

Viral Hepatitis B Infection in Delaware 2005-2015: Incidence Trend, Distribution, and Factors Associated with Its Infection

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ABSTRACT

BACKGROUND: Viral hepatitis B (HBV) infection is a significant public health issue in the United States with approximately 2.2 million HBV-infected persons. An understanding of HBV epidemiology is important for targeted public health efforts. This study aimed to determine Delaware HBV incidence trends, identify its distribution and factors associated with HBV infection during the period 2005-2015.

METHODS: We performed a retrospective study on persons suspected of having HBV who were reported to the Division of Public Health (DPH), Delaware Health and Social Services (DHSS) through the Delaware Electronic Reporting and Surveillance System (DERSS) between January 1, 2005 and December 31, 2015. The charts of 4,981 persons were reviewed and included in the analysis.

RESULTS: Of 4,981 persons, 2,119 [1,988 (39.9%) confirmed, 131 (2.6%) probable] were identified as having either acute or chronic HBV infection. Between 2005 and 2015, acute HBV incidence declined 80.9%, from 4.2 cases to 0.8 per 100,000 population. During the same period, chronic HBV declined 60%, from 36.0 to 14.4 per 100,000 population, for an overall reduction of 62.2%, from 40.2 to 15.2. Between 2005 and 2015, males had a higher yearly incidence rate than females. Rates declined 63.5% among males and 60.1% among females. Interestingly, there was an increase of 13.4% in the incidence in females during 2010-2015. A decline was seen in all racial groups during 2005-2015. Asians had higher HBV incidence compared to whites and blacks, with 2005 rates 25.1-fold and 5.9-fold higher and 2015 rates 31.5-fold and 6.4-fold higher, respectively. HBV incidence among Asians increased 40.0% during 2010-2015. A decline in HBV infection was seen in all age groups from 2005-2015. However, during 2010-2015, an increase of 12.2% was seen among those 15-39 years. Sixty-six percent of infected patients were identified in five cities: Wilmington, Newark, New Castle, Dover, and Bear. In a multivariable logistic model, significant predictors for HBV infection included being male [adjusted odds ratio (aOR): 1.6, 95% CI: 1.4-1.8], age 15-39 years (aOR: 2.3, 95% CI: 1.4-3.7). Compared with white, Asian, black, and others had greater risk, with aOR of 5.3 (95% CI: 4.4-6.4), 1.6 (95% CI: 1.4-1.8), and 1.4 (95% CI: 1.1-1.9), respectively. Having received ≥ 1 dose of HBV vaccination had some protective effect, aOR: 0.4, 95% CI: 0.2-0.5.

CONCLUSIONS: HBV infection is significant in Delaware and concentrated mainly in a few big cities. Despite an overall decline, during 2010-2015, increases were seen among females, in the 15-39 age group, and in the Asian population. Further studies should be conducted to identify factors contributing to these increases

BACKGROUND

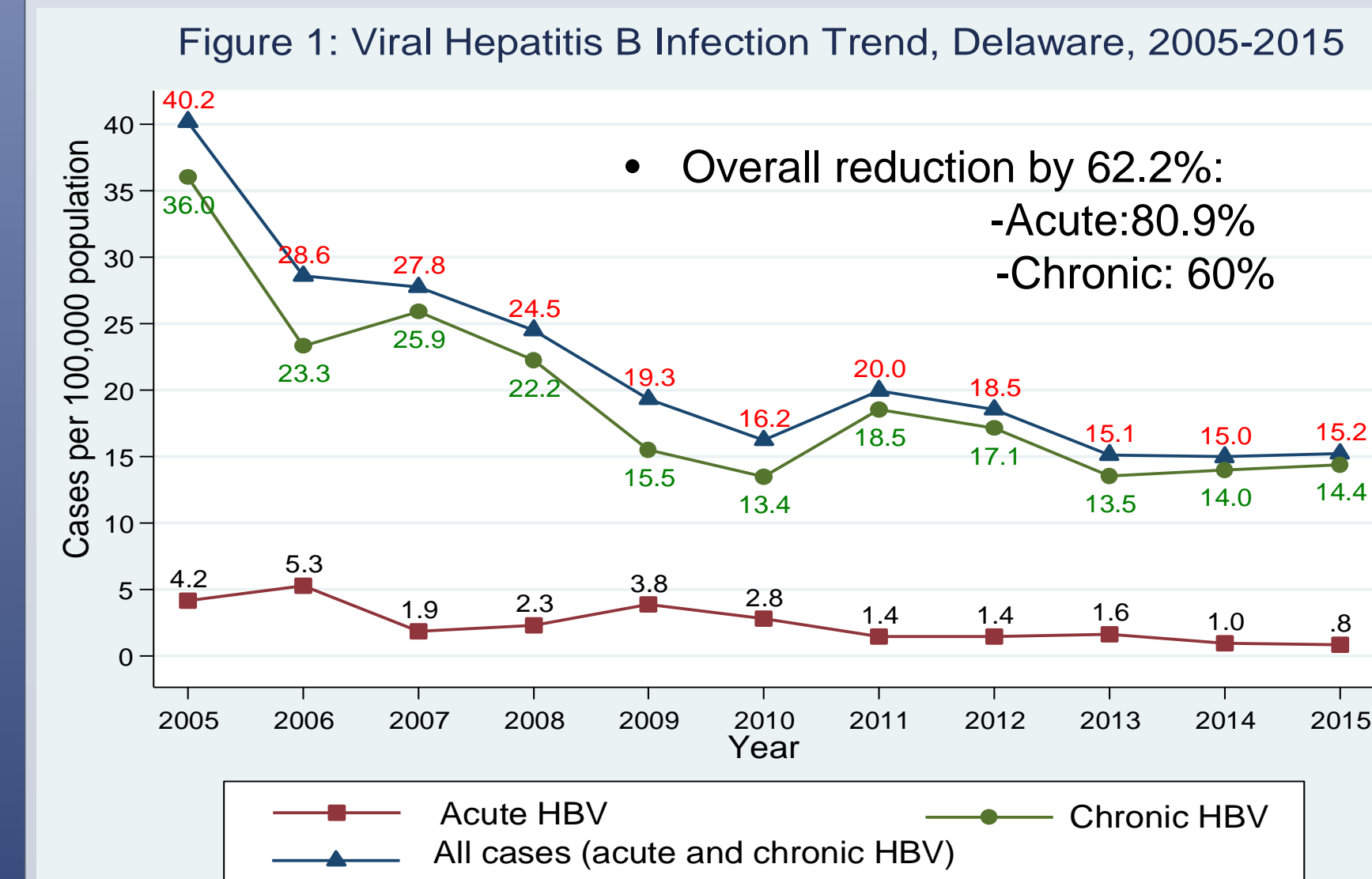
- HBV infection: A major global health problem, around 240 million chronic HBV-infected persons worldwide in 2016
- Around 850,000-2.2 million HBV-infected people in the U.S.
- During 2011-2014: HBV prevalence was 0.4% among U.S adults ≥ 18 years.
- 71.3% of chronic HBV were among persons born outside the U.S and most unaware of their infection status.
- Delaware: small state with population of 945,934 in 2015, home to 76,768 immigrants in 2013
- No published data on incidence trend and epidemiologic characteristics of HBV-infected persons in Delaware. Understanding of HBV epidemiology is important for targeted public health efforts

OBJECTIVES

- To determine HBV incidence trends in Delaware during the period 2005-2015
- To identify HBV distribution and factors associated with HBV infection

METHODS

- A retrospective study on 4,981 persons suspected of having HBV who were reported to the Delaware DPH through the DERSS between January 1, 2005 and December 31, 2015
- Descriptive statistics and cross-tabulation were used for patient characteristics. Yearly incidence and trends of HBV infection by gender, age group, and racial group were determined. In addition, logistic regression models were performed using Stata version 13 to identify factors associated with HBV infection.

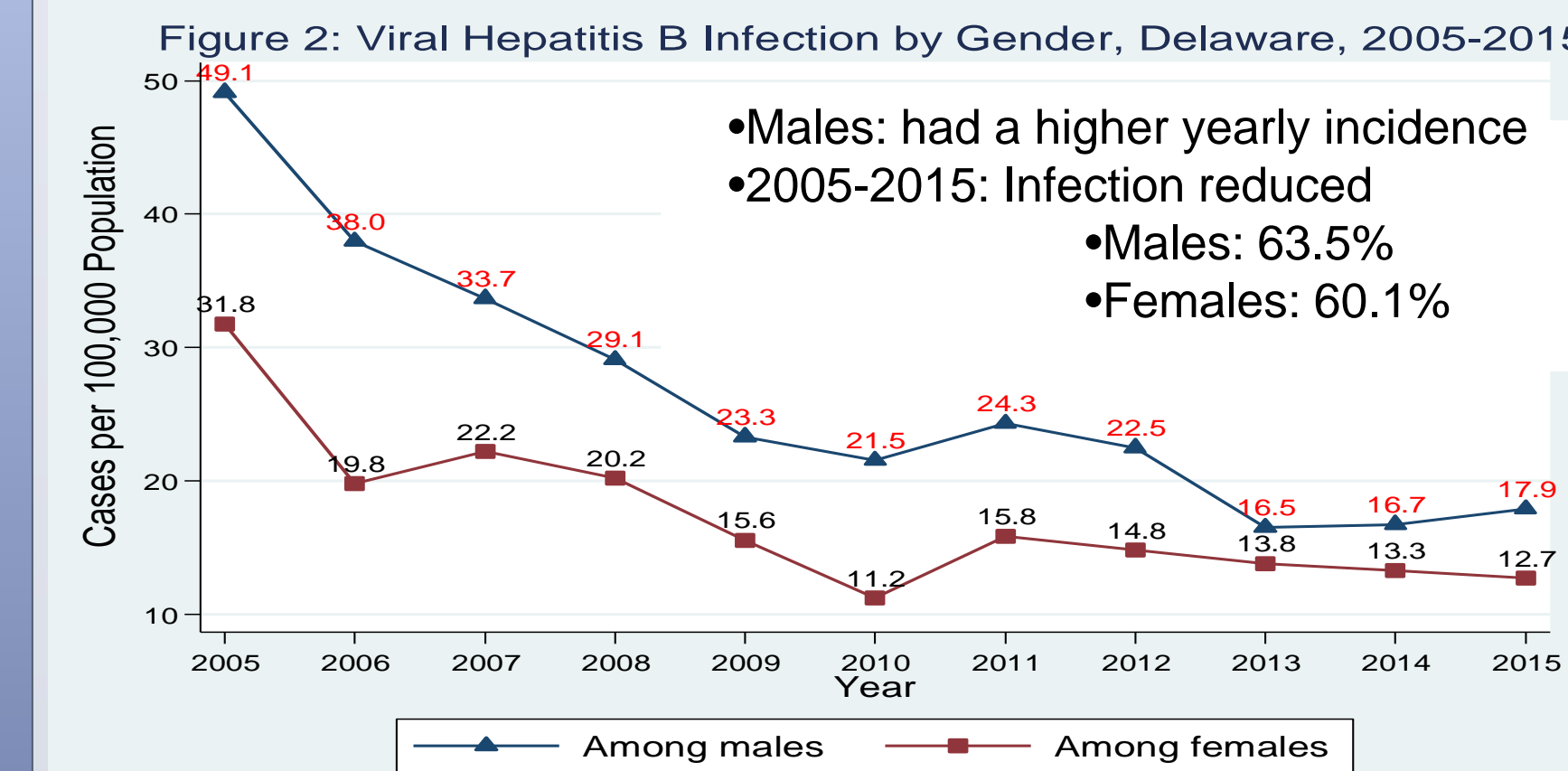


- Chronic: spiked 28% during 2010-12 & 7% during 2013-15

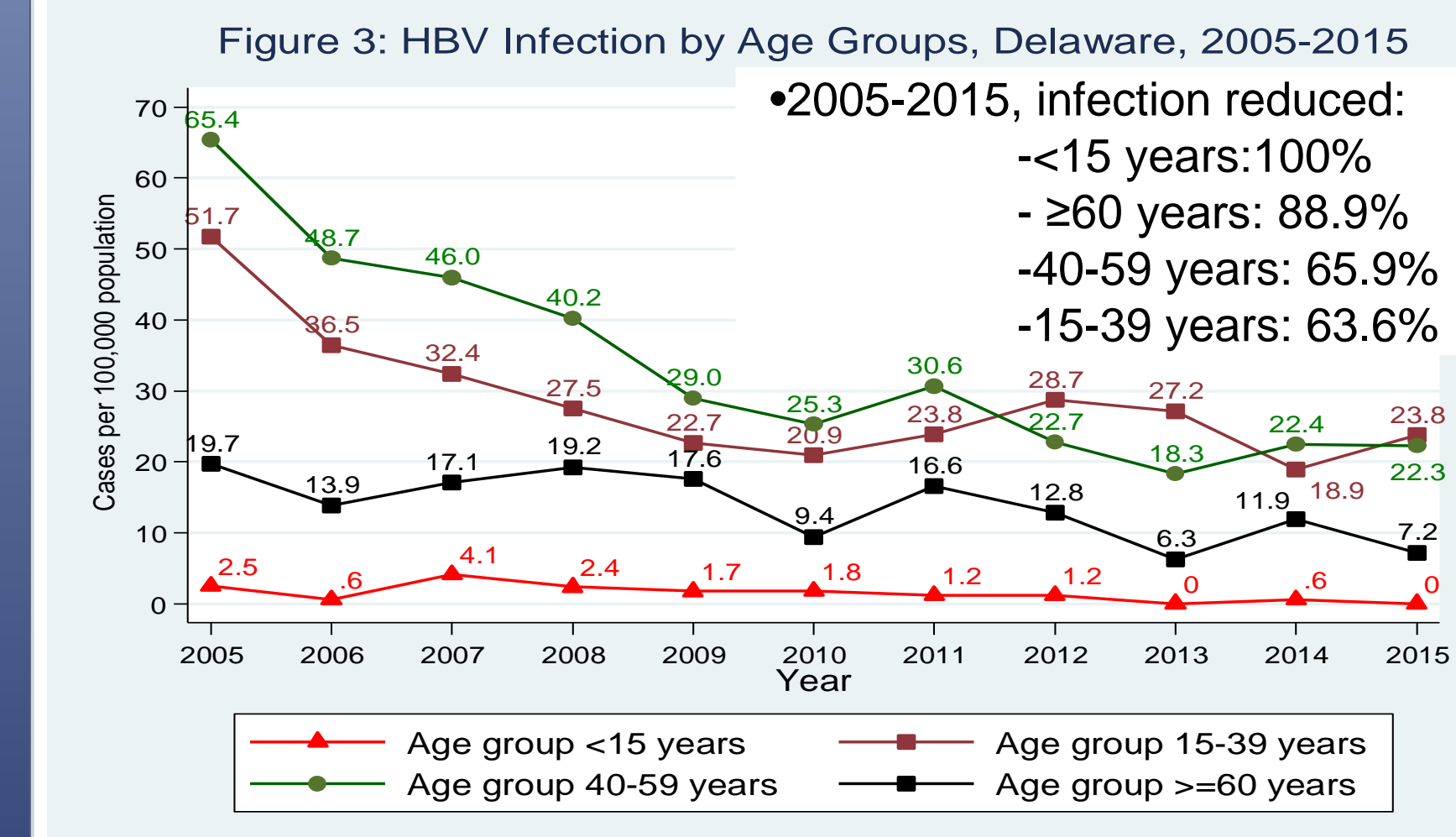
RESULTS

Table 1: Population characteristics

| Characteristics | HBV (N=2,119) | Non-HBV (N=2,862) | Total (N=4,981) | P-value |
|---|---------------|-------------------|-----------------|---------|
| Gender; N (%) | | | | |
| Male | 1246 (58.8) | 1495(52.2) | 2741 (55.0) | <0.001 |
| Female | 870(41.1) | 1363(47.6) | 2233(44.8) | |
| Missing/Unknown | 3(0.1) | 4(0.2) | 7(0.2) | |
| Age, N (%) mean:45.3 years, IQR: 34-56 years) | | | | |
| <15 | 27(1.3) | 94(3.3) | 121(2.4) | <0.001 |
| 15-39 | 914(43.1) | 782(27.3) | 1696(34.1) | |
| 40-59 | 907(42.8) | 1341(46.8) | 2248(45.1) | |
| ≥ 60 | 271(12.8) | 646(22.6) | 917(18.4) | |
| Race/Ethnicity, N (%) | | | | |
| White | 560(26.4) | 1358(47.4) | 1918(38.5) | <0.001 |
| Black | 703(33.2) | 997(34.8) | 1700(34.1) | |
| Asian | 568(26.8) | 227(7.9) | 795(16.0) | |
| Others* | 82(3.8) | 128(4.5) | 210(4.2) | |
| Unknown | 14(0.7) | 68(2.4) | 82(1.7) | |
| Missing | 192(9.1) | 84(3.0) | 276(5.5) | |
| Received ≥ 1 dose of viral hepatitis B vaccination | | | | |
| Yes | 130(6.1) | 399(14.0) | 529(10.6) | <0.001 |
| No | 1987(93.8) | 2463(86.0) | 4450(89.3) | |
| Unknown/Missing | 2(0.1) | 0 | 2(0.1) | |



- 2010-2015: 16.7% declined in males while 13.4 increased in females

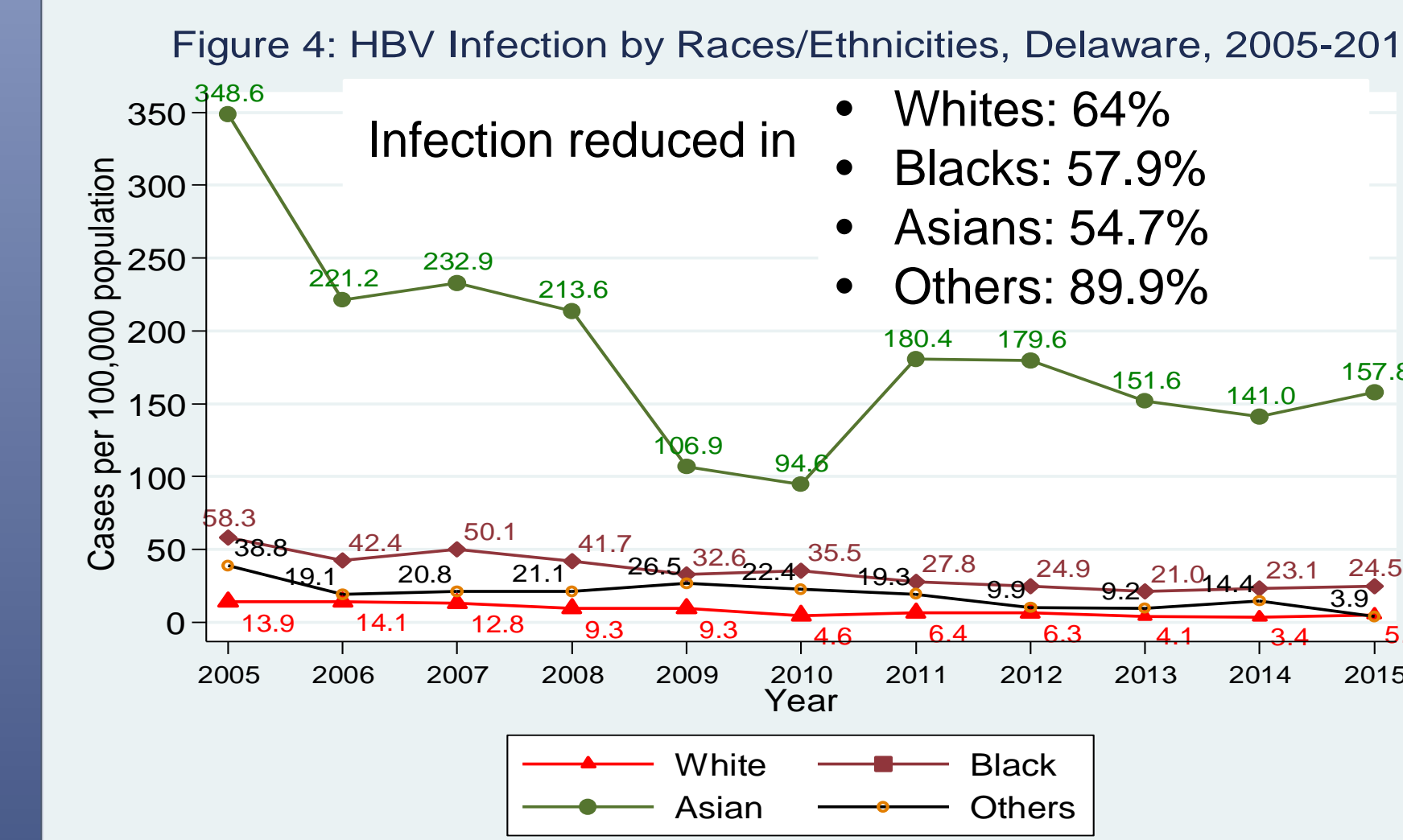


- 2010-2015: an increase of 12.2% in the 15-39 years

RESULTS

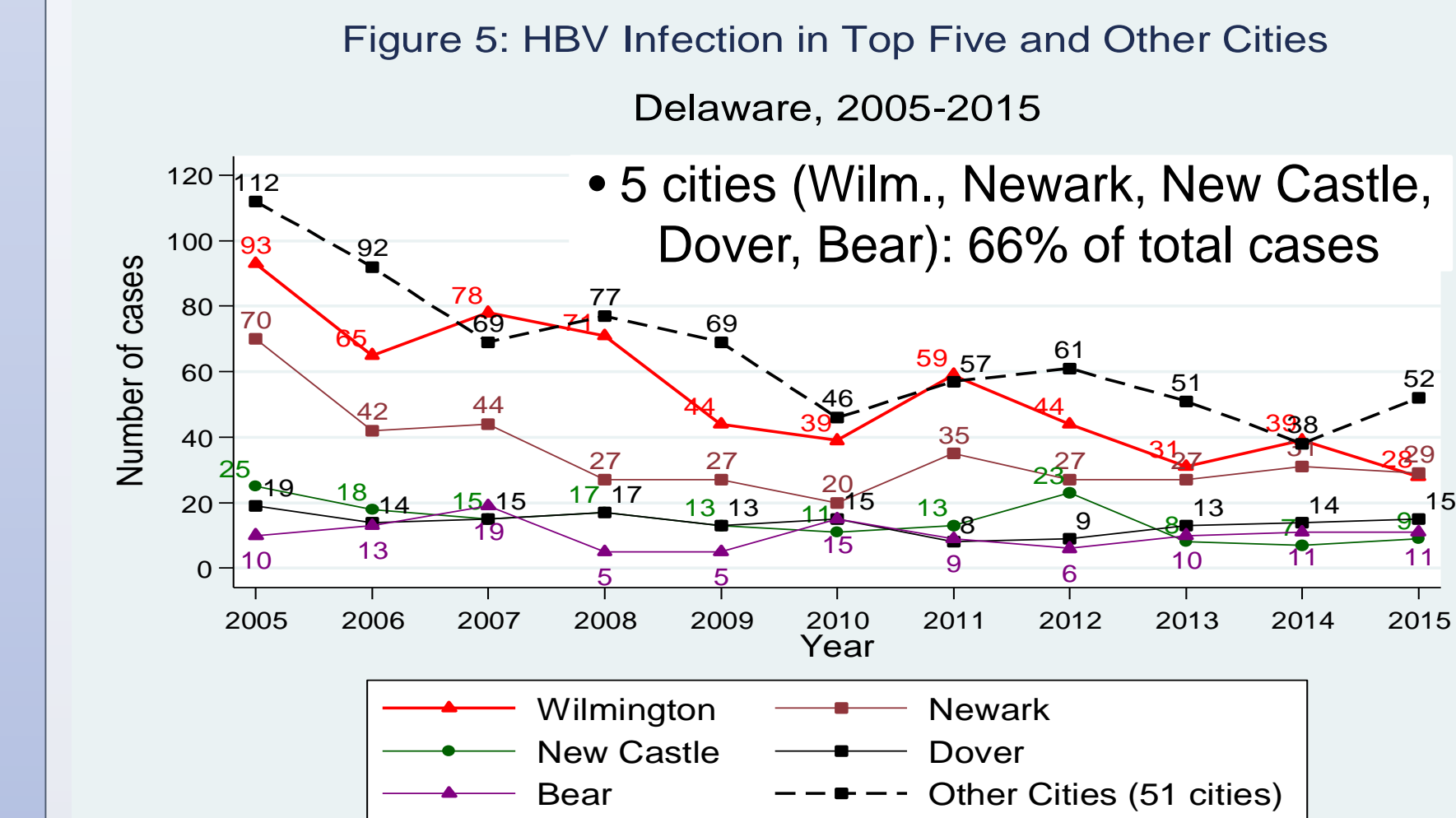
Table 2: Characteristics of Patients with Viral Hepatitis B, Period 2005-2015

| Characteristics | Acute HBV (N=232) | Chronic HBV (N=1,887) | Total (N=2,119) | |
|--|--------------------------|-----------------------|-----------------|------------|
| Gender; N (%) | | | | |
| Male | 153 (66.0) | 1,093 (57.9) | 1,246 (58.8) | |
| Female | 78 (33.6) | 792 (42.0) | 870 (41.1) | |
| Missing/Unknown | 1 (0.4) | 2 (0.1) | 3 (0.1) | |
| Age, N (%) mean:42.7 years, IQR: 32-52 years old) | | | | |
| <15 | 0 | 27 (1.4) | 27 (1.3) | |
| 15-39 | 103 (44.4) | 811 (43.0) | 914 (43.1) | |
| 40-59 | 110 (47.4) | 797 (42.2) | 907 (42.8) | |
| ≥ 60 | 19 (8.2) | 252 (13.4) | 271 (12.8) | |
| Race/Ethnicity, N (%) | | | | |
| White | 101(43.5) | 459(24.3) | 560(26.4) | |
| Black | 94(40.5) | 609(32.3) | 703(33.2) | |
| Asian | 16(6.9) | 552(29.3) | 568(26.8) | |
| Others* | 3(1.3) | 79(4.2) | 82(3.9) | |
| Unknown/Missing | 18(7.8) | 188(9.9) | 206(9.7) | |
| County (N, %) and City** (zip code) | | | | |
| New Castle | Wilmington (19801-19810) | 84 (36.2) | 507 (26.9) | 591 (27.9) |
| | Smyrna (19977) | 3 (1.2) | 25 (1.3) | 28 (1.3) |
| | Newark (19702, -11, -13) | 19 (8.1) | 360 (19.0) | 379 (17.9) |
| | New Castle (19720) | 28 (12.0) | 131 (6.9) | 159 (7.5) |
| | Middletown (19709) | 2 (0.8) | 46 (2.4) | 48 (2.2) |
| Kent | Hockessin (19707) | 1 (0.4) | 51 (2.7) | 52 (2.4) |
| | Claymont (19703) | 6 (2.5) | 58 (3.1) | 63 (3.0) |
| | Bear (19701) | 10 (4.3) | 104 (5.5) | 114 (5.3) |
| | Dover (19901, 19904) | 13 (5.6) | 139 (7.3) | 152 (7.1) |
| Sussex | Smyrna (19977) | 4 (1.7) | 51 (2.7) | 55 (2.6) |
| | Georgetown (19947) | 6 (2.5) | 38 (2.0) | 44 (2.0) |
| | Lewes (19958) | 6 (2.5) | 33 (1.7) | 39 (1.8) |
| | Millsboro (19966) | 3 (1.2) | 27 (1.4) | 30 (1.4) |
| | Rehoboth Beach (19971) | 6 (2.6) | 28 (1.4) | 34 (1.6) |
| | Seaford (19973) | 4 (1.7) | 44 (2.3) | 48 (2.2) |



- Asians: higher yearly incidence compared with other groups
 - vs. Whites: 25.1 fold in 2005 & 31.5 fold in 2015
 - vs. Blacks: 5.9 fold in 2005 & 6.4 fold in 2015
- During 2010-2015: Increased 40% in Asians

RESULTS



- Wilmington: Largest cases (27.9%), reduced 69.9%
- Newark: reduced 71.4% during 2005-2010, increased 45% during 2010-2015
- New Castle: reduced 64%. Dover: reduced 26.3% in 2005-06, fluctuated 13-15 cases/year

Table 3: Factors Associated with Viral Hepatitis B Infection

| Predictor | Univariate | Multivariate |
|---|---------------------|---------------------|
| | Odds ratio (95% CI) | Odds ratio (95% CI) |
| Gender | | |
| Female | 1 | 1 |
| Male | 1.3(1.2-1.5) | 1.6(1.4-1.8) |
| Age, years | | |
| <15 | 1 | 1 |
| 15-39 | 4.1(2.6-6.3) | 2.3(1.4-3.7) |
| 40-59 | 2.4(1.5-3.6) | 1.2(0.7-2.1) |
| ≥ 60 | 1.5(0.9-2.3) | 0.7(0.4-1.3) |
| Race/Ethnicity | | |
| White | 1 | 1 |
| Black | 1.7(1.4-1.9) | 1.6(1.4-1.8) |
| Asian | 6.1(5.1-7.3) | 5.3(4.4-6.4) |
| Others | 1.5(1.1-2.1) | 1.4(1.1-1.9) |
| Received ≥ 1 dose of viral hepatitis B vaccination | | |
| No | 1 | 1 |
| Yes | 0.4(0.3-0.5) | 0.4(0.2-0.5) |

CONCLUSIONS

- HBV infection is a significant public health problem in DE, it concentrated mainly in a few big cities
- Despite an overall decline, during 2010-15, increases seen in females, the 15-39 age group, and Asians
- Significant predictors for HBV infection include being male, age 15-39 years, and being Asian, Black, and Other