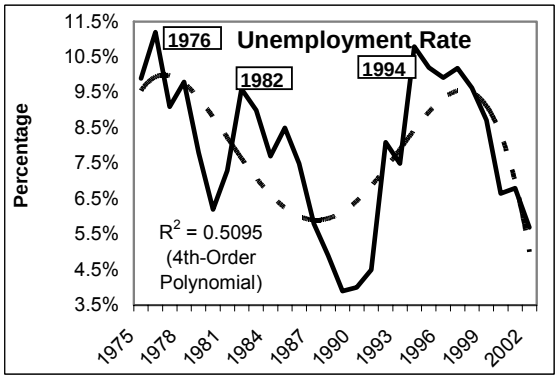
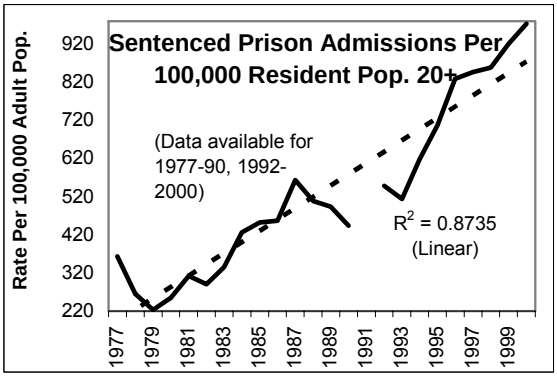


Exhibit 7: Other Possible Predictors and Correlations with Crime Rates – HAWAI`I COUNTY







Simple zero-order Pearson correlation coefficients for Hawaii County, 1975-2000:

Crime Rates	Visitors as % of DeFacto Pop.	Males 15-24 as % of Total Resident Pop.	Unemployment Rate	Sentenced Prison Admissions per 100,000 Adults*
Murder	-0.28	0.37	-0.18	**-0.40**
Rape	**0.55**	**-0.55**	-0.19	0.44
Robbery	0.10	-0.04	-0.02	-0.15
Ag. Assault	0.45	-0.51	**-0.60**	0.04
Burglary	-0.55	0.58	-0.14	**-0.81**
Larceny	-0.05	-0.20	-0.42	**-0.51**
Vehicle Theft	0.42	-0.30	**-0.56**	0.03
Inter-Correlations				
Males 15-24	-0.76			
Unemploy.	-0.08	0.23		
Sent. Prison*	0.78	-0.73	0.22	

* Correlations based on 1977-2000, excl. 1991

Exhibit 8: Trends for Tourism Vs. Index Offense Crimes, 1975-2002 – KAUA`I COUNTY

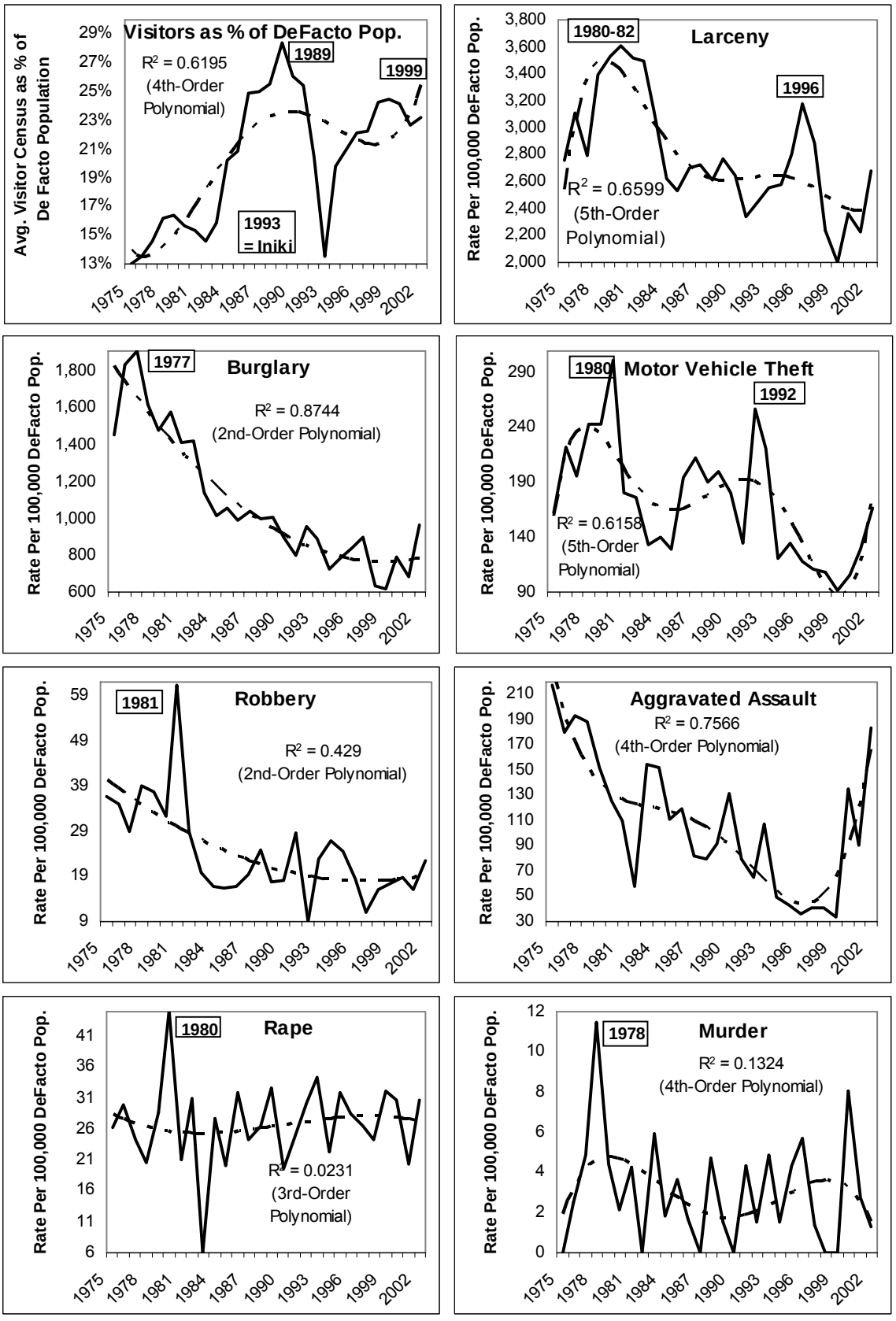
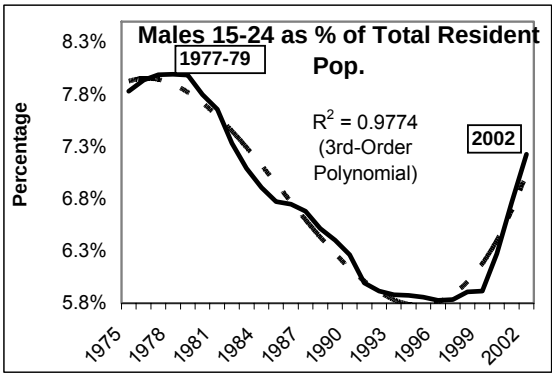
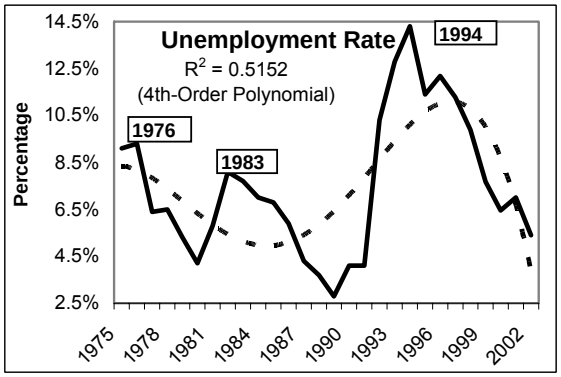
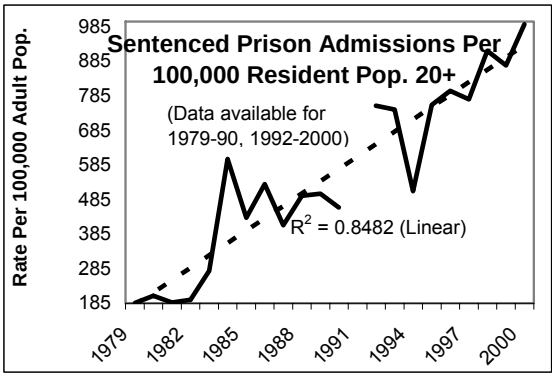


Exhibit 9: Other Possible Predictors and Correlations with Crime Rates – KAUA`I COUNTY







Simple zero-order Pearson correlation coefficients for Kauai County, 1975-2000:

Crime Rates	Visitors as % of DeFacto Pop.	Males 15-24 as % of Total Resident Pop.	Unemployment Rate	Sentenced Prison Admissions per 100,000 Adults*
Murder	-0.22	0.21	-0.03	0.09
Rape	0.01	-0.05	0.01	0.18
Robbery	-0.58	**0.68**	-0.18	-0.61
Ag. Assault	-0.53	**0.79**	-0.33	-0.47
Burglary	-0.72	**0.94**	-0.26	-0.87
Larceny	-0.58	**0.68**	-0.13	-0.76
Vehicle Theft	-0.37	**0.55**	-0.34	-0.53
Inter-Correlations				
Males 15-24	-0.66			
Unemploy.	-0.32	-0.39		
Sent. Prison*	0.46	-0.85	0.48	

* Correlations based on 1979-2000, excl. 1991

Exhibit 10: Trends for Tourism Vs. Index Offense Crimes, 1975-2002 – MAUI COUNTY

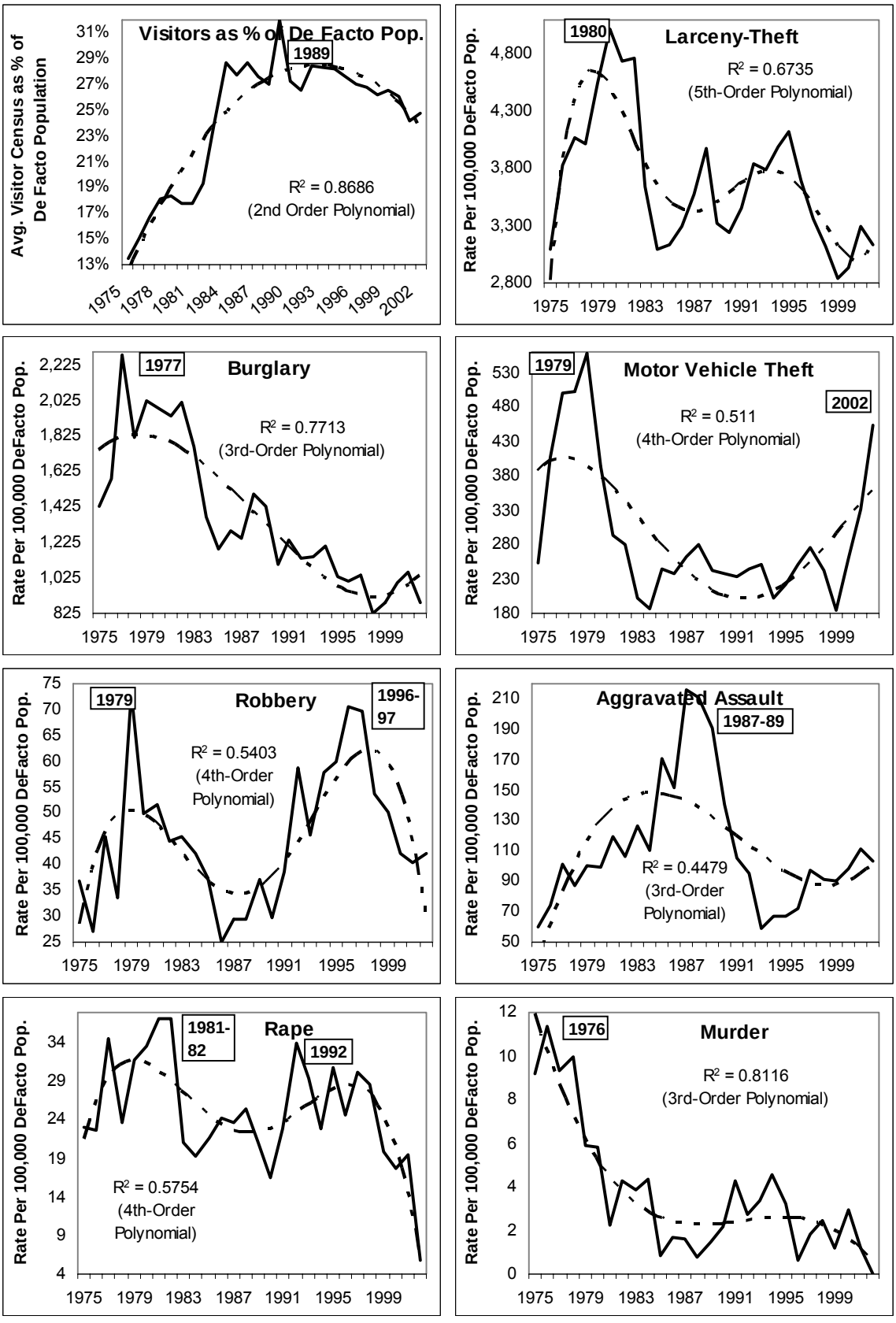
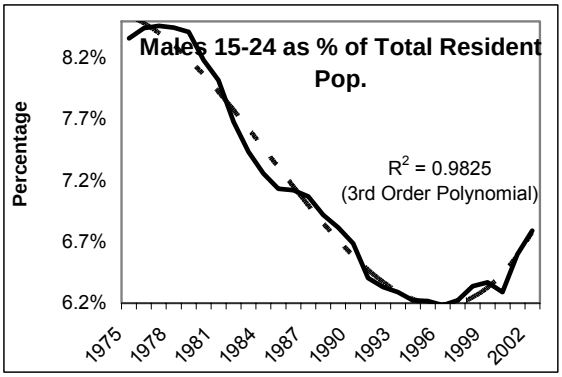
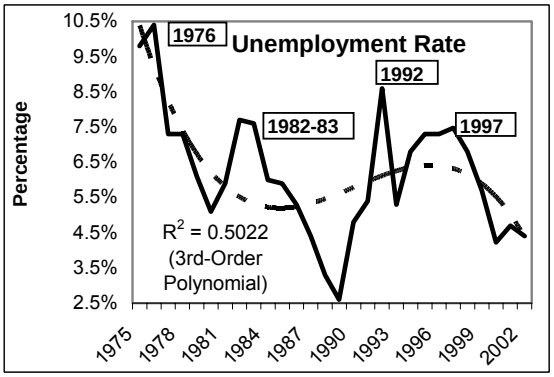
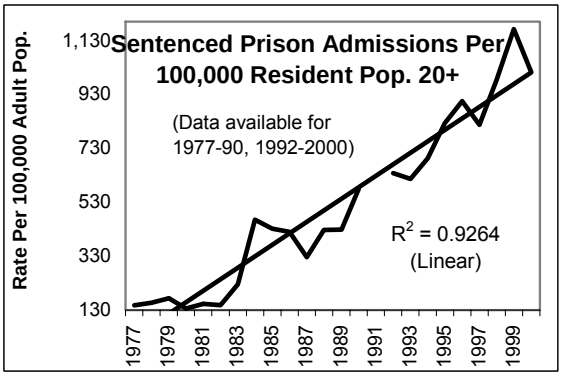


Exhibit 11: Other Possible Predictors and Correlations with Crime Rates – MAUI COUNTY







Simple zero-order Pearson correlation coefficients for Maui County, 1975-2000:

Crime Rates	Visitors as % of DeFacto Pop.	Males 15-24 as % of Total Resident Pop.	Unemployment Rate	Sentenced Prison Admissions per 100,000 Adults*
Murder	**-0.79**	0.74	0.60	-0.51
Rape	-0.38	0.26	0.25	-0.37
Robbery	0.03	-0.26	0.24	0.30
Ag. Assault	0.36	-0.01	**-0.66**	-0.34
Burglary	-0.71	**0.86**	0.13	-0.89
Larceny	-0.49	0.47	0.12	**-0.65**
Vehicle Theft	-0.68	**0.73**	0.18	-0.56
Inter-Correlations				
Males 15-24	-0.86			
Unemploy.	-0.55	0.32		
Sent. Prison*	0.61	-0.87	0.02	

* Correlations based on 1977-2000, excl. 1991

these. If trend lines for two variables essentially matched perfectly, the correlation would be +1.0, and high figures like 0.8 still suggest a very good match. If trend lines were reverse images (e.g., crime rising while, say, unemployment is falling), the correlation would be, or would approach, a perfect negative figure of -1.0. The closer a correlation is to zero, the less "match" between the two variables.

In this part of each exhibit, we have **bold-faced** the single strongest correlation figure with each crime. For example, on O`ahu, Murder is more correlated with the percentage of young males (+0.73) than with tourism (-0.47) or with any other possible predictor variable.

Here is what these simple correlations tell us:

- Tourism is sometimes positively but often *negatively* correlated with various crimes. A negative correlation means that crime tends to go down when tourism goes up – it's the *opposite* of tourism "making crime worse."[18] If we pay attention only to moderate or strong correlations in excess of either +0.3 or -0.3, we see that six of the 28 correlations between tourism and Index Offense crime rates are positive while 14 are actually negative, with the remainder falling in the indeterminate zone.

- Only two crimes have been consistently related to tourism in the same way for all counties, and both are consistent *negative* correlations: Murder and Burglary rates generally declined over the last quarter-century, when tourism increased, for all four counties. The Murder relationship is fairly weak for Hawai`i and Kaua`i Counties, but the negative Burglary correlation is moderate to strong across all counties.

  For other crimes, a correlation may be positive for one county, but negative or close to zero for others. For example, Rape is positively associated with tourism for O`ahu and Hawai`i County, zero-correlated for Kaua`i, and somewhat negatively correlated for Maui

- Non-tourism factors usually were more correlated to various crimes than was tourism: On O`ahu, only Larceny had a higher correlation with tourism than did any other possible predictor.[19] For Hawai`i County, only Rape. And for Maui County, only Murder (with a *negative* correlation). The demographic, economic, and prison/deterrence variables were

[18] Of course, correlations do not establish cause-and-effect. A negative correlation does not mean tourism "make crime better." It just means that, on the face of it, the statistical relationship between tourism and these types of crime certainly do not support the idea that tourism makes crime worse.

[19] But in the other three counties, Larceny was either essentially uncorrelated to tourism (Hawai`i County) or negatively correlated (Kaua`i and Maui Counties).

more likely to have the strongest relationships – though these were also sometimes positive and sometimes negative, varying by county.

- Tourism was often more correlated with other possible predictor variables than with crime rate variables: There was also a high degree of inter-correlation among the other predictor variables – young males, unemployment rates, etc.

This last finding poses a serious problem for the intended next phase of the analysis, as discussed in the following Section F.

Discussion: This sort of analysis is never definitive, because (1) there is still a possibility that Tourism can have *short-term* effects on crime despite the lack of match or correlation between the general long-term trends; and (2) as noted, correlations do not establish cause-and-effect in any case.

But what Exhibits 4 through 11 do make very apparent is that tourism in Hawai`i during this period was not a *sole or major* determinant of any serious Index Offense crime rate in any county. That is, no form of crime in Hawai`i seems to be consistently linked over time (in the expected positive way) to general changes in visitor population.

How can we find so little apparent crime-tourism relationship for the period since 1975, when an earlier study did find relationships for 1961-75, at least on a statewide basis? There are several possible explanations:

- As previously noted, tourism-crime relationships seem to be a matter of circumstance, not a “law of nature.” So it is possible that an observable relationship can exist for one period in time but not another, even in the same place.

- The earlier study using 1961-75 data went farther than our analysis has done so far. It used complex statistical techniques to try to measure the effects of tourism on crime when other factors – such as unemployment or demographics – were held equal. So our last section will look at what might also be possible if these statistical procedures were applied to our present dataset.

F. Multiple Regression Analysis (Partial Findings)

This section assumes the reader has at least a conceptual understanding of Ordinary Least Squares (OLS) multiple regression and the uses of regression in time series analysis, the techniques used in many previous crime-tourism studies.

Multiple regression theoretically has the potential to disentangle inter-correlations among predictor variables and then provide a predictive equation that tells us –

- Whether tourism is part of the equation at all for predicting crime;
- If so, whether tourism is relatively more important than other explanations we *have* measured (such as unemployment); and
- Whether an equation involving tourism does a good job predicting crime, or whether other things we *have not* measured (including simple random chance) are probably more important.

Unfortunately, however, we encountered problems in the data that limited the conclusions we could draw from multiple regression analysis.

1. Difficulties in Conducting Multiple Regression with Available Data

Multiple regression, like many other advanced statistical techniques, depends on assumptions about the nature of the data. Despite its theoretical potential to answer questions about tourism-crime data, there are many things that can make a multiple regression analysis problematic. Two of them are worth emphasizing here:

(1) Independent variables should not be highly inter-correlated: As was already noted, Exhibits 5 to 11 showed us time-series data for tourism, unemployment, sentenced prison rates, etc. that unfortunately *are* highly inter-correlated in most counties for this time period.

(2) For time-series data such as these, more years of observation are usually needed to overcome "auto-correlation" issues.[20] Typically, statisticians would wish for at least 50 observations in order to analyze a complex time series that consists of anything other than a very simple trend. We have at best 26 or 27 years of observations and we have even fewer when considering prison data.

"Auto-correlation" means that a variable is related to itself. For a set of social statistics gathered over time, such as our crime figures – the best predictor of Year 10 crime results would be the crime rates before year 10, not changes in some other variable. Auto-correlation becomes an issue because repeated observations in a time series often show a *trend* over time. (This is because the underlying factors that produce a crime rate in a particular year will themselves

[20] From a statistical point of view, the key issue is that "observations are not independent" in time-series analyses. But the practical implication for this study has to do with the need to have lots of years of observations in order to help overcome this problem.

change in highly predictable ways over time, so that they produce similar crime rates in following years.)

As was noted at the very beginning of this analysis, many Hawai`i crime rates do show clear trends, though the nature of those trends vary depending on the crime and the county – the "picture" for some of them is close to a straight line going up or down, while others rise and fall over time like waves. Also, Exhibits 5 to 11 showed that most of the other possible predictors of crime (unemployment, etc.) themselves have clear trends.

When this is the case, multiple regression analyses become more complicated, and even a simple analysis without complicated modeling may require two different steps. These steps involve disaggregating each variable's time series into two different components:

- Long-Term Trends: The first component would be the underlying general trends shown by the "best-fit" trend lines super-imposed on Exhibits 4 to 11. We could go beyond the simple analysis done in the foregoing Section E (i.e., just describing the trends) by doing an actual multiple regression analysis to determine whether the Tourism trend line has a relationship with any of the crime best-fit trend lines for various counties.

- Short-Term Changes: The second component looks at year-to-year *differences* over time between actual observed values and the expected value according to the "best-fit" general trend line. In other words, a particular crime rate may be changing over time in a way that is best described by a straight line going up or down – but the actual data are *close to* a straight line rather than perfectly forming the straight line. The differences between the line and the actual data can be measured, and are called *residuals.* It is possible to conduct a second and separate multiple regression analysis based not on the original data, but rather on the residuals. The question here is not whether crime and tourism seem to be moving in the same direction over the long haul, but whether short-term "peaks" or "valleys" in tourism are associated with immediate "peaks" or "valleys" in crime.[21]

2. Limited Findings from Multiple Regression Analysis of Residuals

We elected not to attempt a multiple regression for the long-term trend lines because we felt it was unnecessary and because the independent variables in such an analysis are generally highly inter-correlated. The simple visual analysis of peak years and best-fit trends lines in Section E was sufficient to make the point that long-term trends for tourism and crime rates are generally not very similar. Trying to do a multiple regression using the best-fit trends lines would

[21] We should remember that in addition to meaningful short-term year-to-year variation, all measurement errors for each variable are also contained in that residual.

make sense only if we are testing some sort of theory which related to trends of a particular predicted nature. That seemed a more appropriate task for an academic analysis.

We did, however, feel it would be appropriate to attempt some multiple regression analysis for the short-term residuals, despite the data limitations. This type of analysis addresses the kind of question that social agencies – or, for that matter, the general public – might often ask: "If tourism suddenly rises unexpectedly a whole lot next year, will crime suddenly rise a whole lot, too?"[22]

Knowing that our results would be tentative and constrained by the previously discussed data limitations, we decided to conduct analyses just for O`ahu and Maui.[23] And in order to keep the number of observations as high as possible, we:

- Dropped the "sentenced prison admission rate" from our set of independent variables for this particular analysis;

- Kept the number of observations at 27 for all variables by assuming that the 2001 value for "% of young males" would be identical to the 2000 value;[24]

- Restricted our analysis to "synchronous" (same-year) effects, rather than searching for "lagged" relationships (e.g., seeing if crime in one year responded to tourism changes in a preceding year rather than the same year);

- For the analysis of residuals, sometimes chose "best-fit" trend lines that minimized loss of observations ("degrees of freedom") even though a more complicated line would actually fit better – e.g., several O`ahu crimes clearly had wave patterns with several peaks, and 4th-order polynomials would fit better, but we worked instead with simple curves and 2nd- or 3rd-order polynomial equations to maximize the power of the analysis.

O`ahu Results: First, we calculated correlations between the residuals for Tourism and the residuals for the seven Index Offense crimes. We found one statistically significant correlation and one that was not significant but somewhat approached significance. Interestingly, these were for the two crimes that also appeared to have some possible long-term relationship as well with tourism on O`ahu, as was noted in the foregoing Section E:

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[22] The analysis of "peak years" in Section E has already shown us this has not been the case historically. However, analysis of residuals is really asking a slightly more complicated question: "If tourism suddenly rises a whole lot next year – but everything else that might affect crime stays the same" – would crime rise a whole lot, too (independent of other factors)?"

[23] As may be seen in Exhibits 4, 6, 8, and 10, the underlying trend lines – around which residuals are measured – provide fairly good fits for most crimes on O`ahu and Maui. However, the Hawai`i and Kaua`i County "best-fit" lines often had extremely low R^2 values.

[24] At the time of the analysis, we had data for this variable only through the year 2000.

- *Aggravated Assault residuals:* Correlation of +0.47 with Tourism residuals (using best-fit lines described in Exhibit 12 below).

- *Larceny residuals:* Correlation of +.26 with Tourism residuals (not significant, using best-fit lines described in Exhibit 13 below).

Based on this, we conducted a multiple regression analysis using these two O`ahu crime rates as dependent variables.

Exhibit 12: Regression Analysis of Residuals, Using O`ahu Aggravated Assault as Dependent Variable

	Tourism	Unemploy-ment	Young Males	Constant	R^2	F-Test Signif.
Unstandardized Coefficients	+1,436	+0.39	-2,990	+.40	0.64	.000
Standardized Coefficients	+.418	+.024	-.651			
Signif. of Standard. Coeff.	.008	.870	.000			
(Residuals calculated from: Ag. Assault, linear; Tourism, S-curve; Unemployment, 2nd-order polynomial; and Young Males, linear)						

The results indicate that short-term changes in O`ahu's Aggravated Assault rate for this period *were* statistically associated with changes in Tourism, though the relationship with Young Males was even stronger. Unemployment would be "weeded out" of the equation because the statistical significance of its standardized coefficient was far higher than the 0.05 level which is the usual cut-off point.

Exhibit 13: Regression Analysis of Residuals, Using O`ahu Larceny as Dependent Variable

	Tourism	Unemploy-ment	Young Males	Constant	R^2	F-Test Signif.
Unstandardized Coefficients	+28,152	+65	+9,828	-14	0.10	.492
Standardized Coefficients	+.349	+.167	+.091			
Signif. of Standard. Coeff.	.138	.469	.658			
(Residuals calculated from: Larceny, 3rd-order polynomial; Tourism, S-curve; Unemployment, 2nd-order polynomial; and Young Males, linear)						

In this analysis, all three of the possible predictors – including Tourism – would be "weeded out," though Tourism came closer than the others to being statistically significant. However, the overall R^2 was just 0.10, indicating that these independent variables simply lacked much ability at all to predict O`ahu's Larceny rate in the short run.

For O`ahu, we conclude that a possible tourism-crime connection exists only for Aggravated Assault, though the weak connection with Larceny might attain statistical significance in a longer data series.

Maui Results: Again we calculated correlations between Maui Tourism residuals and those for the seven Index Offenses. We found some significant *negative* correlations between Tourism and the crimes of Rape, Burglary, and (unlike O`ahu, where the relationship was positive) Larceny. These match and reinforce the overall negative long-term negative correlations for these and other crimes reported for Maui back in Exhibit 11.

So the principal finding for Maui – both long-term and short-term – would be that "Crime does *not* make tourism worse there." Correlational data do not establish cause and effect, but most of the Maui results would be more consistent with a hypothesis that tourism increases are associated with economic improvement that reduces crime.

We found one barely-significant positive correlation of Tourism residuals with a Maui crime rate residual series:

- *Aggravated Assault residuals:* Correlation of +0.35 with Tourism residuals (using best-fit lines described in Exhibit 14 below).

Especially because of apparent consistency with O`ahu results, we proceeded with the multiple regression analysis of residuals to see if the Tourism-Assault relationship would survive or would be "weeded out" (i.e., explained by the effects of other variables):

Exhibit 14: Regression Analysis of Residuals, Using Maui Aggravated Assault as Dependent Variable

	Tourism	Unemploy-ment	Young Males	Constant	R^2	F-Test Signif.
Unstandardized Coefficients	+4.1	-12.5	-9.5	.000	.36	.016
Standardized Coefficients	+.233	-.507	-.036			
Signif. of Standard. Coeff.	.227	.016	.859			
(Residuals calculated from: Ag. Assault, 3rd-order polynomial; Tourism, 2nd-order polynomial; Unemployment, 2nd-order polynomial; and Young Males, 3rd-order polynomial)						

Exhibit 14 shows the Tourism effect on Maui's short-term Aggravated Assault crime rate was in fact "weeded out," apparently due to inter-relationship with Unemployment. However, the effect of Unemployment on Aggravated Assault in this equation is a highly counter-intuitive *negative* one, and Young Males – the sole statistically significant predictor of short-term O`ahu Aggravated Assault residuals in Exhibit 12 – is shown to have inconsequential effects on Maui.

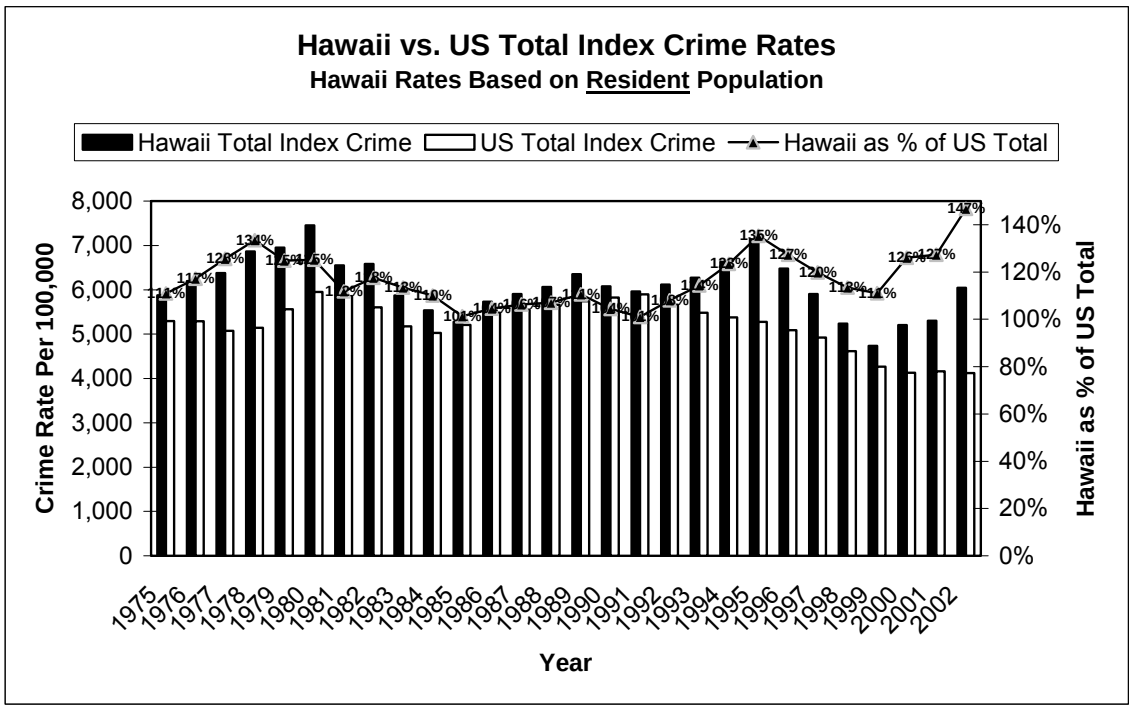
Concluding Statement: Multiple regression is a potentially powerful statistical tool, but the limitations in the data – inter-correlated predictors and a relatively small number of years of observations for a time-series – result in somewhat muddy results.

And yet, muddy results are the norm for tourism-crime studies. It is typical to find a statistical link between tourism and one type of crime (but not others) in one place, and between tourism and another type of crime in a different place.

We pushed the limit of statistical methodology in doing these analyses so that we could say we made the greatest possible effort to test the hypothesis that "tourism makes crime worse." We found only a few hints that this might occasionally be true in Hawai`i. We found more hints that the reverse is true equally or more often – that many types of crime have declined as tourism has increased. Overall, though, we found little evidence of consistent and systematic links over time between Hawai`i crime and tourism in the various counties of the state.

APPENDIX A: HAWAI`I STATEWIDE CRIME RATES VS. NATIONAL CRIME RATES, 1975 – 2002

Exhibit A-1: Comparing Hawaii vs. U.S. Total Crime Rates



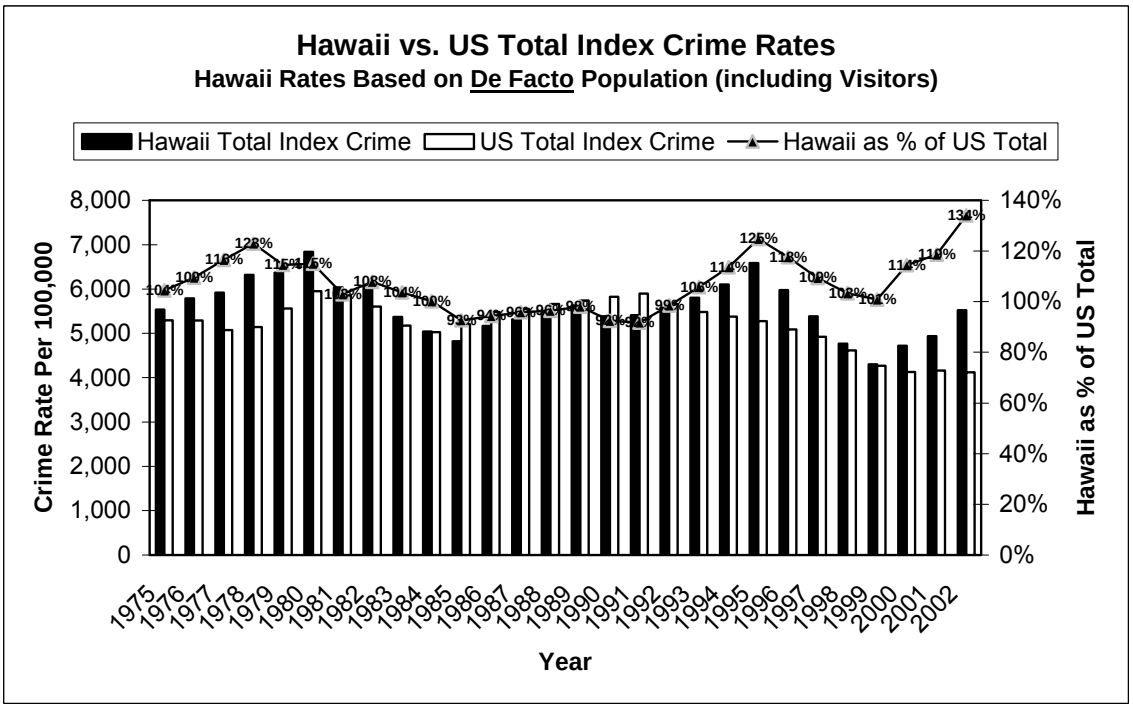
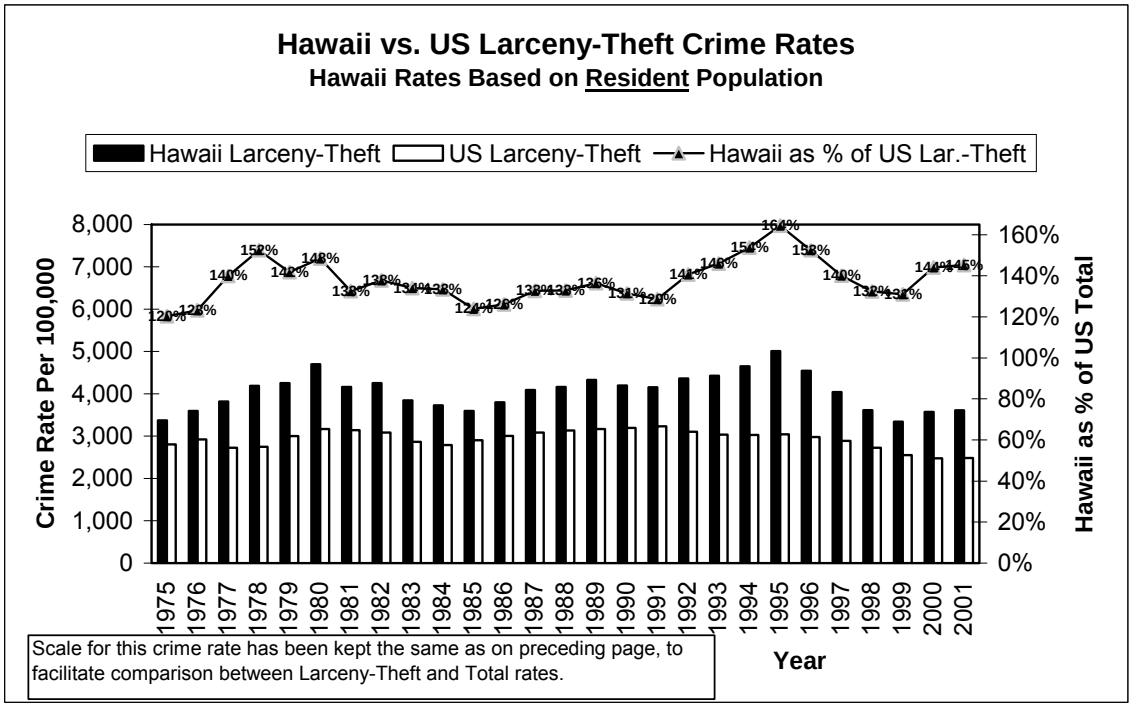
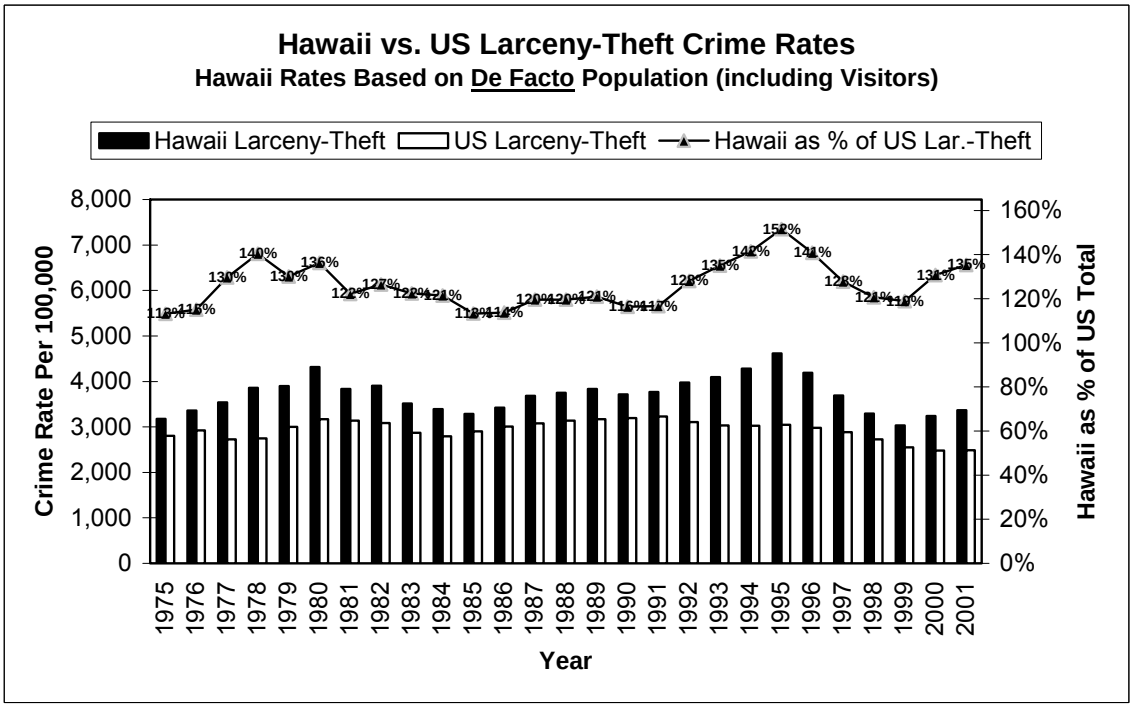


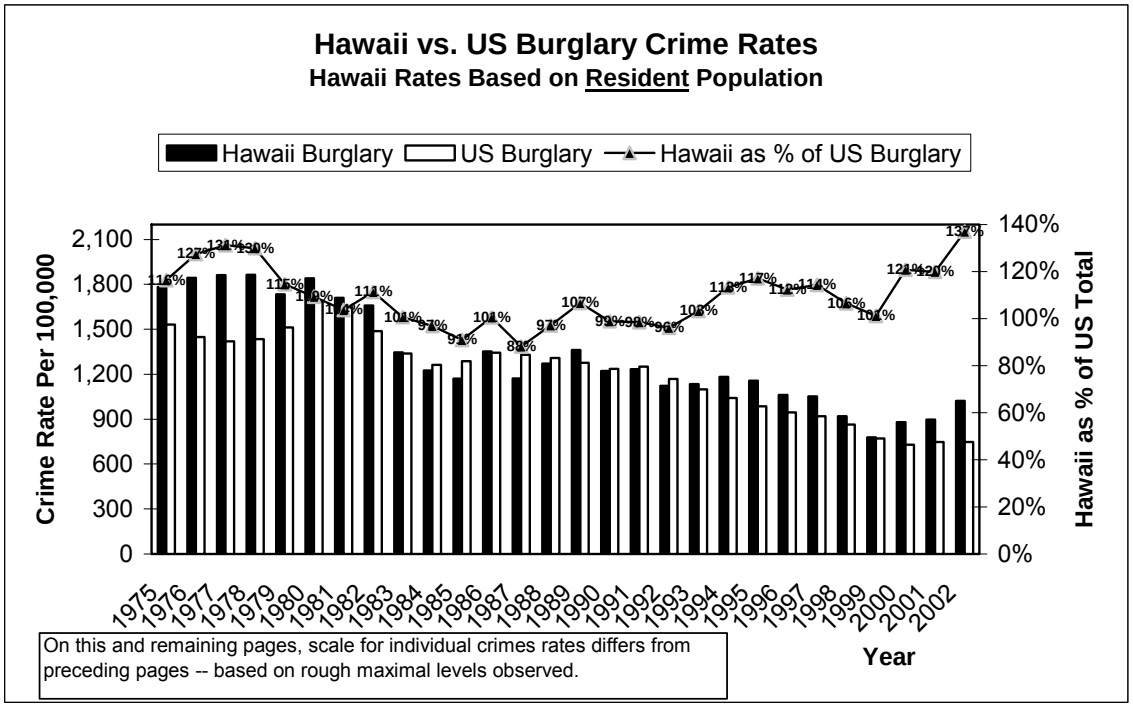
Exhibit A-2: Comparing Hawaii vs. U.S. Larceny-Theft Rates





(Scale for Exhibit A-2 identical to that for Exhibit A-2 to facilitate comparison; scales for remaining Exhibits A-3 to A-8 are necessarily different.)

Exhibit A-3: Comparing Hawaii vs. U.S. Burglary Rates



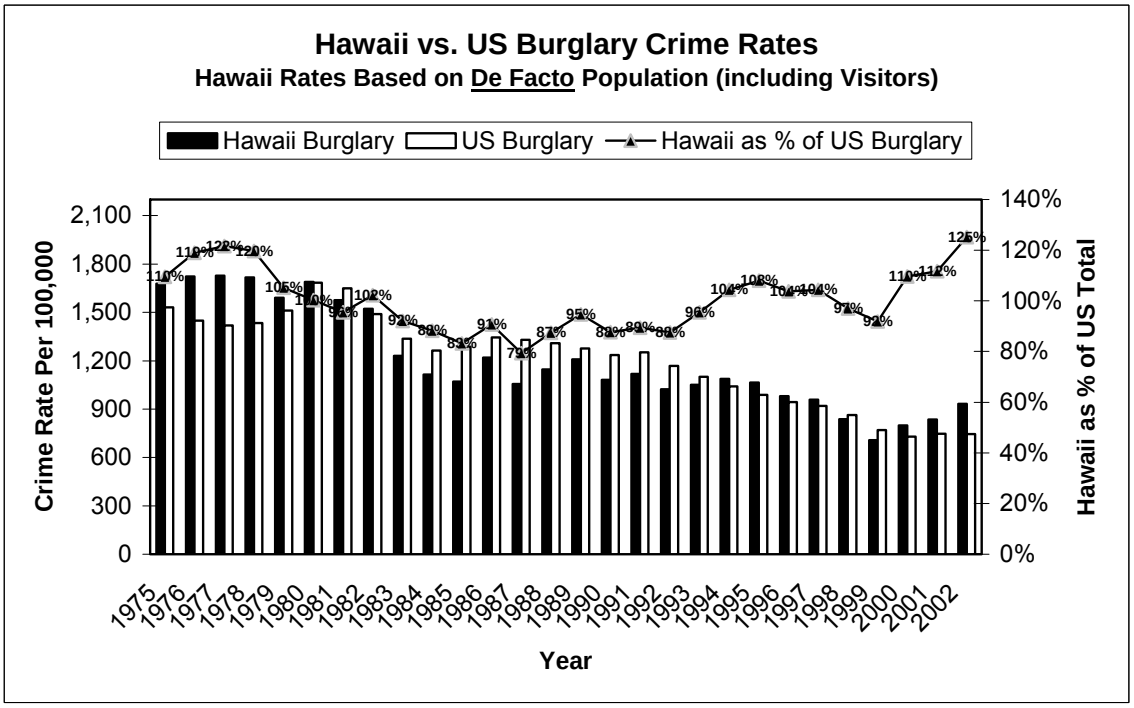
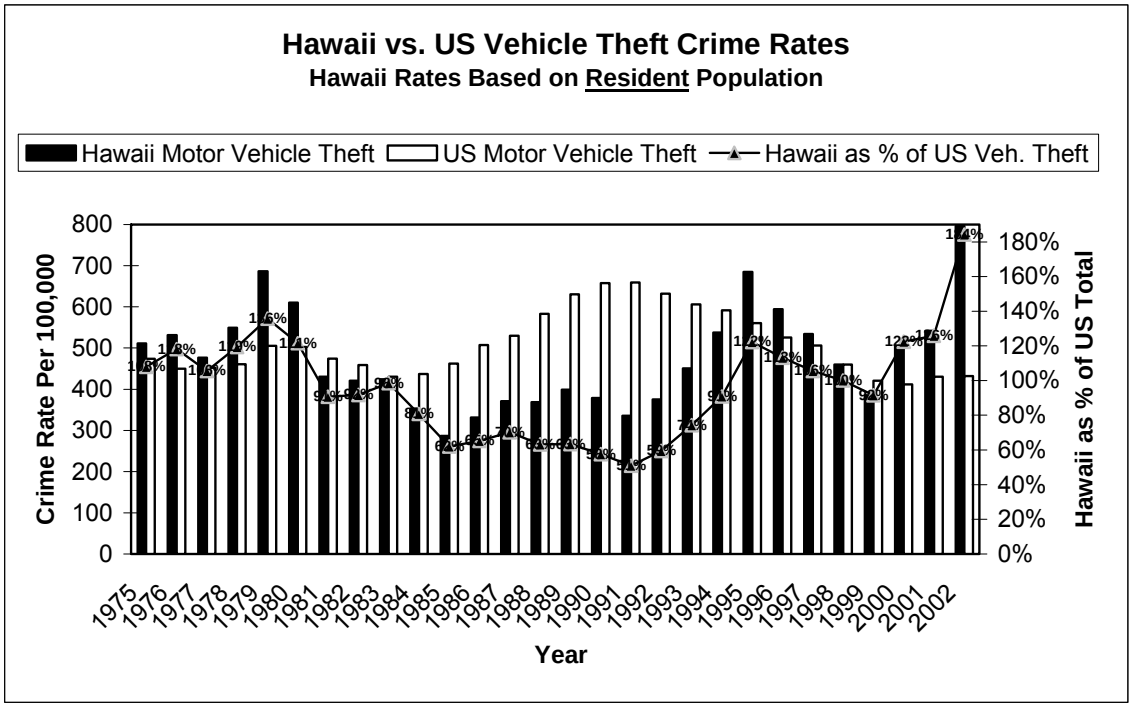


Exhibit A-4: Comparing Hawaii vs. U.S.Motor Vehicle Theft Rates



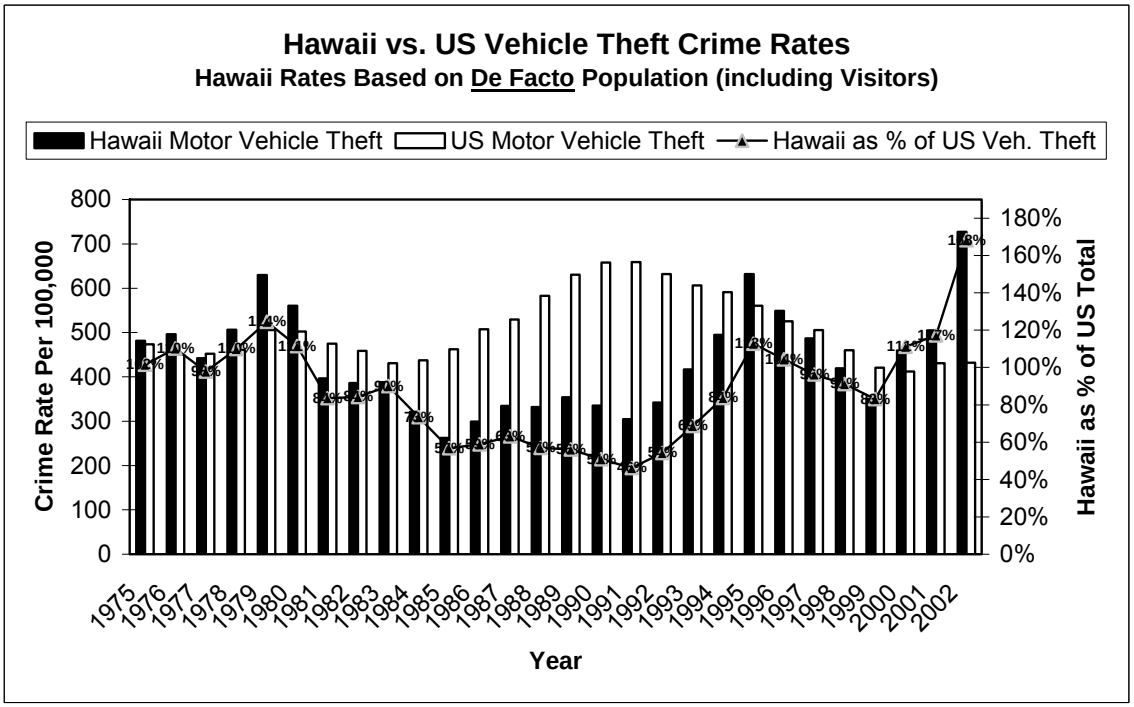
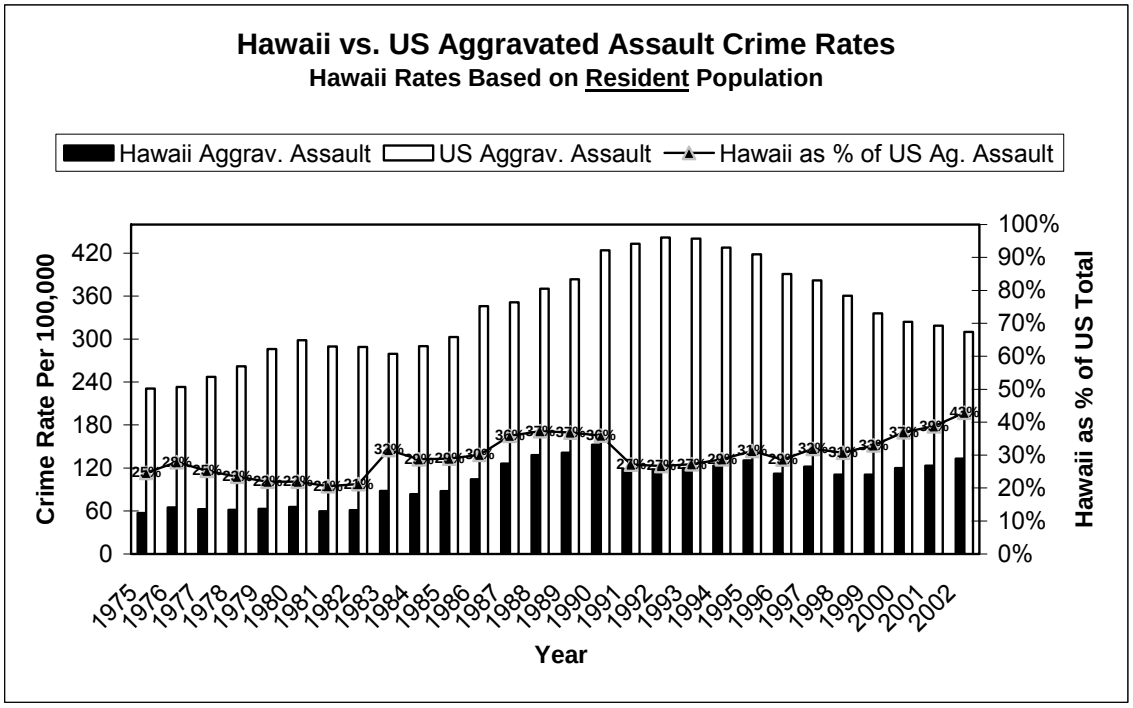


Exhibit A-5: Comparing Hawaii vs. U.S. Aggravated Assault Rates



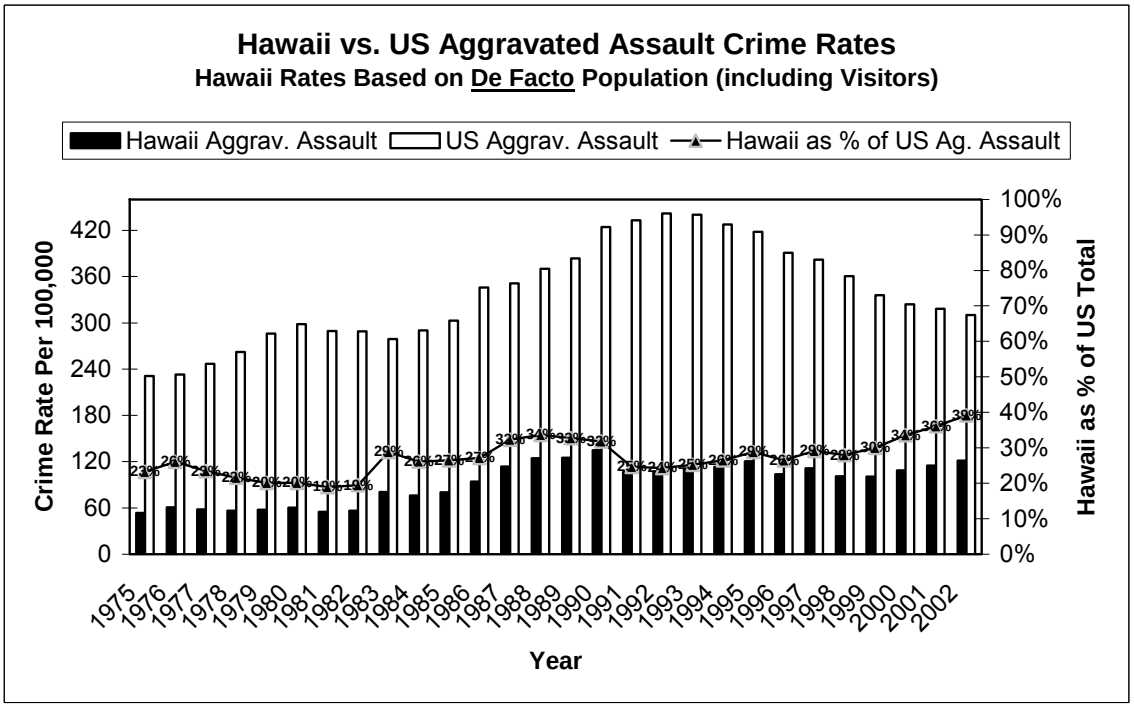
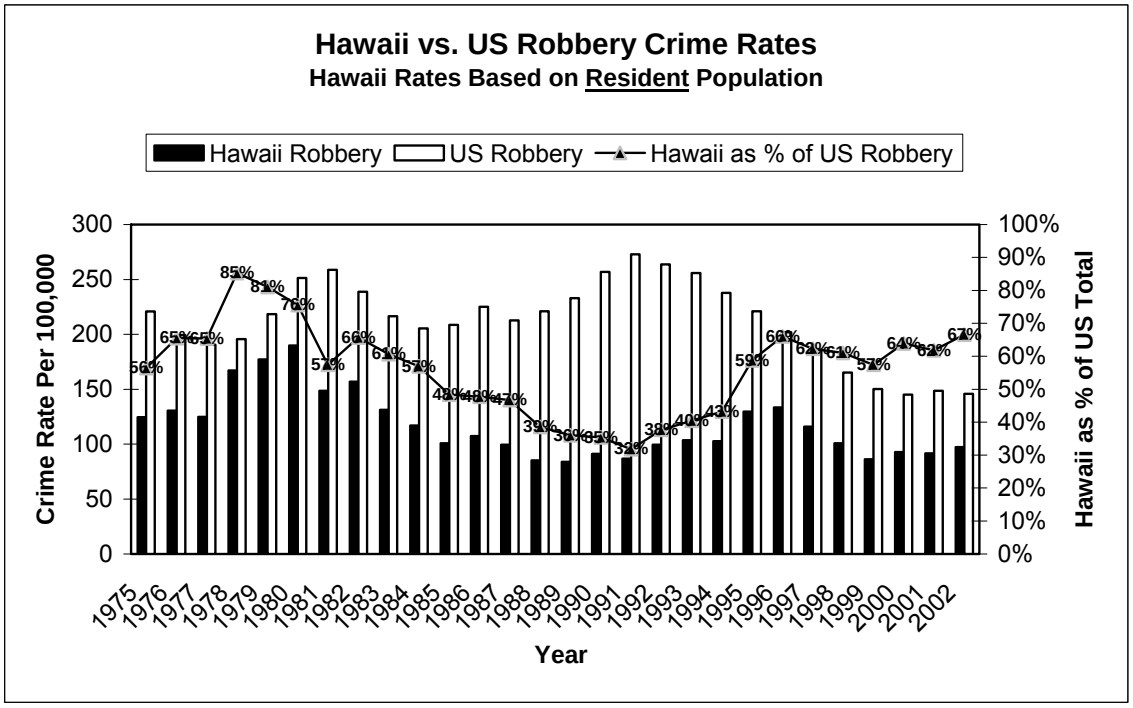


Exhibit A-6: Comparing Hawaii vs. U.S. Robbery Rates



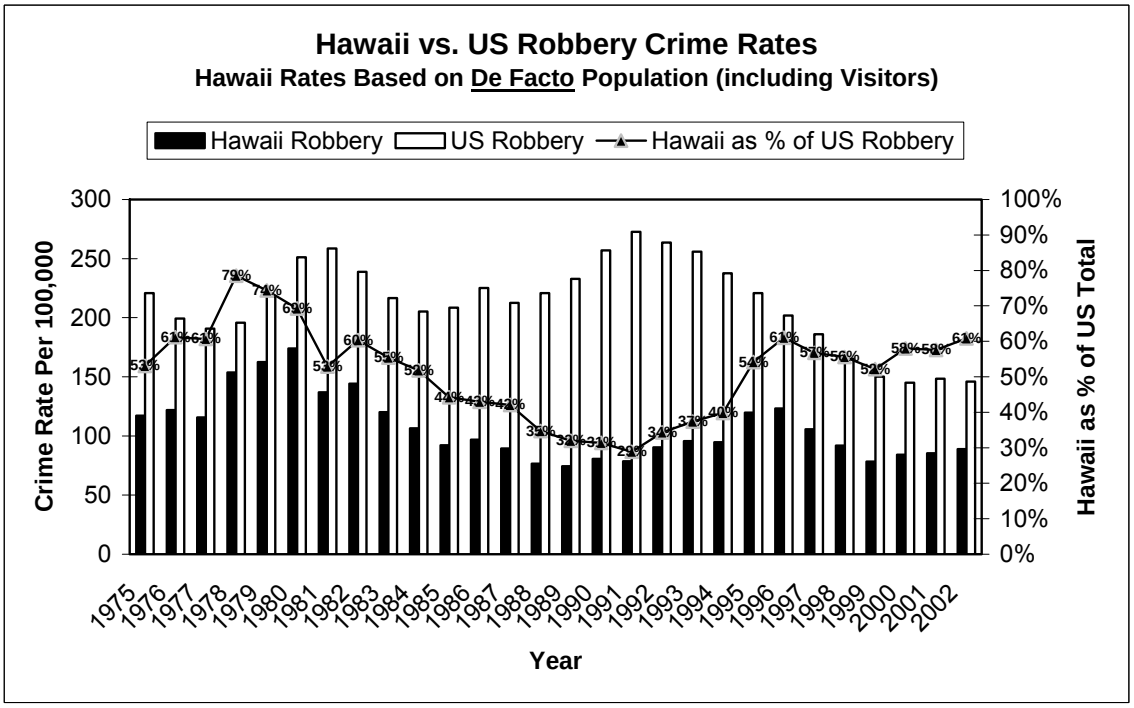
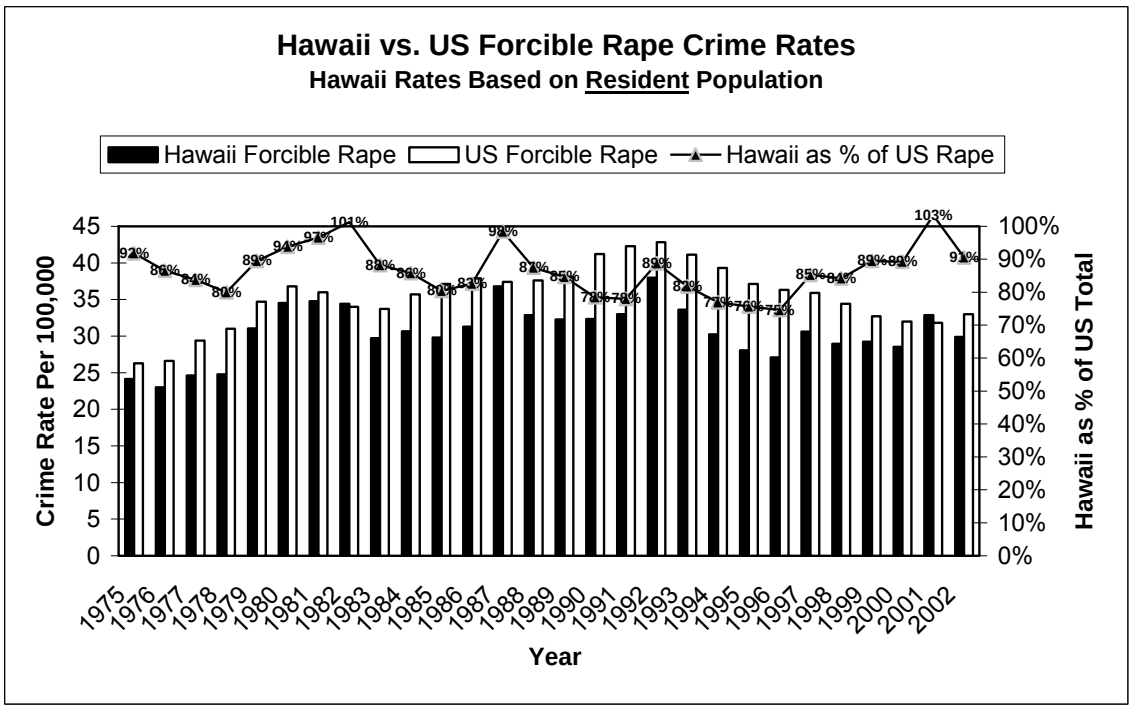


Exhibit A-7: Comparing Hawaii vs. U.S. Forcible Rape Rates



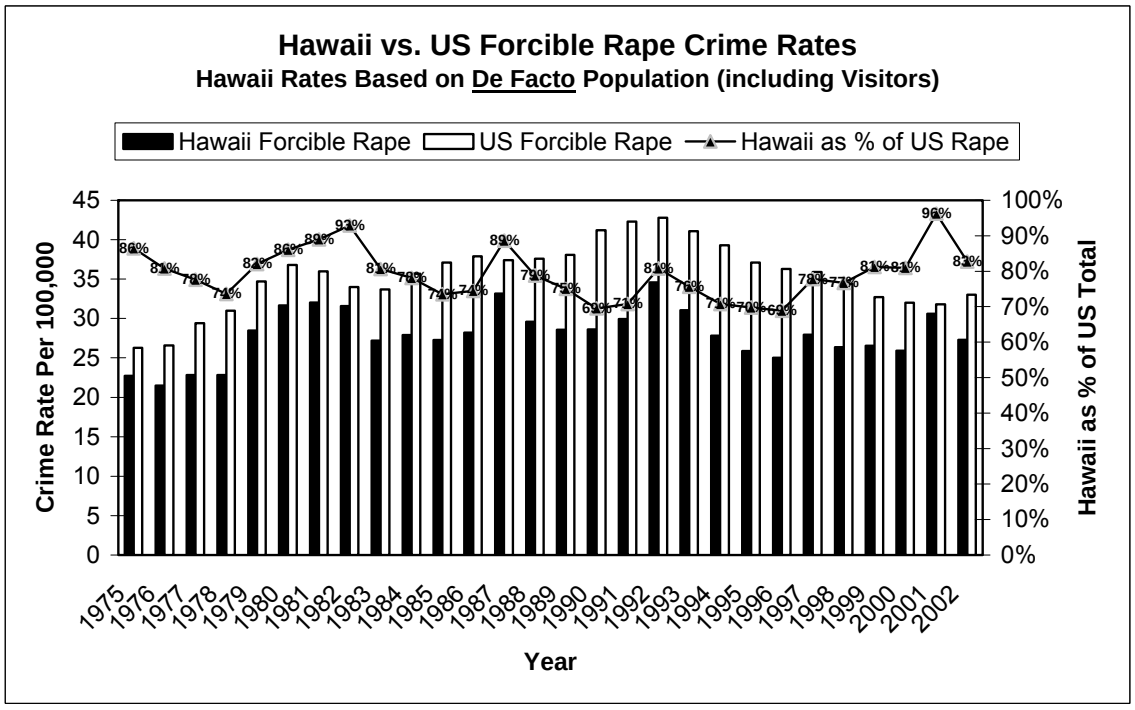
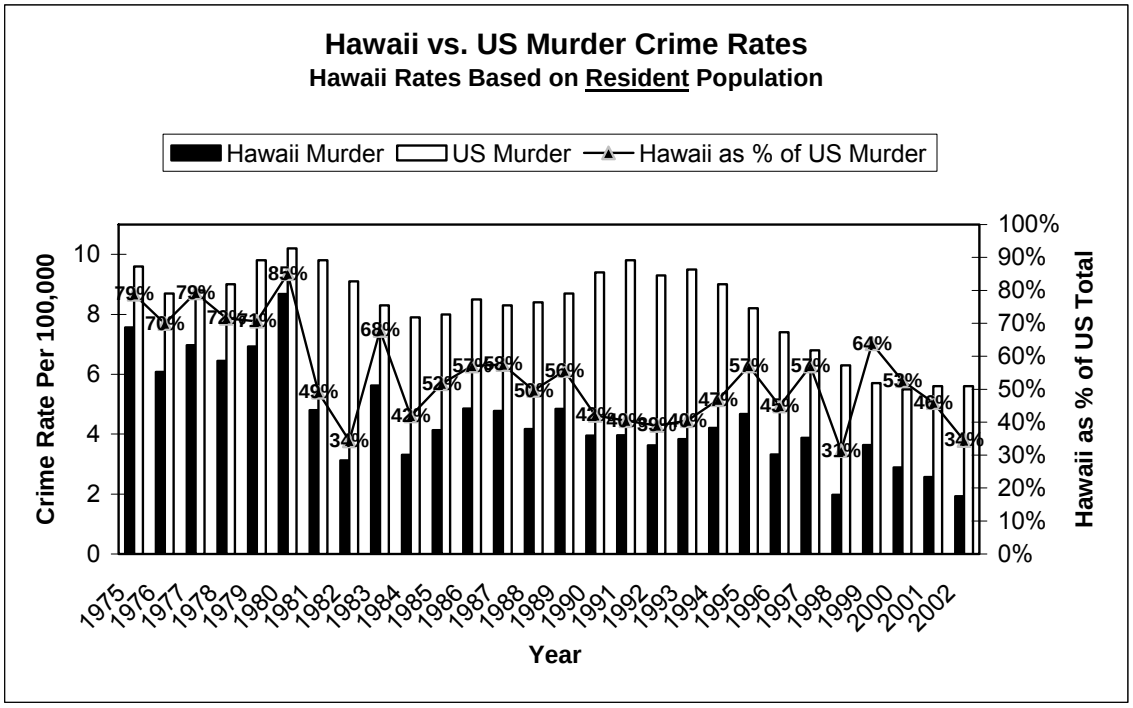
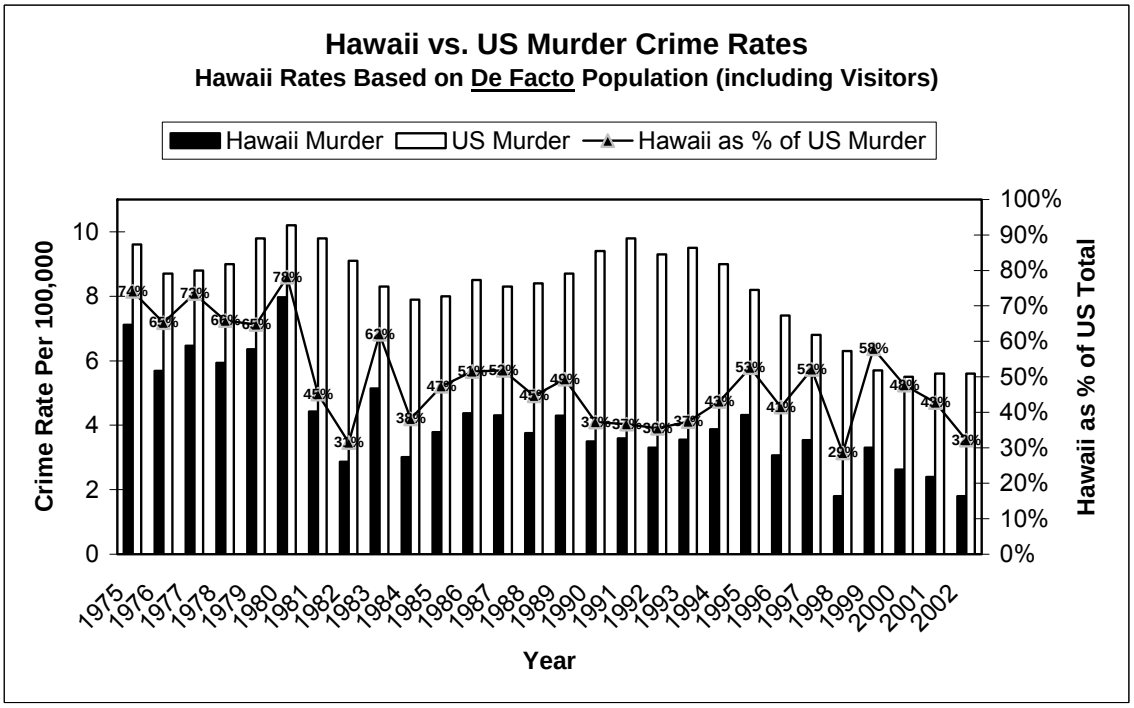


Exhibit A-8: Comparing Hawaii vs. U.S. Murder Rates





APPENDIX B:
DATA USED IN HAWAI`I TOURISM-CRIME ANALYSIS, 1975 – 2002

Exhibit B-1: Raw Data Used for O`ahu Analyses

Tourism Measures, Population Data, and Other Potential Predictors

Year	Total Resident Population	Population ages 20+	Male Residents Ages of 15-24	Military Personnel	Avg. Daily Visitor Census	De Facto Pop.	No. of Visitor Units	Total Prison Admissions	Sentenced Prison Admissions
1975	717,221	462,163	86,654	43,071	48,669	757,091	25,352	N/A	N/A
1976	726,645	473228	87,311	43,903	55,691	772,939	25,851	N/A	N/A
1977	734,966	483,979	87,498	42,835	61,100	786,783	27,363	1,423	488
1978	740,500	493,725	88,277	43,907	66,346	797,227	28,546	1,582	486
1979	753,426	507,443	88,665	45,408	67,688	816,006	30,065	1,836	572
1980	764,600	516,033	87,162	43,313	66,680	822,408	34,334	1,922	493
1981	767,573	524,932	85,670	44,141	66,455	823,849	33,967	2,111	595
1982	776,075	534,616	82,748	44,470	73,445	835,903	33,492	2,325	632
1983	789,097	547,550	81,255	44,651	66,695	844,984	34,354	2,327	868
1984	797,791	557,347	79,915	47,648	67,370	851,350	36,848	2,786	1,436
1985	804,294	564,282	78,427	46,875	65,280	853,605	38,600	3,077	1,753
1986	810,444	573,596	78,115	46,122	73,870	869,891	39,010	2,989	2,021
1987	818,447	584,015	77,438	47,262	74,660	880,191	38,185	2,954	1,975
1988	824,072	590,635	75,169	45,843	80,450	887,025	37,841	3,421	2,295
1989	831,337	598,982	73,653	45,935	88,750	898,727	36,467	4,317	2,797
1990	838,534	609,817	72,071	41,887	82,783	913,268	36,899	3,796	3,469
1991	850,510	614,943	70,373	44,092	75,008	901,717	36,623	N/A	N/A
1992	863,959	621,582	69,940	44,864	77,785	912,514	36,851	4,589	3,194
1993	870,348	623,696	68,841	42,958	78,108	909,506	36,604	4,687	3,556
1994	878,591	627,803	68,638	42,161	81,526	919,898	36,194	4,187	3,156
1995	881,399	628,871	68,163	38,172	81,362	921,626	36,170	4,252	2,775
1996	883,443	629,848	68,001	36,392	80,833	921,609	36,146	3,862	2,545
1997	886,711	633,913	68,131	34,826	76,150	932,931	35,971	3,910	2,547
1998	886,909	636,844	68,437	34,643	72,623	931,439	36,206	5,229	3,579
1999	878,906	634,908	67,534	32,708	79,497	927,689	35,861	5,539	4,104
2000	875,881	644,132	66,256	33,930	84,910	925,444	36,303	5,272	4,474
2001	884,176	653,406	65,905	34,322	79,699	928,134	36,824	N/A	N/A
2002	896,019	663,464	67,034	34,608	82,121	942,193	36,457	N/A	N/A

Reported Crime for Index Offenses (Raw Counts)

Year	Murder and Non-Negligent Man-slaughter	Forcible Rape	Robbery	Aggravated Assault	Burglary	Larceny-Theft	Motor Vehicle Theft
1975	58	169	1,050	319	13,404	24,768	4,181
1976	40	164	1,112	380	13,728	26,082	4,260
1977	46	176	1,081	357	13,291	28,286	3,747
1978	38	187	1,473	346	13,878	31,567	4,403
1979	48	223	1,568	357	12,803	32,166	5,761
1980	65	264	1,729	398	13,848	36,189	5,225
1981	40	265	1,320	340	12,576	31,362	3,645
1982	25	269	1,457	400	12,381	32,416	3,652
1983	45	249	1,243	599	10,044	30,195	3,853
1984	25	255	1,117	553	9,320	30,191	3,099
1985	36	248	965	552	8,989	28,837	2,421
1986	46	241	1,052	737	10,675	30,846	2,858
1987	36	322	985	915	9,136	34,239	3,316
1988	28	283	833	1,042	9,811	34,227	3,245
1989	43	269	809	1,044	10,654	36,305	3,558
1990	34	278	889	1,211	9,785	35,514	3,317
1991	29	275	860	894	9,905	36,019	3,050
1992	31	326	1,013	1,012	9,106	38,563	3,507
1993	31	286	1,085	1,099	9,296	40,148	4,460
1994	35	266	1,058	1,169	10,018	42,552	5,727
1995	38	217	1,371	1,256	10,127	46,696	7,440
1996	27	222	1,421	1,078	9,026	41,915	6,370
1997	34	257	1,214	1,131	8,755	36,430	5,589
1998	17	242	1,052	1,031	7,692	32,669	4,750
1999	37	235	907	1,019	6,087	30,396	3,997
2000	20	240	984	1,058	6,946	32,197	5,214
2001	20	293	999	1,141	7,340	33,052	5,597
2002	18	304	1,072	1,207	8,932	37,250	8,488

Exhibit B-2: Raw Data Used for Hawai`i County Analyses

Tourism Measures, Population Data, and Other Potential Predictors

Year	Total Resident Population	Population ages 20+	Male Residents Ages of 15-24	Military Personnel	Avg. Daily Visitor Census	De Facto Pop.	No. of Visitor Units	Total Prison Admissions	Sentenced Prison Admissions
1975	77,212	49,163	6,844	N/A	6,496	83,258	5,348	N/A	N/A
1976	80,480	51,747	7,063	N/A	6,782	86,850	6,045	N/A	N/A
1977	82,608	53,617	7,154	N/A	7,195	89,348	5,929	642	195
1978	85,661	56,097	7,275	N/A	8,094	93,350	6,002	591	149
1979	89,069	58,764	7,417	N/A	7,996	96,712	6,093	652	131
1980	92,900	61,314	7,434	N/A	7,195	99,181	5,889	724	156
1981	96,122	64,055	7,473	N/A	6,561	101,597	6,705	678	200
1982	98,798	66,147	7,282	N/A	6,725	104,087	7,167	713	192
1983	100,764	67,764	7,112	N/A	8,690	108,331	7,469	555	227
1984	103,528	69,871	7,047	N/A	7,570	109,480	7,149	600	298
1985	105,900	71,582	7,004	N/A	8,040	112,343	7,511	809	324
1986	108,362	73,725	7,081	N/A	9,870	116,451	7,280	741	337
1987	111,735	76,436	7,158	N/A	10,210	120,289	7,328	857	431
1988	113,439	77,719	7,029	N/A	10,690	122,038	8,823	966	395
1989	116,585	80,036	7,024	N/A	17,760	131,153	8,161	1,069	395
1990	121,572	84,019	7,116	N/A	16,698	133,202	8,952	1,156	373
1991	127,266	87,287	7,322	N/A	17,535	141,240	9,383	N/A	N/A
1992	131,630	89,780	7,513	N/A	19,244	146,421	9,170	1,572	492
1993	135,085	91,463	7,692	N/A	18,974	148,014	9,140	1,366	470
1994	137,713	92,727	7,761	N/A	18,902	150,311	9,595	1,482	574
1995	140,492	94,199	7,872	N/A	18,547	152,482	9,577	1,599	665
1996	141,935	95,044	7,954	N/A	19,285	154,364	9,558	1,370	788
1997	144,445	96,884	8,148	N/A	21,656	161,225	9,913	1,171	820
1998	145,833	98,152	8,294	N/A	23,993	165,205	9,655	993	842
1999	146,970	99,099	8,356	N/A	22,736	164,570	9,815	1,152	912
2000	149,261	105,857	9,862	N/A	21,831	166,446	9,774	1,192	1,030
2001	151,709	106,372	10,313	N/A	21,064	168,150	9,944	N/A	N/A
2002	154,794	109,194	10,914	N/A	22,277	172,468	9,297	N/A	N/A

Reported Crime for Index Offenses (Raw Counts)

Year	Murder and Non-Negligent Man-slaughter	Forcible Rape	Robbery	Aggravated Assault	Burglary	Larceny-Theft	Motor Vehicle Theft
1975	3	20	16	63	912	2,057	121
1976	6	16	35	84	1,101	2,493	169
1977	9	14	19	60	1,312	2,576	176
1978	9	16	39	74	1,326	2,767	208
1979	11	33	41	86	1,338	2,911	199
1980	13	20	48	92	1,526	3,309	199
1981	3	32	58	86	1,763	3,461	220
1982	2	23	47	81	1,516	3,666	181
1983	5	27	30	83	1,182	3,374	168
1984	3	23	28	96	1,163	3,146	238
1985	4	26	31	103	1,223	3,518	206
1986	2	40	37	105	1,408	3,521	226
1987	13	27	28	114	1,198	3,360	193
1988	13	23	33	134	1,391	4,057	259
1989	7	33	47	178	1,613	4,613	340
1990	7	46	71	202	1,711	4,972	451
1991	7	51	52	242	1,815	4,716	343
1992	6	44	46	171	1,601	4,713	314
1993	6	43	47	155	1,767	4,548	314
1994	7	43	57	157	1,690	4,895	267
1995	10	49	72	174	1,568	4,881	320
1996	8	45	61	133	1,581	4,718	309
1997	9	46	68	161	1,651	5,029	353
1998	3	45	73	134	1,660	4,474	368
1999	5	62	41	149	1,400	3,870	288
2000	4	53	54	126	1,449	4,355	384
2001	8	68	63	138	1,538	4,677	493
2002	5	35	48	133	1,539	4,663	513

Exhibit B-3: Raw Data Used for Kaua`i County Analyses

Tourism Measures, Population Data, and Other Potential Predictors

Year	Total Resident Population	Population ages 20+	Male Residents Ages of 15-24	Military Personnel	Avg. Daily Visitor Census	De Facto Pop.	No. of Visitor Units	Total Prison Admissions	Sentenced Prison Admissions
1975	33,305	21,296	2,609	N/A	4,941	38,074	3,102	N/A	N/A
1976	34,765	22,456	2,760	N/A	5,445	40,083	3,520	N/A	N/A
1977	35,414	23,115	2,830	N/A	6,025	41,262	3,657	N/A	N/A
1978	36,696	24,177	2,934	N/A	7,069	43,609	3,786	N/A	N/A
1979	38,011	25,246	3,036	N/A	7,394	45,211	4,202	264	47
1980	39,400	26,139	3,073	N/A	7,259	46,341	4,322	223	54
1981	40,457	27,157	3,099	N/A	7,225	47,246	4,738	294	51
1982	41,804	28,203	3,066	N/A	7,050	48,304	5,147	414	55
1983	42,796	29,011	3,036	N/A	7,990	50,419	4,193	540	81
1984	43,634	29,710	3,015	N/A	10,930	54,027	5,313	625	179
1985	44,357	30,259	3,005	N/A	11,470	55,086	5,656	523	131
1986	45,567	31,309	3,076	N/A	14,840	59,599	5,922	586	166
1987	47,203	32,624	3,154	N/A	15,510	62,007	5,956	495	134
1988	48,549	33,637	3,164	N/A	16,400	64,090	7,180	602	167
1989	49,847	34,630	3,193	N/A	19,140	67,300	7,398	593	174
1990	51,676	36,145	3,237	N/A	17,378	66,699	7,546	566	167
1991	53,379	37,054	3,201	N/A	17,720	69,605	7,567	N/A	N/A
1992	54,439	37,546	3,221	N/A	13,479	66,076	7,778	672	284
1993	55,461	37,948	3,262	N/A	8,283	61,262	4,631	694	283
1994	56,478	38,472	3,318	N/A	13,268	67,161	5,870	411	196
1995	57,068	38,720	3,344	N/A	14,439	68,844	6,315	548	294
1996	57,688	39,031	3,362	N/A	15,572	70,474	6,760	597	312
1997	57,712	39,083	3,369	N/A	15,999	71,763	6,589	570	303
1998	57,843	39,309	3,418	N/A	17,909	73,920	6,969	623	360
1999	58,264	39,722	3,448	N/A	18,214	74,441	6,872	659	347
2000	58,560	41,711	3,676	N/A	18,041	74,711	7,159	809	414
2001	59,105	42,801	3,998	N/A	16,830	74,088	7,202	N/A	N/A
2002	59,946	42,884	4,333	N/A	17,432	75,246	7,037	N/A	N/A

Reported Crime for Index Offenses (Raw Counts)

Year	Murder and Non-Negligent Man-slaughter	Forcible Rape	Robbery	Aggravated Assault	Burglary	Larceny-Theft	Motor Vehicle Theft
1975	0	10	14	83	553	1,050	62
1976	1	12	14	72	736	1,245	89
1977	2	10	12	80	788	1,152	81
1978	5	9	17	82	707	1,480	106
1979	2	13	17	69	667	1,594	110
1980	1	21	15	58	730	1,672	140
1981	2	10	29	52	667	1,660	85
1982	0	15	14	28	685	1,688	85
1983	3	3	10	78	573	1,569	67
1984	1	15	9	82	546	1,416	76
1985	2	11	9	61	582	1,397	71
1986	1	19	10	71	591	1,610	116
1987	0	15	12	51	645	1,688	132
1988	3	17	16	51	641	1,674	122
1989	1	22	12	62	676	1,866	135
1990	0	13	12	88	597	1,766	120
1991	3	17	20	55	555	1,632	94
1992	1	20	6	43	633	1,624	170
1993	3	21	14	66	545	1,562	135
1994	1	15	18	33	488	1,729	81
1995	3	22	17	30	541	1,931	93
1996	4	20	13	25	590	2,242	83
1997	1	19	8	29	644	2,068	80
1998	0	18	12	30	465	1,658	80
1999	0	24	13	25	460	1,486	68
2000	6	23	14	101	591	1,764	79
2001	2	15	12	67	506	1,648	96
2002	1	23	17	138	726	2,015	125

Exhibit B-4: Raw Data Used for Maui County Analyses

Tourism Measures, Population Data, and Other Potential Predictors

Year	Total Resident Population	Population ages 20+	Male Residents Ages of 15-24	Military Personnel	Avg. Daily Visitor Census	De Facto Pop.	No. of Visitor Units	Total Prison Admissions	Sentenced Prison Admissions
1975	56,668	36,559	4,738	N/A	8,731	65,056	5,830	N/A	N/A
1976	60,171	39,236	5,082	N/A	10,622	70,451	7,232	N/A	N/A
1977	62,765	41,393	5,312	N/A	12,468	74,892	8,037	268	61
1978	65,947	43,895	5,572	N/A	14,492	80,118	8,736	393	69
1979	69,536	46,669	5,850	N/A	15,598	84,760	9,472	349	81
1980	71,600	48,025	5,861	N/A	15,363	86,288	9,701	203	65
1981	74,043	50,220	5,939	N/A	15,727	88,895	11,359	248	77
1982	77,103	52,624	5,921	N/A	18,090	94,016	12,162	325	78
1983	80,060	54,961	5,952	N/A	24,670	103,829	12,749	379	124
1984	82,969	57,225	6,021	N/A	32,790	114,230	13,138	571	266
1985	85,147	58,854	6,075	N/A	31,910	115,125	14,152	552	254
1986	87,389	60,815	6,224	N/A	34,330	119,885	14,096	524	255
1987	90,532	63,388	6,403	N/A	33,890	122,906	13,849	499	207
1988	93,767	65,785	6,491	N/A	33,870	125,484	15,168	536	281
1989	96,819	68,106	6,599	N/A	44,020	137,460	15,708	635	292
1990	101,709	71,978	6,801	N/A	37,657	138,390	17,869	716	418
1991	105,599	74,124	6,764	N/A	37,060	139,703	18,702	N/A	N/A
1992	108,585	75,785	6,875	N/A	41,740	146,651	19,290	728	483
1993	111,944	77,546	7,043	N/A	42,132	149,067	19,127	730	478
1994	114,754	78,944	7,141	N/A	42,933	152,434	18,804	815	547
1995	117,895	80,644	7,330	N/A	42,751	155,144	18,314	964	664
1996	120,689	82,261	7,462	N/A	42,608	157,468	17,824	1,171	744
1997	122,773	83,613	7,642	N/A	43,383	162,011	18,552	1,130	683
1998	124,648	85,185	7,901	N/A	42,864	163,562	18,650	1,359	839
1999	126,160	86,523	8,037	N/A	43,992	165,743	18,609	1,598	1,014
2000	128,968	92,442	8,113	N/A	43,854	168,540	18,270	1,517	937
2001	132,034	95,202	8,714	N/A	40,650	168,451	18,234	N/A	N/A
2002	134,139	96,840	9,111	N/A	42,742	172,806	17,922	N/A	N/A

Reported Crime for Index Offenses (Raw Counts)

Year	Murder and Non-Negligent Man-slaughter	Forcible Rape	Robbery	Aggravated Assault	Burglary	Larceny-Theft	Motor Vehicle Theft
1975	6	15	24	39	928	2,009	165
1976	8	16	19	52	1,117	2,701	287
1977	7	26	34	76	1,709	3,048	374
1978	8	19	27	70	1,458	3,213	402
1979	5	27	62	85	1,714	3,863	472
1980	5	29	43	86	1,707	4,331	339
1981	2	33	46	106	1,720	4,216	261
1982	4	35	42	100	1,895	4,478	263
1983	4	22	47	131	1,837	3,782	209
1984	5	22	48	126	1,559	3,539	212
1985	1	25	43	196	1,370	3,605	282
1986	2	29	30	182	1,544	3,945	286
1987	2	29	36	265	1,536	4,391	323
1988	1	32	37	265	1,883	4,988	352
1989	2	29	51	263	1,965	4,570	333
1990	3	23	41	195	1,518	4,483	329
1991	6	32	54	147	1,736	4,828	327
1992	4	50	86	139	1,666	5,644	360
1993	5	44	68	88	1,702	5,654	374
1994	7	35	88	102	1,833	6,084	308
1995	5	48	93	104	1,596	6,399	346
1996	1	39	111	114	1,584	5,826	395
1997	3	49	113	157	1,691	5,457	446
1998	4	47	88	150	1,352	5,113	396
1999	2	33	83	150	1,474	4,706	307
2000	5	30	71	165	1,679	4,938	437
2001	2	33	68	188	1,778	5,548	557
2002	0	10	73	178	1,525	5,416	784

APPENDIX C:
REFERENCES FOR TOURISM-CRIME STUDY (FOR EXHIBIT 1)

Albuquerque, K. and McElroy, J. Tourism and Crime in the Caribbean. *Annals of Tourism Research*. Volume 26, pp. 968-984. 1999.

Chesney-Lind, M., and Lind, I. Visitors As Victims: Crimes Against Tourists in Hawai`i. *Annals of Tourism Research*. Volume 13, pp. 167-191. 1986.

Frank, J. A. American Journal of Community Psychology. *Economic Change and Mental Health in an Uncontaminated Setting.* Volume 9, pp. 395-410. 1981.

Fujii, E. T., and Mak, J. The Impact of Alternative Regional Development Strategies on Crime Rates: Tourism Vs. Agriculture. *Annals of Regional Science*. Volume 13, pp. 42-56. 1979

Fujii, E. T., Mak, J., and Nishimura, E. Tourism and Crime. *Tourism Research Publications, Occasional Paper No. 2 Joint Project of The School of Travel Industry Management and the Social Science Research Institute, University of Hawai`i at Mānoa, Honolulu, Hawai`i*, 1978.

Fujii, E. T., Mak, J. Tourism and Crime: Implications for Regional Development Policy. *Regional Studies*. Volume 14, pp. 27-36. 1980.

Jud G. D. Tourism and Crime in Mexico. *Social Science Quarterly*. Volume 56, pp. 324-330. 1975.

McPheters, L. R. and Stronge, W. B. Crime as an Environmental Externality of Tourism. *Land Economics.* Volume 50, pp.288-292. 1974

Pizam, B. P. Tourism and Crime: Is There a Relationship? *Journal of Travel Research*. Volume 20 (Winter), pp. 7-10. 1982.

Schiebler, S., Crotts, J., and Hollinger, R. Florida Tourists' Vulnerability to Crime. In *Tourism, Crime and International Security Issues*. Mansfield and Pizam, eds., pp. 37-49. New York: Wiley. 1996.

Walmsey, J. D., Boskovic, R. M., and Pigram, J. J. Tourism and Crime: An Australian Perspective. *Journal of Leisure Research*. Volume 15, pp. 136-155. 1983.