FH: Where are we and where are we going?

Joshua W. Knowles, MD, PhD
Stanford and the FH Foundation
Disclosures

- My role as CMA of the *FH Foundation* is not compensated.
  - www.thefhfoundation.org

- Grant support: AHA, NIH, Leducq Foundation, Amgen
- The FH Foundation receives support from many pharmaceutical and lab testing companies with an interest in FH
Moving forward for FH

- Lack of awareness
- Underestimate of prevalence and severity
- No ICD9 or ICD10 code
- No systematic approach to cascade screening
- No disease registry
- US healthcare system makes finding cases difficult

Reducing the burden of disease and death from familial hypercholesterolemia: A call to action
Joshua W. Knowles, MD, PhD, 1, 2, 3, 4, 5 Emily C. O’Brian, PhD, 1, 6, 7 Karen Greenhalgh, MA, CGC, 1, 2
Katherine Willerson, BS, 1, 2 Jacques Gervet, MD, 3 Lawrence S. Sperling, MD, 2, 3 William A. Neale, MD, 2
Daniel J. Rider, MD, 9 and Moh J. Khoury, MD, PhD 8 Stanfield, Smith Pascuala, CA, Durham, NC, Montreal,
Canada, Alumina, GA, Morgantown, WV, and Philadelphia, PA

FIND FH Project
Flag, Identify, Network, Deliver
The expected approval of ICD-10 codes for familial hypercholesterolemia (FH) marks a historic effort to prevent premature heart attacks and death.

The FH Foundation team at the ICD-10 Coordination Committee Meeting in 2014

"Hopefully this will send a clear message to the medical community that familial hypercholesterolemia is different. Those of us with FH need to be treated as the high risk population that we are."

- Katherine Wilemon
  Founder and CEO
  The FH Foundation
FH is common and devastating

- FH prevalence: ~1 in 220
- Causes 2-3% of MIs before age 60
- As few as 1% diagnosed

Hopkins et al. J. Clinical Lipidology. 2011
Nordestgaard B G et al. Eur Heart J 2013
Prevalence of Familial Hypercholesterolemia in the 1999 to 2012 United States National Health and Nutrition Examination Surveys (NHANES)

Sarah D. de Ferranti, MD, MPH; Angie Mae Rodday, PhD, MS; Michael M. Mendelson, MD, SM; John B. Wong, MD; Laurel K. Leslie, MD, MPH; R. Christopher Sheldrick, PhD

Table. Characteristics of the Overall US Population ≥20 Years of Age and US Adults With Probable or Definite FH According to the DLC Criteria

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>US Population ≥20 y of Age (n=210,000,000)</th>
<th>Probable FH (n=783,500)</th>
<th>Definite FH (n=51,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SE), y</td>
<td>46.8 (0.2)</td>
<td>55 (1.6)</td>
<td>53.1 (4.8)</td>
</tr>
<tr>
<td>Male sex, % (SE)</td>
<td>48.6 (0.2)</td>
<td>48.6 (6)</td>
<td>52.5 (19.4)*</td>
</tr>
<tr>
<td>Race/ethnicity, % (SE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexican American</td>
<td>7.7 (0.6)</td>
<td>4.5 (1.9)</td>
<td>7.5 (5.6)*</td>
</tr>
<tr>
<td>Other Hispanic</td>
<td>5.3 (0.6)</td>
<td>6.6 (2.9)*</td>
<td>22.9 (21.5)*</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>70.0 (1.2)</td>
<td>71.8 (4.9)</td>
<td>45.6 (18.8)*</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>11.2 (0.7)</td>
<td>12.6 (3)</td>
<td>23 (13)*</td>
</tr>
<tr>
<td>Other race/multiracial</td>
<td>5.8 (0.3)</td>
<td>4.5 (2.7)*</td>
<td>1 (2.5)*</td>
</tr>
<tr>
<td>Plasma lipid concentrations, mean (SE), mmol/L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>5.14 (0.01)</td>
<td>7.89 (0.28)</td>
<td>10.2 (1.36)</td>
</tr>
<tr>
<td>TG</td>
<td>1.60 (0.01)</td>
<td>2.68 (0.22)</td>
<td>3.47 (1.07)</td>
</tr>
<tr>
<td>HDL-C</td>
<td>1.36 (0.01)</td>
<td>1.22 (0.05)</td>
<td>1.25 (0.14)</td>
</tr>
<tr>
<td>LDL-C</td>
<td>3.20 (0.01)</td>
<td>7.14 (0.20)</td>
<td>10.06 (0.81)</td>
</tr>
</tbody>
</table>

### CASCADE FH™ Registry Design

**CASCADE SCreening for Awareness and DEtection of Familial Hypercholesterolemia**

<table>
<thead>
<tr>
<th><strong>Eligibility</strong></th>
<th><strong>Data collection</strong></th>
<th><strong>Data captured</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Clinical or genetic diagnosis of FH</td>
<td>• Prospective/retrospective&lt;br&gt;• Entered by research staff&lt;br&gt;• Abstracted from medical records from routine care</td>
<td>• Demographics&lt;br&gt;• Familial hypercholesterolemia diagnosis&lt;br&gt;• Cardiovascular history&lt;br&gt;• Family history&lt;br&gt;• Medications&lt;br&gt;• Physical examination&lt;br&gt;• Laboratory studies</td>
</tr>
<tr>
<td><strong>Lipid Clinic</strong></td>
<td><strong>Patient Portal</strong></td>
<td><strong>O’Brien. Am Heart J 2014;167:342</strong></td>
</tr>
<tr>
<td><strong>Prospective</strong>&lt;br&gt;• Entered by patient, with curation by research staff</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pace of enrollment

- Retrospective: 1563
- Prospective: 1169

Legend:
- Actual eCOS Patients enrolled
- Actual eCOS Cumulative # of patients
TOTAL ENROLLED 2400

AGE (years)
Median 54
<18 12%

Gender
Male 41%
Female 59%

Race
White 75%
Black/African American 10%
Hispanic 6%
Asian 3%
Other 5%

HoFH 2%

AGE >=18
59% 41%

N=2108
Lipids for HeFH Patients

Cardiovascular Disease

CHD, overall cohort 36%

CHD, men 47%

Age at onset, years 47

CHD, women 29%

Age at onset, years 55

Stroke or TIA 5%

Aortic valve disease 3%
High Prevalence of CHD

5-7-Fold Higher

US NHANES
- Men: 6%
- Women: 6%

US CASCADE-FH
- Men: 47%
- Women: 29%

## Importance of CHD Risk Factors

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Prevalence</th>
<th>Unadjusted OR</th>
<th>Adjusted OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>43%</td>
<td>5.4 (4.2-6.9)</td>
<td>2.7 (1.9-3.8)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>13%</td>
<td>4.0 (2.8-5.6)</td>
<td>1.7 (1.0-2.7)</td>
</tr>
<tr>
<td>Low HDL-C</td>
<td>31%</td>
<td>1.6 (1.3-2.1)</td>
<td>1.5 (1.1-2.1)</td>
</tr>
<tr>
<td>Smoking</td>
<td>7%</td>
<td>1.6 (1.1-2.5)</td>
<td>1.4 (0.7-2.5)</td>
</tr>
</tbody>
</table>
Late Diagnosis and Treatment

- American Association of Pediatrics 2008
- US National Lipid Association 2011
- International FH Foundation 2011
- European Atherosclerosis Society 2013
Coronary Artery Disease in 116 Kindred with Familial Type II Hyperlipoproteinemia

By Neil J. Stone, M.D., Robert I. Levy, M.D., Donald S. Fredrickson, M.D., and Joel Verter, M.S.

A review on the diagnosis, natural history, and treatment of familial hypercholesterolaemia

Dalya Marks, Margaret Thorogood, H. Andrew W. Neil, Steve E. Humphries

* London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK

† Oxford Centre for Diabetes, Endocrinology and Metabolism, The Radcliffe Infirmary, Oxford, UK

‡ Centre for Cardiovascular Genetics, British Heart Foundation Laboratories, Department of Medicine, Royal Free and UCL Medical School, The Royal Brompton, London WC1E 6JJ, UK

Morbidity and mortality in FH men and women NOT treated with statins

<table>
<thead>
<tr>
<th>Reference</th>
<th>No of subjects</th>
<th>Country of study</th>
<th>Risk of CHD in men</th>
<th>Risk of CHD in women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slack [2]</td>
<td>104 (44 index and 60 relatives)</td>
<td>UK</td>
<td>51.4% by age 50 and 85.4% by 60 years</td>
<td>12% by age 50 and 56.5% by age 60 years</td>
</tr>
<tr>
<td>Stone et al. (1979) [3]</td>
<td>1023 relatives of 116 index patients</td>
<td>UK</td>
<td>Affected relatives: 16% by 40 and 52% by aged 60 years. Unaffected relatives: 12.7% by age 60 years</td>
<td>Affected relatives: 32.8% by 60 years. Unaffected relatives: 9.1% by age 60 years</td>
</tr>
</tbody>
</table>
High Prevalence of CHD (Global)


Age 57 59 61 51 50 46 46
LDL-C 239 251 262 259 258 192 TC 389
LDL-C,Tx 134 182 - 128 124 - 194

Lipid lowering therapies in adult HeFH Patients

Reasons for sub-maximal statin use

- Statin intolerance or allergy (60%)
- Patient preference (11%)
- Physician preference (11%)
- Pregnancy (3%)
- Cost (1%)
- Clinical trial participation (1%)
<table>
<thead>
<tr>
<th>Treated LDL-C*</th>
<th>Statin-treated</th>
<th>Not statin-treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;70 mg/dl</td>
<td>58 (6%)</td>
<td>5 (4%)</td>
</tr>
<tr>
<td>70-99 mg/dl</td>
<td>194 (20%)</td>
<td>11 (9%)</td>
</tr>
<tr>
<td>100-129 mg/dl</td>
<td>238 (25%)</td>
<td>7 (6%)</td>
</tr>
<tr>
<td>130-159 mg/dl</td>
<td>153 (16%)</td>
<td>35 (28%)</td>
</tr>
<tr>
<td>160-189 mg/dl</td>
<td>113 (12%)</td>
<td>22 (18%)</td>
</tr>
<tr>
<td>≥190 mg/dl</td>
<td>203 (21%)</td>
<td>45 (36%)</td>
</tr>
</tbody>
</table>

* n=959 | n=125

Conclusions

- High CHD prevalence among adult FH patients
- Poor LDL goal attainment (<100 mg/dl, ↓>50%)
- Opportunities to improve care of FH patients:
  - Early diagnosis of FH
  - Early initiation of LDL-lowering therapy
  - Use of high-intensity statin therapy
  - Use of combination therapy
  - Management of other risk factors
  - Careful elicitation of family history
治験

次の一連の質問に答える前に、服用している薬剤のピンまたは薬剤のリストを目前に置いてください。

コレステロールを低下させる薬や治療法を利用したことがありますか？

現在受けている治療は以下のどれですか？

スタチン

<table>
<thead>
<tr>
<th>薬剤名</th>
<th>Dosage</th>
<th>頻度は</th>
</tr>
</thead>
<tbody>
<tr>
<td>ロスピスタチン（クレストール）</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>アトルバスタチン（リビントール）</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>シンバスタチン（ソコール）</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ピタバスタチン（リパロ）</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ブラバスタチン（ブラバコール）</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ロパスタチン（アルトコール、アルトプレブ、メバコール）</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
The FIND FH® Initiative

www.theFHfoundation.org
FIND FH®
A multiyear screening and engagement initiative to identify and encourage the diagnosis and treatment of FH

Lab & Claims Data Mining
- Healthcare Encounter Data on 89 Million Americans with Cardiovascular Disease
- Data from a significant majority of clinical practices

EHR Data Mining
- Comprehensive EHR data from two academic centers
- Expanding to key integrated health systems

HCP & Individual Engagement
- Multichannel tools to engage health systems and individual HCPs
- Tools for clinicians and individuals with FH
The sources of features (Weber et al)
• Software that learns by example.
  – Analogous to a SPAM filter
• We show the model examples of FH and Non-FH patients
• Patients are described to the model using features (inputs):
  – Lab Results
  – Patient Age
  – ICD9 codes
  – Etc...
• The model learns correlation between certain features and FH rate.
• Model can classify FH in new patients using just their features.
Identifying FH patient characteristics using orthogonal data

Use discovered patterns in the small number of patients with the most complete data to identify other patients in the larger data set.

Unstructured data
- Clinic notes, dictations for key words, phrases
  - Personal medical Hx: age of cardiac event, procedure
  - Disease names: FH, hyperlipidemia,
  - Family history: premature coronary disease
  - Signs: xanthoma, xanthelasma, arcus

Structured data
- Labs: LDL-C, Total-C
- Procedure codes: cardiac cath, PCI, CABG, stress test
- Drug lists: statin and non-statin agents

Confirmed FH Patients

Rx Claims

Lab Results

Procedure codes
Cohort of 89 physician-labeled FH patients

CONTROLS: Sample of 300 patients

Terms Normalize & filter ICD9/CPT codes

Drugs

Labs

CASES: 80 patients

Evaluate model performance

Train classifier

Precision (PPV) = 0.64
Recall (Sensitivity) = 0.87
F1 = 0.74
Specificity = 0.90
AUC = 0.95

Thus, could identify 87% of cases in test set with false positive rate of 36%.

Now in the process of doing chart reviews
Striking a Balance Between Precision (PPV) & Recall (Sensitivity)

Perfect Recall; Low Precision

Balanced Recall and Precision

Low Recall; Perfect Precision

Patients w/Dx

Patients w/out Dx
19,149,553
Unique Patients in Lx Data

12,861,217
Unique Patients in Lx/Dx/Px Overlap

19,095,699
Unique Patients in Lx/Rx Overlap

12,834,404
Unique Patients in Lx/Rx/Dx/Px Overlap

40,422,524
Unique Patients in Dx/Px Data

40,328,108
Unique Patients in Rx/Dx/Px Overlap

89,112,339
Unique Patients in Rx Data

FIND FH® Lab & Claims Database
### Results

<table>
<thead>
<tr>
<th>Metric</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision (PPV)</td>
<td>0.75</td>
</tr>
<tr>
<td>Recall (Sensitivity)</td>
<td>0.65</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.99</td>
</tr>
<tr>
<td>F1 Score</td>
<td>0.69</td>
</tr>
<tr>
<td>AUC Score</td>
<td>0.68</td>
</tr>
</tbody>
</table>

- This means the model could identify 65% of FH patients in the test set with a 25% false positive rate.
- Precision/Recall can be adjusted
  - Increasing model prediction threshold can increase precision but decreases recall.

FIND FH® Lab & Claims Algorithm Results as of 4/1/16
FIND FH® Lab & Claims Algorithm Developed by The FH Foundation

Claims Data Source: IMS Health Real World Data: LRx longitudinal prescriptions and Dx medical claims
• Additional Clinical Partnerships
  – Geisinger Health System (GHS)
  – Ohio State University Wexner Medical Center (OSU)
  – Others through eMERGE
• FIND FH® Algorithm Clinical Validation
Thank you!

CASCADE FH™:
FHF: Iris Kindt, Bill Neal, Lala Manoukian
Site PIs, Coordinators
DCRI: Matt Roe, Emily O’Brien, Beth Fraulo, Shannon Carr, Peter Shrader

Sponsors:
Amgen
Sanofi
Regeneron
AstraZeneca
Pfizer
Aegerion

FIND FH®:
FHF: Seth and Kelly Myers, Christiane Rivard, Katherine Wilemon
Stanford: Nigam Shah, Juan Banda
Collaborating Institutions:
Penn: Dan Rader
Geisinger: Mike Murray
Mayo: Iftikhar Kullo
OHSU: Kavita Sharma

Sponsors:
American Heart Association
Stanford Data Science Initiative
Amgen (Founding)
Sanofi/Regeneron
Lipids for HoFH Patients

**<18 Years**
- Untreated Total Cholesterol: 815 mg/dl
- Untreated LDL: 707 mg/dl
- Treated Total Cholesterol: 425 mg/dl
- Treated LDL: 360 mg/dl
- n=10

**>=18 Years**
- Untreated Total Cholesterol: 698 mg/dl
- Untreated LDL: 599 mg/dl
- Treated Total Cholesterol: 290 mg/dl
- Treated LDL: 219 mg/dl
- n=29
Cardiovascular Disease in HoFH Patients

<18 Years
n=10

Prior CAD: 1%
Prior MI: 0%
Prior Stroke/TIA: 0%
Aortic Valve Stenosis: 10%

>=18 Years
n=29

Prior CAD: 82%
Prior MI: 28%
Prior Stroke/TIA: 7%
Aortic Valve Stenosis: 28%

(documentation of CAD with Diagn studies)
Combination Therapies for HoFH Patients

HoFH<18 y
- Lomitapide: 0
- Mipomersen: 1

HoFH>18 y
- Lomitapide: 16
- Mipomersen: 6
**Table 2: Clinically diagnosed patients that meet formal criteria**

<table>
<thead>
<tr>
<th>Diagnostic Method</th>
<th>Subjects with pre-treatment lipids values (n = 660)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDPED</td>
<td>245 (37.12%)</td>
</tr>
<tr>
<td><strong>Simon Broome</strong></td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td>401 (60.76%)</td>
</tr>
<tr>
<td>Definite</td>
<td>20 (3.03%)</td>
</tr>
<tr>
<td><strong>DLCN</strong></td>
<td></td>
</tr>
<tr>
<td>Possible</td>
<td>351 (53.18%)</td>
</tr>
<tr>
<td>Probable</td>
<td>101 (15.30%)</td>
</tr>
<tr>
<td>Definite</td>
<td>130 (19.70%)</td>
</tr>
<tr>
<td><strong>Any Diagnosis Method</strong>*</td>
<td>611 (92.58%)</td>
</tr>
<tr>
<td>Characteristics of heterozygous FH CASCADE participants &lt;18 years. Data presented as n (%), mean (SD), or median (interquartile range [IQR]).</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All youth (n=268)</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
</tr>
<tr>
<td>Age at enrollment, years mean (SD)</td>
<td>11.9 (3.5)</td>
</tr>
<tr>
<td>Age at diagnosis, years mean SD</td>
<td>9.0 (4.0)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male (%)</td>
<td>134 (50.0%)</td>
</tr>
<tr>
<td>Female (%)</td>
<td>122 (45.5%)</td>
</tr>
<tr>
<td>Missing (%)</td>
<td>12 (4.5%)</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
</tr>
<tr>
<td>– Hispanic</td>
<td>19 (7.1%)</td>
</tr>
<tr>
<td>– Black/African American</td>
<td>30 (11.2%)</td>
</tr>
<tr>
<td>– American Indian</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>– Asian</td>
<td>10 (3.7%)</td>
</tr>
<tr>
<td>– White</td>
<td>190 (70.9%)</td>
</tr>
<tr>
<td>– Native Hawaiian</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>– Other</td>
<td>18 (6.7%)</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>23.9 (11.7)</td>
</tr>
<tr>
<td>Lipid profile at enrollment, mg/dL mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>264 (75.1)</td>
</tr>
<tr>
<td>LDL-C</td>
<td>192 (59.3)</td>
</tr>
</tbody>
</table>
My Heart Health

Total Progress: 7%

By participating in the FH registry, YOU are making FH visible.
You have 5 days left to complete the modules below.

FH Registry Community:

FH Registry Statistics:

Did you know...

Recent FH News:

Diagnosing Familial Hypercholesterolemia – The Need for ICD-10 Codes for FH

Have you heard? There is a conversation going on about your health care.

World Heart Day – September 29, 2015
Minha história de HF

Você foi diagnosticado(a) com hipercolesterolemia familiar (HF) por um profissional de saúde?

Não  Sím  Desconhecido

Quando você foi informado(a) de que apresenta colesterol elevado?

- Por favor selecione -

Qual foi seu valor mais alto de LDL e colesterol total antes de iniciar os medicamentos ou enquanto você não estava tomando medicamentos?

Unidades de resultados de laboratório

mg/dL  mmol/L

LDL (mg/dL)

Exato  Aproximado  Desconhecido

Aproximado Encontro

mm/dd/yyyy

Colesterol total (mg/dL)
Diagnostic Yield of Sequencing Familial Hypercholesterolemia Genes in Patients with Severe Hypercholesterolemia

Amit V. Khera, MD, Hong-Hee Won, PhD, Gina M. Peloso, PhD, Kim S. Lawson, MS,
• Patients with a clinical diagnosis of FH
  • As determined by site Principal Investigator

• Patients who meet the following criteria:

<table>
<thead>
<tr>
<th>Measurement*</th>
<th>LDL</th>
<th>OR</th>
<th>Total Cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child (&lt;18 years old)</td>
<td>&gt;160 mg/dL</td>
<td>&gt;260 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Adult (18+ years old)</td>
<td>&gt;190 mg/dL</td>
<td>&gt;300 mg/dL</td>
<td></td>
</tr>
</tbody>
</table>

*For patients on lipid-lowering medications at the time of lipid profile measurement, cholesterol values multiplied by a correction factor of 1.54
Additional CHD Factors for HeFH Patients

**<18 Years**
- Diabetes: 1%
- Smoking History: 2%
- Current Smoker: <1%
- Hypertension: 4%
  n=213

**>=18 Years**
- Diabetes: 11%
- Smoking History: 31%
- Current Smoker: 7%
- Hypertension: 40%
  n=1553
Modern genetic studies support a prevalence of FH ~ 1 in 220

- Looked for \(LDLR\) mutations in 9,793 individuals (half “control”, half with MI)
- 1:217 controls & 1:51 cases had \(LDLR\) mutation and LDL-C > 190 mg/dl
- \(LDLR\) mutations responsible for 2% of early onset MIs
- Only 26% achieve LDL-C < 100 mg/dl
- Only 45% get > 50% reduction in LDL-C
Magnitude of LDL-C Reduction

- **On non-statin therapy**: 55%
- **On statin therapy ± non-statin therapy**: 23%, 33%, 33%, 44%

LDL-C reduction, treated vs untreated

- <30%: 55%
- 30-50%: 33%, 33%
- >50%: 12%, 44%
Statins in HeFH Patients

**<18 Years**

- Statins Yes: 53%
- High Dose: 32%
- Low/Moderate Dose: 17%

* n=213

**>=18 Years**

- Statins Yes: 76%
- High Dose: 62%
- Low/Moderate Dose: 13%

* n=1553
Combination Therapies for HeFH Patients

**<18 Years**
- n=213
- 0 LLT: 34%
- 1 LLT: 51%
- 2 LLT: 13%
- 3 LLT: 1%
- 4 LLT: 1%
- LDL Apheresis: 0%

**>=18 Years**
- n=1553
- 0 LLT: 13%
- 1 LLT: 38%
- 2 LLT: 27%
- 3 LLT: 15%
- 4 LLT: 5%
- LDL Apheresis: 3%
FIND FH®
A multiyear screening and engagement initiative to identify and encourage the diagnosis and treatment of FH

Lab & Claims Data Mining
- Healthcare Encounter Data on 89 Million Americans with Cardiovascular Disease
- Data from a significant majority of clinical practices

EHR Data Mining
- Comprehensive EHR data from two academic centers
- Expanding to key integrated health systems

HCP & Individual Engagement
- Multichannel tools to engage health systems and individual HCPs
- Tools for clinicians and individuals with FH