THE BURDEN OF HEPATITIS A IN TEXAS BEFORE AND AFTER VACCINATION LEGISLATION

THESIS

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Kelly M. K. Johnson, B.S.

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Kelly Michelle Kummer Johnson, B.S.

Texas State University - San Marcos

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SUPERVISING PROFESSOR: RAM SHANMUGAM

Hepatitis A is one of the most commonly reported vaccine-preventable diseases in Texas. The virus that causes hepatitis A is primarily spread via the fecal-oral route. Children play an important role in spread of the disease as infected children are often asymptomatic and because most have poorly developed personal hygiene. A licensed vaccine against hepatitis A has been available since the 1995, but it was not listed among the recommended childhood vaccines until recently. The vaccine has been required for children entering school in select Texas counties beginning in 1999. The objective of this study is to determine if routine vaccination against hepatitis A in children can reduce disease incidence. Deidentified hepatitis A surveillance records were obtained from the Texas Department of State Health Services. Incidence rates adjusted for age and race/ethnicity, along with their corresponding 95% confidence limits, were calculated for the time before versus the time after vaccination against hepatitis A became required for school-age children in applicable counties. Results indicate that rates of hepatitis A infection have decreased in Texas beginning in 1999. Hispanic Texans have the highest

rates both before and after vaccination legislation; however, all racial-ethnic groups had significantly decreased incidence after vaccination became a requirement. Children ages 0 to 9 years had the highest incidence rates; however, all age groups experienced significantly decreased incidence after legislation. The results of this study suggest that vaccination requirements for school-age children were successful in reducing the burden of hepatitis A infection in Texas. Further investigation is required to determine why hepatitis A vaccination rates lag behind those for other diseases for which vaccination is required for school attendance and to investigate the efficacy and cost effectiveness in controlling infection in certain special populations (those living in prisons or nursing homes, children, college students living in dormitories, etc).

CHAPTER I

INTRODUCTION

Background

Hepatitis is a condition characterized by an inflammation of the liver. Usual causes for hepatitis are viral in nature; however it can also result from exposure to toxic substances. Viral hepatitis is caused by at least five genetically unrelated viruses, collectively known as the hepatitides. The viruses are grouped together not because they are structurally or functionally similar, but because they all cause liver inflammation. The similarities and differences among the five main hepatitis viruses are shown in Table 1.

Hepatitis A is a picornavirus that causes acute liver inflammation and damage (MMWR, 1999). Transmission of the virus occurs most commonly via the fecal-oral route by ingestion of contaminated foods or water, however it can be transmitted by almost any form of close contact including any form of sexual contact and sharing intravenous drugs or drug equipment with a person who is shedding virus in his or her stool (TDH, 2003). The average incubation period is 28 days, with a range from 14 to 50 days. Infection usually lasts less than two months, with peak infectivity usually occurring in the two weeks prior to the onset of symptoms. Most young children infected with hepatitis A remain asymptomatic throughout the course of infection, and severity of

Table 1: Comparison of the Five Main Causes of Viral Hepatitis

	Hepatitis A (HAV)	Hepatitis B (HBV)	Hepatitis C (HCV)	Hepatitis D (HDV)	Hepatitis E (HEV)
Taxonomy	Piconavirus	Hepadnovirus	Flavivirus	Delta-type	Calicivirus
Genome	RNA	DNA	RNA	RNA	RNA
Transmission	Fecal-Oral	Bloodborne	Bloodborne	Bloodborne	Fecal-oral
Incubation Period	15-50 days	40-80 days	30-90 days	10-18 days	30-50 days
Treatment	Immunoglobin	Adefovir dipivoxil, alpha interferon, lamivudine, and entecavir	Interferon, ribavirin	Supportive care for acute infections, interferon-alpha, liver transplant for Chronic	Nothing available to change disease course, supportive only
Outcome	Resolves in most cases	Resolves, Chronic	Chronic, Resolve Acute	Resolve, Chronic, Death	Resolves in most cases
Deaths	Rarely fatal			Commonly fatal	Rarely fatal
Vaccine Availability	Yes	Yes	No	No	No
Additional Information				Must be co-infected with HBV due to defective gene product	20% case fatality rate in pregnant women

symptoms increases with increasing age. Symptoms of hepatitis A infection include fever, malaise, nausea, abdominal pain, anorexia, dark urine, light stools, and jaundice. It is important to note that, while most children show no symptoms, they still shed virus in their stool. Lack of symptoms combined with contact with many potentially infected children in schools and daycare settings and inconsistent personal hygiene (e.g. hand washing after using the restroom) make children an important factor in spread of the virus. Hepatitis A infections rarely result in death of the patient. Figures 1 and 2 show deaths due to hepatitis A infection for Texas during 1990-2002 (2003 data are not available at this time).

The hepatitis A vaccine, licensed for use in the United States in 1995, contains formalin-inactivated virus. The vaccine is administered intramuscularly in two doses, usually 6 to 18 months apart. The vaccine is not licensed for children less than two years of age.

Two studies conducted by Werzberger, Mensch, and Kuter et al. (1992) and Innis, Snitbhan, and Kunasol et al. (1994) found antibody titers sufficient to provide immunity were present in an average of 94% of vaccinated persons with a single dose and nearly all vaccinated persons after both doses.

A number of studies were conducted in the early to mid-1990s to determine how effective the vaccine is at preventing hepatitis A infection and to determine the vaccine's safety in humans. Most of the studies focused on school-age children, as they are an important factor in transmission of the virus. One study in the Kamphaeng Phet Province in Thailand involved 40,119 children aged 1 to 16 years (Innis, 1994). This cohort study found that after two doses of the vaccine, protective efficacy was 94% (one cohort

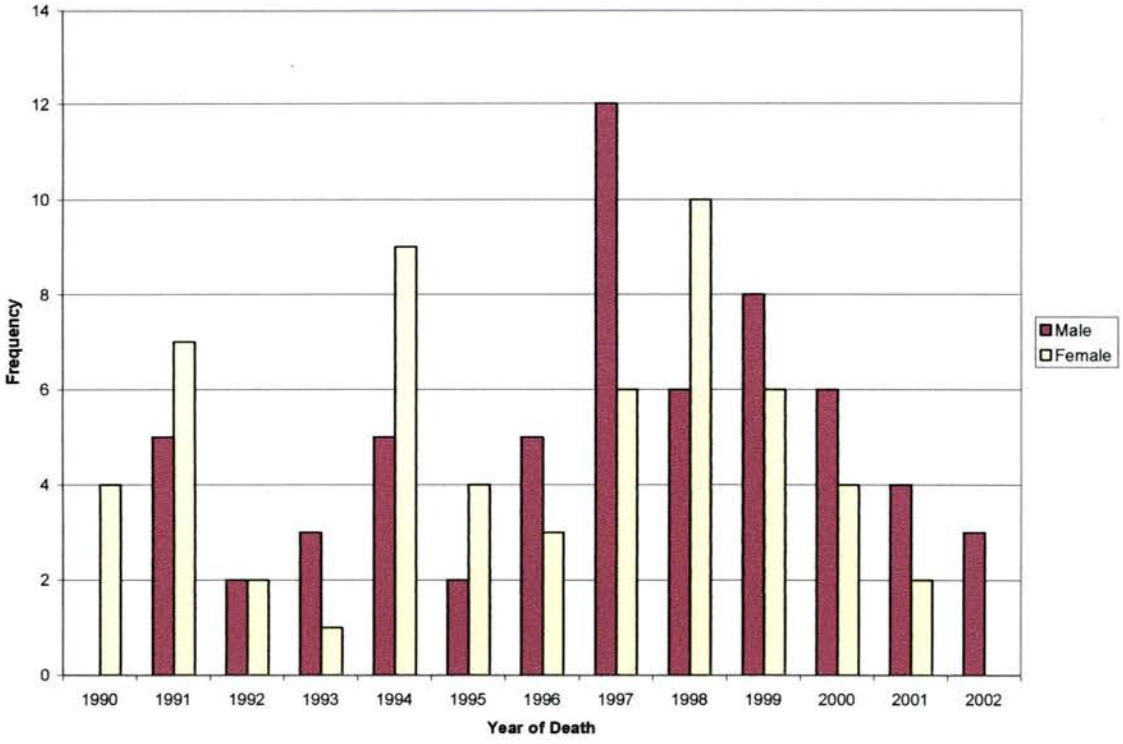

Figure 1: Hepatitis A Deaths by Sex, Texas 1990-2002

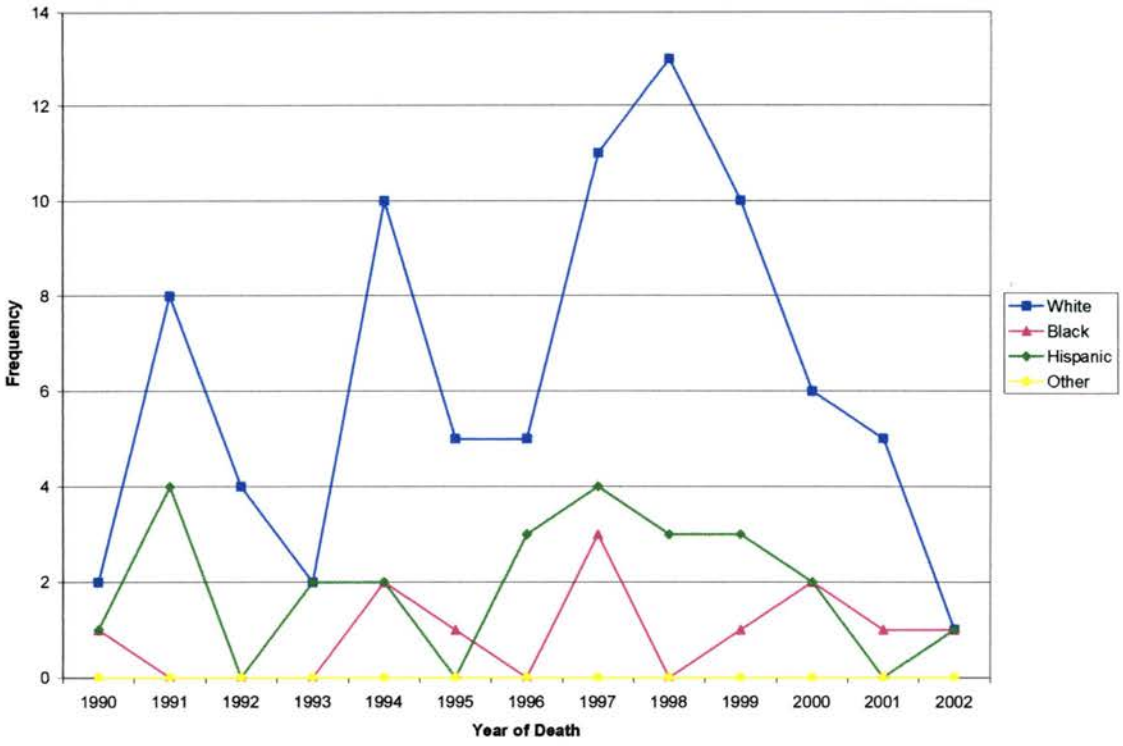

Figure 2: Hepatitis A Deaths by Race/Ethnicity, Texas 1990-2002

received the hepatitis A vaccine; the other received the hepatitis B vaccine). Of the 40 cases of symptomatic hepatitis A that were identified in the post-vaccination study population, 38 were in the unvaccinated cohort. A second study by Werzberger et al. (1992) involved a Hasidic Jewish population in New York. This double-blinded study involved 1,037 children; 519 received the hepatitis A vaccine and 518 received a placebo. This study also found that the vaccine induced a protective immunogenic response. Beginning at 50 days after the vaccine was administered, 25 cases of symptomatic hepatitis A were identified in the placebo group and no cases were detected in the vaccinated group. Neither study found any serious adverse effects from the vaccine; however, fever and injection site pain were observed in both studies.

A number of studies have been conducted to examine the effectiveness of vaccinations in controlling hepatitis A in communities. A study conducted by the Tennessee Department of Health looked at prevention of hepatitis A both pre-exposure using the vaccine using school-age children and post-exposure using either vaccine or immunoglobulin (Craig & Schaffner, 2004). The researchers found that vaccination during outbreaks could help control spread in smaller communities, but that this was not very effective in communities with larger populations. The routine vaccination of children was found to be far more successful. This study also found that immune globulin could prevent disease in approximately 85% of persons if administered in the first two weeks after exposure. However, this passive immunity is only temporary while vaccination confers lifelong immunity. Another study by Averhoff, Shapiro, and Bell et al. (2001) examined the effectiveness of controlling community-wide spread of hepatitis A by vaccinating school-age children in Butte County, California. This study found the

vaccine efficacy to be approximately 98%. Studies examining the effect of mass vaccination in large geographical areas, such as the region along the Texas-Mexico border, appear to be quite limited.

Age, income, and race/ethnicity distributions vary among Texans living in different regions. The population in the region along the Texas-Mexico border is historically younger and poorer than populations in the non-border counties in Texas, with more residents being of Hispanic origin. For example, approximately 32.0% of Texans are of Hispanic origin. However, in the fifteen counties that physically border Mexico, approximately 84.4% of residents are of Hispanic origin compared with only 26.5% of residents in non-border populations. This dramatic difference in ethnic composition make studying disease burden in Texas quite interesting, but does require additional care in analysis.

A statewide study conducted by Brender, Vanegdom, and Nuno (2001) examined trends in hepatitis A incidence rates by race/ethnicity and seasonality in Texas from 1986 through 1997. Using statewide surveillance data, the study found that Hispanics had substantially higher infection rates (32.2 per 100,000 population) than did non-Hispanic Whites (8.2 per 100,000) and African Americans (6.0 per 100,000). Incidence in males averaged 10-30% higher than that of females, and children aged 5 to 9 years had the highest rates of infection. Incidence rates of hepatitis A also varied by geographic location within Texas, with the highest incidence occurring along the border with Mexico (this is consistent with the findings by race-ethnicity). During the latter portion of the study period, from 1994 to 1997, a 44% increase in reported hepatitis A incidence occurred. The study also indicated that the months of August through October

experienced the largest number of reported cases. In a study of primary school students in San Elizario, Texas (located in the Texas-Mexico border region), Redlinger, O'Rourke, and VanDerslice (1997) found approximately 17% of tested students had antibodies against hepatitis A in their blood.

Description of the Problem

Hepatitis A is the second most frequently reported vaccine-preventable disease in Texas, with an average of 2,994 cases reported annually from 1990 through 1999. Even though a vaccination for hepatitis A has been licensed for use since 1995 (TDH, 2004), there was no mandate requiring its inclusion as part of the routine set of childhood vaccinations until August, 1999.

The Advisory Council on Immunization Practices (ACIP) recommends that states or counties with hepatitis A incidence rates at or exceeding twice the 1987-1997 national average require routine vaccination of children entering primary school. In addition, the ACIP recommends that counties at or exceeding, but not reaching twice the 1987-1997 national average incidence rate consider routine vaccination for children entering primary school (CDC, 1999). In December of 2001, the Texas Board of Health amended the Texas Administrative Code (TAC) to require hepatitis A vaccination for children entering primary school and living in those counties in Texas that exhibit a high incidence of hepatitis A infection (TAC, Chapter 97). As of August 1, 2003, thirty-nine counties in Texas have been identified as having high hepatitis A incidence rates (TDH, 2004). These include the thirty-two counties along the Texas-Mexico border as well as Bexar, Grayson, Moore, Nueces, Potter, Randall, and Terry counties. Gonzales County will be

added to the list as of August 1, 2005. In addition, routine hepatitis A vaccination is recommended for school-age children in 40 Texas counties. Figure 3 shows the counties where hepatitis A vaccination is either required or recommended for children entering primary school. Table 2 shows the vaccination coverage percentages for the 32 border counties where vaccination is required of school-age children. As more areas implement routine hepatitis A vaccination for children entering school, infection rates in high incidence areas are expected to decrease, thereby decreasing the national average. Over time, additional states and counties are expected to implement routine vaccination of children against hepatitis A.

Research Objectives

The purpose of this study was to examine reported hepatitis A infection rates from 1990-2003, with a particular focus on the five years prior to and the one year following implementation of a vaccination requirement for school attendance. The questions that will be answered by this study are as follows:

1. Have reported rates of hepatitis A infection decreased in areas previously classified as high incidence?
2. Have reported rates of hepatitis A infection decreased in counties bordering counties previously classified as high incidence?
3. What are hepatitis A vaccination rates in counties where vaccination is required and in counties where vaccination is not required?

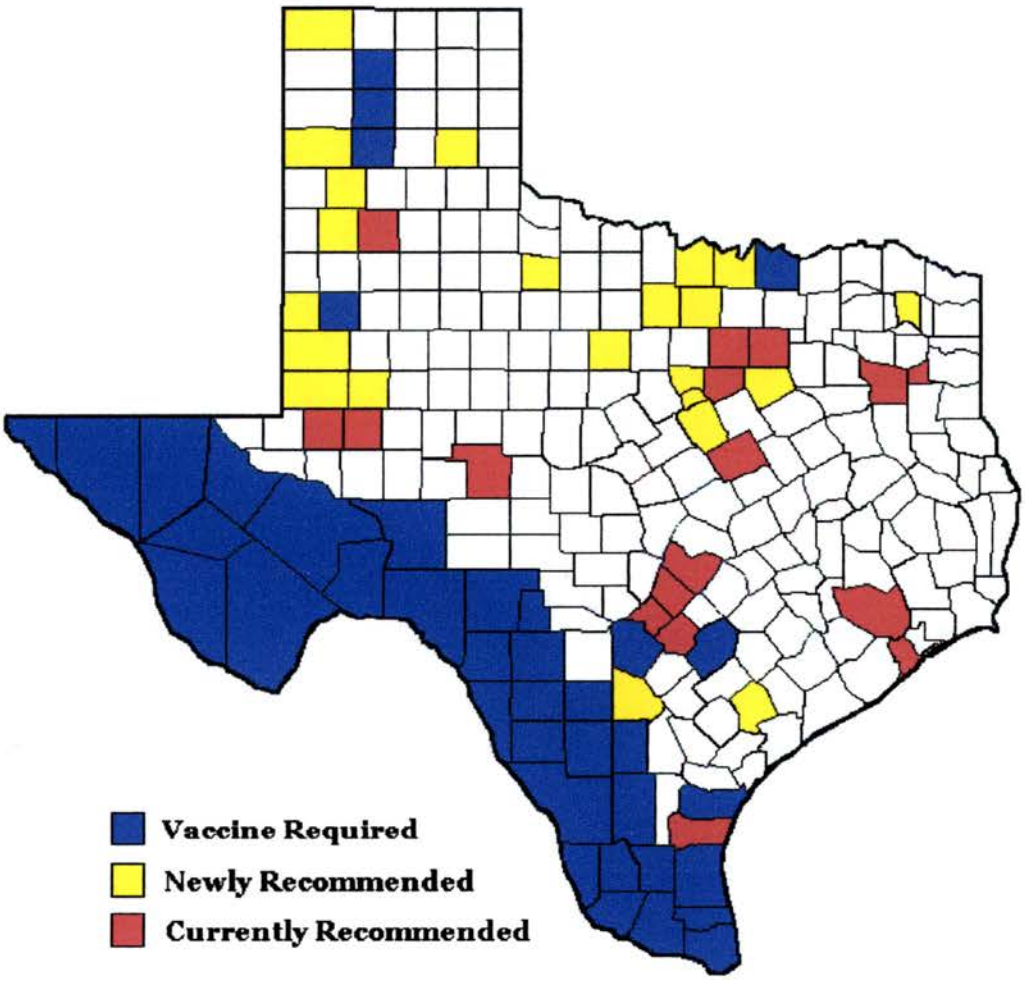

Figure 3: Texas Counties Requiring or Recommending Hepatitis A Vaccination for Children Entering Primary School

Table 2: Hepatitis A Vaccination Coverage Levels (%) of School Aged Children in the 32 Texas Border Counties Where Vaccination Was Required, 1999 – 2004 School Years

County	1999-2000	2000 - 2001	2001 - 2002	2002 - 2003	2003 - 2004
Brewster	40	81	77	79	77
Brooks	10	72	95	97	98
Cameron	32	91	95	96	97
Crockett	**	90	90	**	**
Culberson	51	98	94	99	98
Dimmit	25	81	99	99	98
Duval	35	95	97	99	99
Edwards	6	83	89	93	93
El Paso	35	85	92	94	96
Frio	2	85	90	91	94
Hidalgo	51	91	94	95	96
Hudspeth	80	96	97	99	99
Jeff Davis	55	73	74	76	89
Jim Hogg	4	100	100	100	99
Kenedy	100	75	64	**	**
Kinney	**	43	52	86	74
La Salle	100	89	91	95	96
Maverick	**	94	95	97	97
McMullen	**	87	82	95	**
Pecos	41	90	91	89	90
Presidio	38	63	75	54	68
Real	**	72	83	78	**
Reeves	1	73	94	**	96
Starr	48	92	98	99	99
Sutton	**	71	87	89	93
Terrell	86	0	94	**	90
Uvalde	9	75	97	94	97
Val Verde	28	76	**	90	99
Webb	61	95	96	98	98
Willacy	64	95	95	94	98
Zapata	64	93	96	97	95
Zavala	32	89	97	98	98

*Hep A Vaccine - required of children in 32 border counties who were born on or after Sept 2, 1992 at the time they turn 5.

During the 1999-2000 school year, Hep A vaccine was implemented for students entering kindergarten who attended schools in the 32 county border area.

Data based on schools self-reporting their information.

**Schools within the county did not report Hep A immunization levels

CHAPTER II

METHODS

Data Source

Deidentified hepatitis A case reports for illness onset dates between 1990 and 2003 were obtained from the Infectious Disease Surveillance and Epidemiology Branch of the Texas Department of State Health Services (DSHS). A letter from Dr. Tom Betz (Branch Chief the Infectious Disease Surveillance and Epidemiology Branch) granting permission to use the data was required. The Center for Disease Control and Prevention's case definition for hepatitis A is as follows: "an acute illness with a) discrete onset of symptoms and b) jaundice or elevated serum aminotransferase levels" along with laboratory confirmation of hepatitis A infection (CDC, 2004). Laboratory diagnosis of hepatitis A is made based on presence of IgM against hepatitis A (anti-HAV) in a serum specimen. Laboratory-confirmed cases that meet the clinical case definition are reported to the Department of State Health Services and from there to the CDC, as hepatitis A is a notifiable condition at both the state and national level. These reports are collected from laboratories, physician's offices, and other reporters through passive surveillance. By state law, a Viral Hepatitis Case Report (CDC Viral Hepatitis Case Report Form) is required to be completed and sent to the Texas Department of State Health Services within one working day of an acute hepatitis A diagnosis. This form is included in

Appendix A. Reports contain patient identifiers (which were removed from the analysis file used for this study), demographic information, diagnostic procedures, liver enzyme levels, and information concerning possible exposure factors during the two to six weeks prior to the onset of symptoms.

Population data for 1990-2003 were obtained from the Texas State Data Center located at the University of Texas at San Antonio. These data included population counts grouped by year, county of residence, race/ethnicity (non-Hispanic White, African American, Hispanic, and Other), and age group (standard five-year age groups up to 75).

Methods

Data analyses included calculating frequencies of each variable, age and race/ethnicity-adjusted hepatitis A incidence rates by county of residence, as well as significance testing between the time intervals before and after vaccination for hepatitis A was mandated. Recoded variables for age group and race/ethnicity were created for consistency across time and with the population data. Race/ethnicities used in analysis included non-Hispanic white, African American, Hispanic (regardless of race), and other. Age groups used in the calculation of county-level rates included standard 10-year age groupings up to 70 years (0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70+). Cases with unknown age or unknown race/ethnicity were excluded from rate calculation. Table 3 provides a summary of cases removed from analysis by year. Case counts stratified by county, race/ethnicity, and age group were calculated for each year and, using MS Access XP (Microsoft, 2001), linked to similarly stratified population data. Age and

Table 3: Hepatitis A Cases Removed from Analysis Due to Missing Information, Texas, 1990-2003

Year of Incidence	Total Cases by Year	Cases Removed	Percentage Analyzed
1990	2,722	2,722	0%
1991	2,663	2,663	0%
1992	1,828	216	88.2%
1993	2,798	286	89.8%
1994	2,877	335	88.4%
1995	3,001	606	79.8%
1996	3,460	586	83.1%
1997	4,511	796	82.4%
1998	3,537	1,299	63.3%
1999	2,516	693	72.5%
2000	1,932	712	63.1%
2001	1,148	591	48.5%
2002	856	332	61.2%
2003	613	383	37.5%

race/ethnicity-adjusted rates were calculated using population data obtained from the Texas State Data Center. Statewide population counts for Texas, stratified by county, race/ethnicity, and age group for 2000, were used as the standard population for adjustment. SPSS® Base 10.0 (SPSS Incorporated, 1999) was used to create the combined analysis file for this study. Confidence limits at the 95% level were calculated in Microsoft Excel XP using the following formula:

Rate for group/Square Root Total Frequency for group = Standard Error

Limits = Rate for group +/- (1.96*Standard Error)

Confidence limits that overlapped were considered not statistically significant, while confidence limits that did not overlap were considered significant at the 0.05 significance level.

Importance of the Study

This investigation is important for public health in Texas for several reasons. Decreasing or eliminating hepatitis A infections would alleviate substantial illness and financial burden to the citizens of Texas. By vaccinating children entering Texas schools, the number of susceptible persons would be reduced on a continuing basis. Each year, a new cohort of children immune to hepatitis A would enter the school system. By reducing the number of susceptible persons, especially in those groups that play significant roles in the spread of the virus (children, daycare workers, and food handlers), spread within communities would be reduced through herd-immunity and a decrease in the number of asymptomatic carriers. Second, it is not uncommon for vaccination campaigns to be met with concern and even distrust. By illustrating its efficacy at

protecting against infection, hepatitis A vaccination campaigns might be met with less resistance from the public. By illustrating the hepatitis A vaccine's effectiveness at preventing transmission of the disease, this study might also be used by legislators in the creation or modification of public health policy. Inclusion of the hepatitis A vaccine as a childhood vaccination requirement statewide is a beneficial and reasonable goal.

CHAPTER III

RESULTS

Changes in Incidence by County of Residence

Hepatitis A incidence rates have decreased statewide since 1999 when CDC made recommendations to require vaccination against hepatitis A for school-aged children in 40 Texas counties that exhibited infection rates at least twice as high as the national rate. Rates have decreased both in counties requiring vaccination and in most counties in which the legislation does not apply. Decreases in both county categories were statistically significant. Table 4 shows the age-adjusted rates with 95% confidence limits for infection rates by county vaccination requirement status (crude rates in italics). Rates by county of residence for 1992-2003 are in Appendix B.

Changes in Incidence by Age Group

Since the hepatitis A vaccination became a requirement in 40 counties in Texas, incidence rates have decreased in all age groups. The 95% confidence levels calculated for the time period before (1992-1998) and after (1999-2003) the vaccination requirement show no overlaps in any of the 10-year age groups, indicating significant differences in the infection rates before and after vaccination for hepatitis A became a requirement.

Table 4: Hepatitis A Infection Rates per 100,000 Population With 95% Confidence Limits Comparing Hepatitis A Incidence Rates Before and After Vaccination Legislation by Vaccination Requirement Status, Texas 1992-2003

	Rate and 95% Confidence Limit Before Vaccination Legislation (1992-1998)	Rate and 95% Confidence Limit After Vaccination Legislation (1999-2003)
Counties Where Vaccination was Required	25.99 (24.30, 27.68) *43.85*	5.33 (4.77, 5.89) *11.61*
Counties Where Vaccination was Not Required	11.73 (11.30, 12.16) *15.09*	5.28 (4.99, 5.57) *8.19*

Table 5 shows the 95% confidence limits for infection rates by age group (crude rates in italics).

Changes in Incidence by Race/Ethnicity

All four race/ethnic groups show significant reductions in infection rates following vaccination legislation in 1999. The largest decline was seen in non-Hispanic whites with Hispanics having large declines as well. Other races showed only a modest decline, though this may be due to the small number of cases in that racial group. Table 6 shows the infection rates and 95% confidence limits by race/ethnicity (crude rates in italics).

Table 5: Statewide Hepatitis A Infection Rates per 100,000 Population With 95% Confidence Limits Comparing Hepatitis A Incidence Before and After Vaccination Legislation by Age Group, Texas 1992-2003

	Rate and 95% Confidence Limit Before Vaccination Legislation (1992-1998)	Rate and 95% Confidence Limit After Vaccination Legislation (1999-2003)
0-9 years	33.41 (32.61, 34.21) *34.19*	7.33 (6.29, 7.74) *9.61*
10-19 years	20.83 (20.17, 21.49) *21.43*	5.49 (5.13, 5.85) *7.63*
20-29 years	15.70 (15.14, 16.26) *18.37*	4.82 (4.48, 5.16) *7.65*
30-39 years	10.58 (10.15, 11.01) *13.60*	3.54 (3.25, 3.83) *6.42*
40-49 years	6.02 (5.66, 6.38) *8.27*	2.39 (2.15, 2.63) *4.74*
50-59 years	3.90 (3.54, 4.26) *5.84*	1.88 (1.62, 2.14) *3.94*
60-69 years	3.52 (3.12, 3.92) *4.90*	1.82 (1.50, 2.14) *3.82*
70+ years	3.49 (3.10, 3.88) *5.56*	2.37 (2.02, 2.72) *5.07*

Table 6: Statewide Hepatitis A Infection Rates per 100,000 Population With 95% Confidence Limits Comparing Hepatitis A Incidence Before and After Vaccination Legislation by Race/Ethnicity, Texas 1992-2003

	Rate and 95% Confidence Limit Before Vaccination Legislation (1992-1998)	Rate and 95% Confidence Limit After Vaccination Legislation (1999-2003)
White	7.19 (7.00, 7.38) *7.55*	1.44 (1.37, 1.51) *2.71*
Black	5.67 (5.30, 6.04) *5.88*	1.68 (1.45, 1.91) *1.69*
Hispanic	30.09 (29.53, 30.65) *31.30*	7.45 (7.16, 7.74) *7.49*
Other	4.93 (4.16, 5.70) *5.16*	3.01 (2.43, 3.59) *2.97*

CHAPTER IV

DISCUSSION

Discussion of the Results

The results of this study suggest that hepatitis A incidence has been declining in Texas since legislation was passed requiring routine vaccination against hepatitis A in children entering primary school, despite the relatively small number of the counties in Texas requiring or even recommending vaccination. Furthermore, the vaccine initiative has been highly effective in reducing the burden of this disease in the highest risk populations in Texas, specifically Hispanics and young children.

With very few exceptions, Hispanic Texans have had, and continue to have, a greater hepatitis A burden than non-Hispanics. In the years post legislation in which the incidence rate for Hispanics did not exceed the rate for non-Hispanic whites, the difference between the two rates was not statistically significant. Incidence rates in all age groups decreased after hepatitis A vaccination became legally mandated in specific Texas counties, demonstrating the efficacy of childhood immunization in reducing the incidence of this disease in all age groups in the population. Children aged 0-9 years consistently had the highest incidence rates until 1999, at which time the highest incidence rates began to be reported among 10-19 year olds.

How This Study Compares to Others

The study, like those published in the literature, seems to indicate that routine vaccination results in decreased disease burden over time. Even though changes in reporting patterns cannot be ruled out as a potential cause for at least part of the decline in reported cases of hepatitis A, there are indications that support the effectiveness of vaccination campaigns in areas of high incidence. Hispanic Texans had a greater hepatitis A burden than other racial/ethnic groups in Texas, which is also consistent with the findings of other studies. The results of this study are consistent with the Brender et al. (2001) study conducted in Texas from 1986-1997. Both studies found higher incidence rates in Hispanic Texans versus Texans not of Hispanic origin. This study also supports studies concluding that the vaccination of school-aged children can be effective in controlling infection in selected populations. In the Butte County, California study by Averhoff et al. (2001), vaccination of school-aged children was shown to be quite effective as well.

Strengths and Limitations

The manner in which these data were collected, i.e. through passive surveillance, is the most significant limiting factor of this study. With passive surveillance, the onus for reporting is not on the individuals desiring the data, so the completeness, timeliness, accuracy, and quality of the data must always be questioned. Decreased reporting after 2000 as compared with earlier years cannot be ruled out as at least a potential cause for the marked decrease in the number of cases recorded since 2000. Though one would like to assume that reporting participation levels would, at worst, remain constant across time,

this assumption cannot be made. Issues of data quality impact the interpretation of the results from this study. There were two entire years of data, 1990 and 1991, which had to be excluded from analysis due to the lack of an ethnicity field. As the rates calculated for this study were adjusted for race/ethnicity as well as age, these years could not be used. This is not a major concern as there were still many years prior to the implementation of the vaccine mandate for which data exist. However, it was important to adjust the rates for race/ethnicity due to the diverse demographics in the state of Texas. For the remaining years used in analysis, 1992-2003, portions of data (anywhere from 10.2% to 62.5% of the annual cases) had to be removed due to the inability to determine one or more patient characteristics (race/ethnicity, age, or county of residence). Since previous studies conducted in Texas have shown race/ethnicity to be an important factor in hepatitis A infection burden, these cases may have held additional information that could have helped clarify the results of this and previous studies. It is unknown if and how the cases without race/ethnicity and those with this information differ.

Lack of specific information pertaining to the epidemiology of an individual case is another limitation of this study. The source of the exposure, whether it was a result of travel to a foreign county, sexual practices, intravenous drug use, a foodborne outbreak, or transmission via close personal contacts, could not be discerned for this study. In fact, a report recently published by the Centers for Disease Control and Prevention indicated that 0-10% of the incidence reports in Texas contain risk factor information (CDC, 2004). Although data related to diagnosis and case definition criteria (epi-link versus IgM positive) are available for some cases during certain years, this information is not consistently available across time. Different sources of exposure might play a factor in

the spread of the virus from person to person and outcomes by exposure source should be investigated at some point in the future. In addition, identifying sources of hepatitis A infection will help to identify specific areas for targeted prevention efforts. For example, if travel to Mexico is a frequent source of hepatitis A infection, interventions that target persons who frequently travel to Mexico or any other area where hepatitis A is highly endemic (adults as well as children) should be considered.

A major strength of this study lies in the fact that the form used for reporting cases of hepatitis A is standard across all states in the United States. Since the form originated from the CDC and all states are required to fill out the same form, disease burden can be compared across areas of the country. This allows Texas to gauge its disease control efforts in relation to other states.

Another major strength in this study was the consistency of age reporting. The vast majority of records that were removed from analysis were removed due to a lack of race/ethnic designation, not due to the lack of a known age. This at least allows for the adjustment of rate by age to compensate for variation in the distribution of age across the counties in Texas.

Public Health Implications

Hepatitis A is the second most frequently reported vaccine-preventable disease in Texas. Demonstrating that routine vaccination reduces the incidence of infection in the general population justifies the inclusion of the hepatitis A vaccine among the required childhood vaccinations. Evidence from this investigation indicates that vaccination campaigns in school-aged children can help reduce the burden of disease in a population.

A statewide requirement for hepatitis A vaccination should be considered for Texas. In addition to reducing the number of potential carriers – carriers that are more often than not asymptomatic – immunity from the vaccine is lifelong, thereby over time creating at least herd immunity if not 100% immunity to hepatitis A in the population.

Evidence from other studies suggests that in areas where vaccination against hepatitis A is recommended by the ACIP, 2003 vaccination rates against hepatitis A lag behind other routine childhood vaccinations (CDC, 2005). The cause of this shortfall is currently unknown, and further investigation is needed to determine the reasons why hepatitis A vaccination rates fall short of those for other vaccinations.

Further studies focusing on the effectiveness of vaccinating food service personnel in institutional-type settings such as nursing homes, college and university dormitories, and prisons should be considered. These types of living situations involve the preparation of food for large numbers of people, so a single infected person could potentially infect hundreds of others.

Additionally, studies to determine the feasibility and cost-effectiveness of vaccination campaigns for those populations that do not have access to healthcare should be conducted. A considerable portion of the population in Texas does not have adequate access to healthcare, and in high incidence areas, such as the Texas-Mexico border region, this portion of the population is large. Vaccination campaigns where the people are visited at home or a location that can be accessed without a personal vehicle might improve the vaccination rates in those areas. Staff who are able to communicate effectively with the local population, such as Spanish speakers when visiting the colonias,

should be included in vaccination teams. Educational information about the importance of vaccinations should be provided prior to the vaccination clinics to help participation.

APPENDICES

APPENDIX A

VIRAL HEPATITIS CASE REPORT FORM

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U.S. DEPARTMENT OF
HEALTH & HUMAN SERVICES
PUBLIC HEALTH SERVICE

VIRAL HEPATITIS CASE REPORT

CDC
Centers for Disease Control
and Prevention
Hepatitis Branch, (G37)
Atlanta, Georgia 30333

The following questions should be asked for every case of viral hepatitis

Prefix: (Mr. Mrs. Miss Ms. etc) _____ Last: _____ First: _____ Middle: _____

Preferred Name (nickname): _____ Maiden: _____

Address: Street. _____

City: _____ Phone: ( ) - Zip Code: __ __ __ __ __ -- __ __ __ __

SSN # (optional) __ __ __ - __ __ __ - __ __ __ __

Only data from lower portion of form will be transmitted to CDC

State: _____ County: _____ Date of Public Health Report__ __ / __ __ / __ __ __ __

Was this record submitted to CDC through the NETSS system? Yes ☐ No ☐

If yes, please enter **NETSS ID NO.** ☐☐☐☐☐☐☐☐☐☐ If no, please enter **STATE CASE NO.** _____

DEMOGRAPHIC INFORMATION

RACE (check all that apply):

☐ Amer Indian or Alaska Native ☐ Black or African American ☐ White
☐ Asian ☐ Native Hawaiian or Pacific Islander ☐ Other Race, specify. _____

SEX: Male ☐ Female ☐ Unk ☐ **PLACE OF BIRTH:** ☐USA ☐Other:_____

DATE OF BIRTH: ___ /__ __ /_ _ _ _ **AGE:** __ __ **(years)** **(00= <1yr , 99= Unk)**

ETHNICITY:

Hispanic ..... ☐
Non-hispanic ..... ☐
Other/Unknown ..... ☐

CLINICAL & DIAGNOSTIC DATA

REASON FOR TESTING: (Check all that apply) ☐ Symptoms of acute hepatitis ☐ Evaluation of elevated liver enzymes
☐ Screening of asymptomatic patient with reported risk factors ☐ Blood / organ donor screening
☐ Screening of asymptomatic patient with no risk factors (e.g., patient requested) ☐ Follow-up testing for previous marker of viral hepatitis
☐ Prenatal screening ☐ Unknown ☐ Other. specify: _____

CLINICAL DATA:

Diagnosis date __ __ / __ __ / _ _ _ _

	Yes	No	Unk
Is patient symptomatic?	☐	☐	☐
if yes, onset date: __ __ / __ __ / _ _ _ _			
Was the patient			
• Jaundiced?	☐	☐	☐
• Hospitalized for hepatitis?	☐	☐	☐
Was the patient pregnant ?	☐	☐	☐
due date : __ __ / __ __ / _ _ _ _			
Did the patient die from hepatitis?	☐	☐	☐
• Date of death: __ __ / __ __ / _ _ _ _			

DIAGNOSTIC TESTS: CHECK ALL THAT APPLY

	Pos	Neg	Unk
• Total antibody to hepatitis A virus [total anti-HAV]	☐	☐	☐
• IgM antibody to hepatitis A virus [IgM anti-HAV]	☐	☐	☐
• Hepatitis B surface antigen [HBsAg]	☐	☐	☐
• Total antibody to hepatitis B core antigen [total anti-HBc]	☐	☐	☐
• IgM antibody to hepatitis B core antigen [IgM anti-HBc]	☐	☐	☐
• Antibody to hepatitis C virus [anti-HCV]	☐	☐	☐
- anti-HCV signal to cut-off ratio _____			
• Supplemental anti-HCV assay [e.g., RIBA]	☐	☐	☐
• HCV RNA [e.g., PCR]	☐	☐	☐
• Antibody to hepatitis D virus [anti-HDV]	☐	☐	☐
• Antibody to hepatitis E virus [anti-HEV]	☐	☐	☐

LIVER ENZYME LEVELS AT TIME OF DIAGNOSIS

• ALT [SGPT] Result _____ Upper limit normal_____
• AST [SGOT] Result _____ Upper limit normal_____
• Date of ALT result __ __ / __ __ / _ _ _ _
• Date of AST result __ __ / __ __ / _ _ _ _

• If this case has a diagnosis of hepatitis A that has not been serologically confirmed, is there an epidemiologic link between this patient and a laboratory-confirmed hepatitis A case? Yes ☐ No ☐ Unk ☐

DIAGNOSIS: (Check all that apply)

☐ Acute hepatitis A
☐ Acute hepatitis B ☐ Chronic HBV infection ☐ Perinatal HBV infection ☐ Hepatitis Delta (co- or super-infection)
☐ Acute hepatitis C ☐ HCV infection (chronic or resolved)
☐ Acute hepatitis E ☐ Acute non-ABCD hepatitis

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Patient History- Acute Hepatitis A NETSS ID NO. ☐☐☐☐☐☐☐☐☐☐

STATE CASE NO. _____

During the **2-6 weeks** prior to onset of symptoms-	Yes	No	Unk
Was the patient a contact of a person with confirmed or suspected hepatitis A virus infection?	☐	☐	☐
If yes, was the contact (check one)			
• household member (non-sexual)	☐	☐	☐
• sex partner	☐	☐	☐
• child cared for by this patient	☐	☐	☐
• babysitter of this patient	☐	☐	☐
• playmate	☐	☐	☐
• other _____	☐	☐	☐
Was the patient			
• a child or employee in a day care center, nursery, or preschool ?	☐	☐	☐
• a household contact of a child or employee in a day care center, nursery or preschool ?	☐	☐	☐
If yes for either of these, was there an identified hepatitis A case in the child care facility?	☐	☐	☐

Please ask both of the following questions regardless of the patient's gender.

In the **2- 6 weeks** before symptom onset how many	0	1	2-5	>5	Unk
• male sex partners did the patient have?	☐	☐	☐	☐	☐
• female sex partners did the patient have?	☐	☐	☐	☐	☐

In the **2- 6 weeks** before symptom onset	Yes	No	Unk
Did the patient inject drugs not prescribed by a doctor?	☐	☐	☐
Did the patient use street drugs but not inject?	☐	☐	☐
Did the patient **travel** outside of the U.S.A. or Canada	☐	☐	☐
• If yes, where? 1) _____ 2) _____ (Country) 3) _____			
In the **3 months** prior to symptom onset Did anyone in the patient's household travel outside of the U.S. A. or Canada?	☐	☐	☐
• If yes, where? 1) _____ 2) _____ (Country) 3) _____			
Is the patient suspected as being part of a common-source outbreak?	☐	☐	☐
If yes, was the outbreak			
Foodborne- associated with an infected food handler	☐	☐	☐
Foodborne - **NOT** associated with an infected food handler	☐	☐	☐
• specify food item _____			
Waterborne	☐	☐	☐
Source not identified	☐	☐	☐
Was the patient employed as a food handler during the **TWO WEEKS** prior to onset of symptoms or while ill?	☐	☐	☐

VACCINATION HISTORY

	Yes	No	Unk
Has the patient ever received the hepatitis A vaccine ?	☐	☐	☐
	1	≥2	
• If yes, how many doses?	☐	☐	
• In what year was the last dose received?	YYYY		
	Yes	No	Unk
Has the patient ever received immune globulin ?	☐	☐	☐
• If yes, when was the last dose received?	____ / ____ mo yr		

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STATE CASE NO. _____

NETSS ID NO. ☐☐☐☐☐☐☐☐☐☐

Patient History- Acute Hepatitis B

During the **6 weeks- 6 months** prior to onset of symptoms was the patient a contact of a person with confirmed or suspected acute or chronic hepatitis B virus infection? Yes ☐ No ☐ Unk ☐

If yes, type of contact

- Sexual ☐ ☐ ☐
- Household [Non-sexual] ☐ ☐ ☐
- Other: _____ ☐ ☐ ☐

Ask both of the following questions regardless of the patient's gender.

In the **6 months** before symptom onset how many — 0 ☐ 1 ☐ 2-5 ☐ >5 ☐ Unk ☐

- male sex partners did the patient have?
- female sex partners did the patient have?

Was the patient *EVER* treated for a sexually-transmitted disease? Yes ☐ No ☐ Unk ☐

- If yes, in what year was the most recent treatment ? __ __ __ __

During the **6 weeks- 6 months** prior to onset of symptoms

- inject drugs not prescribed by a doctor?
- use street drugs but not inject?

During the **6 weeks- 6 months** prior to onset of symptoms

Did the patient- Yes ☐ No ☐ Unk ☐

- undergo hemodialysis?
- have an accidental stick or puncture with a needle or other object contaminated with blood?
- receive blood or blood products [transfusion]
  - if yes, when?
- receive any IV infusions and/or injections in the outpatient setting
- have other exposure to someone else's blood

specify: _____

During the **6 weeks - 6 months** prior to onset of symptoms

- Was the patient employed in a medical or dental field involving direct contact with human blood ?
  If yes, frequency of direct blood contact?
  Frequent (several times weekly) ☐ Infrequent ☐
- Was the patient employed as a public safety worker (fire fighter, law enforcement or correctional officer) having direct contact with human blood?
  If yes, frequency of direct blood contact?
  Frequent (several times weekly) ☐ Infrequent ☐
- Did the patient receive a tattoo?
  where was the tattooing performed? (select all that apply)
  ☐ commercial parlor / shop ☐ correctional facility ☐ other _____

During the **6 weeks- 6 months** prior to onset of symptoms

- Did the patient have any part of their body pierced (other than ear)?
  where was the piercing performed? (select all that apply)
  ☐ commercial parlor / shop ☐ correctional facility ☐ other _____

Yes ☐ No ☐ Unk ☐

- Did the patient have dental work or oral surgery?
- Did the patient have surgery ? (other than oral surgery)
- Was the patient- ***Check all that apply***
  - hospitalized ?
  - a resident of a long term care facility ?
  - incarcerated for longer than 24 hours ?
    if yes, what type of facility (check all that apply)
    prison
    jail
    juvenile facility

During his/her lifetime, was the patient *EVER*

- incarcerated for longer than 6 months ?
  - If yes,
    what year was the most recent incarceration ? __ __ __ __
    for how long ? __ __ __ mos

Did the patient ever receive hepatitis B vaccine? Yes ☐ No ☐ Unk ☐

If yes, how many shots? 1 ☐ 2 ☐ 3+ ☐

- In what year was the last shot received? Y Y Y Y

Was the patient tested for antibody to HBsAg (anti-HBs) within 1-2 months after the last dose? Yes ☐ No ☐ Unk ☐

- If yes, was the serum anti-HBs ≥ 10mIU/ml? ☐ ☐ ☐
  (answer 'yes' if the laboratory result was reported as 'positive' or 'reactive')

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Perinatal Hepatitis B Virus Infection

NETSS ID NO. ☐☐☐☐☐☐☐☐☐☐

STATE CASE NO. _____

RACE OF MOTHER:

☐ Amer Ind or Alaska Native ☐ Black or African American ☐ White ☐ Unknown
☐ Asian ☐ Native Hawaiian or Pacific Islander ☐ Other Race, specify _____

ETHNICITY OF MOTHER:

Hispanic ☐
Non-hispanic ☐
Other/Unknown ☐

	Yes	No	Unk
Was **Mother** born outside of United States?	☐	☐	☐
If yes, what country? _____			
Was the **Mother** confirmed HBsAg positive prior to or at time of delivery ?	☐	☐	☐
• If no, was the mother confirmed HBsAg positive after delivery?	☐	☐	☐
Date of HBsAg positive test result	M M / D D / Y Y Y Y		
How many doses of hepatitis B vaccine did the child receive ?	0	1	2	3

- When?
- Dose 1- M M / D D / Y Y Y Y
- Dose 2- M M / D D / Y Y Y Y
- Dose 3- M M / D D / Y Y Y Y

	Yes	No	Unk
Did the child receive hepatitis B immune globulin (HBIG)?	☐	☐	☐
• If yes, on what date did the child receive HBIG?	M M / D D / Y Y Y Y		

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[34]

NETSS ID NO. ☐☐☐☐☐☐☐☐☐☐

Patient History- Acute Hepatitis C

STATE CASE NO. _____

During the **2 weeks- 6 months** prior to onset of symptoms was the patient a contact of a person with confirmed or suspected acute or chronic hepatitis C virus infection? Yes ☐ No ☐ Unk ☐

If yes, type of contact

- Sexual ☐ ☐ ☐
- Household [Non-sexual] ☐ ☐ ☐
- Other: _____ ☐ ☐ ☐

Ask both of the following questions regardless of the patient's gender.

In the **6 months** before symptom onset how many **0** **1** **2-5** **>5** **Unk**

- male sex partners did the patient have? ☐ ☐ ☐ ☐ ☐
- female sex partners did the patient have? ☐ ☐ ☐ ☐ ☐

Was the patient *EVER* treated for a sexually transmitted disease? **Yes** ☐ **No** ☐ **Unk** ☐

- If yes, in what year was the most recent treatment ? __ __ __ __

During the **2 weeks- 6 months** prior to onset of symptoms

- inject drugs not prescribed by a doctor? ☐ ☐ ☐
- use street drugs but not inject? ☐ ☐ ☐

During the **2 weeks- 6 months** prior to onset of symptoms

Did the patient- **Yes** **No** **Unk**

- undergo hemodialysis? ☐ ☐ ☐
- have an accidental stick or puncture with a needle or other object contaminated with blood? ☐ ☐ ☐
- receive blood or blood products [transfusion] ☐ ☐ ☐
  - if yes, when?
- receive any IV infusions and/or injections in the outpatient setting ☐ ☐ ☐
- have other exposure to someone else's blood ☐ ☐ ☐

specify: _____

During the **2 weeks - 6 months** prior to onset of symptoms

- Was the patient employed in a medical or dental field involving direct contact with human blood ? ☐ ☐ ☐

  If yes, frequency of direct blood contact?

  Frequent (several times weekly) ☐ Infrequent ☐
- Was the patient employed as a public safety worker (fire fighter, law enforcement or correctional officer) having direct contact with human blood? ☐ ☐ ☐

  If yes, frequency of direct blood contact?

  Frequent (several times weekly) ☐ Infrequent ☐
- Did the patient receive a tattoo? ☐ ☐ ☐

  where was the tattooing performed? (select all that apply)

  ☐ commercial parlor / shop ☐ correctional facility ☐ other _____

During the **2 weeks- 6 months** prior to onset of symptoms

- Did the patient have any part of their body pierced (other than ear)?

  where was the piercing performed? (select all that apply)

  ☐ commercial parlor / shop ☐ correctional facility ☐ other _____

Yes **No** **Unk**

- Did the patient have dental work or oral surgery? ☐ ☐ ☐
- Did the patient have surgery ? (other than oral surgery) ☐ ☐ ☐
- Was the patient- ***Check all that apply***
  - hospitalized ? ☐ ☐ ☐
  - a resident of a long term care facility ? ☐ ☐ ☐
  - incarcerated for longer than 24 hours ? ☐ ☐ ☐

  if yes, what type of facility (check all that apply)

  prison ☐ ☐
  jail ☐ ☐
  juvenile facility ☐ ☐

During his/her lifetime, was the patient *EVER*

- incarcerated for longer than 6 months ? ☐ ☐ ☐
  - If yes,

    what year was the most recent incarceration ? __ __ __ __

    for how long ? __ __ __ mos

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NETSS ID NO. ☐☐☐☐☐☐☐☐☐☐

Patient History- Hepatitis C Virus Infection (chronic or resolved)

STATE CASE NO. _____

The following questions are provided as a guide for the investigation of lifetime risk factors for HCV infection. Routine collection of risk factor information for persons who test HCV positive is not required. However, collection of risk factor information for such persons may provide useful information for the development and evaluation of programs to identify and counsel HCV-infected persons.

	Yes	No	Unk
• Did the patient receive a blood transfusion prior to 1992?	☐	☐	☐
• Did the patient receive an organ transplant prior to 1992?	☐	☐	☐
• Did the patient receive clotting factor concentrates produced prior to 1987?	☐	☐	☐
• Was the patient ever on long-term hemodialysis?	☐	☐	☐
• Has the patient ever injected drugs not prescribed by a doctor even if only once or a few times?	☐	☐	☐
• How many sex partners has the patient had (approximate lifetime) ? _____			
• Was the patient ever incarcerated?	☐	☐	☐
• Was the patient ever treated for a sexually transmitted disease?	☐	☐	☐
• Was the patient ever a contact of a person who had hepatitis ?	☐	☐	☐
If yes, type of contact			
• Sexual	☐	☐	☐
• Household [Non-sexual]	☐	☐	☐
• Other _____	☐	☐	☐

	Yes	No	Unk
• Was the patient ever employed in a medical or dental field involving direct contact with human blood?	☐	☐	☐

APPENDIX B

HEPATITIS A INCIDENCE RATES PER 100,000 POPULATION BY COUNTY OF RESIDENCE, TEXAS 1992-2003

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
ANDERSON	8.9	0.5	2.6	3.4	24.5	2.9	1.1	0.0	0.0	0.0	0.0	0.0
ANDREWS	6.8	0.0	11.1	0.0	0.0	17.2	0.0	5.3	0.0	0.0	0.0	0.0
ANGELINA	0.0	0.0	1.8	1.0	0.0	0.0	10.6	42.6	5.9	0.0	0.0	4.4
ARANSAS	0.0	7.9	4.2	0.0	0.0	0.0	0.0	7.2	0.0	0.0	0.0	0.0
ARCHER	0.0	0.0	12.9	0.0	0.0	0.0	7.9	5.5	0.0	0.0	0.0	0.0
ARMSTRONG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ATASCOSA	11.2	7.8	10.2	30.2	27.9	0.0	1.7	4.1	2.4	1.3	0.0	2.9
AUSTIN	0.0	0.0	0.0	4.4	0.0	0.0	8.7	9.2	0.0	12.1	14.5	3.6
BAILEY	0.0	0.0	9.5	0.0	0.0	61.5	139.0	0.0	0.0	0.0	0.0	80.9
BANDERA	0.0	0.0	0.0	24.8	5.0	16.5	30.2	0.0	0.0	0.0	0.0	0.0
BASTROP	3.5	0.0	37.5	12.0	12.0	20.0	27.2	3.1	4.4	3.1	3.4	0.0
BAYLOR	0.0	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	111.5	0.0	15.0
BEE	4.3	6.3	5.8	16.1	168.5	21.6	0.0	0.0	0.0	0.0	0.0	0.0
BELL	2.2	59.1	77.0	0.3	2.4	4.7	1.4	2.7	40.7	27.0	13.4	0.8
BEXAR	104.2	187.1	116.0	8.9	13.6	22.8	8.7	17.6	5.6	2.5	8.4	6.2
BLANCO	0.0	0.0	0.0	26.4	0.0	25.8	26.2	19.9	0.0	0.0	0.0	0.0
BORDEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BOSQUE	0.0	4.9	0.0	23.0	12.5	38.3	5.2	51.1	96.6	24.7	0.0	0.0
BOWIE	0.0	17.6	2.1	1.7	45.0	25.3	2.6	2.4	1.4	0.0	0.0	0.0
BRAZORIA	7.0	14.7	30.3	3.6	4.4	16.1	3.2	2.2	1.9	1.1	0.0	8.7
BRAZOS	7.2	2.5	18.9	10.1	0.3	5.3	3.2	5.3	3.9	0.0	2.8	1.8
BREWSTER	0.0	0.0	9.3	0.0	0.0	0.0	73.5	0.0	0.0	0.0	0.0	0.0
BRISCOE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.4	0.0	0.0	0.0	0.0
BROOKS	75.2	0.0	0.0	0.0	0.0	35.3	0.0	0.0	0.0	0.0	0.0	4.4
BROWN	1.9	2.3	0.0	10.9	2.2	6.4	67.5	1.8	1.9	15.4	6.2	0.0
BURLESON	0.0	19.3	0.0	0.0	22.5	6.3	0.0	48.3	4.8	13.5	0.0	0.0
BURNET	0.0	0.0	63.2	22.9	2.8	9.9	6.5	35.0	0.0	0.0	0.0	0.0
CALDWELL	0.0	3.0	0.0	43.4	0.0	17.2	0.0	2.7	18.3	0.0	8.1	2.5
CALHOUN	5.6	0.0	0.0	3.3	23.3	0.0	0.0	5.3	3.7	0.0	0.0	5.2
CALLAHAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.1	4.9	0.0	0.0	3.4
CAMERON	41.9	64.9	95.4	27.8	27.4	53.8	21.3	32.0	4.4	3.8	33.9	9.4
CAMP	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	19.3	0.0	0.0	0.0
CARSON	0.0	0.0	82.7	0.0	0.0	0.0	21.0	106.3	0.0	0.0	0.0	0.0
CASS	0.0	1.7	2.4	4.2	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CASTRO	15.6	47.5	20.6	20.7	13.0	6.9	0.0	5.6	0.0	0.0	0.0	0.0

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
CHAMBERS	0.0	0.0	14.1	3.0	0.0	10.0	3.8	2.9	0.0	11.0	0.0	0.0
CHEROKEE	0.0	0.0	9.2	11.8	28.9	2.8	0.0	0.0	4.3	0.0	0.0	0.0
CHILDRESS	0.0	0.0	32.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CLAY	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COCHRAN	0.0	0.0	15.5	0.0	0.0	17.3	0.0	0.0	0.0	0.0	0.0	0.0
COKE	0.0	0.0	0.0	0.0	54.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COLEMAN	0.0	0.0	27.2	81.7	37.2	0.0	30.5	0.0	0.0	90.7	0.0	0.0
COLLIN	0.6	14.2	16.6	6.4	20.5	17.4	5.0	1.8	8.8	3.4	9.2	5.2
COLLINGSWORTH	0.0	0.0	0.0	0.0	0.0	24.4	0.0	0.0	0.0	0.0	0.0	0.0
COLORADO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0
COMAL	12.5	14.4	7.1	19.6	31.5	132.6	41.7	20.9	5.0	0.7	2.4	2.6
COMANCHE	0.0	11.6	12.2	0.0	119.5	0.0	0.0	13.5	0.0	0.0	0.0	0.0
CONCHO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	174.0	0.0
COOKE	0.0	0.0	7.6	93.4	0.0	5.0	30.6	45.9	9.2	0.0	13.7	0.0
CORYELL	0.0	3.1	0.0	3.7	0.9	0.0	0.0	0.0	0.0	6.0	0.0	0.0
COTTLE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	166.0	0.0	0.0	0.0	0.0
CRANE	0.0	15.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.8	0.0	0.0
CROCKETT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CROSBY	0.0	0.0	8.2	112.1	0.0	0.0	163.1	38.3	9.1	0.0	9.5	0.0
CULBERSON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DALLAM	0.0	0.0	14.0	36.9	84.8	13.7	0.0	0.0	0.0	0.0	0.0	0.0
DALLAS	68.4	844.2	414.1	12.3	13.2	23.1	4.1	1.0	7.1	3.3	31.2	6.6
DAWSON	370.1	5.5	5.5	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0
DEAF SMITH	6.3	2.7	7.1	2.7	2.6	10.0	34.0	7.7	2.7	6.2	0.0	0.0
DELTA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DENTON	1.9	31.7	52.4	8.8	11.9	7.7	9.0	10.2	1.2	1.9	3.6	11.9
DE WITT	10.7	0.0	6.7	0.0	0.0	5.6	0.0	0.0	0.0	6.8	0.0	0.0
DICKENS	0.0	0.0	0.0	67.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0
DIMMIT	0.0	0.0	0.0	4.9	2.3	11.0	7.1	48.7	0.0	0.0	0.0	60.1
DONLEY	19.4	0.0	0.0	0.0	15.2	15.2	14.9	0.0	0.0	0.0	0.0	0.0
DUVAL	4.6	0.0	0.0	2.9	4.3	0.0	0.0	41.9	0.0	0.0	0.0	0.0
EASTLAND	0.0	0.0	3.9	0.0	0.0	15.9	0.0	326.9	1.9	0.0	0.0	0.0
ECTOR	68.1	23.7	11.3	28.1	4.2	13.1	14.4	2.9	0.0	0.8	0.0	0.6
EDWARDS	0.0	20.2	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ELLIS	3.7	8.6	13.6	7.3	6.1	19.9	14.7	17.8	8.5	5.1	3.5	0.8

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
EL PASO	76.1	256.8	157.3	26.3	19.5	18.1	10.0	2.6	2.2	0.4	9.3	6.7
ERATH	2.4	77.7	28.1	0.0	2.0	13.5	0.0	9.2	5.5	0.0	5.3	0.0
FALLS	63.9	0.0	3.1	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FANNIN	0.0	0.0	0.0	0.0	0.0	2.8	1.5	5.7	8.8	0.0	21.5	0.0
FAYETTE	0.0	0.0	0.0	0.0	0.0	3.6	13.6	23.2	11.5	0.0	0.0	0.0
FISHER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.1	102.8	33.4	0.0
FLOYD	0.0	7.5	0.0	7.6	0.0	0.0	7.6	0.0	10.3	0.0	0.0	0.0
FOARD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FORT BEND	4.6	10.4	11.9	12.0	2.4	18.9	16.5	12.6	4.2	3.6	5.4	2.6
FRANKLIN	68.0	0.0	5.1	0.0	45.3	20.8	0.0	0.0	0.0	0.0	0.0	0.0
FREESTONE	4.6	0.0	0.0	0.0	9.9	33.8	0.0	0.0	0.0	0.0	0.0	0.0
FRIO	0.0	0.0	115.1	12.3	0.0	0.0	5.2	5.5	0.0	0.0	0.0	0.0
GAINES	6.3	0.0	19.0	22.6	4.3	7.0	0.0	12.6	0.0	0.0	0.0	0.0
GALVESTON	11.5	19.9	53.4	12.6	20.8	7.8	6.9	9.7	5.3	2.8	17.2	3.7
GARZA	0.0	0.0	0.0	64.7	0.0	41.9	95.6	138.1	0.0	0.0	0.0	0.0
GILLESPIE	4.0	0.0	9.3	4.2	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GLASSCOCK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.4	0.0
GOLIAD	0.0	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GONZALES	0.0	48.4	20.6	29.6	0.0	10.0	6.9	0.0	74.7	4.8	4.6	7.7
GRAY	0.0	16.2	78.3	6.5	0.0	27.9	80.4	0.0	10.5	0.0	0.0	0.0
GRAYSON	1.6	1.8	8.7	25.0	21.0	43.4	13.7	31.3	33.2	0.0	1.8	2.7
GREGG	0.5	2.0	16.4	0.6	14.2	43.3	1.3	3.8	0.0	0.0	0.0	0.0
GRIMES	3.8	0.0	0.0	0.0	0.0	3.2	8.2	0.0	0.0	0.0	8.6	0.0
GUADALUPE	11.3	0.0	4.1	10.7	7.5	7.5	18.1	1.1	1.0	0.0	1.7	1.8
HALE	6.8	28.4	1.8	7.0	3.3	5.4	17.0	1.9	1.6	3.5	0.0	3.3
HALL	0.0	0.0	0.0	0.0	0.0	0.0	56.6	0.0	38.0	0.0	0.0	0.0
HAMILTON	0.0	0.0	0.0	0.0	319.9	0.0	0.0	7.6	84.4	14.3	0.0	0.0
HANSFORD	0.0	0.0	0.0	0.0	0.0	0.0	51.3	0.0	0.0	0.0	16.5	0.0
HARDEMAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0
HARDIN	0.0	0.0	1.3	2.7	0.0	1.8	18.4	1.5	0.0	0.0	0.0	0.0
HARRIS	56.1	381.6	372.7	15.1	16.1	17.4	6.3	1.8	3.3	0.1	148.7	58.1
HARRISON	0.0	1.3	1.5	0.0	1.1	0.0	0.4	2.7	9.7	0.0	0.0	0.0
HARTLEY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HASKELL	0.0	0.0	70.0	14.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HAYS	2.0	6.4	1.7	14.5	18.6	2.9	10.8	7.4	12.2	5.8	2.9	0.0

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
HEMPHILL	0.0	0.0	0.0	0.0	0.0	0.0	212.7	48.5	0.0	0.0	0.0	0.0
HENDERSON	1.1	9.6	47.3	4.9	2.3	11.3	10.0	1.6	5.9	0.0	0.0	0.0
HIDALGO	11.6	69.2	92.6	19.3	22.0	53.2	38.9	15.9	8.0	2.6	11.3	14.1
HILL	0.0	2.7	10.8	2.8	2.7	11.1	3.8	40.9	2.6	3.3	0.0	0.0
HOCKLEY	0.0	0.0	0.0	3.7	4.0	11.3	4.6	3.2	7.0	0.0	35.4	0.0
HOOD	1.8	9.5	4.4	1.7	50.4	35.6	14.2	19.8	19.5	1.0	1.0	2.0
HOPKINS	0.0	0.0	0.0	0.0	1.9	4.7	16.8	16.6	2.3	0.0	0.0	0.0
HOUSTON	0.0	0.0	0.0	0.0	0.0	9.0	0.0	4.6	0.0	0.0	0.0	0.0
HOWARD	0.0	21.2	19.2	32.5	0.0	5.8	0.0	0.0	3.5	0.0	0.0	0.0
HUDSPETH	0.0	0.0	0.0	0.0	0.0	0.0	19.7	34.4	0.0	0.0	0.0	0.0
HUNT	0.0	0.0	1.2	0.9	12.2	0.0	1.1	0.0	4.3	8.7	8.3	0.0
HUTCHINSON	9.0	29.2	0.0	0.0	59.6	90.6	72.1	4.9	0.0	0.0	0.0	0.0
IRION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JACK	0.0	8.3	0.0	6.8	0.0	0.0	6.3	21.0	0.0	7.9	0.0	0.0
JACKSON	0.0	0.0	22.8	0.0	22.8	3.7	0.0	5.8	0.0	0.0	0.0	0.0
JASPER	66.7	0.0	4.1	1.7	236.9	1.5	17.1	1.9	0.0	0.0	1.6	22.9
JEFF DAVIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JEFFERSON	28.6	7.8	9.5	5.3	11.9	8.3	29.5	8.4	0.0	3.6	1.2	1.2
JIM HOGG	5.2	0.0	0.0	0.0	7.2	0.0	197.0	0.0	0.0	0.0	0.0	0.0
JIM WELLS	0.0	1.4	15.8	24.2	8.0	1.3	6.8	0.0	2.3	0.0	0.0	0.7
JOHNSON	3.3	14.3	33.2	5.0	4.2	0.5	5.7	8.2	15.9	6.6	76.3	13.7
JONES	0.0	0.0	0.0	0.0	0.0	0.0	9.6	0.0	0.0	10.4	4.1	4.6
KARNES	0.0	0.0	0.0	0.0	162.4	43.0	0.0	0.0	0.0	0.0	0.0	11.7
KAUFMAN	2.8	4.8	1.4	2.0	1.0	1.1	7.6	24.0	4.7	0.0	4.0	1.1
KENDALL	3.8	0.0	3.2	0.0	0.0	3.6	12.0	0.0	0.0	0.0	0.0	2.3
KENEDY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KERR	0.0	4.6	82.5	47.4	10.1	5.9	0.0	2.0	0.0	0.0	6.3	3.8
KIMBLE	0.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KINNEY	0.0	23.0	0.0	0.0	0.0	22.6	0.0	21.4	0.0	0.0	0.0	0.0
KLEBERG	13.3	1.8	1.7	1.8	3.4	6.9	0.0	0.0	0.0	0.9	0.0	0.0
KNOX	49.4	16.9	44.5	0.0	0.0	0.0	0.0	0.0	0.0	54.2	0.0	0.0
LAMAR	0.0	0.0	0.0	0.0	0.0	3.0	4.6	0.0	44.9	0.0	0.0	0.0
LAMB	8.9	44.5	6.5	23.9	14.3	15.9	5.3	28.3	6.7	0.0	0.0	0.0

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
LAMPASAS	0.0	0.0	0.0	3.8	24.3	0.0	0.0	11.8	0.0	0.0	0.0	0.0
LA SALLE	0.0	0.0	26.3	6.9	8.5	0.0	0.0	7.1	3.5	0.0	0.0	0.0
LAVACA	1.7	7.3	24.3	3.4	1.7	7.0	130.8	0.0	0.0	0.0	0.0	0.0
LEE	0.0	0.0	15.6	6.8	6.4	22.4	0.0	0.0	0.0	0.0	0.0	0.0
LEON	0.0	0.0	0.0	6.3	0.0	4.1	0.0	0.0	0.0	0.0	2.4	6.4
LIBERTY	2.4	0.0	3.8	1.1	0.0	0.0	3.8	5.8	0.0	0.0	3.8	0.0
LIMESTONE	0.0	1.2	51.0	0.0	0.0	19.9	4.9	0.0	0.0	0.0	0.0	4.4
LIPSCOMB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIVE OAK	0.0	0.0	0.0	8.6	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0
LLANO	0.0	2.1	0.0	0.0	0.0	238.5	0.0	0.0	0.0	22.0	0.0	0.0
LOVING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LUBBOCK	8.8	21.6	8.9	6.6	5.6	7.5	4.0	15.7	29.3	4.5	73.6	19.4
LYNN	19.9	0.0	0.0	0.0	0.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0
MCCULLOCH	0.0	0.0	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MCLENNAN	4.2	3.9	6.0	2.1	3.4	9.2	3.2	4.4	2.2	10.3	39.8	0.0
MCMULLEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MADISON	0.0	31.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MARION	0.0	0.0	5.1	0.0	0.0	18.2	0.0	0.0	8.5	0.0	0.0	0.0
MARTIN	13.1	0.0	28.9	20.0	0.0	0.0	0.0	46.1	0.0	0.0	0.0	0.0
MASON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MATAGORDA	9.8	0.0	0.0	0.0	5.8	7.3	42.3	2.3	2.6	0.0	0.0	0.0
MAVERICK	13.8	26.6	76.7	23.9	19.3	227.3	0.0	0.6	0.8	1.0	0.0	0.0
MEDINA	3.1	42.2	11.7	0.0	8.6	4.8	0.0	0.0	0.0	0.0	0.0	0.0
MENARD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MIDLAND	19.2	6.8	9.8	5.8	22.7	17.5	3.5	0.0	3.9	0.9	0.0	0.0
MILAM	11.3	19.2	0.0	0.0	12.9	0.0	0.0	7.1	9.6	17.0	0.0	0.0
MILLS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MITCHELL	0.0	0.0	0.0	4.9	25.9	0.0	0.0	11.1	0.0	0.0	0.0	0.0
MONTAGUE	0.0	6.8	7.5	58.5	14.1	0.0	0.0	28.3	24.4	20.3	2.0	0.0
MONTGOMERY	6.0	7.6	0.0	1.5	3.4	1.1	8.1	17.0	10.6	0.4	7.3	4.1
MOORE	0.0	0.0	76.1	155.8	50.4	17.4	62.0	4.8	0.0	0.0	5.7	0.0
MORRIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOTLEY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NACOGDOCHES	6.3	11.0	9.2	0.0	1.3	18.9	25.8	0.0	16.8	0.0	0.0	1.3
NAVARRO	0.0	0.0	1.7	1.6	0.0	6.5	0.0	16.3	0.0	3.8	0.0	0.0

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
NEWTON	3.5	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	4.1	0.0
NOLAN	0.0	17.6	27.4	0.0	0.0	7.1	0.0	3.2	0.0	0.0	0.0	5.4
NUECES	15.0	281.1	622.0	15.6	18.7	24.0	8.1	3.0	0.7	1.2	3.3	0.9
OCHILTREE	0.0	0.0	6.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
OLDHAM	0.0	0.0	30.5	148.9	0.0	0.0	154.0	0.0	0.0	0.0	0.0	0.0
ORANGE	0.6	0.0	0.0	2.2	0.0	9.1	27.1	0.0	6.9	3.5	0.0	0.0
PALO PINTO	16.5	16.7	12.5	0.0	0.0	0.0	8.6	19.3	0.0	0.0	0.0	1.7
PANOLA	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PARKER	2.2	15.2	1.4	10.4	3.0	10.5	17.3	20.9	16.3	0.0	4.8	0.7
PARMER	0.0	0.0	13.7	0.0	6.1	43.5	0.0	14.9	0.0	0.0	10.8	0.0
PECOS	3.8	0.0	0.0	9.6	23.9	78.2	0.0	0.0	0.0	0.0	0.0	0.0
POLK	4.9	0.0	0.0	0.0	1.1	2.3	1.0	23.5	1.0	1.5	0.0	0.0
POTTER	5.5	8.1	9.8	30.6	32.5	27.5	141.0	44.4	9.5	0.6	2.2	0.0
PRESIDIO	0.0	0.0	0.0	0.0	34.9	4.0	10.8	0.0	0.0	0.0	6.4	0.0
RAINS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RANDALL	10.4	2.5	0.0	1.1	9.0	11.0	6.2	5.2	1.8	2.9	3.2	0.0
REAGAN	0.0	0.0	0.0	0.0	0.0	0.0	26.4	50.6	0.0	0.0	0.0	0.0
REAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RED RIVER	0.0	0.0	0.0	0.0	6.2	69.6	213.8	0.0	0.0	0.0	0.0	0.0
REEVES	0.0	0.0	0.0	15.3	5.3	5.0	0.0	0.0	0.0	0.0	0.0	0.0
REFUGIO	0.0	11.3	0.0	0.0	0.0	9.6	0.0	0.0	0.0	0.0	0.0	0.0
ROBERTS	0.0	0.0	164.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROBERTSON	0.0	1.1	49.2	0.0	0.0	36.6	0.0	0.0	25.3	0.0	0.0	4.8
ROCKWALL	0.0	0.0	15.3	1.8	0.0	1.6	2.9	2.7	12.4	0.0	0.0	0.0
RUNNELS	12.9	3.2	10.6	11.5	10.4	41.6	0.0	0.0	0.0	0.0	0.0	0.0
RUSK	0.0	0.0	0.0	0.0	13.9	12.3	0.0	0.0	0.0	0.0	0.0	1.2
SABINE	0.0	0.0	0.0	2.9	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0
SAN AUGUSTINE	0.0	0.0	0.0	0.0	0.0	172.1	0.0	0.0	0.0	0.0	0.0	0.0
SAN JACINTO	2.3	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0
SAN PATRICIO	3.2	12.2	16.7	3.7	22.8	1.8	25.1	1.6	1.5	1.7	1.5	0.6
SAN SABA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCHLEICHER	0.0	0.0	0.0	0.0	27.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCURRY	0.0	0.0	19.5	6.3	6.9	0.0	0.0	5.3	0.0	0.0	5.8	0.0
SHACKELFORD	0.0	173.3	0.0	0.0	0.0	0.0	0.0	89.9	0.0	0.0	0.0	0.0
SHELBY	0.0	0.0	0.0	0.0	4.0	0.0	41.5	0.0	3.8	0.0	0.0	0.0

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
SHERMAN	0.0	0.0	0.0	0.0	50.8	0.0	52.0	0.0	0.0	0.0	27.7	0.0
SMITH	5.1	47.1	7.0	3.6	29.4	22.5	15.5	0.4	6.3	0.0	0.0	3.5
SOMERVELL	0.0	0.0	11.9	9.0	12.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0
STARR	56.3	65.4	13.0	7.3	7.9	371.7	8.1	53.3	1.3	0.8	0.0	0.4
STEPHENS	4.8	0.0	6.7	14.8	57.3	6.5	279.0	0.0	0.0	0.0	0.0	0.0
STERLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STONEWALL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUTTON	0.0	0.0	25.1	0.0	0.0	0.0	0.0	30.6	0.0	0.0	0.0	0.0
SWISHER	0.0	0.0	12.4	0.0	0.0	13.4	36.9	0.0	0.0	0.0	0.0	0.0
TARRANT	190.8	390.4	143.6	11.1	10.4	18.3	0.5	5.4	7.4	4.3	18.7	12.6
TAYLOR	3.4	0.0	22.2	3.2	1.4	7.5	20.2	39.9	3.4	2.2	9.0	2.2
TERRELL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TERRY	64.8	44.5	0.0	4.6	0.0	36.4	47.1	28.1	0.0	0.0	13.0	9.6
THROCKMORTON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	0.0	0.0	0.0	0.0
TITUS	0.0	0.0	13.5	23.6	2.2	34.1	3.9	20.4	12.3	2.4	0.0	0.0
TOM GREEN	1.1	4.5	5.6	28.2	18.6	6.0	5.8	12.9	0.7	1.6	0.0	0.0
TRAVIS	31.7	134.5	151.4	4.6	20.2	15.6	19.6	18.2	10.3	6.5	38.4	11.2
TRINITY	0.0	0.0	7.1	6.4	0.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0
TYLER	0.0	0.0	0.0	8.6	0.0	0.0	6.2	3.8	0.0	0.0	0.0	0.0
UPSHUR	0.0	35.3	0.0	3.1	2.2	0.0	5.1	0.0	0.0	0.0	0.0	0.0
UPTON	0.0	18.1	0.0	0.0	0.0	27.1	0.0	0.0	0.0	0.0	0.0	0.0
UVALDE	2.2	7.6	317.7	16.5	23.6	10.1	0.0	12.3	0.0	0.0	0.0	1.7
VAL VERDE	0.0	19.7	85.4	1.2	50.7	32.8	3.1	18.2	3.2	0.0	6.8	1.2
VAN ZANDT	0.0	1.5	0.0	2.8	48.8	28.4	9.3	1.2	3.7	4.4	0.0	1.4
VICTORIA	117.6	15.6	2.2	6.8	11.5	10.9	4.2	23.4	2.4	2.1	3.1	1.9
WALKER	11.1	6.3	11.4	0.6	0.0	11.6	0.0	6.1	0.0	0.0	5.6	2.8
WALLER	0.0	0.0	0.0	0.0	48.3	3.7	1.2	3.4	0.0	0.0	9.3	3.9
WARD	0.0	6.8	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WASHINGTON	0.0	0.0	0.0	1.9	0.0	19.0	1.1	0.0	1.6	0.0	12.0	0.0
WEBB	52.6	200.9	183.5	11.0	17.2	51.6	3.1	21.2	1.7	0.3	8.1	4.8
WHARTON	0.0	0.0	2.7	0.0	5.8	7.8	25.7	9.4	0.0	3.1	0.0	0.0
WHEELER	19.2	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	0.0	0.0	0.0
WICHITA	1.5	148.6	12.7	0.9	3.1	17.5	5.1	4.6	3.1	1.6	0.0	1.9
WILBARGER	0.0	4.9	12.3	0.0	0.0	0.0	12.3	0.0	0.0	57.1	6.0	8.5
WILLACY	4.1	1.7	7.4	5.5	28.6	93.0	18.9	6.1	0.0	0.0	0.0	0.0

County Name	1992 Rate	1993 Rate	1994 Rate	1995 Rate	1996 Rate	1997 Rate	1998 Rate	1999 Rate	2000 Rate	2001 Rate	2002 Rate	2003 Rate
WILLIAMSON	3.3	27.7	40.2	4.3	6.6	7.7	10.8	8.5	12.1	8.9	15.2	9.4
WILSON	0.0	0.0	16.3	7.2	7.1	3.1	0.0	0.0	0.0	0.0	0.0	0.0
WINKLER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WISE	26.2	35.1	74.3	11.7	1.7	26.3	36.5	39.3	0.0	0.0	0.0	1.1
WOOD	0.0	39.8	26.2	0.0	2.4	0.0	28.1	22.4	82.7	0.0	0.0	1.4
YOAKUM	0.0	0.0	23.9	62.9	10.1	9.1	7.5	9.5	10.2	0.0	0.0	0.0
YOUNG	0.0	7.4	3.5	0.0	0.0	0.0	5.6	19.8	6.8	121.8	0.0	2.6
ZAPATA	2.3	3.5	0.0	0.0	0.0	195.9	36.0	20.3	90.8	0.0	0.0	0.0
ZAVALA	0.0	3.0	3.6	0.0	3.7	0.0	192.1	48.2	0.0	0.0	0.0	0.0

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VITA

Kelly Michelle Kummer Johnson was born in Houston, Texas, on April 26, 1977, the daughter of Will Ernest Kummer and Erin Asselstine Kummer. She has one sister, Melissa Ann Kummer. After graduating from Tomball High School, Tomball, Texas, in 1995, she entered the University of Texas at Austin. In January 1999, she married Daniel Johnson. She received the degree of Bachelor of Science in Microbiology from the University of Texas in December, 1999. During the following years, she worked as a Public Health Technician for the Texas Neural Tube Defects Project at the Texas Department of Health and later worked as a Research Specialist for the Texas Cancer Registry also with the Texas Department of Health. In August 2002, she entered the Graduate College at Texas State University – San Marcos. She currently works as an Epidemiologist for the Texas EMS/Trauma Registry at the Texas Department of State Health Services.

Permanent Address: Kelly Michelle Kummer Johnson

Austin, Texas 78751

This thesis was typed by Kelly Michelle Kummer Johnson.