

## Supplementary Materials

Supplementary table 1: Alberta Health (AH) data elements used to identify chronic diseases

| AH dataset                                      | Data elements                                                                                                                                                                                                                                     | Start-end date                  |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Ambulatory Care</b>                          | <ul style="list-style-type: none"> <li>• Most Responsible Diagnosis (ICD-9/10) *</li> <li>• Service Start Date</li> </ul>                                                                                                                         | October 01, 2000–March 31, 2018 |
| <b>Inpatient</b>                                | <ul style="list-style-type: none"> <li>• Most Responsible Health Diagnosis Code (ICD-9/10)*</li> <li>• Other Health Diagnosis Code (ICD-9/10)*</li> <li>• Services/Intervention Primary/Other (CCP/CCI)*</li> <li>• Service Start Date</li> </ul> | October 01, 2000–March 31, 2018 |
| <b>Physician/Clinical Service Claim</b>         | <ul style="list-style-type: none"> <li>• Health Diagnosis -Primary/Secondary/Tertiary (ICD9)*</li> <li>• Health Service Delivered (CCP-Alberta code)*</li> <li>• Service End Date</li> </ul>                                                      | October 01, 2000–March 31, 2018 |
| <b>Population Registry</b>                      | <ul style="list-style-type: none"> <li>• Fiscal Year End Date</li> <li>• In/Out-Migration (Yes/No)</li> <li>• Age</li> <li>• Gender</li> </ul>                                                                                                    | October 01, 2000–March 31, 2018 |
| <b>Alberta Blue Cross</b>                       | <ul style="list-style-type: none"> <li>• Drug Identification Number</li> <li>• Drug Anatomical Therapeutic Chemical (ATC) Code</li> <li>• Claim Service Date</li> </ul>                                                                           | October 01, 2000–March 31, 2018 |
| <b>Pharmaceutical Information Network (PIN)</b> | <ul style="list-style-type: none"> <li>• Drug Identification Number</li> <li>• Drug Anatomical Therapeutic Chemical (ATC) Code</li> <li>• Dispensed Date</li> </ul>                                                                               | April 01, 2008–March 31, 2018   |
| <b>Vital Statistics</b>                         | <ul style="list-style-type: none"> <li>• Date of death</li> <li>• Cause of Death (ICD-10)</li> </ul>                                                                                                                                              | October 01, 2000–March 31, 2018 |

\*ICD-9 and CCP codes used retroactively before 2002/2003.



Supplementary table 2: Case definition of 16 chronic conditions using Alberta Health administrative healthcare data

| Conditions                  | Case definition algorithms                                                                                                                                                                                                                                                     |                                                                                                                                        |                                                                                              |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                             | Case definition                                                                                                                                                                                                                                                                | Index date                                                                                                                             | ICD, CCI/CCP & ATC/DIN codes*                                                                |
| Hypertension                | One or more hospitalizations<br><b>OR</b><br>two or more physician claims within two years (4, 54)                                                                                                                                                                             | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 401-405<br>ICD-10: I10-I13, I15                                                       |
| Unstable angina             | One or more hospitalizations (55)                                                                                                                                                                                                                                              | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 411.X, 413.X<br>ICD-10: I20.X, I24.X                                                  |
| Acute myocardial infarction | One or more hospitalizations (54, 55)                                                                                                                                                                                                                                          | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 410.X<br>ICD-10: I21.X, I22.X                                                         |
| Ischemic heart disease      | One or more hospitalizations<br><b>OR</b><br>one or more physician claims (55)                                                                                                                                                                                                 | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 410.X, 411.X, 412.X, 413.X, 414.X, ICD-10: I20-I25.X                                  |
| Heart Failure               | One or more hospitalizations<br><b>OR</b><br>one or more physician claims (54, 55)                                                                                                                                                                                             | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 428.X<br>ICD-10: I50.X                                                                |
| Transient ischemic attack   | One or more hospitalizations (55)                                                                                                                                                                                                                                              | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 435.X<br>ICD-10: G45, G45.0, G45.1, G45.2, G45.3, G45.8, G45.9, <b>NOT</b> G45.4      |
| Acute ischemic stroke       | One or more hospitalizations (55)                                                                                                                                                                                                                                              | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 433.X, 434.X, 436.X, 362.3X<br>ICD-10: I63.X, I64.X, H34.1; <b>NOT</b> 433.X0, 434.X0 |
| Diabetes                    | One or more hospitalizations<br><b>OR</b><br>two or more physician claims within two years<br><b>OR</b><br>(ATP self-report <b>AND</b> (one or more hospitalizations <b>OR</b> one or more physician claims <b>OR</b> one or more drug prescriptions for diabetes)(14, 54, 55) | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 250<br>ICD-10: E10-E14<br>ATC: A10A, A10B                                             |
| Hypothyroidism              | One or more hospitalizations<br><b>OR</b><br>Two or more physician claims within two years (4)                                                                                                                                                                                 | the earliest date of medical records that contribute to the case definition                                                            | ICD-9: 240.9, 243, 244, 246.1, 246.8<br>ICD-10: E00-E03, E89.0                               |
| COPD                        | [One or more hospitalizations<br><b>OR</b><br>Two or more primary diagnoses in physician claims within two years<br>]<br><b>AND</b><br>Age $\geq$ 35 years (54)                                                                                                                | the earliest date of [1 <sup>st</sup> hospitalization date, 2 <sup>nd</sup> date of two claims] that contribute to the case definition | ICD-9: 491, 492, 496, ICD-10: J41-J44                                                        |
| Asthma                      | One or more hospitalizations<br><b>OR</b><br>two physician claims at least 30 days apart within two years (54, 56)                                                                                                                                                             | the earliest date of [1 <sup>st</sup> hospitalization date, 2 <sup>nd</sup> date of two claims] that contribute to the case definition | ICD-9: 493<br>ICD-10: J45, J46                                                               |

Continued

Supplementary table 2: Continued.

| Conditions     | Case Definition Algorithms                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Case Definition                                                                                                                                                                                                                                                                                                                                                                                                         | Index date                                                                                                                                                                                                                    | ICD, CCI/CCP & ATC/DIN codes*                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Sleep apnea    | One or more hospitalizations<br><b>OR</b><br>two or more physician claims within two years (57)                                                                                                                                                                                                                                                                                                                         | the earliest date of medical records that contribute to the case definition                                                                                                                                                   | ICD-9: 780.5<br>ICD-10: G47.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Osteoarthritis | One or more hospitalizations<br><b>OR</b><br>two or more physician claims within two years<br><b>OR</b><br>two or more ambulatory care encounters within two years (7, 54)                                                                                                                                                                                                                                              | the earliest date of medical records that contribute to the case definition                                                                                                                                                   | ICD-9: 715<br>ICD-10: M15-M19                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Osteoporosis   | [One or more hospitalizations<br><b>OR</b><br>One or more physician claims ]<br><b>AND</b><br>One or more BMD (Bone mineral density) tests in Claim Data within 3 years ] (54, 58)                                                                                                                                                                                                                                      | the earliest BMD test date                                                                                                                                                                                                    | ICD-9: 733.0 , or 733.0X, ICD-10: M80, M81, M82<br>CCP for BMD: X128                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Depression     | One or more hospitalizations (ICD-9/10-1)<br><b>OR</b><br>One or more physician claims (ICD-9-2)<br><b>OR</b><br>[One or hospitalizations (ICD-9-3, ICD-10-2)<br><b>AND</b><br>One or more drug prescriptions for depression within 6 months of hospitalization]<br><b>OR</b><br>[One or more physician claims (ICD-9-3)<br><b>AND</b><br>One or more drug prescriptions for depression within 6 months of claims] (59) | the earliest date of [hospitalization, claim date, drug dispense date] that contribute to the case definition within a period of 6 months (one episode)<br><b>AND</b> time between two index dates (episodes) $\geq 4$ months | ICD-9-1: 296.2-296.8, 300.4, 309, 311<br>ICD-9-2: 296, 309, 311<br>ICD-9-3: 300<br>ICD-10-1: F31, F32, F33, F34.1, F38.0, F38.1, F41.2, F43.1, F43.2, F43.8, F53.0, F93.0<br>ICD-10-2: F32.0, F34.1, F40, F41, F42, F44, F45.0, F45.1, F45.2, F48, F68.0, F99<br>ATC: N03AB02, N03AB52, N03AF01, N05AN01, N06A                                                                                                                                                                                           |
| Chronic pain   | Two or more hospitalizations within 30 days<br><b>OR</b><br>Two or more physician claims within 30 days<br><b>OR</b><br>Two or more ambulatory care encounters within 30 days (4)                                                                                                                                                                                                                                       | the earlier date of health records that contribute to the case definition with a period of 30 days (one episode)<br><b>AND</b> time between two index dates (episodes) $\geq 2$ years                                         | ICD-9: 307.80, 307.89, 338.0, 338.2, 338.4, 719.41, 719.45 – 719.47, 719.49, 720.0, 720.2, 720.9, 721.0 – 721.4, 721.6, 721.8, 721.9, 722, 723.0, 723.1, 723.3 – 723.9, 724.0 – 724.6, 724.70, 724.79, 724.8, 724.9, 729.0 – 729.2, 729.4, 729.5<br>ICD-10: F45.4, M08.1, M25.50, M25.51, M25.55 – M25.57, M43.2 – M43.6, M45, M46.1, M46.3, M46.4, M46.9, M47, M48.0, M48.1, M48.8, M48.9, M50.8, M50.9, M51, M53.1 – M53.3, M53.8, M53.9, M54, M60.8, M60.9, M63.3, M79.0 – M79.2, M79.6, M79.7, M96.1 |

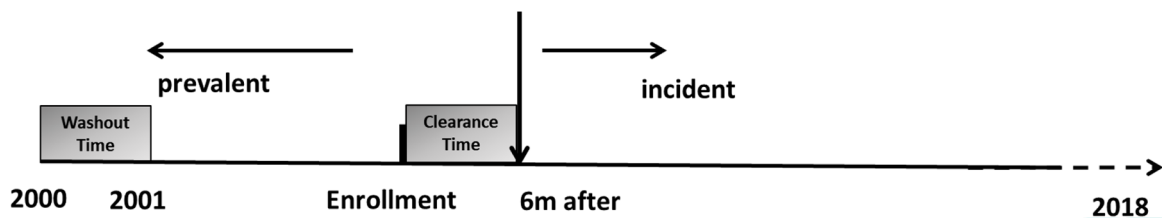
\*ICD-9 and CCP codes used retroactively before 2002/2003.

Supplementary table 3: Baseline characteristics of study participants by sex

|                                           |                     | Women<br>n = 33,627 | Men<br>n = 19,143 | Total<br>n = 52,770 |
|-------------------------------------------|---------------------|---------------------|-------------------|---------------------|
|                                           |                     | Mean (SD), %        | Mean (SD), %      | Mean (SD), %        |
| Sex distribution                          |                     | 63.7                | 36.3              | –                   |
| Age                                       | years               | 50.9 (9.3)          | 51.7 (9.5)        | 51.2 (9.4)          |
| Ethnicity                                 | Caucasian           | 81.4                | 82.4              | 81.8                |
|                                           | Other               | 6.7                 | 8.3               | 7.3                 |
|                                           | Missing             | 11.9                | 9.3               | 10.9                |
| Rural/urban                               | Rural               | 17.4                | 16.8              | 17.2                |
|                                           | Urban               | 82.6                | 83.2              | 82.8                |
| Education level                           | High school or less | 24.7                | 21.6              | 23.6                |
|                                           | Some post-secondary | 44.0                | 43.1              | 43.7                |
|                                           | Post-secondary      | 31.2                | 35.2              | 32.6                |
|                                           | Missing             | 0.1                 | 0.1               | 0.1                 |
| BMI category                              | Normal/under weight | 27.4                | 14.5              | 22.7                |
|                                           | Overweight          | 26.5                | 39.0              | 31.0                |
|                                           | Obese               | 24.5                | 29.9              | 26.5                |
|                                           | Missing             | 21.6                | 16.6              | 19.8                |
| Current Smoking                           | No                  | 50.5                | 46.3              | 49.0                |
|                                           | Yes                 | 49.2                | 53.4              | 50.7                |
|                                           | Missing             | 0.3                 | 0.3               | 0.3                 |
| Physically active*                        | No                  | 25.9                | 25.0              | 25.6                |
|                                           | Yes                 | 22.2                | 25.6              | 23.5                |
|                                           | Missing             | 51.8                | 49.4              | 50.9                |
| Healthy Eating Index-Canada (range 0–100) |                     | n = 16,239          | n = 9,714         | n = 25,953          |
| Average                                   |                     | 55.2 (9.5)          | 50.8 (8.9)        | 53.6 (9.5)          |

\*Categories (Yes/No) were created by whether or not participants reported accumulating at least 210 min moderate- to vigorous-intensity recreational physical activities per week in the past 12 month.

Supplementary Figure 1: The definition of “prevalent” and “incident” cases based on timing of enrollment in ATP

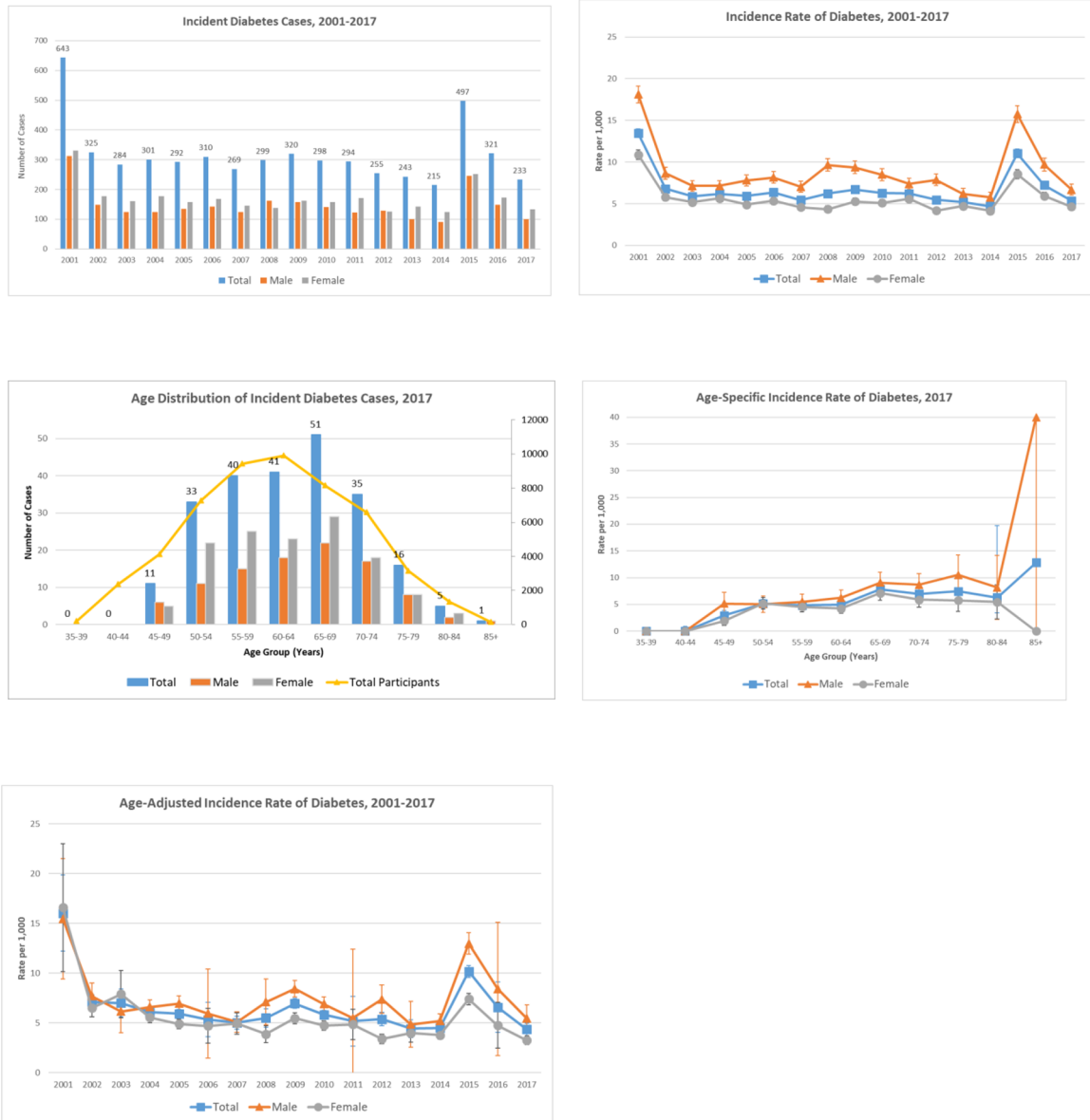


Alberta's Tomorrow Project (ATP) participants were enrolled on a rolling basis from 2000–2015. Cases with chronic diseases were identified as “non-prevalent” or “incident” cases only if the diagnosis date (index date) was >6 months after enrollment (“clearance time”) and not within the first year (October 01 2000–October 01 2001) when AH data was linked to the ATP cohort (“wash-out time”), to ensure the true “non-prevalent” or “incident” cases were identified; otherwise, cases were considered as the baseline “prevalent” cases.

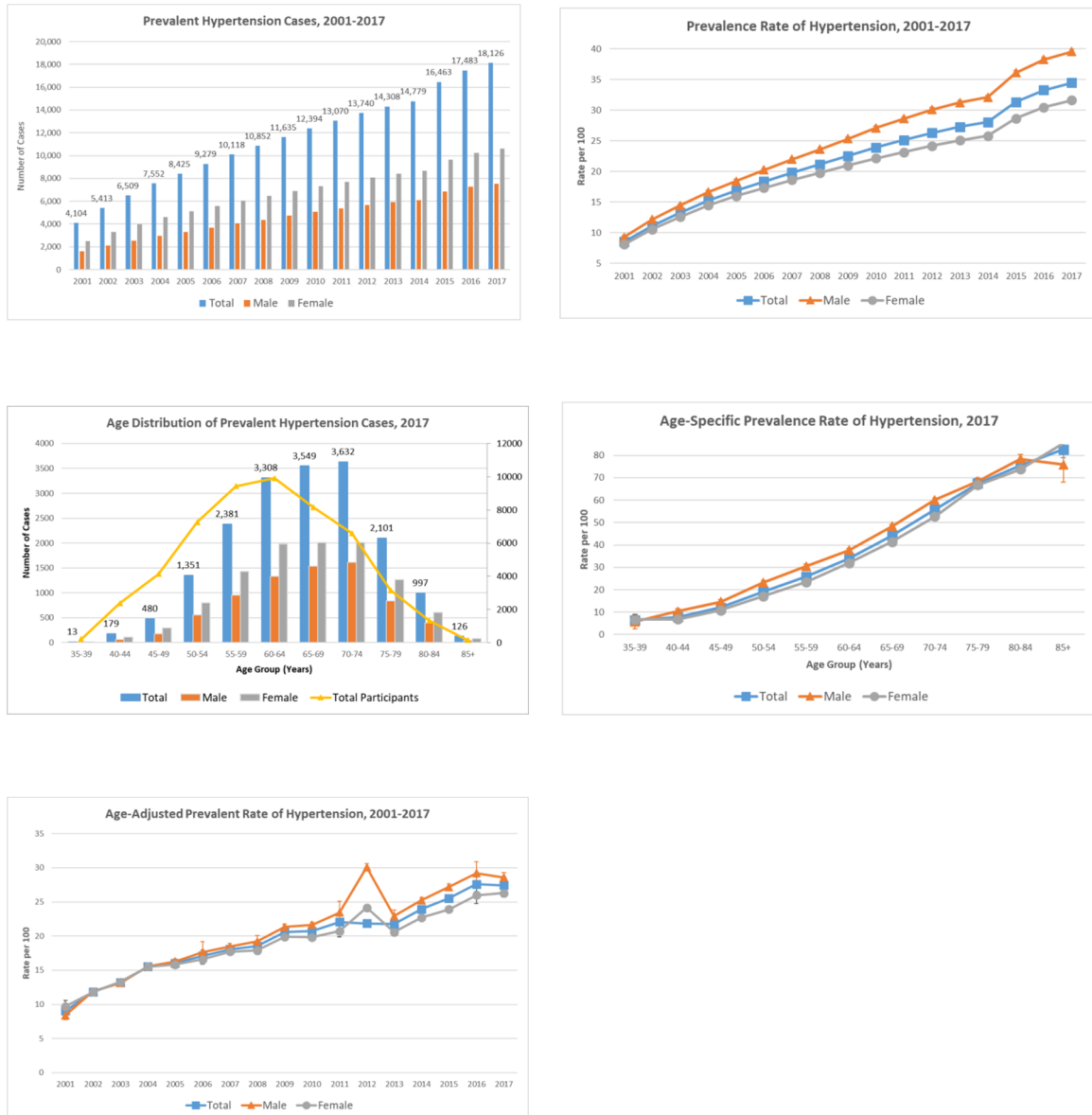
Supplementary Figure 2a: Prevalence of diabetes in ATP, 2001–2017



Supplementary Figure 2b: Incidence of diabetes in ATP, 2001–2017



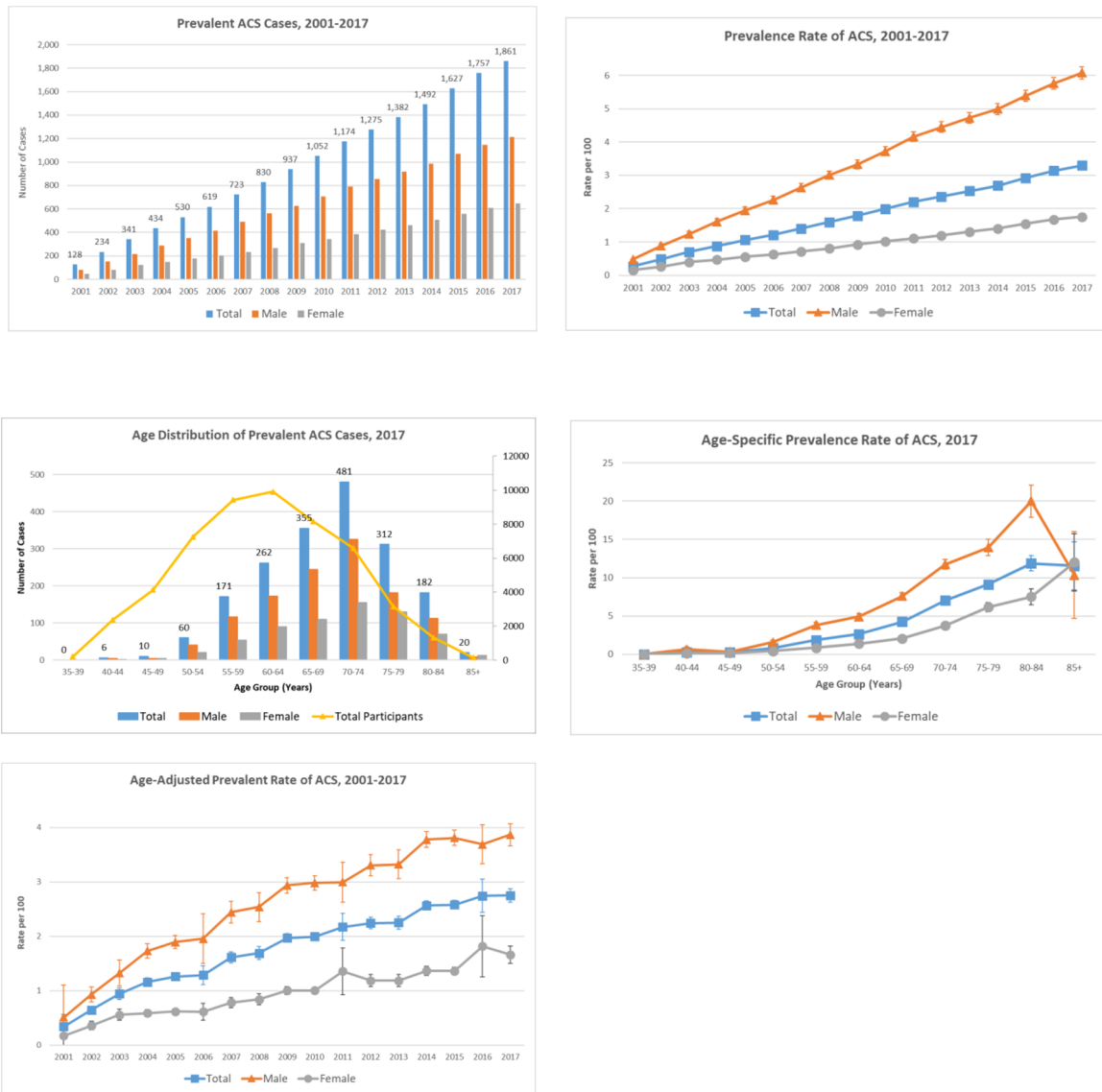
Supplementary Figure 3a: Prevalence of hypertension in ATP, 2001–2017



Supplementary Figure 3b: Incidence of hypertension in ATP, 2001–2017



Supplementary Figure 4a: Prevalence of acute coronary syndrome (ACS)\* in ATP, 2001–2017



\*Patients with unstable angina and myocardial infarction were considered as ACS cases (please refer to Supplementary Table 2 for detailed case definition using ICD codes).



Supplementary Figure 4b: Incidence of acute coronary syndrome (ACS)\* in ATP, 2001–2017



\*Patients with unstable angina and myocardial infarction were considered as ACS cases (please refer to Supplementary Table 2 for detailed case definition using ICD codes).

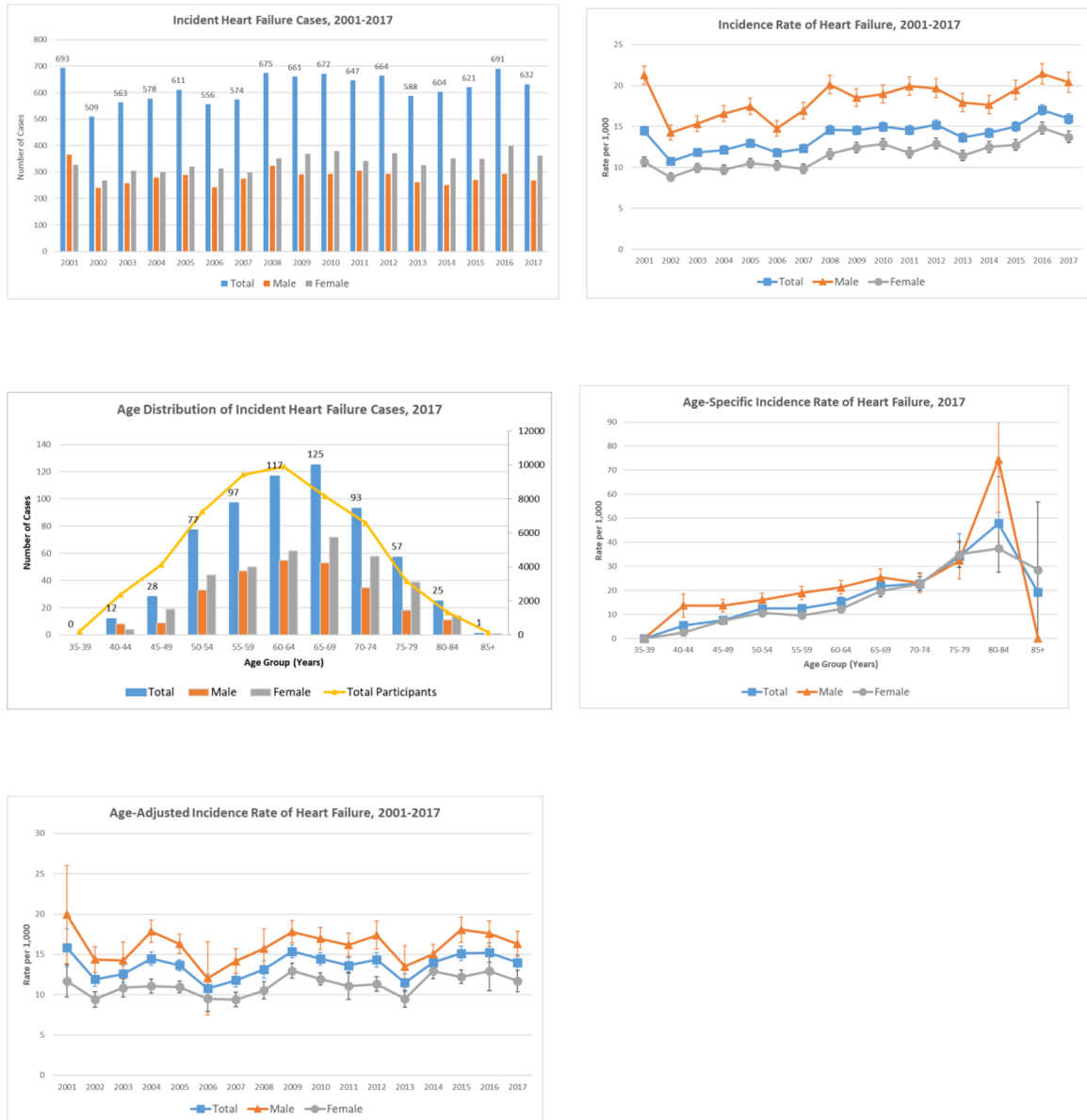


Supplementary Figure 5a: Prevalence of heart failure\* in ATP, 2001–2017



\*Patients with ischemic heart disease and heart failure were considered as heart failure cases (please refer to Supplementary Table 2 for detailed case definition using ICD codes).

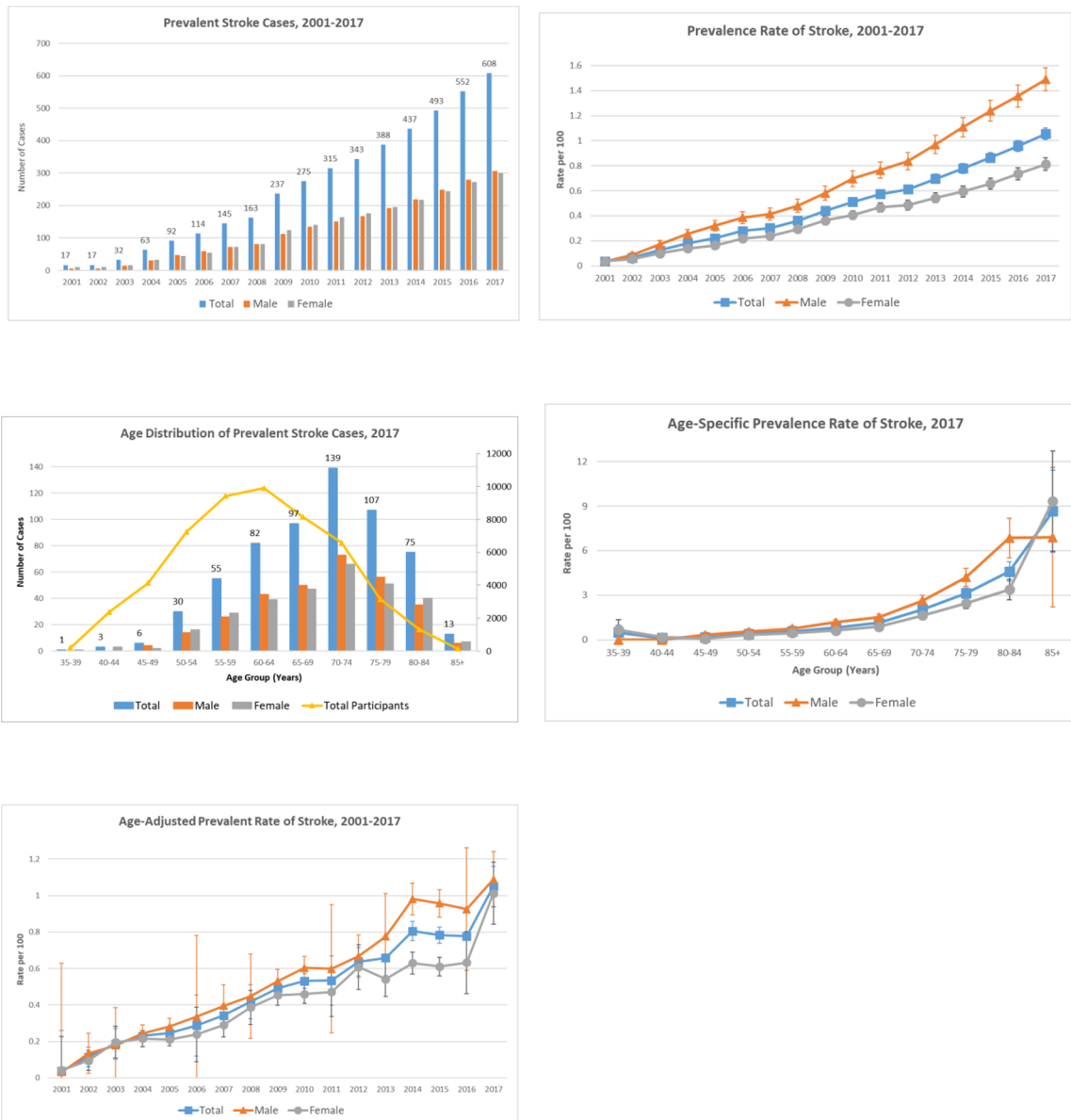
Supplementary Figure 5b: Incidence of heart failure\* in ATP, 2001–2017



\*Patients with ischemic heart disease and heart failure were considered as heart failure cases (please refer to Supplementary Table 2 for detailed case definition using ICD codes).



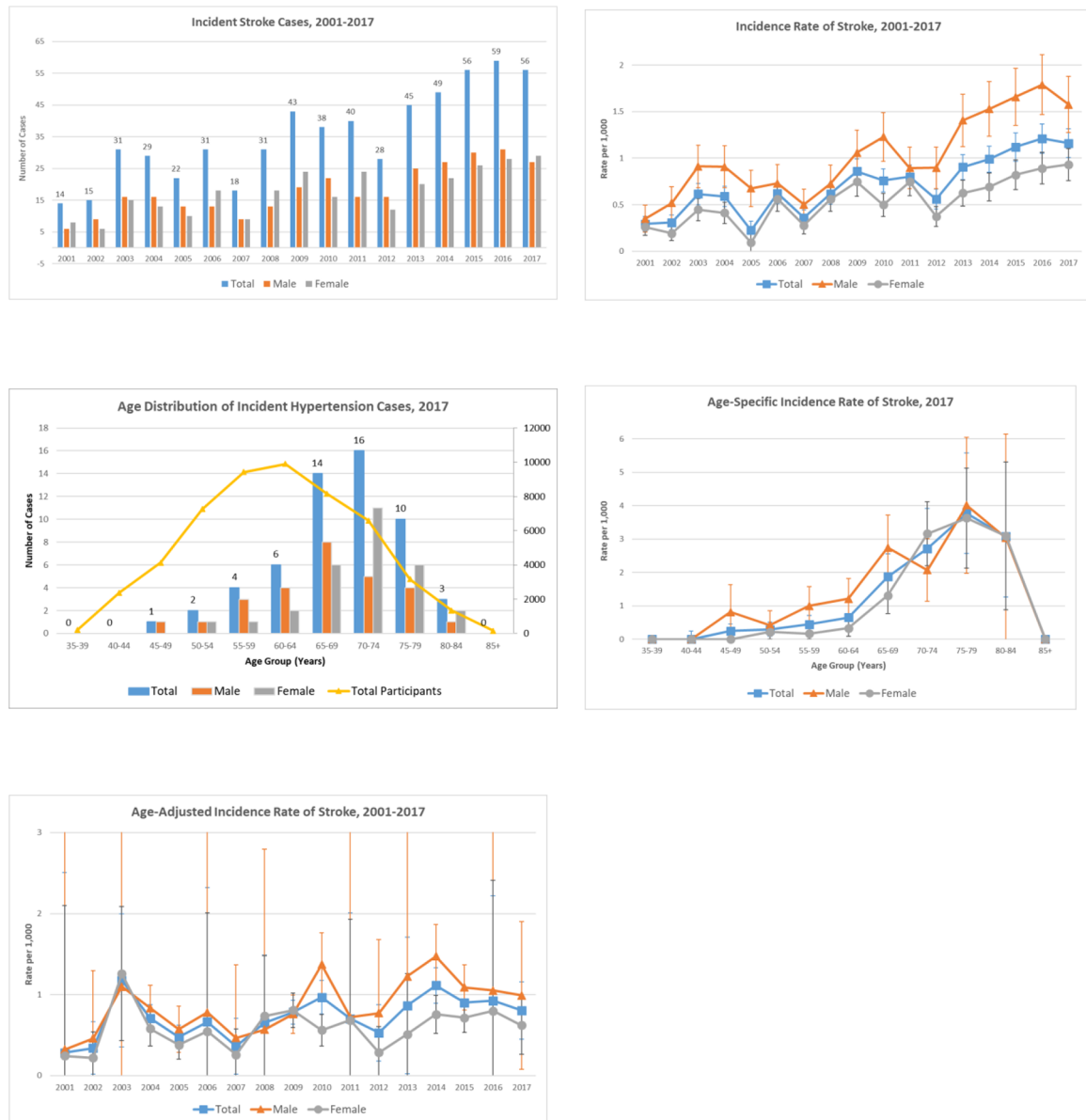
Supplementary Figure 6a: Prevalence of stroke\* in ATP, 2001–2017



\*Patients with transient ischemic attack (TIA) and acute ischemic attack (AIA) were considered as stroke cases (please refer to Supplementary Table 2 for detailed case definition using ICD codes).



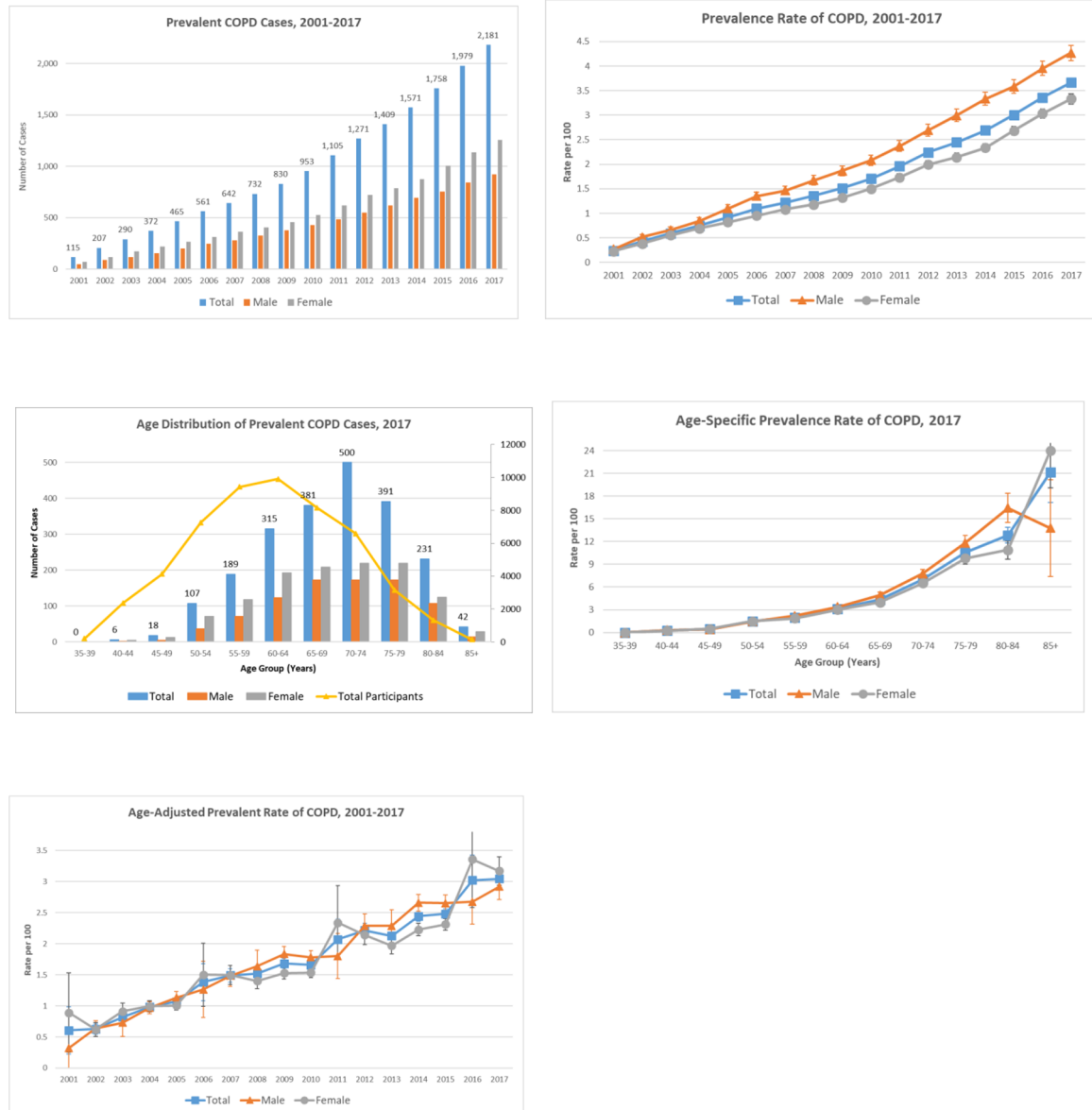
Supplementary Figure 6b: Incidence of stroke in ATP\*, 2001–2017



\*Patients with transient ischemic attack (TIA) and acute ischemic attack (AIA) were considered as stroke cases (please refer to Supplementary Table 2 for detailed case definition using ICD codes).



Supplementary Figure 7a: Prevalence of chronic obstructive pulmonary disease (COPD) in ATP, 2001–2017



Supplementary Figure 7b: Incidence of chronic obstructive pulmonary disease (COPD) in ATP, 2001–2017



Supplementary Figure 8a: Prevalence of asthma in ATP, 2001–2017



Supplementary Figure 8b: Incidence of asthma in ATP, 2001–2017



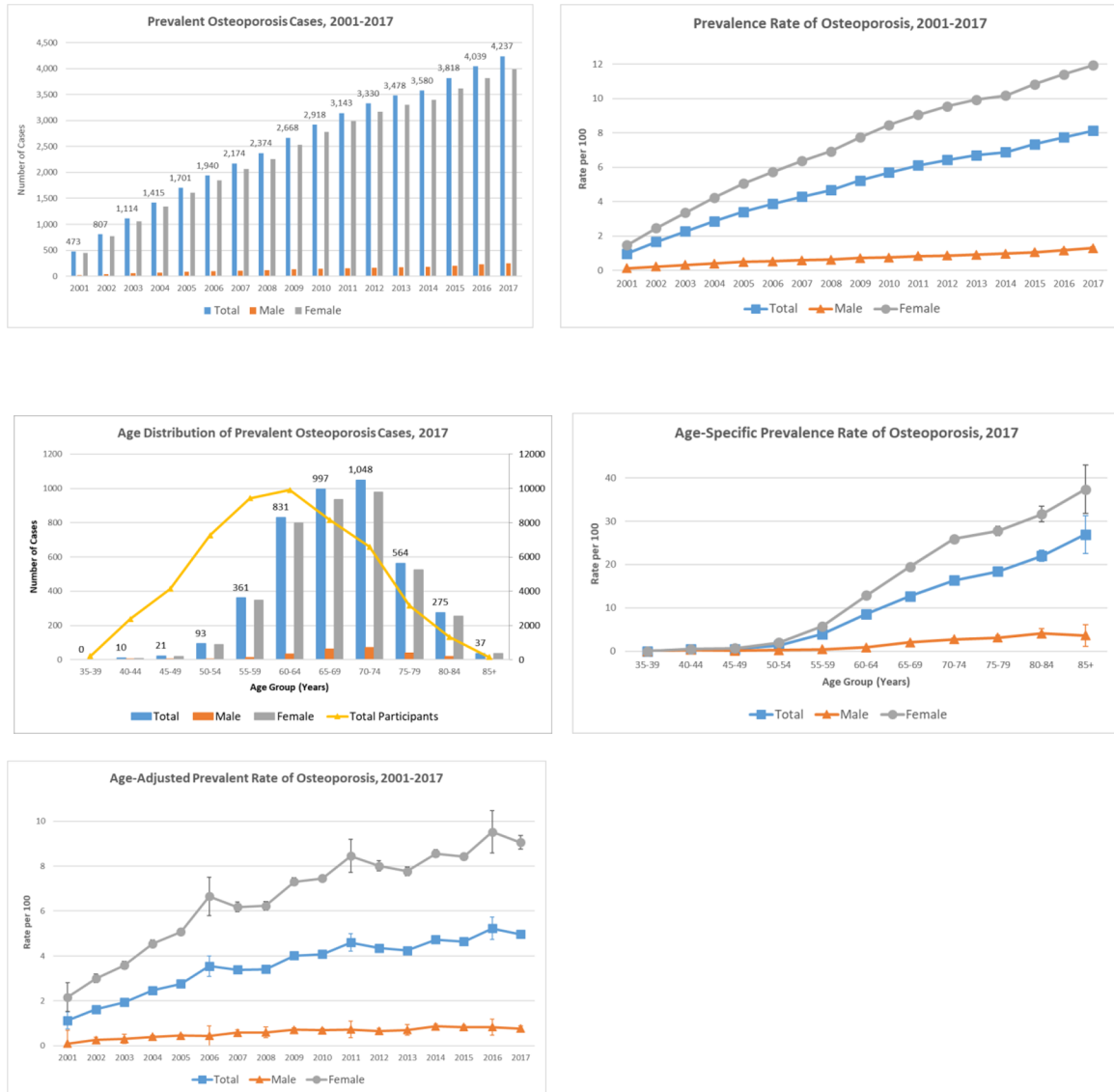
Supplementary Figure 9a: Prevalence of osteoarthritis in ATP, 2001–2017



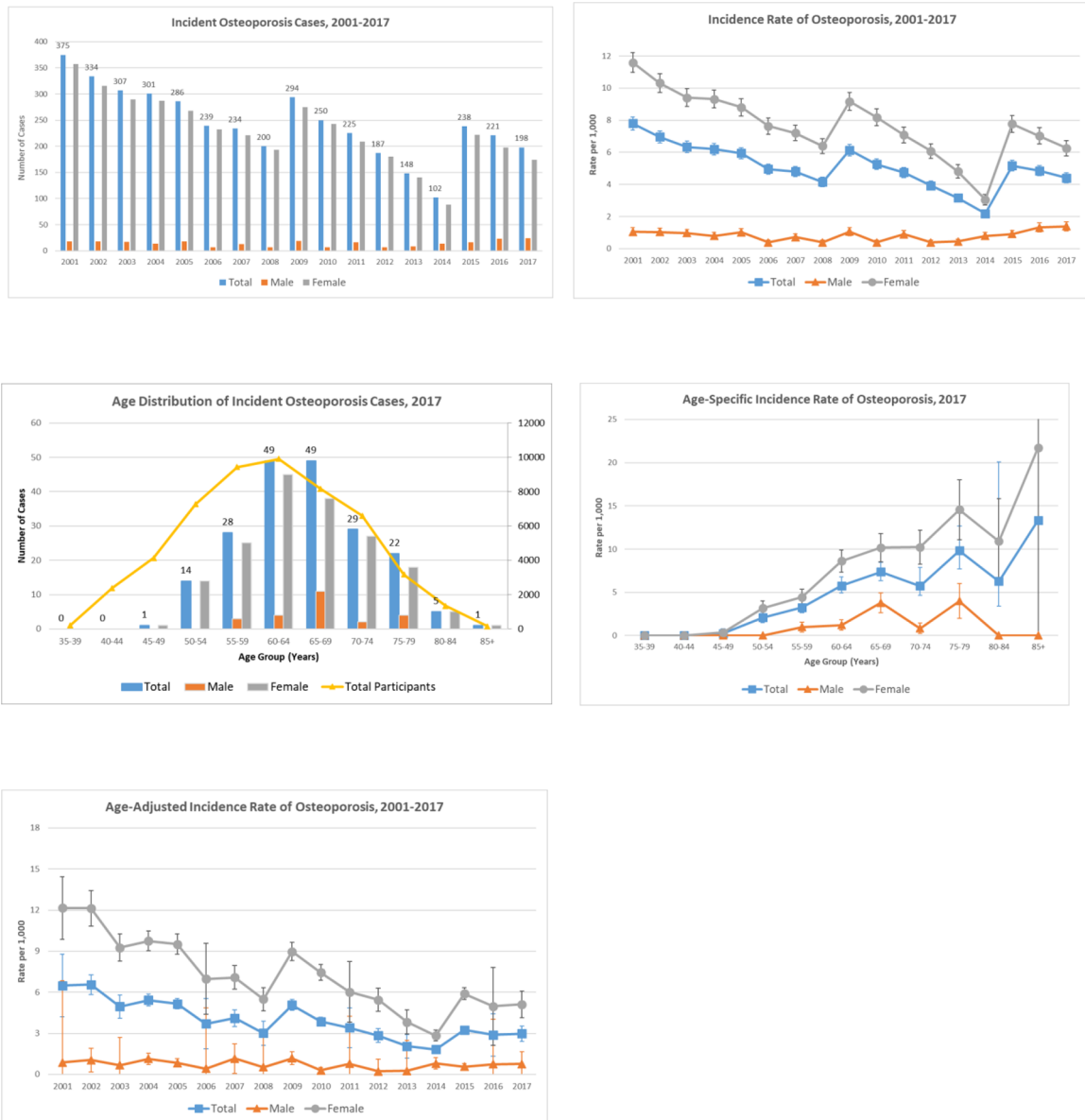
Supplementary Figure 9b: Incidence of osteoarthritis in ATP, 2001–2017



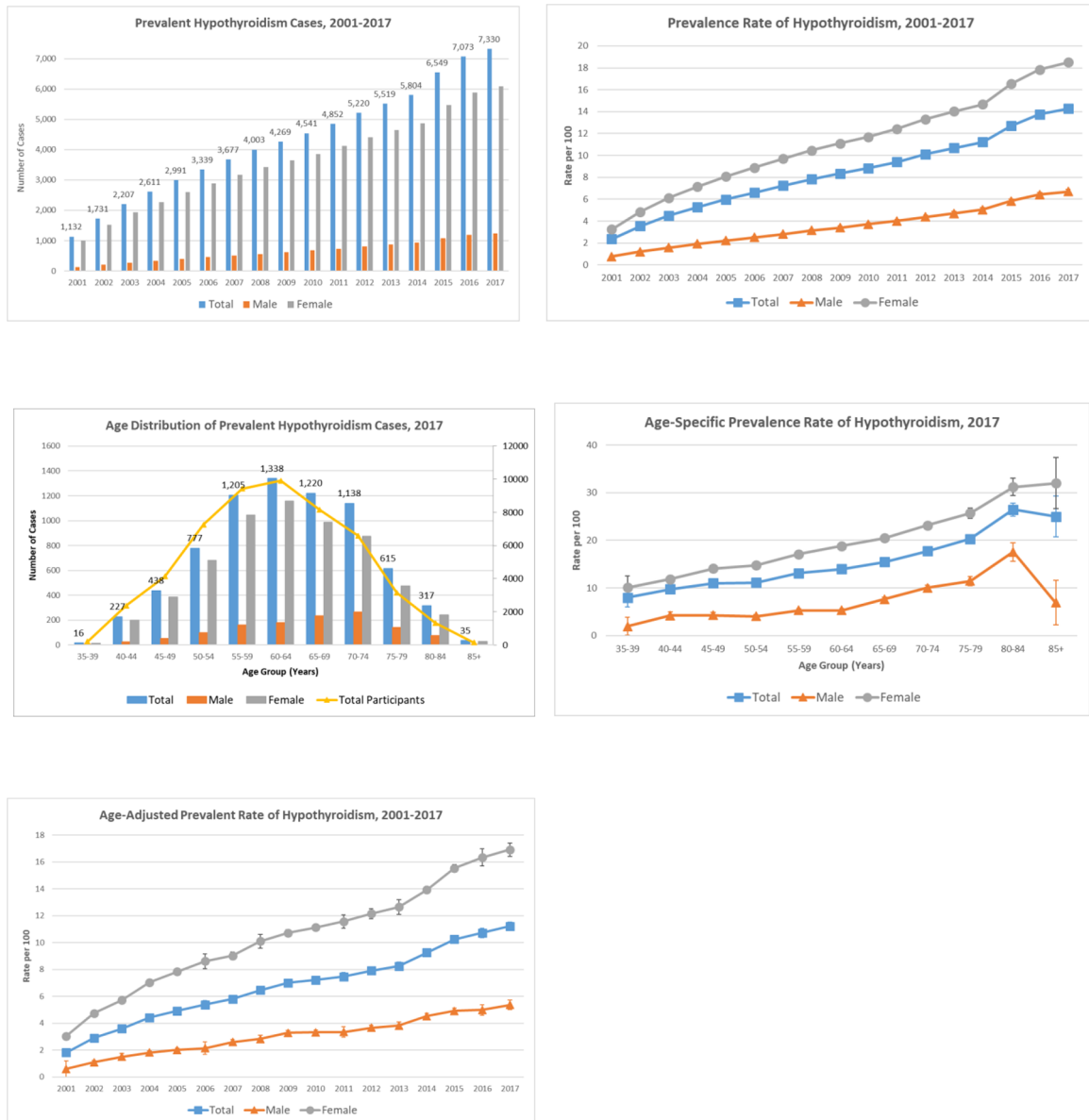
Supplementary Figure 10a: Prevalence of osteoporosis in ATP, 2001–2017



Supplementary Figure 10b: Incidence of osteoporosis in ATP, 2001–2017



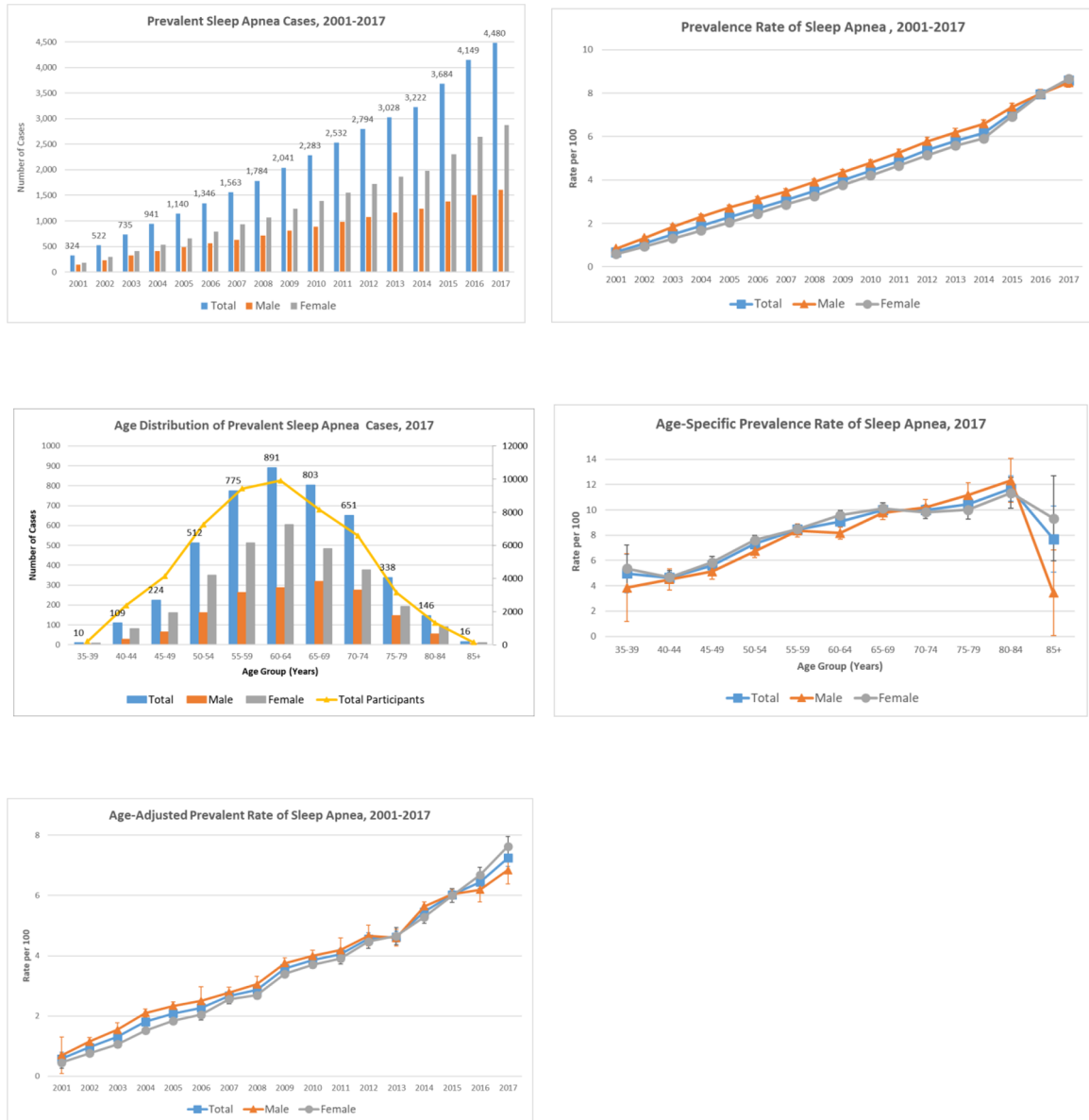
Supplementary Figure 11a: Prevalence of hypothyroidism in ATP, 2001–2017



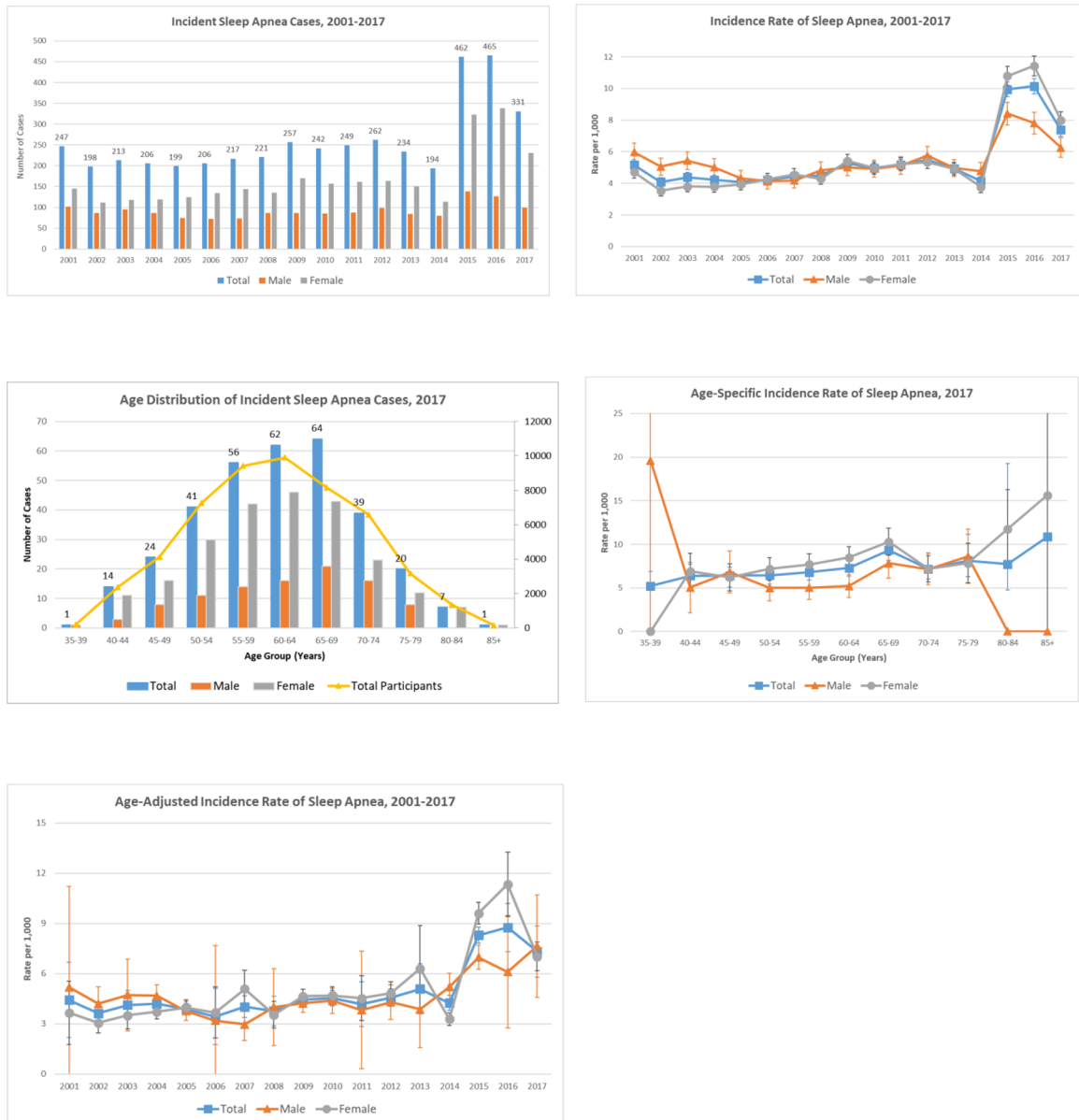
Supplementary Figure 11b: Incidence of hypothyroidism in ATP, 2001–2017



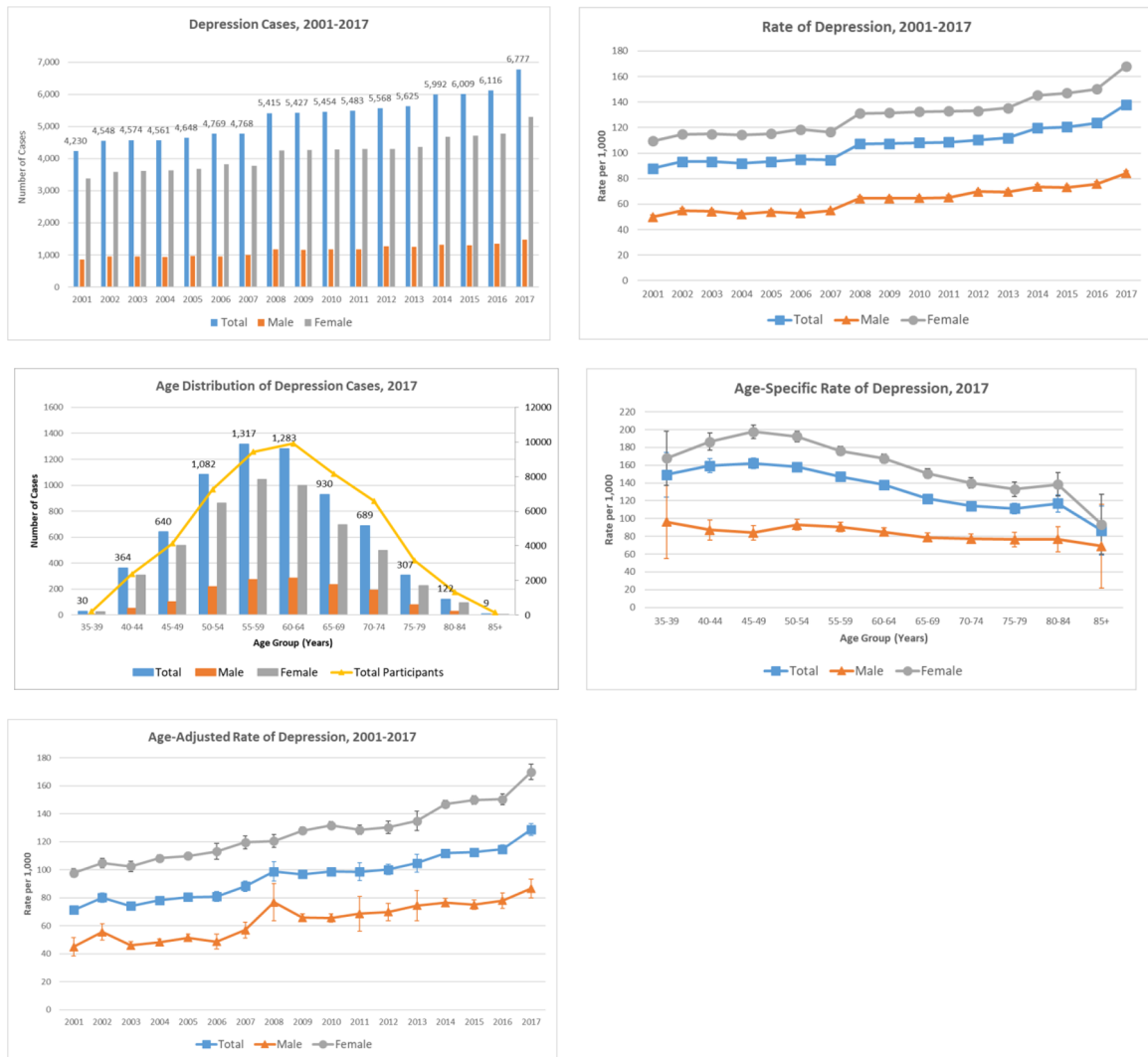
Supplementary Figure 12a: Prevalence of obstructive sleep apnea in ATP, 2001–2017



Supplementary Figure 12b: Incidence of obstructive sleep apnea in ATP, 2001–2017



Supplementary Figure 13: Rate of depression in ATP, 2001–2017



Supplementary Figure 14: Rate of chronic pain in ATP, 2001–2017

