The polygenic architecture of left ventricular mass mirrors the clinical epidemiology

Supplementary Materials

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Supplementary Figure 1: Results of a GWAS analysis of LV mass. Results are based on an additive model adjusted for age, sex and 10 PCs. The figures show the (A) Manhattan plot and (B) the QQ plot.
**Supplementary Table 1.** Characteristics of the BioVU subjects with TTE measurements. Shown are the 100 most prevalent PheWAS diagnoses.

| Characteristic | All Subjects | Males | Female |
|----------------|--------------|-------|--------|
| Males [n (%)]  | 4,025 (53.0%) |       |        |
| Females [n (%)]| 3,576 (47.0%) |       |        |
| Age at echo (years) [mean (s.d)] | 64 (12) |       |        |

**Most common prevalent diagnoses:**

| Diagnosis                                      | All Subjects | Males | Female |
|------------------------------------------------|--------------|-------|--------|
| Hypertension                                  | 6121         | 3347  | 2774   |
| Essential hypertension                        | 6018         | 3281  | 2737   |
| Other symptoms of respiratory system          | 5702         | 3037  | 2665   |
| Cardiac dysrhythmias                          | 5171         | 2893  | 2278   |
| Disorders of lipoid metabolism                | 5123         | 2885  | 2238   |
| Hyperlipidemia                                | 5114         | 2880  | 2234   |
| Nonspecific chest pain                        | 4647         | 2466  | 2181   |
| Shortness of breath                           | 4413         | 2361  | 2052   |
| Ischemic Heart Disease                        | 4359         | 2684  | 1675   |
| Fluid, electrolyte, & acid-base balance disorders | 3965 | 2156  | 1809   |
| Coronary atherosclerosis                      | 3929         | 2501  | 1428   |
| Malaise and fatigue                           | 3818         | 1879  | 1562   |
| Other anemias                                 | 3686         | 2005  | 1681   |
| Pulmonary collapse; interstitial/compensatory emphysema | 3659 | 2148  | 1511   |
| Other dyspnea                                 | 3422         | 1865  | 1557   |
| Electrolyte imbalance                         | 3263         | 1775  | 1488   |
| Congestive heart failure, nonhypertensive     | 3205         | 1853  | 1352   |
| Diseases of esophagus                         | 3164         | 1602  | 1562   |
| Pain in joint                                 | 3011         | 1371  | 1640   |
| Heart valve disorders                         | 2976         | 1678  | 1298   |
| Cardiomegaly                                  | 2926         | 1776  | 1150   |
| Esophagitis, GERD & related diseases          | 2865         | 1436  | 1429   |
| Abdominal pain                                | 2748         | 1336  | 1412   |
| GERD                                          | 2724         | 1340  | 1384   |
| Diabetes mellitus                             | 2720         | 1605  | 1115   |
| Renal failure                                 | 2718         | 1658  | 1060   |
| Tobacco use disorder                          | 2701         | 1868  | 1015   |
| Pleurisy                                      | 2700         | 1556  | 1144   |
| Congestive heart failure NOS                  | 2684         | 1552  | 1132   |
| Atrial fibrillation & flutter                 | 2678         | 1643  | 1035   |
| Hypertensive heart and/or renal disease       | 2654         | 1544  | 1110   |
| Cardiac conduction disorders                  | 2645         | 1610  | 1035   |
| Type 2 diabetes                               | 2641         | 1560  | 1081   |
| Atrial fibrillation                           | 2614         | 1602  | 1012   |
| Cerebrovascular disease                       | 2564         | 1394  | 1170   |
| Mixed hyperlipidemia                          | 2528         | 1450  | 1078   |
| Cough                                         | 2442         | 1209  | 1233   |
| Hypotension                                   | 2398         | 1417  | 981    |
| Respiratory failure; insufficiency; arrest     | 2354         | 1334  | 1020   |
| Diagnosis                                                                 | Code | Frequency | Discharge | Length of Stay | Reimbursement       |
|--------------------------------------------------------------------------|------|-----------|-----------|----------------|---------------------|
| Back pain                                                                | 2331 | 30.7%     | 1070      | 26.6%          | 1261 35.3%          |
| Osteoarthrosis                                                           | 2321 | 30.5%     | 1061      | 26.4%          | 1260 35.2%          |
| Edema                                                                    | 2225 | 29.3%     | 1086      | 27.0%          | 1139 31.9%          |
| Mood disorders                                                           | 2164 | 28.3%     | 967       | 24.0%          | 1197 33.5%          |
| Symptoms/disorders of the urinary system                                 | 2152 | 28.3%     | 1033      | 25.7%          | 1119 31.3%          |
| Other forms of chronic heart disease                                     | 2106 | 27.7%     | 1287      | 32.0%          | 819 22.9%           |
| Other diseases of lung                                                   | 2104 | 27.7%     | 1165      | 28.9%          | 939 26.3%           |
| Overweight                                                               | 2094 | 27.5%     | 1058      | 26.3%          | 1036 29.0%          |
| Acute renal failure                                                      | 2092 | 27.5%     | 1270      | 31.6%          | 822 23.0%           |
| Tachycardia NOS                                                          | 2084 | 27.4%     | 1116      | 27.7%          | 968 27.1%           |
| Nausea and vomiting                                                      | 2072 | 27.3%     | 930       | 23.1%          | 1142 31.9%          |
| Urinary tract infection                                                  | 2056 | 27.0%     | 748       | 18.6%          | 1308 36.6%          |
| Hypopotassemia                                                           | 2051 | 27.0%     | 1046      | 26.0%          | 1005 28.1%          |
| Chronic ischemic heart disease                                          | 2049 | 27.0%     | 1435      | 35.7%          | 614 17.2%           |
| Nonrheumatic mitral valve disorders                                      | 2037 | 26.8%     | 1117      | 27.8%          | 920 25.7%           |
| Osteoporosis, osteopenia, & pathological fractures                       | 2018 | 26.5%     | 693       | 17.2%          | 1325 37.1%          |
| Hypotension NOS                                                          | 2008 | 26.4%     | 1200      | 29.8%          | 808 22.6%           |
| Hypovolemia                                                              | 2005 | 26.4%     | 1100      | 27.3%          | 905 25.3%           |
| Abnormal glucose                                                         | 1999 | 26.3%     | 1147      | 28.5%          | 852 23.8%           |
| Depression                                                               | 1990 | 26.2%     | 870       | 21.6%          | 1120 31.3%          |
| Pulmonary heart disease                                                  | 1978 | 26.0%     | 1119      | 27.8%          | 859 24.0%           |
| Palpitations                                                             | 1950 | 25.7%     | 879       | 21.8%          | 1071 29.9%          |
| Long-term use of anticoagulants                                          | 1937 | 25.5%     | 1137      | 28.2%          | 800 22.4%           |
| Fever of unknown origin                                                  | 1937 | 25.5%     | 1078      | 26.8%          | 859 24.0%           |
| Myocardial infarction                                                    | 1927 | 25.4%     | 1287      | 32.0%          | 640 17.9%           |
| Cardiac arrhythmia NOS                                                   | 1913 | 25.2%     | 1142      | 28.4%          | 771 21.6%           |
| Neurological disorders                                                   | 1912 | 25.2%     | 1029      | 25.6%          | 883 24.7%           |
| Hypercholesterolemia                                                     | 1843 | 24.2%     | 990       | 24.6%          | 853 23.9%           |
| Other abnormal glucose                                                  | 1842 | 24.2%     | 1072      | 26.6%          | 770 21.5%           |
| Pneumonia                                                                | 1842 | 24.2%     | 1013      | 25.2%          | 829 23.2%           |
| Chronic airway obstruction                                               | 1826 | 24.0%     | 992       | 24.6%          | 834 23.3%           |
| Hypertensive heart disease                                              | 1809 | 23.8%     | 1006      | 25.0%          | 803 22.5%           |
| Obesity                                                                  | 1799 | 23.7%     | 922       | 22.9%          | 877 24.5%           |
| Acute posthemorrhagic anemia                                             | 1780 | 23.4%     | 1032      | 25.6%          | 748 20.9%           |
| Disorders of the kidney & ureters                                        | 1772 | 23.3%     | 1087      | 27.0%          | 685 19.2%           |
| Anxiety, phobic & dissociative disorders                                 | 1753 | 23.1%     | 720       | 17.9%          | 1033 28.9%          |
| Other specified cardiac dysrhythmias                                     | 1736 | 22.8%     | 1009      | 25.1%          | 727 20.3%           |
| Chronic renal failure                                                    | 1729 | 22.7%     | 1087      | 27.0%          | 642 18.0%           |
| Hypothyroidism                                                           | 1717 | 22.6%     | 654       | 16.2%          | 1063 29.7%          |
| Osteoarthritis NOS                                                       | 1711 | 22.5%     | 781       | 19.4%          | 930 26.0%           |
| Ill-defined descriptions and complications of heart disease              | 1708 | 22.5%     | 972       | 24.1%          | 736 20.6%           |
| Occlusion and stenosis of precerebral arteries                           | 1661 | 21.9%     | 957       | 23.8%          | 704 19.7%           |
| Diseases of white blood cells                                            | 1651 | 21.7%     | 902       | 22.4%          | 749 20.9%           |
| Atherosclerosis                                                          | 1642 | 21.6%     | 956       | 23.8%          | 686 19.2%           |
| Hypothyroidism NOS                                                       | 1630 | 21.4%     | 614       | 15.3%          | 1016 28.4%          |
| Nonrheumatic aortic valve disorders                                      | 1606 | 21.1%     | 942       | 23.4%          | 664 18.6%           |
| Cardiomyopathy                                                           | 1593 | 21.0%     | 1049      | 26.1%          | 544 15.2%           |
| Encounter for long-term use of anticoagulants/antithrombotics             | 1587 | 20.9%     | 974       | 24.2%          | 613 17.1%           |
| Light-headedness and vertigo                                             | 1585 | 20.9%     | 744       | 18.5%          | 841 23.5%           |
| Systolic or combined heart failure                                       | 1584 | 20.8%     | 1018      | 25.3%          | 566 15.8%           |
| Syncope and collapse                                                     | 1558 | 20.5%     | 846       | 21.0%          | 712 19.9%           |
| Respiratory failure                                                      | 1537 | 20.2%     | 835       | 20.7%          | 702 19.6%           |
| Anxiety disorder                                                         | 1532 | 20.2%     | 619       | 15.4%          | 913 25.5%           |
| Primary pulmonary hypertension                                          | 1532 | 20.2%     | 843       | 20.9%          | 689 19.3%           |
| Condition                                      | Count | Percentage | Count | Percentage | Count | Percentage |
|-----------------------------------------------|-------|------------|-------|------------|-------|------------|
| Sleep disorders                               | 1530  | 20.1%      | 719   | 17.9%      | 811   | 22.7%      |
| Diverticulosis and diverticulitis             | 1516  | 19.9%      | 832   | 20.7%      | 684   | 19.1%      |
| Chronic rheumatic disease of the heart valves | 1501  | 19.7%      | 801   | 19.9%      | 700   | 19.6%      |
| Diverticulosis                                | 1452  | 19.1%      | 811   | 20.1%      | 641   | 17.9%      |
| Encounter for long-term use of aspirin        | 1440  | 18.9%      | 890   | 22.1%      | 550   | 15.4%      |
| Symptoms and disorders of the joints          | 1434  | 18.9%      | 662   | 16.4%      | 772   | 21.6%      |
| Primary/intrinsic cardiomyopathies            | 1426  | 18.8%      | 944   | 23.5%      | 482   | 13.5%      |
**Supplementary Table 2.** Characteristics of the eMERGE and additional BioVU subjects. Shown are the 100 most common PheWAS diagnoses.

### eMERGE subjects

| Characteristic                        | Count       | Prevalence  |
|---------------------------------------|-------------|-------------|
| Males [n (%)]                         | 14,268      | (44.9%)     |
| Females [n (%)]                       | 17,503      | (55.1%)     |
| Age at echo [mean (s.d)]              | 1945 (1935-1955) |       |

### BioVU subjects (excluding TTE subjects)

| Characteristic                        | Count       | Prevalence  |
|---------------------------------------|-------------|-------------|
| Males [n (%)]                         | 12,011      | (44.4%)     |
| Females [n (%)]                       | 15,054      | (55.6%)     |
| Age at echo [mean (s.d)]              | 51.0 (20.2) |             |

### Most Common diagnoses - eMERGE subjects

| Diagnosis                              | Count | Prevalence |
|----------------------------------------|-------|------------|
| Hypertension                           | 19753 | 62.2%      |
| Disorders of lipid metabolism          | 19751 | 62.2%      |
| Hyperlipidemia                         | 19668 | 61.9%      |
| Essential hypertension                 | 19433 | 61.2%      |
| Other symptoms of respiratory system  | 18083 | 56.9%      |
| Pain in joint                          | 17994 | 56.6%      |
| Cardiac dysrhythmias                   | 14636 | 46.1%      |
| Nonspecific chest pain                 | 14382 | 45.3%      |
| Osteoarthritis                         | 13963 | 43.9%      |
| Back pain                              | 13598 | 42.8%      |
| Abdominal pain                         | 13330 | 42.0%      |
| Malaise and fatigue                    | 12643 | 39.8%      |
| Cough                                  | 11941 | 37.6%      |
| Diseases of esophagus                  | 11801 | 37.1%      |
| Hypercholesterolemia                   | 11652 | 36.7%      |
| Osteoarthritis NOS                     | 11603 | 36.5%      |
| Peripheral enthesopathies              | 11555 | 36.4%      |
| Esophagitis, GERD & related diseases   | 11334 | 35.7%      |
| Ischemic Heart Disease                 | 11104 | 34.9%      |
| Symptoms/disorders of the urinary system | 10936 | 34.4%      |

### Most Common diagnoses - BioVU subjects (excluding TTE subjects)

| Diagnosis                              | Count | Prevalence |
|----------------------------------------|-------|------------|
| Hypertension                           | 13185 | 48.7%      |
| Essential hypertension                 | 12958 | 47.9%      |
| Other symptoms of respiratory system  | 12838 | 47.4%      |
| Malaise and fatigue                    | 11085 | 41.0%      |
| Pain in joint                          | 10365 | 38.3%      |
| Disorders of lipid metabolism          | 10305 | 38.1%      |
| Hyperlipidemia                         | 10264 | 37.9%      |
| Other symptoms of respiratory system  | 10122 | 37.4%      |
| Abdominal pain                         | 9856  | 36.4%      |
| Cardiac dysrhythmias                   | 9548  | 35.3%      |
| Diseases of esophagus                  | 8392  | 31.0%      |
| Fluid, electrolyte, & acid-base balance disorders | 8354 | 30.9%     |
| Esophagitis, GERD & related diseases   | 7843  | 29.0%      |
| Other anemias                          | 7801  | 28.8%      |
| Shortness of breath                    | 7674  | 28.4%      |
| Back pain                              | 7354  | 27.2%      |
| GERD                                   | 7249  | 26.8%      |
| Cough                                  | 6967  | 25.7%      |
| Ischemic Heart Disease                 | 6723  | 24.8%      |
| Symptoms/disorders of the urinary system | 6314 | 23.3%      |
| Condition                                                                 | Code   | Percentage |
|--------------------------------------------------------------------------|--------|------------|
| Degenerative skin conditions and other dermatoses                        | 10877  | 34.2%      |
| Overweight                                                               | 10783  | 33.9%      |
| Other anemias                                                            | 10772  | 33.9%      |
| Acute upper respiratory infections                                       | 10763  | 33.9%      |
| Other dyspnea                                                            | 10637  | 33.5%      |
| GERD                                                                     | 10357  | 32.6%      |
| Cataract                                                                  | 10066  | 31.7%      |
| Osteoporosis, osteopenia, & pathological fractures                      | 10007  | 31.5%      |
| Coronary atherosclerosis                                                  | 9640   | 30.3%      |
| Disorders of refraction and accommodation                               | 9595   | 30.2%      |
| Fluid, electrolyte, & acid-base balance disorders                       | 9400   | 29.6%      |
| Atopic or contact dermatitis                                             | 9211   | 29.0%      |
| Shortness of breath                                                      | 9152   | 28.8%      |
| Urinary tract infection                                                  | 8802   | 27.7%      |
| Seborrheic keratosis                                                    | 8729   | 27.5%      |
| Obesity                                                                  | 8697   | 27.4%      |
| Cardiac conduction disorders                                             | 8664   | 27.3%      |
| Benign neoplasm of skin                                                 | 8590   | 27.0%      |
| Light-headedness and vertigo                                             | 8443   | 26.6%      |
| Senile cataract                                                          | 8355   | 26.3%      |
| Mood disorders                                                           | 8275   | 26.0%      |
| Anxiety, phobic & dissociative disorders                                | 8104   | 25.5%      |
| Disorder of skin and subcutaneous tissue NOS                            | 7961   | 25.1%      |
| Benign neoplasm of colon                                                | 7942   | 25.0%      |
| Depression                                                               | 7920   | 24.9%      |
| Diabetes mellitus                                                        | 7787   | 24.5%      |
| Spondylosis and allied disorders                                         | 7714   | 24.3%      |
| Intervertebral disc disorders                                            | 7685   | 24.2%      |
| Hearing loss                                                             | 7675   | 24.2%      |
| Type 2 diabetes                                                          | 7627   | 24.0%      |
| Nausea and vomiting                                                      | 6314   | 23.3%      |
| Mood disorders                                                           | 6064   | 22.4%      |
| Electrolyte imbalance                                                    | 6049   | 22.3%      |
| Osteoarthrosis                                                           | 5979   | 22.1%      |
| Coronary atherosclerosis                                                 | 5932   | 21.9%      |
| Other dyspnea                                                            | 5876   | 21.7%      |
| Urinary tract infection                                                  | 5764   | 21.3%      |
| Pulmonary collapse; interstitial/compensatory emphysema                  | 5688   | 21.0%      |
| Tobacco use disorder                                                     | 5638   | 20.8%      |
| Fever of unknown origin                                                  | 5543   | 20.5%      |
| Depression                                                               | 5506   | 20.3%      |
| Acute upper respiratory infections                                       | 5416   | 20.0%      |
| Overweight                                                               | 5368   | 19.8%      |
| Anxiety, phobic & dissociative disorders                                | 5330   | 19.7%      |
| Diabetes mellitus                                                        | 5250   | 19.4%      |
| Mixed hyperlipidemia                                                    | 5168   | 19.1%      |
| Other headache syndromes                                                | 5051   | 18.7%      |
| Osteoporosis, osteopenia, & pathological fractures                      | 5040   | 18.6%      |
| Type 2 diabetes                                                          | 5001   | 18.5%      |
| Hypovolemia                                                              | 4646   | 17.2%      |
| Hypercholesterolemia                                                    | 4475   | 16.5%      |
| Allergic rhinitis                                                        | 4467   | 16.5%      |
| Anxiety disorder                                                         | 4464   | 16.5%      |
| Edema                                                                    | 4337   | 16.0%      |
| Hypertensive heart and/or renal disease                                  | 4329   | 16.0%      |
| Renal failure                                                            | 4295   | 15.9%      |
| Peripheral enthesopathies                                                | 4218   | 15.6%      |
| Hypothyroidism                                                           | 4206   | 15.5%      |
| Cerebrovascular disease                                                  | 4200   | 15.5%      |
| Obesity                                                                  | 4199   | 15.5%      |
| Symptoms and disorders of the joints | 7605 | 23.9% |
|-------------------------------------|------|-------|
| Other headache syndromes           | 7567 | 23.8% |
| Diverticulosis and diverticulitis   | 7499 | 23.6% |
| Osteoarthritis, localized           | 7480 | 23.5% |
| Spondylosis without myelopathy      | 7463 | 23.5% |
| Superficial cellulitis & abscess    | 7447 | 23.4% |
| Other hypertrophic and atrophic     | 7407 | 23.3% |
| conditions of skin                 |      |       |
| Sleep disorders                     | 7328 | 23.1% |
| Osteopenia                          | 7321 | 23.0% |
| Cerebrovascular disease             | 7309 | 23.0% |
| Heart valve disorders               | 7276 | 22.9% |
| Sprains and strains                 | 7224 | 22.7% |
| Electrolyte imbalance               | 7179 | 22.6% |
| Disorders of synovium, tendon, and  | 7172 | 22.6% |
| bursa                               |      |       |
| Edema                               | 7120 | 22.4% |
| Actinic keratosis                   | 7100 | 22.3% |
| Diverticulosis                      | 7093 | 22.3% |
| Diseases of sebaceous glands        | 7073 | 22.3% |
| Renal failure                       | 7069 | 22.2% |
| Enthesopathy                        | 7052 | 22.2% |
| Hemorrhoids                         | 7023 | 22.1% |
| Menopausal & postmenopausal         | 6935 | 21.8% |
| disorders                           |      |       |
| Cervicalgia                         | 6902 | 21.7% |
| Abdominal hernia                    | 6881 | 21.7% |
| Nausea and vomiting                 | 6698 | 21.1% |
| Anxiety disorder                    | 6669 | 21.0% |
| Contusion                           | 6534 | 20.6% |
| Hypothyroidism                      | 6340 | 20.0% |
| Abnormal glucose                    | 6292 | 19.8% |
| Abnormal findings on mammogram or   | 6273 | 19.7% |
| breast exam                         |      |       |
| Tobacco use disorder                | 6271 | 19.7% |
| Hypothyroidism NOS                  | 6141 | 19.3% |
| Other specified cardiac dysrhythmias| 6141 | 19.3% |
| Osteoarthritis NOS                  | 4177 | 15.4% |
| Sleep disorders                     | 4047 | 15.0% |
| Vitamin deficiency                  | 3969 | 14.7% |
| Symptoms and disorders of the joints| 3944 | 14.6% |
| Tachycardia NOS                     | 3924 | 14.5% |
| Hypopotassemia                      | 3913 | 14.5% |
| Hypothyroidism NOS                  | 3893 | 14.4% |
| Pleurisy                            | 3861 | 14.3% |
| Congestive heart failure, nonhypertensive | 3842 | 14.2% |
| Pneumonia                           | 3788 | 14.0% |
| Neurological disorders              | 3779 | 14.0% |
| Light-headedness and vertigo        | 3718 | 13.7% |
| Other diseases of lung              | 3712 | 13.7% |
| Superficial cellulitis & abscess    | 3707 | 13.7% |
| Palpitations                        | 3696 | 13.7% |
| Cardiac conduction disorders        | 3663 | 13.5% |
| Cervicalgia                         | 3613 | 13.3% |
| Acute sinusitis                     | 3583 | 13.2% |
| Rash and other nonspecific skin     | 3551 | 13.1% |
| eruption                            |      |       |
| Hypotension                         | 3541 | 13.1% |
| Intervertebral disc disorders       | 3530 | 13.0% |
| Degenerative skin conditions and     | 3500 | 12.9% |
| other dermatoses                    |      |       |
| Benign neoplasm of colon            | 3483 | 12.9% |
| Abdominal hernia                    | 3450 | 12.7% |
| Heart valve disorders               | 3449 | 12.7% |
| Diverticulosis and diverticulitis   | 3445 | 12.7% |
| Disorders of the kidney & ureters   | 3428 | 12.7% |
| Atrial fibrillation & flutter       | 3387 | 12.5% |
| Vitamin D deficiency                | 3360 | 12.4% |
| Respiratory failure; insufficiency; | 3312 | 12.2% |
| arrest                              |      |       |
| Diseases of white blood cells       | 3305 | 12.2% |
| Diverticulosis                      | 3294 | 12.2% |
| Atrial fibrillation                 | 3289 | 12.2% |
| Condition                                      | Code  | Percentage |
|-----------------------------------------------|-------|------------|
| Other peripheral nerve disorders              | 6127  | 19.3%      |
| Degeneration of intervertebral disc           | 6116  | 19.2%      |
| Gastrointestinal hemorrhage                   | 6107  | 19.2%      |
| Pneumonia                                     | 6077  | 19.1%      |
| Disturbance of skin sensation                 | 6077  | 19.1%      |
| Cardiac arrhythmia NOS                        | 5961  | 18.8%      |
| Ill-defined descriptions and complications of heart disease | 5950  | 18.7%      |
| Other abnormal blood chemistry                | 5882  | 18.5%      |
| Dermatophytosis / Dermatomycosis              | 5870  | 18.5%      |
| Fever of unknown origin                       | 5865  | 18.5%      |
| Atrial fibrillation & flutter                 | 5853  | 18.4%      |
| Allergic rhinitis                             | 5849  | 18.4%      |
| Congestive heart failure, nonhypertens        | 5841  | 18.4%      |
| Astigmatism                                   | 5784  | 18.2%      |
| Atrial fibrillation                           | 5708  | 18.0%      |
| Frequency of urination and polyuria           | 5706  | 18.0%      |
| Abnormal movement                             | 5687  | 17.9%      |
| Gastrointestinal hemorrhage                   | 3287  | 12.1%      |
| Hearing loss                                  | 3258  | 12.0%      |
| Acute pain                                    | 3240  | 12.0%      |
| Cardiomegaly                                  | 3202  | 11.8%      |
| Dysphagia                                     | 3173  | 11.7%      |
| Abnormal glucose                              | 3138  | 11.6%      |
| Other symptoms involving abdomen and pelvis   | 3137  | 11.6%      |
| Chronic airway obstruction                    | 3134  | 11.6%      |
| Skin neoplasm of uncertain behavior           | 3126  | 11.5%      |
| Hypertensive heart disease                    | 3106  | 11.5%      |
| Osteoarthritis; localized                     | 3095  | 11.4%      |
| Disturbance of skin sensation                 | 3092  | 11.4%      |
| Congestive heart failure NOS                  | 3027  | 11.2%      |
| Spondylosis and allied disorders              | 3023  | 11.2%      |
| Other disorders of intestine                  | 3009  | 11.1%      |
| Menopausal & postmenopausal disorders         | 3007  | 11.1%      |
| Osteoporosis, NOS or other                    | 3001  | 11.1%      |
| PheCode | Phenotype                               | Cases   | Controls  | Odds-ratio | 95% CI         | p-value     | FDR p-value |
|--------|----------------------------------------|---------|-----------|------------|----------------|-------------|-------------|
| 278    | Overweight                             | 10282   | 37475     | 1.08       | (1.05-1.11)    | 3.5E-08     | 2.5E-05     |
| 278.1  | Obesity                                | 8250    | 36493     | 1.09       | (1.05-1.12)    | 5.6E-08     | 2.5E-05     |
| 278.11 | Morbid obesity                         | 3548    | 36319     | 1.10       | (1.06-1.15)    | 7.9E-06     | 2.0E-03     |
| 401.1  | Essential hypertension                 | 22662   | 20492     | 1.06       | (1.03-1.09)    | 1.0E-05     | 2.0E-03     |
| 425.1  | Primary/intrinsic cardiomyopathies     | 2231    | 46830     | 1.13       | (1.07-1.19)    | 1.2E-05     | 2.0E-03     |
| 401    | Hypertension                           | 24010   | 20492     | 1.06       | (1.03-1.08)    | 1.6E-05     | 2.0E-03     |
| 411.4  | Coronary atherosclerosis               | 11882   | 29867     | 1.06       | (1.03-1.09)    | 2.0E-05     | 2.0E-03     |
| 411    | Ischemic Heart Disease                 | 13796   | 32202     | 1.06       | (1.03-1.09)    | 2.1E-05     | 2.0E-03     |
| 425    | Cardiomyopathy                         | 2569    | 46841     | 1.11       | (1.06-1.17)    | 2.3E-05     | 2.0E-03     |
| 428.1  | Congestive heart failure NOS           | 5085    | 37458     | 1.09       | (1.05-1.13)    | 2.3E-05     | 2.0E-03     |
| 428    | Congestive heart failure, nonhypertensive | 6682   | 37458     | 1.08       | (1.04-1.11)    | 2.5E-05     | 2.0E-03     |
| 411.2  | Myocardial infarction                  | 4632    | 31854     | 1.09       | (1.04-1.13)    | 5.5E-05     | 4.1E-03     |
| 586    | Disorders of the kidney & ureters      | 4448    | 37758     | 1.08       | (1.04-1.12)    | 7.3E-05     | 4.9E-03     |
| 250.2  | Type 2 diabetes                        | 9040    | 33956     | 1.06       | (1.03-1.09)    | 7.6E-05     | 4.9E-03     |
| 250.3  | Insulin pump user                      | 1324    | 35092     | 1.14       | (1.07-1.22)    | 9.8E-05     | 5.9E-03     |
| 428.3  | Systolic or combined heart failure     | 2013    | 37458     | 1.12       | (1.06-1.18)    | 1.1E-04     | 6.0E-03     |
| 585.1  | Acute renal failure                    | 3577    | 37758     | 1.09       | (1.04-1.13)    | 1.4E-04     | 6.6E-03     |
| 415    | Pulmonary heart disease                | 3324    | 42094     | 1.09       | (1.04-1.14)    | 1.4E-04     | 6.6E-03     |
| 586.2  | Cyst of kidney, acquired               | 996     | 36665     | 1.16       | (1.07-1.25)    | 1.4E-04     | 6.6E-03     |
| 250    | Diabetes mellitus                      | 9384    | 33956     | 1.06       | (1.03-1.09)    | 1.6E-04     | 7.2E-03     |
| 416    | Cardiomegaly                           | 3710    | 40939     | 1.08       | (1.04-1.13)    | 1.8E-04     | 7.7E-03     |
| 286.2  | Long-term use of anticoagulants        | 4440    | 39127     | 1.08       | (1.03-1.12)    | 3.0E-04     | 0.01        |
| 427.22 | Atrial flutter                         | 1395    | 25110     | 1.13       | (1.06-1.21)    | 3.6E-04     | 0.01        |
| 427.2  | Atrial fibrillation & flutter          | 6393    | 24628     | 1.07       | (1.03-1.11)    | 4.3E-04     | 0.02        |
| 585.32 | End stage renal disease                | 1168    | 37754     | 1.14       | (1.06-1.22)    | 4.8E-04     | 0.02        |
| 411.1  | Unstable angina (intermediate coronary syndrome) | 2145  | 29301     | 1.10       | (1.04-1.16)    | 7.9E-04     | 0.03        |
| 411.8  | Chronic ischemic heart disease         | 3826    | 29859     | 1.08       | (1.03-1.12)    | 1.3E-03     | 0.04        |
| 426    | Cardiac conduction disorders           | 6840    | 26928     | 1.06       | (1.02-1.10)    | 1.4E-03     | 0.04        |

Supplementary Table 3: PheWAS phenotypes associated LV mass at FDR q<0.1.
| ICD-10 Code | Condition                                      | Cases | Controls | Odds Ratio | 95% CI      | p-value | OR   |
|------------|------------------------------------------------|-------|----------|------------|-------------|---------|------|
| 427.21     | Atrial fibrillation                            | 5771  | 24292    | 1.06       | (1.02-1.11) | 1.4E-03 | 0.04 |
| 585.3      | Chronic renal failure                          | 5881  | 37767    | 1.06       | (1.02-1.10) | 1.7E-03 | 0.05 |
| 585        | Renal failure                                  | 8339  | 37767    | 1.05       | (1.02-1.08) | 1.8E-03 | 0.05 |
| 428.2      | Heart failure NOS                              | 1694  | 37458    | 1.10       | (1.04-1.17) | 2.1E-03 | 0.06 |
| 427.4      | Cardiac arrest & ventricular fibrillation      | 488   | 26918    | 1.19       | (1.06-1.33) | 2.2E-03 | 0.06 |
| 426.9      | Cardiac pacemaker/device in situ              | 2394  | 26928    | 1.09       | (1.03-1.15) | 2.2E-03 | 0.06 |
| 272        | Disorders of lipoid metabolism                 | 22026 | 22638    | 1.04       | (1.01-1.06) | 2.7E-03 | 0.07 |
| 272.1      | Hyperlipidemia                                 | 21741 | 22638    | 1.04       | (1.01-1.06) | 2.7E-03 | 0.07 |
| 426.2      | AV block                                      | 1672  | 25310    | 1.11       | (1.04-1.18) | 2.8E-03 | 0.07 |
| 426.32     | Left bundle branch block                      | 882   | 24282    | 1.14       | (1.05-1.24) | 2.9E-03 | 0.07 |
| 585.34     | Chronic Kidney Disease, Stage IV              | 1063  | 37767    | 1.12       | (1.04-1.21) | 2.9E-03 | 0.07 |
| 250.1      | Type 1 diabetes                               | 1793  | 35092    | 1.09       | (1.03-1.16) | 3.4E-03 | 0.07 |
| 327.32     | Obstructive sleep apnea                       | 3170  | 36287    | 1.07       | (1.02-1.12) | 3.4E-03 | 0.07 |
| 285.21     | Anemia in chronic kidney disease              | 831   | 33345    | 1.13       | (1.04-1.23) | 3.5E-03 | 0.08 |
| 415.2      | Primary pulmonary hypertension                | 2199  | 40926    | 1.08       | (1.03-1.14) | 3.7E-03 | 0.08 |
| 426.3      | Bundle branch block                           | 1714  | 26918    | 1.10       | (1.03-1.18) | 3.7E-03 | 0.08 |
| 401.22     | Hypertensive chronic kidney disease           | 2832  | 21532    | 1.08       | (1.02-1.14) | 4.0E-03 | 0.08 |
| 276        | Fluid, electrolyte, & acid-base balance disorders | 10865 | 36334    | 1.04       | (1.01-1.07) | 4.3E-03 | 0.08 |
| 426.91     | Cardiac pacemaker in situ                     | 1753  | 26928    | 1.10       | (1.03-1.17) | 4.4E-03 | 0.08 |
| 335        | Multiple sclerosis                            | 1082  | 39411    | 1.11       | (1.03-1.19) | 4.6E-03 | 0.09 |
| 250.22     | Type 2 diabetic nephropathy                   | 1403  | 31651    | 1.10       | (1.03-1.17) | 4.8E-03 | 0.09 |
| 433        | Cerebrovascular disease                       | 7646  | 40246    | 1.05       | (1.01-1.08) | 5.0E-03 | 0.09 |
| 252        | Disorders of parathyroid gland                | 970   | 44476    | 1.12       | (1.03-1.21) | 5.1E-03 | 0.09 |
| 426.7      | Abnormal electrocardiogram                    | 2300  | 26915    | 1.09       | (1.03-1.15) | 5.5E-03 | 0.09 |
Supplementary Table 4: Validating the genetic risk scores.

| GRS                                      | Validation Phenotype | Beta (se)     | p-value       |
|------------------------------------------|----------------------|---------------|---------------|
| Body mass index (BMI)                    | BMI                  | 0.24 (0.01)   | 1x10^{-100}   |
| Coronary artery disease (CAD)            | CAD                  | 0.115 (0.011) | 7.8x10^{-24}  |
| Type 2 diabetes (T2D)                    | T2D                  | 0.205 (0.012) | 8.7x10^{-63}  |
| Systolic blood pressure (SBP)            | SBP                  | 0.079 (0.011) | 5.5x10^{-13}  |
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