

# FIB-4 TO ASSESS PREVALENCE OF ADVANCED FIBROSIS IN HOMELESS ADULTS WITH HEPATITIS C IN BOSTON

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## Background

- Boston Health Care for the Homeless Program (BHCHP) observes a high prevalence of HCV and excess mortality from liver disease in its population of homeless and marginally-housed patients<sup>1,2</sup>
- Barriers to HCV treatment and specialty liver care in marginalized populations are numerous<sup>3-6</sup>
- The FIB-4 is a low-cost, easily-calculated tool with high specificity to identify advanced liver fibrosis and expedite HCV treatment<sup>7,8</sup>
- A benchmark study utilizing the FIB-4 to assess advanced fibrosis in a US national sample of housed individuals with HCV found a 16% prevalence of advanced fibrosis<sup>9</sup>

## Objectives

- Utilize the FIB-4 fibrosis assessment tool to characterize the prevalence of advanced liver fibrosis (F3-F4) among individuals with HCV seen at BHCHP
- Compare fibrosis levels of BHCHP cohort to housed sample described by NHANES
- Examine differences within BHCHP cohort, separating individuals born before 1965 ("baby-boomers") from a younger subgroup, to highlight the population of focus for US HCV efforts

## Methods

- Extracted the following variables from the BHCHP EHR for all individuals with HCV seen at BHCHP from 9/1/15-9/1/16:
  - Demographic: age, sex, race, ethnicity, housing status
  - Hepatic parameters: HCV antibody, HCV viral load, ALT, AST, platelets
  - Comorbid conditions associated with cirrhosis: body mass index (BMI), diabetes mellitus, alcohol use disorder (AUD)
- FIB-4 was calculated and interpreted using standard scoring
  - FIB-4 <1.45 High probability of low-level fibrosis (F0-F1)
  - 1.45 ≤ FIB-4 ≤ 3.25 Indeterminate
  - FIB-4 >3.25 High probability of advanced fibrosis (F3-F4)
- Univariate logistic regression used to identify variables associated with advanced fibrosis

Individuals seen at BHCHP 9/1/15-9/1/16  
9,586

Individuals with a diagnosis of HCV  
1,115 (11.6%)

HCV VL Detectable  
864 (77.4%)

HCV VL Not Detected  
251 (22.5%)

Available FIB-4 data points  
832

No available FIB-4 data points  
32

Age <50  
354

Age ≥ 50  
478

## Results

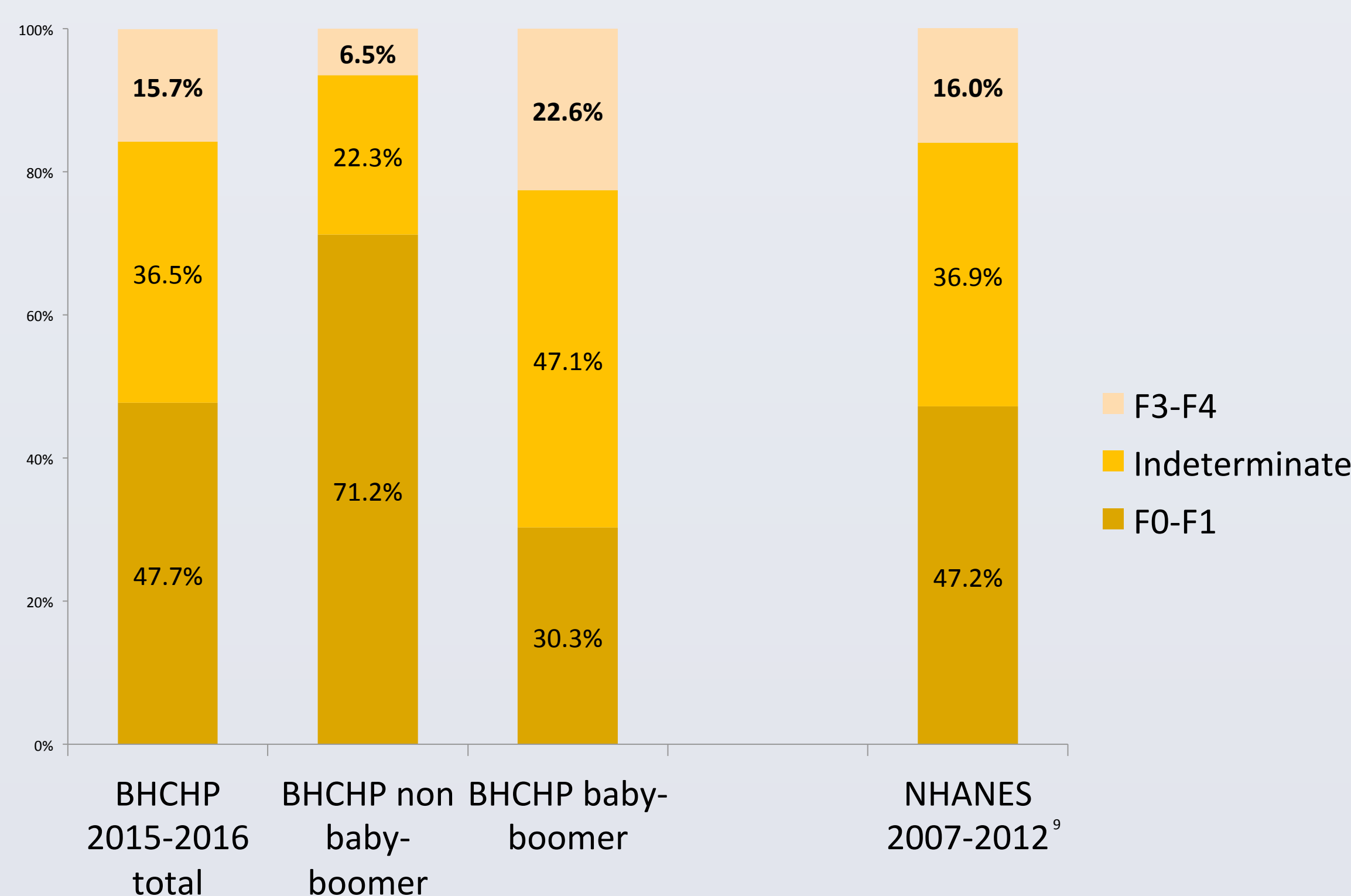
**Table 1.** Demographic characteristics and comorbid conditions of individuals with HCV seen at BHCHP 9/1/15-9/1/16, overall and by baby-boomer status

| Characteristic              | All (N=832) | Non baby-boomers, <50 (N=354) | Baby-boomers, ≥50 (N=478) | P value |
|-----------------------------|-------------|-------------------------------|---------------------------|---------|
| Age, mean                   | 49.8        | 38.8                          | 57.9                      | <0.0001 |
| Sex, N (% female)           | 180 (21.6)  | 101 (28.5)                    | 79 (16.5)                 | <0.0001 |
| Race, N (%)                 |             |                               |                           | <0.0001 |
| White/Caucasian             | 475 (57.2)  | 233 (65.8)                    | 242 (50.7)                |         |
| Black/African American      | 204 (24.5)  | 33 (9.3)                      | 171 (35.8)                |         |
| More than one race          | 53 (6.4)    | 26 (7.3)                      | 27 (5.7)                  |         |
| Other                       | 11 (1.3)    | 8 (2.3)                       | 3 (0.6)                   |         |
| Unreported/missing          | 88 (10.6)   | 54 (15.3)                     | 34 (7.1)                  |         |
| Hispanic ethnicity, N (%)   | 157 (18.9)  | 92 (26.0)                     | 65 (13.6)                 | <0.0001 |
| Housing Status, N (%)       |             |                               |                           | <0.0001 |
| Housed                      | 79 (9.5)    | 21 (5.9)                      | 58 (12.1)                 |         |
| Street                      | 58 (7.0)    | 20 (5.6)                      | 38 (7.9)                  |         |
| Shelter                     | 396 (47.6)  | 147 (41.5)                    | 249 (52.1)                |         |
| Doubled Up                  | 53 (6.4)    | 15 (4.2)                      | 38 (7.9)                  |         |
| Transitional/residential    | 202 (24.3)  | 128 (36.2)                    | 74 (15.5)                 |         |
| Other                       | 21 (2.5)    | 10 (2.8)                      | 11 (2.3)                  |         |
| Unknown                     | 23 (2.8)    | 13 (3.7)                      | 10 (2.1)                  |         |
| Alcohol use disorder, N (%) | 308 (37.0)  | 86 (24.3)                     | 222 (46.4)                | <0.0001 |
| BMI category, N (%)         |             |                               |                           | 0.607   |
| ≥ 30 (obese)                | 205 (25.1)  | 89 (25.6)                     | 116 (24.7)                |         |
| 25-29.9 (overweight)        | 332 (40.7)  | 146 (42.1)                    | 186 (39.7)                |         |
| < 25 (lean)                 | 279 (34.2)  | 112 (32.3)                    | 167 (35.6)                |         |
| Diabetes mellitus, N (%)    | 193 (23.2)  | 44 (12.4)                     | 149 (31.2)                | <0.0001 |

**Table 2.** Hepatic parameters and FIB-4 values for the BHCHP cohort, overall and by baby-boomer status, and for the NHANES sample (2007-2012)

| Value                                 | All (N=832) | Non baby-boomers, <50 (N=354) | Baby-boomers, ≥50 (N=478) | P value | NHANES 2007-2012 <sup>9</sup> (N=215) |
|---------------------------------------|-------------|-------------------------------|---------------------------|---------|---------------------------------------|
| Age (y), mean                         | 49.8        | 38.8                          | 57.9                      | <0.0001 | 50.5                                  |
| ALT (U/L), mean                       | 70          | 89.3                          | 55.7                      | <0.0001 | 70                                    |
| AST (U/L), mean                       | 60.3        | 66                            | 56.1                      | 0.068   | 63.4                                  |
| Platelets (10 <sup>3</sup> /uL), mean | 213.1       | 223.6                         | 205.3                     | 0.001   | 221.3                                 |
| FIB-4, mean                           | 2.2         | 1.7                           | 2.7                       | <0.0001 | 2.21 ± 0.17                           |
| FIB-4 category, N (%)                 |             |                               |                           | <0.0001 |                                       |
| F3-F4 (>3.25)                         | 131 (15.7)  | 23 (6.5)                      | 108 (22.6)                |         | (16.0)                                |
| Indeterminate                         | 304 (36.5)  | 79 (22.3)                     | 225 (47.1)                |         | (36.9)                                |
| F0-F1 (<1.45)                         | 397 (47.7)  | 252 (71.2)                    | 145 (30.3)                |         | (47.2)                                |

## Prevalence of FIB-4 classification by cohort



**Table 3.** Univariate analysis of factors associated with advanced fibrosis score (FIB-4 >3.25)

| Factor               | Odds ratio (95% CI) |
|----------------------|---------------------|
| Baby-boomer status   | 4.20 (2.66-6.90)    |
| Age, per year        | 1.08 (1.05-1.10)    |
| Alcohol use disorder | 2.80 (1.91-4.10)    |
| Housing Status       | —                   |
| Housed               | reference level     |
| Transitional/Res Tx  | 0.36 (0.17-0.76)    |

## Conclusions

- Homeless and marginally-housed individuals with HCV in Boston have equivalent rates of advanced fibrosis compared to a national housed sample of people with HCV infection
- Analysis of age-stratified BHCHP subgroups demonstrates stark differences in advanced fibrosis as well as in demographic and comorbid characteristics
  - Possibly reflecting shifting HCV epidemiology in Boston related to the opioid epidemic?<sup>10</sup>
  - Underscores heterogeneity of population and possibility of distinct treatment needs
- In univariate (unadjusted) analysis:
  - Alcohol use disorder was associated with a 2.8-fold higher odds of advanced fibrosis.
  - Residing in transitional housing or residential treatment programs was associated with a reduced risk of advanced fibrosis. Multivariate analysis will attempt to confirm this finding.
  - Obesity, diabetes, race, and ethnicity were not associated with advanced fibrosis.
- The FIB-4 can be readily applied in a homeless healthcare setting, recorded in the EHR, and incorporated into the population management efforts aimed at:
  - Recruiting individuals who may not otherwise present for HCV treatment assessment
  - Identifying individuals who would benefit from screening for the sequelae of advanced fibrosis (e.g. liver cancer, esophageal varices)
  - Emphasizing the importance of screening for and treating AUD in patients with HCV

## References

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