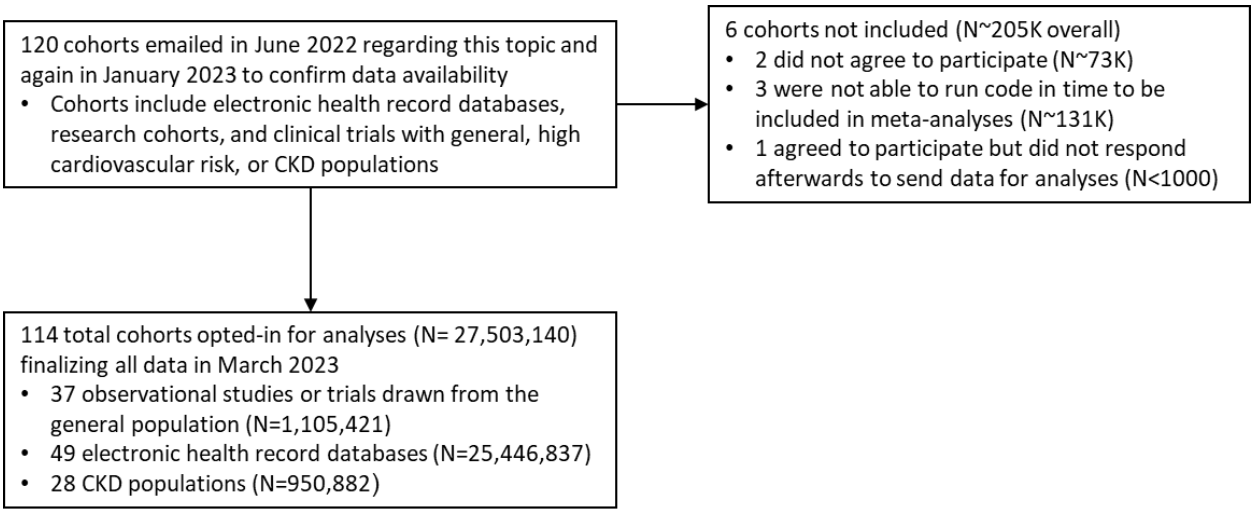
**Supplemental Appendices**

# Table of Contents

## Appendix 1. Data analysis overview and analytic notes for some individual cohorts

### 1.1 Overview:

In order to determine the cohorts eligible for this paper, in June 2022 all cohorts in CKD-PC were contacted regarding their interest in this topic and in January 2023 cohorts were contacted to confirm availability of data.




As previously described,[1] the collaborating cohorts were asked to compile a dataset with approximately 30 variables (main exposure [serum creatinine to estimate GFR, albuminuria, age, sex, race/ethnicity, history of cardiovascular diseases, smoking, diabetes, diabetes medications systolic blood pressure, antihypertensive medications, total cholesterol, HDL cholesterol, use of statins, BMI], outcome [all-cause mortality, cardiovascular mortality, myocardial infarction, stroke, heart failure, peripheral artery disease, atrial fibrillation, kidney failure with replacement therapy, acute kidney injury, hospitalizations]).

To be consistent across cohorts, the CKD-PC Data Coordinating Center sent definitions for those medical history variables to participating cohorts (outlined below). We instructed studies not to impute any variables and let us know of any differences in definitions.

| **Medical history variable** | **Definition** |
|---|---|
| History of cardiovascular disease (CVD) | Prior diagnosis of CVD based on myocardial infarction, bypass grafting, percutaneous coronary intervention, heart failure, or stroke. Identification at any time during study period (from baseline to follow-up). |
| History of coronary heart disease (CHD) | Prior diagnosis of CHD based on myocardial infarction, bypass grafting, percutaneous coronary intervention. Identification at any time during study period (from baseline to follow-up). |
| History of heart failure (HF) | Prior diagnosis of heart failure. Identification at any time during study period (from baseline to follow-up). |
| History of stroke | Prior diagnosis of stroke. Identification at any time during study period (from baseline to follow-up). |
| History of atrial fibrillation (Afib) | Prior diagnosis of atrial fibrillation. Identification at any time during study period (from baseline to follow-up). |
| History of peripheral artery disease (PAD) | Prior diagnosis of peripheral artery disease. Identification at any time during study period (from baseline to follow-up). |
| Diabetes mellitus | Glycated hemoglobin A1c ≥6.5% or fasting glucose ≥7.0 mmol/L (≥126 mg/dL) or non-fasting glucose ≥11.1 mmol/L (≥200 mg/dL) or use of glucose lowering drugs (ADA 2010 criteria). Self-report of physician diagnosed diabetes can be included.<br>Identification at any time during study period (from baseline to follow-up). |

| | |
|---|---|
| Hypertension | Systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg or antihypertensive drugs (JNC-7 criteria).<br>Self-reported hypertension if other data not available.<br>Identification at any time during study period (from baseline to follow-up). |
| History of cancer | Prior diagnosis of any cancer. Identification at any time during study period (from baseline to follow-up). |
| History of liver disease | Prior diagnosis of liver disease. Identification at any time during study period (from baseline to follow-up). |
| History of chronic obstructive pulmonary disease (COPD) | Prior diagnosis of COPD. Identification at any time during study period (from baseline to follow-up). |

Outcome definitions below were provided to cohorts, cohort deviations from these definitions listed in the analytic notes for each cohort.

| **Outcome** | **Definition** |
|---|---|
| All-cause mortality | Death |
| Cardiovascular mortality | Death due to CVD |
| Myocardial infarction | First incidence of myocardial infarction or fatal myocardial infarction |
| Stroke | First incidence of stroke (ischemic or hemorrhagic) or fatal stroke |
| Heart Failure | First hospitalization or death due to heart failure |
| Peripheral artery disease | First incidence of peripheral artery disease based on your study definition |
| Atrial fibrillation | First incidence of atrial fibrillation |
| Kidney failure with replacement therapy | Initiation of dialysis or transplantation |
| Acute kidney injury | First hospitalization of acute kidney injury |
| Hospitalizations | First hospitalization after baseline |

ICD codes used to define outcomes within cohorts, if not specified in analytic notes

| **Outcome** | **ICD-9 codes** | **ICD-10 codes** |
|---|---|---|
| Cardiovascular mortality | 401-414, 426-443 (excluding 426.7, 429.0, 430, 432.1, 437.3, 437.4, 437.5) | I10-I25, I44-I73 (excluding I45.6, I51.4, I60, I62.0, I67.1, I67.5, I67.7) |
| Myocardial infarction (MI) | 410 | I21, I22 |
| Stroke | 431, 432, 433.x1, 434.x1 | I61, I62, I63 |
| Heart failure | 428 | I50 |
| Peripheral artery disease | 440.2, 440.3, 440.4, 38.18, 39.25, 39.29, 39.50, 84.1 | I70.2, I70.3, I70.4, I70.5, I70.92, 031, 041, 047, 04B, 04C, 04H, 04R, 04U, 0Y6 |
| Atrial fibrillation | 427.3 | I48 |
| Acute kidney injury | 584 | N17 |

The CKD-PC data request and processing procedures are as follows. After obtaining opt-in preferences from cohorts for the topics for each phase, the Data Coordinating Center (DCC) requests de-identified data using a specific data request document describing the variables and preferred definitions needed for the current phase of the CKD-PC. Cohorts work with the DCC on any data use agreements, IRB approvals, and other logistic issues for de-identified data transfer. The DCC also advises on any differences in definitions or questions on data formatting. Cohorts then provide de-identified data (in whatever program format, e.g., Stata, SAS, csv) via a secure data transfer provided or their own secure transfer program/platform. Data is stored on a secure password protected network server that is only accessed by limited faculty and staff (<10). All those faculty and staff have completed HIPAA and CITI certification and have signed internal data use agreements to not use the data for any other than stated purposed and to not remove the data from that network drive. The CKD-PC does not share data with any external parties. Once data is received and stored in the network drive, the DCC programmer reviews the data and the data dictionary provided by the cohort to check for any missing information, outliers, and potentials issues with variable units, dates, etc. Any questions are sent to the cohort representatives for data checking and cleaning. Further data checking is done throughout the analysis process for each CKD-PC paper, including a review from a cohort representative of all tables and figures to confirm their cohort representation.

For 98 of the 114 cohorts in this specific study, the DCC at Johns Hopkins University conducted the analysis; the remainder ran the standard code written in Stata by the DCC and shared the output with the DCC. As in the data processing procedures above, the DCC works with the cohort to confirm the variable definitions and data formatting to prepare for the code. The standard code was designed to automatically save all estimates and variance-covariance matrices needed for the meta-analysis. Then the DCC meta-analyzed the estimates across cohorts using Stata.

As detailed in our previous reports,[2,3] each cohort was instructed to standardize their serum creatinine and report its method when available. The reported creatinine standardization allows grouping studies into studies that reported using a standard IDMS traceable method or conducted some serum creatinine standardization to IDMS traceable methods (ARIC, AusDiab, BIS, CanPREDDICT , CKD-JAC, CKD-REIN, COBRA, CRIC, ESTHER, GCKD, Geisinger, GLOMMS, Go-DARTS, Gubbio, ICES-KDT, ICKD, LCC, JHS, Maccabi, MASTERPLAN, MMKD, Nanjing CKD, NEPHROTEST, NHANES, Okinawa, PREVEND, PSPA, Rancho Bernardo, RCAV, REGARDS, SCREAM, SKS, SEED, SRR-CKD, STOP-CKDu, Takahata, West of Scotland, UK Biobank) and studies where the creatinine standardization was not done (AASK, ADVANCE, Aichi, CARE, BC CKD, Beijing, China NS, CHS, CIRCS, CRIB, Framingham, KP Hawaii, MDRD, MESA, MRC, NEFRONA, NIPPON DATA80/90, Ohasama, Pima, PSP-CKD, RENAAL, SMART, Sunnybrook, Taiwan MJ, TLGS, ULSAM, ZODIAC). For those cohorts without standardization, the creatinine levels were reduced by 5%, the calibration factor used to adjust non-standardized MDRD Study samples to IDMS.[2,4]. We did not adjust creatinine levels in those studies with unknown standardization status (CURE-CKD, Gonryo, Hong Kong CKD, JMS, J-SHC, Mt Sinai BioMe, SHARP, NRHP-URU, YWSCC, and OLDW all cohorts).

Serum cystatin C values were calibrated and/or standardized to International Federation for Clinical Chemists (IFCC) reference (Inker et al., 2011; Grubb et al., 2010).[5,6] Cohort details below:

| **Cohort** | **Notes including if a calibration equation was applied** |
|---|---|
| ARIC | IFCC Cystatin C = 1.12*(0.083+0.914*(ARIC cystatin C)) |
| AUSDIAB | IFCC Cystatin C = 1.12*(-0.25+1.07*(AusDiab cystatin C)) |
| BIS | ERM-DA471/IFCC Standardized assay |
| CHS | IFCC= 1.12*(0.083+0.789*(CHS cystatin C)) |
| ESTHER | IFCC= 1.12*(0.105+0.848*(ESTHER cystatin C)) |
| FRAMINGHAM | IFCC= 1.12*(0.083+0.789*(Framingham cystatin C)) |
| MESA | IFCC= 1.12*(0.083+0.789*(MESA cystatin C)) |
| NHANES99-02 | IFCC= 1.12*((NHANES1999-2002 cystatin C)-0.12) |
| PREVEND | IFCC= 1.12*(0.083+0.789*(PREVEND cystatin C)) |
| REGARDS | Calibrated by primary study |
| SCREAM | Calibrated by primary study |
| UK BioBank | ERM-DA471/IFCC Standardized assay |
| ULSAM | IFCC= 1.12*(0.083+0.789*(ULSAM cystatin C)) |
| AASK | IFCC= 1.12*(0.083+0.789*(AASK cystatin C)) |
| CKD-Rein | ERM-DA471/IFCC Standardized assay |
| CRIB | IFCC= 1.12*(0.083+0.789*(CRIB cystatin C)) |
| CRIC | Calibrated by primary study |
| GCKD | ERM-DA471/IFCC Standardized assay |
| MASTERPLAN | IFCC=1.12*(MASTERPLAN cystatin C)) |
| MDRD | IFCC=1.12*(0.083+0.789*(MDRD cystatin C)) |

We calculated eGFR using the 2021 CKD-EPI creatinine and the 2021 CKD-EPI creatinine-cystatin C equations,[7] as follows:

| Sex | Serum Creatinine (mg/dL) | Serum Cystatin C (mg/L) | Equation |
|---|---|---|---|
| **CKD-EPI creatinine equation** | | | |
| Female | ≤0.7 | | $GFR = 142 \times (Scr/0.7)^{-0.241} \times 0.9938^{Age}$ |
| | >0.7 | | $GFR = 142 \times (Scr/0.7)^{-1.200} \times 0.9938^{Age}$ |
| Male | ≤0.9 | | $GFR = 142 \times (Scr/0.9)^{-0.302} \times 0.9938^{Age}$ |
| | >0.9 | | $GFR = 142 \times (Scr/0.9)^{-1.200} \times 0.9938^{Age}$ |
| **CKD-EPI creatinine-cystatin C equation** | | | |
| Female | ≤0.7 | ≤0.8 | $GFR = 135 \times (Scr/0.7)^{-0.219} \times (Scys/0.8)^{-0.323} \times 0.9961^{Age} \times 0.963$ |
| | | >0.8 | $GFR = 135 \times (Scr/0.7)^{-0.544} \times (Scys/0.8)^{-0.778} \times 0.9961^{Age} \times 0.963$ |
| | >0.7 | ≤0.8 | $GFR = 135 \times (Scr/0.7)^{-0.219} \times (Scys/0.8)^{-0.323} \times 0.9961^{Age} \times 0.963$ |
| | | >0.8 | $GFR = 135 \times (Scr/0.7)^{-0.544} \times (Scys/0.8)^{-0.778} \times 0.9961^{Age} \times 0.963$ |
| Male | ≤0.9 | ≤0.8 | $GFR = 135 \times (Scr/0.9)^{-0.144} \times (Scys/0.8)^{-0.323} \times 0.9961^{Age}$ |
| | | >0.8 | $GFR = 135 \times (Scr/0.9)^{-0.544} \times (Scys/0.8)^{-0.778} \times 0.9961^{Age}$ |
| | >0.9 | ≤0.8 | $GFR = 135 \times (Scr/0.9)^{-0.144} \times (Scys/0.8)^{-0.323} \times 0.9961^{Age}$ |
| | | >0.8 | $GFR = 135 \times (Scr/0.9)^{-0.544} \times (Scys/0.8)^{-0.778} \times 0.9961^{Age}$ |

The selection of knots for eGFR and urine albumin-to-creatinine ratio was based on clinical thresholds.[8] Baseline for each study was considered first available creatinine unless otherwise noted. Other variables were taken either on baseline date or within one year before baseline date.

Each analysis was performed separately within each cohort. The models were adjusted for the following variables:

| Outcome | Model adjustment variables |
|---|---|
| All-cause mortality | Age, sex, smoking status (current, former, never), systolic blood pressure, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, heart failure, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |
| Cardiovascular mortality | Age, sex, smoking status (current, former, never), systolic blood pressure, total cholesterol, high-density lipoprotein cholesterol, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, heart failure, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |
| Myocardial infarction | Age, sex, smoking status (current, former, never), systolic blood pressure, total cholesterol, high-density lipoprotein cholesterol, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, stroke, heart failure, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |
| Stroke | Age, sex, smoking status (current, former, never), systolic blood pressure, total cholesterol, high-density lipoprotein cholesterol, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, heart failure, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |
| Heart Failure | Age, sex, smoking status (current, former, never), systolic blood pressure, total cholesterol, high-density lipoprotein cholesterol, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |

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|---|---|
| Peripheral artery disease | Age, sex, smoking status (current, former, never), systolic blood pressure, total cholesterol, high-density lipoprotein cholesterol, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, heart failure, atrial fibrillation, cancer, and chronic obstructive pulmonary disease |
| Atrial fibrillation | Age, sex, smoking status (current, former, never), systolic blood pressure, total cholesterol, high-density lipoprotein cholesterol, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, heart failure, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |
| Kidney failure with replacement therapy | Age, sex, smoking status (current, former, never), systolic blood pressure, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, heart failure, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |
| Acute kidney injury | Age, sex, smoking status (current, former, never), systolic blood pressure, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, heart failure, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |
| Hospitalizations | Age, sex, smoking status (current, former, never), systolic blood pressure, body-mass index, use of anti-hypertensive medications, and a medical history of diabetes, coronary heart disease, stroke, heart failure, atrial fibrillation, peripheral artery disease, cancer, and chronic obstructive pulmonary disease |

Within each cohort, if a variable was missing more than 50% or not available, the variable was not included in the model. For variables that were missing <50% of the time, missing values were imputed with the mean.

By definition, age, sex, and eGFR were never missing.

Because albuminuria was a main exposure, different criteria were used. If albuminuria was missing <10%, complete case analysis was performed. Otherwise, missing albuminuria was analyzed as a separate “dummy” category. For estimation of hazard ratios in meta-analysis, the missing category was meta-analyzed only for EHR cohorts.

Details of missingness in each cohort are provided in the supplement Table S1.

**1.2 Notes for individual cohorts:**

| Cohort | Study Design | Baseline Year(s) | Albuminuria type(s)* | Cystatin C available | Specific notes, including outcome ascertainment |
|---|---|---|---|---|---|
| **General and High-Risk Cohorts** | | | | | |
| ADVANCE | Clinical trial cohort | 2001-03 | ACR | No | This study is a clinical trial which includes participants with diabetes only. All outcomes were actively ascertained and verified by an adjudication committee blinded to the randomized treatment. |
| Aichi | Worker health checkup database | 2002-03 | Dipstick | No | Reports from the worksite's healthcare division, and self-report with or without hospital records review were used to ascertain cardiovascular diseases incidence. The former and the reports of the next of kin were used to ascertain mortality. |
| ARIC | Research Cohort | 1996-98 | ACR | Yes | Visit 4 was used as the baseline. Kidney failure replacement therapy was ascertained through linkage to the USRDS.[9] All-cause mortality was actively ascertained as well as through linkage to a registry. Cardiovascular mortality was ascertained through review of ICD codes. |
| AusDiab | Research Cohort | 1999-2000 | ACR | Yes | Linkage to National Death Index for all-cause mortality and other fatal outcomes. |
| Beijing | Research Cohort | 2004 | ACR | No | All-cause mortality was actively ascertained. |
| BIS | Research Cohort | 2009-11 | ACR, | No | Kidney failure replacement therapy was ascertained by self-report during follow-up and validated by health records. All-cause mortality was actively ascertained through information of the insurance company and death certificates. Cardiovascular mortality was ascertained through death certificates. All other outcomes were self-reported. |
| CARE | Clinical trial cohort | 1989-90 | Dipstick | No | All outcomes were actively ascertained by an independent review committee. |
| China NS | Research cohort | 2006-10 | ACR | No | All-cause mortality was actively ascertained. Cardiovascular mortality was ascertained from medical chart review of death due to CHD or stroke. |
| CHS | Research Cohort | 1996-97 | ACR | Yes | Kidney failure replacement therapy was ascertained through linkage to a registry. All-cause mortality was actively ascertained. Cardiovascular mortality was |

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|---|---|---|---|---|---|
| | | | | | ascertained through review of autopsies, death certificates, hospitalization records, and physician notes by the CHS Events Committee. |
| CIRCS | Research Cohort | 1986-93 | Dipstick | No | All-cause mortality was actively ascertained. Cardiovascular mortality was ascertained from medical chart review of fatal CHD or death within 30 days of an incident stroke. MI was ascertained by chart review. Stroke was ascertained by a physician panel reviewing medical charts and CT/MRI images for most cases. |
| COBRA | Research Cohort | 2004-05 | ACR | No | This study had no separate history of CHD, thus all participants with history of CVD were excluded from any of the analyses of CVD outcomes. Ascertainment of mortality and CVD mortality in COBRA was via active follow-up of participants and review of records (not linked registry). |
| ESTHER | Research Cohort | 2000-02 | Dipstick | Yes | All outcomes were actively ascertained by questionnaires sent to the study participants and their general practitioners 2, 5, 8, 11 and 14 years after the cohort's baseline assessment. In addition, fatal disease events were ascertained by a mortality register and ICD-10 codes of the leading cause of death on the death certificate. |
| Framingham | Research Cohort | 1981-86 | ACR | Yes | All outcomes from medical record review. |
| Geisinger | Healthcare administrative database | 2008-19 | ACR, PCR, Dipstick | No | Kidney failure replacement therapy was ascertained through linkage to a registry. No cause of death information available. Cardiovascular mortality was defined by any hospitalization with related ICD codes and died within 30 days. Baseline index date was set as the earliest date of a serum creatinine measurement after 2008 and at least one year after enrollment. |
| GLOMMS | Clinical database | 2010-19 | ACR, PCR | No | Kidney failure replacement therapy was ascertained through linkage to a registry. Baseline index date was set as the earliest date of a serum creatinine at least one year after enrollment. |
| Go-DARTs | Research cohort | 2004-12 | ACR | No | Kidney failure replacement therapy was ascertained through linkage to the Scottish Renal Registry plus eGFR<15 on two occasions at least 90 days apart. Baseline index date was set as the earliest date of a serum creatinine measurement at least one year after enrollment. |

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|---|---|---|---|---|---|
| Gubbio | Research Cohort | 1988-92 | ACR | No | All outcomes were actively ascertained. Cardiovascular mortality was ascertained via ICD codes for MI based on hospital diagnoses or death certificates. |
| ICES-KDT | Healthcare administrative database | 2008-17 | ACR, PCR, Dipstick | No | Kidney failure replacement therapy was ascertained through linkage to a registry and ICD codes. Baseline index date was set as the earliest date of a serum creatinine measurement at least one year after enrollment. |
| JHS | Research Cohort | 2000-04 | ACR | No | All-cause mortality and cardiovascular mortality and events were ascertained through active follow-up in annual follow-up phone calls as well as review of medical records for hospitalizations. Cardiovascular events are validated and adjudicated. |
| JMS | Research Cohort | 1992-95 | Dipstick | No | |
| J-SHC | Health checkup database | 2008 | Dipstick | No | To ascertain all-cause mortality, in each district, used the birth date, sex, death date, and address code to identify the subject in both the National database of death certificates and National Health Insurance agency. If not clear in that first step, as the study does not have names, they asked for help from public health nurses in each district to confirm deaths. The study does not have the name in both databases, but the public health nurse has both information such as who participated and who died after the screening. Final data was verified by Chiho Iseki, Okinawa Heart and Renal Association. Cardiovascular mortality was ascertained using ICD-10 codes for cause of death. |
| KP Hawaii | Clinical database | 2005-09 | PCR | No | Kidney failure replacement therapy was actively ascertained. |
| Maccabi | Healthcare administrative database | 2008-17 | ACR | No | Urine albumin-to-creatinine ratio measures above 300 were imputed by PCR measures. First creatinine after 2008 was selected. Kidney failure replacement therapy was actively ascertained. No cause of death information available. Cardiovascular mortality was defined by any hospitalization with related ICD codes and died within 30 days. Baseline index date was set as the earliest date of a serum creatinine measurement after 2008 and at least one year after enrollment. |
| MESA | Research cohort | 2000-02 | ACR | Yes | All participants free from previous cardiovascular disease at baseline. There was no information of kidney failure replacement therapy in this study. All-cause mortality was |

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|---|---|---|---|---|---|
| | | | | | actively ascertained. Cardiovascular mortality was ascertained through review of hospital records or, for participants who experienced out-of-hospital cardiovascular deaths, review of interviews with next of kin and physicians by the MESA morbidity and mortality review committee. |
| MRC | Research cohort | 1995-99 | Dipstick | No | Outcomes were ascertained through linkage with national death and hospitalization records. |
| Mt Sinai BioMe | Clinical database | 2008-15 | ACR, PCR | No | Kidney failure replacement therapy was ascertained through ICD codes. Cardiovascular events were ascertained from ICD codes at hospital discharge. No mortality information available. Baseline index date was set as the earliest date of a serum creatinine measurement after 2008 and at least one year after enrollment. |
| NHANES | Research cohort | 1988-2014 | ACR | Yes | The information of kidney failure replacement therapy is not available in for this analysis. All-cause mortality was ascertained through linkage to National Death Index files. Cardiovascular mortality was ascertained by ICD codes. |
| NIPPON DATA80 | Research cohort | 1980 | Dipstick | No | Cardiovascular mortality was ascertained by ICD codes from death certificates. |
| NIPPON DATA90 | Research cohort | 1990 | Dipstick | No | Cardiovascular mortality was ascertained by ICD codes from death certificates. |
| Ohasama | Research cohort | 1992-2011 | Dipstick | No | All-cause mortality was actively ascertained. Cardiovascular mortality was ascertained from ICD codes for fatal CHD or fatal stroke. Stroke included fatal stroke from ICD codes and ischemic and hemorrhagic stroke adjudicated by a physician panel. |
| Okinawa | Health screening | 1993-94 | Dipstick | No | Kidney failure replacement therapy was ascertained through linkage to a registry. |
| OLDW | Healthcare administrative database | 2012-2021 | ACR, PCR, Dipstick | No | This study used de-identified electronic health record (EHR) data from the Optum Labs Data Warehouse (OLDW). The database contains longitudinal health information on enrollees and patients, representing a diverse mixture of ages, ethnicities and geographical regions across the United States. The EHR-derived data includes a subset of EHR data that has been normalized and standardized into a single database.[10] Cohort inclusion criteria was more than 50 events of any outcome before excluding missing values of main exposure variables. Smoking status might be under measured in this study. All outcomes were defined by ICD codes from encounters. No |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | cause of death information available. Cardiovascular mortality was defined by any hospitalization with related ICD codes and died within 30 days. Baseline index date was set as the earliest date of a serum creatinine measurement after 2008 and at least one year after enrollment. |
| Pima | Research cohort | 1982-2007 | ACR | No | All-cause mortality was ascertained by linkage to the National Death Index. Cardiovascular mortality was adjudicated by review of all available clinical records and the ICD codes from the death certificate. Kidney failure replacement therapy was ascertained through review of clinical records. |
| PREVEND | Research cohort | 1997-98 | ACR | Yes | All-cause mortality was ascertained by linkage to a death registry. Cardiovascular mortality was ascertained by ICD codes from the death registry. Cardiovascular events were ascertained by ICD codes at hospital discharge. |
| Rancho Bernardo | Research cohort | 1992-96 | ACR | No | All-cause mortality was ascertained by linkage to a death registry. Cardiovascular mortality was ascertained by ICD codes from the death registry. Non-fatal cardiovascular events were ascertained by participant self-report. |
| RCAV | Healthcare administrative database | 2004-2011 | ACR, PCR | No | Kidney failure replacement therapy was ascertained through linkage to a registry. All other outcomes were defined by ICD codes from encounters. No cause of death information available. Cardiovascular mortality was defined by any hospitalization with related ICD codes and died within 30 days. Baseline index date was set as the earliest date of a serum creatinine at least one year after enrollment. |
| REGARDS | Research cohort | 2003-07 | ACR | Yes | Kidney failure replacement therapy was ascertained through linkage to USRDS.[9] All-cause mortality was actively ascertained. Cardiovascular mortality was ascertained through death certificates, medical records, and autopsy reports obtained to adjudicate cause of death. |
| SCREAM | Clinical database | 2008-18 | ACR, Dipstick | Yes | Kidney failure replacement therapy was actively ascertained through linkage to a registry that validates these endpoints through medical record comparison. All other non-mortality outcomes were defined by ICD codes from encounters. Baseline index date was set as the earliest date of a serum creatinine measurement after 2008 and at least one year after enrollment. |

| | | | | | |
|---|---|---|---|---|---|
| SEED | Research cohort | 2004-11 | ACR | No | All-cause mortality, cardiovascular mortality, acute myocardial infarction, stroke and kidney failure replacement therapy were ascertained by linkage to National Disease Registry and Death Registry. |
| SHARP | Clinical trial cohort | 2003-2007 | ACR | No | All outcomes were actively ascertained. |
| SMART | Research cohort | 1996-2018 | ACR | No | Kidney failure replacement therapy was actively ascertained (with chart validation). All-cause mortality was actively ascertained. Cardiovascular outcomes were adjudicated by a physician panel. |
| STOP-CKDu | Research cohort | 2018 | PCR | No | All-cause mortality was ascertained through active participant contact, medical record review, and verbal autopsy. |
| Taiwan MJ | Research cohort | 1994-2011 | Dipstick | No | Cardiovascular mortality was ascertained from ICD codes. |
| Takahata | Research cohort | 2004 | ACR, PCR, Dipstick | No | Cardiovascular mortality was ascertained from ICD codes from death certificates. |
| TLGS | Research cohort | 1999-2001 | Dipstick | No | Cardiovascular mortality was ascertained by cause of death adjudicated by a physician panel. |
| UK BioBank | Clinical database | 2007-10 | ACR | Yes | All-cause mortality was ascertained by linkage to a death registry. Cardiovascular mortality was ascertained by ICD codes from the death registry. All other outcome events were ascertained by ICD codes at hospital discharge. |
| ULSAM | Research cohort | 1991-95 | ACR | Yes | All-cause mortality was ascertained by linkage to a death registry. Cardiovascular mortality was ascertained by ICD codes from the death registry. All other outcome events were ascertained by ICD codes at hospital discharge. |
| ZODIAC | Research cohort | 1998-2002 | ACR | No | Mortality was ascertained by coupling information with the official death registration in the Netherlands, and where possible, ascertained cause of death with the GPs. |
| **CKD Cohorts** | | | | | |
| AASK | Clinical trial cohort | 1995-98 | PCR | Yes | This study only had black participants. Kidney failure replacement therapy and all-cause mortality were actively ascertained. There was no information of cardiovascular mortality. |
| BC CKD | Clinical database | 2012 | ACR, PCR | No | Kidney failure replacement therapy was actively ascertained. |
| CanPREDDICT | Research cohort | 2008 | ACR, PCR | No | Kidney failure replacement therapy was actively ascertained. |

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|---|---|---|---|---|---|
| CKD-JAC | Research cohort | 2007-08 | ACR, PCR | No | All outcomes were actively ascertained. Cardiovascular events were adjudicated by an independent committee. |
| CKD-REIN | Research cohort | 2013-15 | ACR, PCR | Yes | All outcomes were actively ascertained. Furthermore, kidney failure with replacement therapy and all-cause mortality were also ascertained through linkage with national registries. Cardiovascular deaths were adjudicated by 2 cardiologists. |
| CRIB | Research cohort | 1996-98 | ACR, Dipstick | Yes | Kidney failure replacement therapy was actively ascertained (with chart validation). |
| CRIC | Research cohort | 2003-08 | ACR, PCR | Yes | Kidney failure replacement therapy was actively ascertained with chart validation as well as through linkage to a registry. All-cause mortality was actively ascertained as well as through linkage to a registry. Cardiovascular mortality was ascertained through adjudicated chart review. |
| CURE-CKD | Healthcare administrative database | 2007-17 | ACR, PCR | No | All outcomes were ascertained from ICD codes. |
| GCKD | Research Cohort | 2010-12 | ACR | Yes | All outcomes were actively ascertained (with confirmation in medical chart review). |
| Gonryo | Research Cohort | 2006-08 | PCR, Dipstick | No | All outcomes were actively ascertained. |
| Hong Kong CKD | Clinical database | 2007-12 | PCR | No | All outcomes were actively ascertained. Cardiovascular events and mortality were adjudicated by a physician panel. |
| ICKD | Research Cohort | 2013-19 | ACR | No | All outcomes were actively ascertained through direct contact with participants and medical record review. |
| LCC | Clinical database | 2011 | ACR, PCR | No | All-cause mortality was ascertained from medical records. All other outcomes ascertained through ICD codes from hospital discharge. |
| MASTERPLAN | Clinical trial cohort | 2004-05 | ACR, PCR | Yes | All outcomes were actively ascertained. |
| MDRD | Clinical trial cohort | 1989-91 | PCR | Yes | Kidney failure replacement therapy and all-cause mortality were actively ascertained as well as through linkage to a registry. Cardiovascular mortality was ascertained through review of ICD codes. Due to super low eGFR in this study, eGFR was modeled as linear term without knot. |
| MMKD | Research cohort | 1997-98 | PCR | No | Kidney failure replacement therapy was actively ascertained. |
| Nanjing CKD | Research cohort | 2003-15 | PCR, Dipstick | No | All outcomes were actively ascertained. |

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| NEFRONA | Research cohort | 2009-12 | ACR, PCR | No | Participants free from previous cardiovascular disease at baseline. Cardiovascular events were ascertained by ICD codes from referring physicians. |
| NephroTest | Research cohort | 2000-12 | ACR, PCR | No | All-cause mortality and cardiovascular mortality and events were actively ascertained. Kidney failure replacement therapy was ascertained through linkage to a registry. |
| NRHP-URU | Clinical database | 2001-14 | ACR, PCR, Dipstick | No | Kidney failure replacement therapy was ascertained through linkage to a registry. |
| PSP-CKD | Clinical database | 2010-13 | ACR, PCR, Dipstick | No | All-cause mortality was ascertained from medical records. All other outcomes ascertained through ICD codes from hospital discharge. |
| PSPA | Research cohort | 2009-10 | PCR | No | Kidney failure replacement therapy was actively ascertained as well as through linkage to a registry. All-cause and cardiovascular mortality were actively ascertained. |
| RENAAL | Clinical trial cohort | 1996-98 | ACR | No | All outcomes were actively ascertained (with physician panel adjudication). |
| SKS | Research cohort | 2002-16 | PCR | No | All outcomes were actively ascertained (with physician panel adjudication). |
| SRR-CKD | Renal registry | 2005-11 | ACR | No | All-cause mortality was ascertained from medical records. Kidney failure replacement therapy was ascertained through linkage to a registry. |
| Sunnybrook | Clinical database | 2001-10 | ACR, PCR, Dipstick | No | Kidney failure replacement therapy was ascertained through linkage to a registry. All other outcomes ascertained through ICD codes from hospital discharge. |
| West of Scotland CKD | Clinical database | 2009-18 | ACR, PCR, Dipstick | No | Kidney failure replacement therapy, hospitalizations, myocardial infarction, stroke, heart failure, atrial fibrillation and peripheral arterial disease were actively ascertained and prospectively recorded by clinical staff in the renal electronic record. All-cause mortality was additionally ascertained by linkage to non-renal electronic health records. |
| YWSCC | Clinical database | 2017 | ACR, PCR, Dipstick | No | |

*Type of albuminuria used in analyses with a preference for ACR. Does not necessarily indicate all types available within the cohort.

## Appendix 2. Acronyms or abbreviations for cohorts included in the current study and their key references linked to the Web references

| General population and High Cardiovascular Risk Cohorts | |
|---|---|
| ADVANCE | The Action in Diabetes and Vascular Disease: Preterax and Diamicron Modified Release Controlled Evaluation (ADVANCE) trial[11] |
| Aichi | Aichi Workers' Cohort Study[12] |
| ARIC | Atherosclerosis Risk in Communities Study[13] |
| AusDiab | Australian Diabetes, Obesity, and Lifestyle Study[14] |
| Beijing | Beijing Cohort Study[15] |
| BIS | Berlin Initiative Study[16] |
| CARE | The Cholesterol and Recurrent Events (CARE) Trial[17] |
| China NS | The China National Survey of Chronic Kidney Disease |
| CHS | Cardiovascular Health Study[18] |
| CIRCS | Circulatory Risk in Communities Study[19] |
| COBRA | Control Of Blood Pressure and Risk Attenuation Study[20] |
| ESTHER | Epidemiologische Studie zu Chancen der Verhütung, Früherkennung und optimierten THerapie chronischer ERkrankungen in der älteren Bevölkerung [GERMAN][21] |
| Framingham | Framingham Heart Study[22] |
| Geisinger | Geisinger Health System[23] |
| GLOMMS | Grampian Laboratory Outcomes, Morbidity and Mortality Studies[24] |
| Go-DARTs | Genetics of Diabetes Audit and Research in Tayside Scotland[25] |
| Gubbio | Gubbio Study[26] |
| ICES-KDT | ICES, Provincial Kidney, Dialysis and Transplantation program (ICES KDT)[27] |
| JHS | Jackson Heart Study[28] |
| JMS | Jichi Medical School cohort |
| J-SHC | Japan Specific Health Checkups Study[29] |
| KP Hawaii | Kaiser Permanente Hawaii Cohort[30] |
| Maccabi | Maccabi Health System[31] |
| MESA | Multi-Ethnic Study of Atherosclerosis[32] |
| MRC | MRC Study of assessment of older people[33] |
| Mt Sinai BioMe | Mount Sinai BioMe Biobank Platform[34] |
| NHANES | US National Health and Nutrition Examination Survey, using both NHANES III and the continuous NHANES from 1999-2010[35] |
| NIPPON DATA80 | National Integrated Project for Prospective Observation of Non-communicable Disease And its Trends in the Aged 1980[36] |
| NIPPON DATA90 | National Integrated Project for Prospective Observation of Non-communicable Disease And its Trends in the Aged 1990[37] |
| Ohasama | Ohasama Study[38] |
| Okinawa | Okinawa 93-96 Cohort[39] |
| OLDW | Optum Labs Data Warehouse |
| Pima | Pima Indian Study[40] |
| PREVEND | Prevention of Renal and Vascular End-stage Disease Study[41] |
| Rancho Bernardo | Rancho Bernardo Study[42] |
| RCAV | Racial and Cardiovascular Risk Anomalies in CKD Cohort[43] |
| REGARDS | Reasons for Geographic And Racial Differences in Stroke Study[44] |
| SCREAM | Stockholm CREAtinine Measurements Project[45] |

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| SEED | Singapore Epidemiology of Eye Diseases[46] |
| SHARP | Study of Heart and Renal Protection |
| SMART | Second Manifestations of ARTerial Disease Study[47] |
| STOP-CKDu | Study to Test and Operationalize Preventive Approaches for CKD of Undetermined Etiology in Andhra Pradesh, India |
| Taiwan MJ | Taiwan MJ Cohort Study[48] |
| Takahata | Takahata Study[49] |
| TLGS | Tehran Lipid and Glucose Study[50] |
| UK BioBank | The United Kingdom Biobank Study[51] |
| ULSAM | Uppsala Longitudinal Study of Adult Men[52] |
| ZODIAC | Zwolle Outpatient Diabetes project Integrating Available Care[53] |
| **CKD cohorts** | |
| AASK | African American Study of Kidney Disease and Hypertension[54] |
| BC CKD | British Columbia CKD Study[55] |
| CanPREDDICT | Canadian Study of Prediction of Death, Dialysis and Interim Cardiovascular Events[56] |
| CKD-JAC | Chronic Kidney Disease Japan Cohort[57] |
| CKD-REIN | Chronic Kidney Disease - Renal Epidemiology and Information Network Collaboration (CKD-REIN) cohort[58] |
| CRIB | Chronic Renal Impairment in Birmingham[59] |
| CRIC | Chronic Renal Insufficiency Cohort Study[60] |
| CURE-CKD | Center for Kidney Disease Research, Education, and Hope[61] |
| GCKD | German Chronic Kidney Disease Study[62] |
| Gonryo | Gonryo Study[63] |
| Hong Kong CKD | Hong Kong CKD Studies[64] |
| ICKD | Indian Chronic Kidney Disease Study[65] |
| LCC | The Leicester City and County Chronic Kidney Disease Cohort[66] |
| MASTERPLAN | Multifactorial Approach and Superior Treatment Efficacy in Renal Patients with the Aid of a Nurse Practitioner[67] |
| MDRD | Modification of Diet in Renal Disease Study[68] |
| MMKD | Mild to Moderate Kidney Disease Study[69] |
| Nanjing CKD | Nanjing CKD Network Cohort |
| NEFRONA | Observatorio Nacional de Aterosclerosis en Nefrologia[70] |
| NephroTest | NephroTest Study[71] |
| NRHP-URU | National Renal Healthcare Program - Uruguay |
| PSP-CKD | Primary-Secondary Care Partnership to Prevent Adverse Outcomes in Chronic Kidney Disease[72] |
| PSPA | Parcours de Soins des Personnes Agées[73] |
| RENAAL | Reduction of Endpoints in NIDDM with the Angiotensin II Antagonist Losartan[74] |
| SKS | Salford Kidney Study[75] |
| SRR-CKD | Swedish Renal Registry CKD Cohort[76] |
| Sunnybrook | Sunnybrook Cohort[77] |
| West of Scotland CKD | West of Scotland study[78] |
| YWSCC | Yonsei Wonju Severance CKD Cohort |

## Appendix 3. Acknowledgements and funding for collaborating cohorts

| Cohort | List of sponsors |
|---|---|
| AASK | AASK was supported by grants to each clinical center and the coordinating center from the National Institute of Diabetes and Digestive and Kidney Diseases. In addition, AASK was supported by the Office of Research in Minority Health (now the National Center on Minority Health and Health Disparities, NCMHD) and the following institutional grants from the National Institutes of Health: M01 RR-00080, M01 RR-00071, M0100032, P20-RR11145, M01 RR00827, M01 RR00052, 2P20 RR11104, RR029887, and DK 2818-02. King Pharmaceuticals provided monetary support and antihypertensive medications to each clinical center. Pfizer Inc, AstraZeneca Pharmaceuticals, Glaxo Smith Kline, Forest Laboratories, Pharmacia and Upjohn also donated antihypertensive medications. |
| ADVANCE | ADVANCE was supported by research grants from Servier International and from the National Health and Medical Research Council (NHMRC) of Australia program grants 358395, 571281, 1052555 and 1149987 and project grant 211086 |
| Aichi | KAKENHI (09470112, 13470087, 17390185, 18590594, 20590641, 20790438, 22390133, 26293153, 18H03057) |
| ARIC | The Atherosclerosis Risk in Communities study has been funded in whole or in part with Federal funds from the National Heart, Lung, and Blood Institute, National Institutes of Health, Department of Health and Human Services, under Contract nos. (HHSN268201700001I, HHSN268201700003I, HHSN268201700005I, HHSN268201700004I, HHSN2682017000021). The authors thank the staff and participants of the ARIC study for their important contributions. |
| AusDiab | We wish to thank the AusDiab Steering Committee for providing data from the AusDiab study. Funding from NHMRC of Australia, Grant #1007544. |
| BC CKD | BC Provincial Renal Agency, an Agency of the Provincial Health Services Authority in collaboration with University of British Columbia. |
| Beijing | The research for this study was supported by the Program for New Century Excellent Talents in University (BMU2009131) from the Ministry of Education of the People's Republic of China, and the grants for the Early Detection and Prevention of Non-communicable Chronic Diseases from the International Society of Nephrology Research Committee. |
| BIS | Foundation for Preventive Medicine of the KfH (Kuratorium für Heimdialyse und Nierentransplantation e.V. – Stiftung Präventivmedizin; www.kfh-stiftung-praeventivmedizin.de). Verband deutscher Nierenzentren (DDnÄ) |
| CanPREDDICT | N/A |
| CARE | Alberta Heritage Foundation for Medical Research/Alberta Innovates Health Solutions Interdisciplinary Team Grants Program |
| China NS | N/A |
| CHS | This research was supported by contracts HHSN268201200036C, HHSN268200800007C, HHSN268201800001C, N01HC55222, N01HC85079, N01HC85080, N01HC85081, N01HC85082, N01HC85083, N01HC85086, 75N92021D00006, and grants U01HL080295 and U01HL130114 from the National Heart, Lung, and Blood Institute (NHLBI), with additional contribution from the National Institute of Neurological Disorders and Stroke (NINDS). Additional support was provided by R01AG023629 from the National Institute on Aging (NIA). A full list of principal CHS investigators and institutions can be found at CHS-NHLBI.org. |
| CIRCS | N/A |
| CKD-JAC | The CKD-JAC Study was financially supported by Kyowa Kirin Co., Ltd. |
| CKD-REIN | CKD-REIN is funded by the *Agence Nationale de la Recherche* through the 2010 «*Cohortes-Investissements d'Avenir* » program (ANR-IA-COH-2012/3731) and by the 2010 national *Programme Hospitalier de Recherche Clinique.* CKD-REIN is also supported through a public-private partnership with Fresenius Medical Care and |

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| | GlaxoSmithKline (GSK) since 2012 and Vifor France since 2018, Sanofi-Genzyme from 2012 to 2015, Baxter and Merck Sharp & Dohme-Chibret (MSD France) from 2012 to 2017, Amgen from 2012 to 2020, Lilly France from 2013 to 2018, Otsuka Pharmaceutical from 2015 to 2020, AstraZeneca from 2018 to 2021 and Boehringer Ingelheim France since 2022. |
| COBRA | Wellcome Trust, UK |
| CRIB | British Renal Society Project Grant Award<br>British Heart Foundation Project Grant Award. |
| CRIC | Funding for the CRIC Study was obtained under a cooperative agreement from National Institute of Diabetes and Digestive and Kidney Diseases (*U01DK060990, U01DK060984, U01DK061022, U01DK061021, U01DK061028, U01DK060980, U01DK060963, U01DK060902 and U24DK060990*). In addition, this work was supported in part by: the Perelman School of Medicine at the University of Pennsylvania Clinical and Translational Science Award NIH/NCATS *UL1TR000003*, Johns Hopkins University *UL1 TR-000424*, University of Maryland *GCRC M01 RR-16500*, Clinical and Translational Science Collaborative of Cleveland, *UL1TR000439* from the National Center for Advancing Translational Sciences (NCATS) component of the National Institutes of Health and NIH roadmap for Medical Research, Michigan Institute for Clinical and Health Research (MICHR) *UL1TR000433*, University of Illinois at Chicago CTSA *UL1RR029879*, Tulane COBRE for Clinical and Translational Research in Cardiometabolic Diseases *P20 GM109036*, Kaiser Permanente NIH/NCRR *UCSF-CTSI UL1 RR-024131*, Department of Internal Medicine, University of New Mexico School of Medicine Albuquerque, *NM R01DK119199*. |
| CURE-CKD | The CURE-CKD registry was supported by institutional funding from Providence St. Joseph health and the University Of California, Los Angeles and by grant 75D301-19-Q-69877 from the US Centers for Disease Control and Prevention. |
| ESTHER | Ministry of Research, Science and the Arts Baden-Württemberg (Stuttgart, Germany), Federal Ministry of Education and Research (Berlin, Germany), Federal Ministry of Family Affairs, Senior Citizens, Women and Youth (Berlin, Germany), Saarland state Ministry for Social Affairs, Health, Women and Family Affairs (Saarbrücken, Germany). Measurement of urinary albumin was funded by Dade-Behring, Marburg, Germany. |
| Framingham | NHLBI Framingham Heart Study (N01-HC-25195). |
| GCKD | The GCKD study is supported by grants from the Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung; www.bmbf.de), FKZ 01ER 0804, 01ER 0818, 01ER 0819, 01ER 0820, 01ER 0821, and 01ER 0822, and the Foundation for Preventive Medicine of the KfH (Kuratorium für Heimdialyse und Nierentransplantation e.V. – Stiftung Präventivmedizin; www.kfh-stiftung-praeventivmedizin.de) and corporate partners (for a list see www.gckd.org). The GCKD investigators gratefully acknowledge the expert support of all members of study staff, the dedicated contribution of all collaborating nephrologists (for a list of contributors and the 169 study sites, see www.gckd.org) and the support of patients participating in the study. The work of AK was supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) Project ID 431984000 SFB 1453. |
| Geisinger | Geisinger Clinic; NIDDK R01DK100446 |
| GLOMMS | GLOMMS was initially funded, in first version, by a grant from Chief Scientist Office CZH/4/656. GLOMMS was subsequently expanded with support from a starter grant from the Academy of Medical Sciences, Wellcome Trust; Medical Research Council, British Heart Foundation; Arthritis Research UK; the Royal College of Physicians; and Diabetes UK [SGL020\1076]; and a research training fellowship from the Wellcome Trust [102729/Z/13/Z]. The GLOMMS study also acknowledges support from the Grampian Data Safe Haven (DaSH) facility within the Aberdeen Centre for Health Data Science and the associated financial support of |

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| | the University of Aberdeen, and National Health Service (NHS) Research Scotland (through NHS Grampian investment in DaSH). More information is available at the DaSH website: http://www.abdn.ac.uk/iahs/facilities/grampian-data-safe-haven.php. |
| Go-DARTs | The Wellcome Trust United Kingdom Type 2 Diabetes Case Control Collection (supporting GoDARTS) was funded by the Wellcome Trust, under grants 072960/Z/03/Z, 084726/Z/08/Z, 084727/Z/08/Z, 085475/Z/08/Z, and 085475/B/08/Z. |
| Gonryo | This study was supported by grants from Astellas Pharm Inc. and the Miyagi Kidney Foundation. |
| Gubbio | Municipal and Health Authorities of Gubbio, Italy; Center of Gubbio Epidemiological Studies, Gubbio, Italy; University of Naples "Federico II", Naples, Italy. |
| Hong Kong CKD | This study was supported by the Hong Kong Health Service Research Funds and Fund support from Sanofi Renal. |
| ICES-KDT | This study was conducted at the ICES Western Site. ICES is funded by an annual grant from the Ontario Ministry of Health and Long-Term Care. ICES Western is funded by an operating grant from the Academic Medical Organization of Southwestern Ontario. This project was conducted with members of the provincial ICES Kidney, Dialysis and Transplantation Research Program (www.ices.on.ca/kdt), which receives programmatic grant funding from the Canadian Institutes of Health Research. Dr. Amit Garg is supported by the Dr. Adam Linton Chair in Kidney Health Analytics. This study was supported by ICES, which is funded by an annual grant from the Ontario Ministry of Health (MOH) and the Ministry of Long-Term Care (MLTC). The opinions, results and conclusions reported in this paper are those of the authors and are independent from the funding sources. No endorsement by ICES, the MOH or MLTC is intended or should be inferred. Parts of this material are based on data and/or information compiled and provided by CIHI and the Ontario Ministry of Health. The analyses, conclusions, opinions and statements expressed herein are solely those of the authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred. |
| ICKD | This study is funded by a grant by the Department of Biotechnology, Government of India (No. BT/PR11105/MED/30/1345/2014). |
| JHS | The Jackson Heart Study (JHS) is supported and conducted in collaboration with Jackson State University (HHSN268201800013I), Tougaloo College (HHSN268201800014I), the Mississippi State Department of Health (HHSN268201800015I) and the University of Mississippi Medical Center (HHSN268201800010I, HHSN268201800011I and HHSN268201800012I) contracts from the National Heart, Lung, and Blood Institute (NHLBI) and the National Institute on Minority Health and Health Disparities (NIMHD). The authors also wish to thank the staffs and participants of the JHS. |
| JMS | N/A |
| J-SHC | This study was supported by a Health and Labor Sciences Research Grant for "Design of the Comprehensive Health Care System for Chronic Kidney Disease (CKD) based on the Individual Risk Assessment by Specific Health Checkup" from the Ministry of Health, Labor and Welfare of Japan and a Grant-in-Aid for "Research on Advanced Chronic Kidney Disease (REACH-J), Practical Research Project for Renal Disease" from the Japan Agency for Medical Research and Development (AMED). |
| KP Hawaii | N/A |
| LCC | Funded by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care (CLAHRC) East Midlands and Kidney Research UK (Grant TF2/2015) |
| Maccabi | N/A |
| MASTERPLAN | The MASTERPLAN study is a clinical trial with trial registration ISRCTN registry: 73187232. Sources of funding: The MASTERPLAN Study was supported by grants from the Dutch Kidney Foundation (Nierstichting Nederland, number PV 01), and the |

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| MDRD | NIDDK UO1 DK35073 and K23 DK67303, K23 DK02904 |
| MESA | This research was supported by contracts HHSN268201500003I, N01-HC-95159, N01-HC-95160, N01-HC-95161, N01-HC-95162, N01-HC-95163, N01-HC-95164, N01-HC-95165, N01-HC-95166, N01-HC-95167, N01-HC-95168 and N01-HC-95169 from the National Heart, Lung, and Blood Institute and by grants UL1-TR-000040 and UL1-TR-001079 from NCRR. The authors thank the other investigators, the staff, and the participants of the MESA study for their valuable contributions. A full list of participating MESA investigators and institutions can be found at http://www.mesa-nhlbi.org. |
| MMKD | The MMKD study was funded by the Austrian Heart Fund and by the Innsbruck Medical University. |
| MRC | UK Medical Research Council, Department of Health for England, Wales and the Scottish Office and Kidney Research UK |
| Mt Sinai BioMe | N/A |
| Nanjing CKD | N/A |
| NEFRONA | The NEFRONA study was funded by research grants from Abvie, and Instituto de Salud Carlos III (PI16/01354, PI18/00610, RD16/0009/0011 (Co-funded by European Regional Development Fund "A way to make Europe"). |
| NephroTest | The NephroTest CKD cohort study is supported by grants from: Inserm GIS-IReSP AO 8113LS TGIR; French Ministry of Health AOM 09114 and AOM 10245; Inserm AO 8022LS; Agence de la Biomédecine R0 8156LL, AURA, and Roche 2009-152-447G. The Nephrotest initiative was also sponsored by unrestricted grants from F.Hoffman-La Roche Ltd.<br>The authors thank the collaborators and the staff of the NephroTest Study: François Vrtovsnik, Eric Daugas, Martin Flamant, Emmanuelle Vidal-Petiot (Bichat Hospital); Alexandre Karras, Eric Thervet, P. Houillier, M. Courbebaisse, D. Eladari (European Georges Pompidou Hospital ); Jean-Jacques Boffa, Pierre Ronco, H. Fessi, Eric Rondeau, Emmanuel Letavernier, Jean Philippe Haymann, P. Urena-Torres (Tenon Hospital) |
| NHANES | United States Center for Disease Control |
| NIPPON 80/90 | A Grant-in-Aid from the Ministry of Health, Labour and Welfare under the auspices of the Japanese Association for Cerebro-cardiovascular Disease Control, a Research Grant for Cardiovascular Diseases (7A-2) from the Ministry of Health, Labour and Welfare, and Health and Labour Sciences Research Grants, Japan (Comprehensive Research on Aging and Health [H11- Chouju-046, H14-Chouju-003, H17-Chouju-012, H19-Chouju-Ippan-014] and Comprehensive Research on Life-Style Related Diseases including Cardiovascular Diseases and Diabetes Mellitus [H22-Junkankitou-Seishuu- Sitei-017, H25-Junkankitou-Seishuu-Sitei-022, H30-Junkankitou-Seishuu-Sitei-002]) |
| NRHP-URU | The NRHP-URU is supported by the Fondo Nacional de Recursos (public / private institution that provides high-cost medical acts for all inhabitants of Uruguay) and a grant of ISN. |
| Ohasama | Comprehensive Research on Cardiovascular and Life-Style Related Diseases (H26-Junkankitou [Seisaku]-Ippan-001) and (H29–Junkankitou–Ippan–003) from the Ministry of Health, Labor and Welfare, Japan; Japan Atherosclerosis Prevention Fund. |
| Okinawa | Research Working Group for Establishing Guidelines for Clinical Evaluation of Chronic Kidney Disease; AMED 20mk0101172h0001 |
| OLDW | N/A |
| Pima | This work was supported by the Intramural Research Program of the National Institute of Diabetes and Digestive and Kidney Diseases. |

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| PSPA | Financial support for the PSPA project including disclosure of financial interests: Agence de Biomedecine (Grant 2009 & 2012), Société Francophone de Néphrologie et de Dialyse (Grant 2014) and compagnies Roche, Baxter, Amgen, and Fresenius. The funders played no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.<br><br>French centers that participated in the study (heads of departments, investigators): Y Lemeur (Chu Brest), T Lobbedez (CHU Caen), C Passeron (CH Cannes), A Djema (CH Cholet), M Matignon (APHP, Creteil), P Zaoui (CHU Grenoble), I Farah (CH Le mans), E Boulanger (CHU Lille), V Allot (CHU Limoges), S Roche (CH Macon), J Sampol (Clinique Bouchard, Marseille), D Babici (CH Mulhouse), O Moranne (CHU Nice), M Souid (CH Poissy), F Bridoux (CHU Poitiers), C Vigneau (CHU Rennes), J Potier (CH St Brieuc), C Mariat (CHU St Etienne), E Renaudineau (CH Saint Malo), S Roueff (CH Saint Maurice), A Kolko-Labadens (Hopital Foch), M Francois (CHU Tours), L Vrigneaud, D Fleury (CH Valenciennes), Didier Aguiléra (CH Vichy). |
| PSP-CKD | The PSP-CKD study was funded by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care (CLAHRC) East Midlands. Ongoing support for the study is funded by NIHR CLAHRC East Midlands and Kidney Research UK (Grant TF2/2015). |
| Rancho Bernardo | NIA AG07181 and AG028507 NIDDK DK31801 |
| RCAV | This study was supported by grant R01DK096920 from NIH-NIDDK and is the result of work supported with resources and the use of facilities at the Memphis VA Medical Center and the Long Beach VA Medical Center. Support for VA/CMS data is provided by the Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, Health Services Research and Development, VA Information Resource Center (project numbers SDR 02-237 and 98-004). |
| REGARDS | This research project is supported by cooperative agreement U01 NS041588 co-funded by the National Institute of Neurological Disorders and Stroke (NINDS) and the National Institute on Aging (NIA), National Institutes of Health, Department of Health and Human Service. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NINDS or the NIA. Representatives of the NINDS were involved in the review of the manuscript but were not directly involved in the collection, management, analysis or interpretation of the data. The authors thank the other investigators, the staff, and the participants of the REGARDS study for their valuable contributions. A full list of participating REGARDS investigators and institutions can be found at: https://www.uab.edu/soph/regardsstudy/<br><br>Additional funding was provided by National Heart, Lung, and Blood Institute (NHLBI) grant R01 HL080477. Representatives from NHLBI did not have any role in the design and conduct of the study, the collection, management, analysis, and interpretation of the data, or the preparation or approval of the manuscript. |
| RENAAL | This study was supported by Merck and Company. |
| SCREAM | This study was supported by Swedish Research Council and the Swedish Heart and Lung Foundation. |
| SEED | This study was supported by grants from the Singapore Ministry of Health's National Medical Research Council (NMRC), NMRC/STaR/0003/2008, NMRC/0796/2003, NMRC/1249/2010, NMRC/TA/0008/2012, Duke-NUS-KMRA/2015/0003, NMRC CIRG/1371/2013, NMRC/STaR/016/2013/ and NMRC/OFLCG/001/2017. |

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| SHARP | SHARP was funded by Merck/Schering-Plough Pharmaceuticals (North Wales, PA), with additional support from the Australian National Health and Medical Research Council, the British Heart Foundation, and the UK Medical Research Council. SHARP was initiated, conducted, and interpreted independently of the principal study funder (Merck & Co. and Schering Plough Corp., which merged in 2009). The authors thank the participants in the SHARP trials, as well as the local clinical center staff, regional and national coordinators, steering committees, and data monitoring committees. |
| SKS | Unrestricted educational grant from SHIRE. |
| SMART | Funded by the University Medical Center Utrecht. |
| SRR-CKD | The SRR-CKD is a national health care quality register funded by The Swedish Association of Local Authorities and Regions, which is an organisation that represents and advocates for local government in Sweden. All of Sweden's municipalities, county councils and regions are members. |
| STOP-CKDu | This study is funded by a grant from the Government of Andhra Pradesh (GoAP) (grant no. 38248/CKD/NCD/2017). |
| Sunnybrook | N/A |
| Taiwan MJ | This study was supported in part by Taiwan Ministry of Health and Welfare Clinical Trial Center (MOHW109-TDU-B-212-114004), MOST Clinical Trial Consortium for Stroke (MOST 109-2321-B-039-002), China Medical University Hospital (DMR-109-231), Tseng-Lien Lin Foundation, Taichung, Taiwan. |
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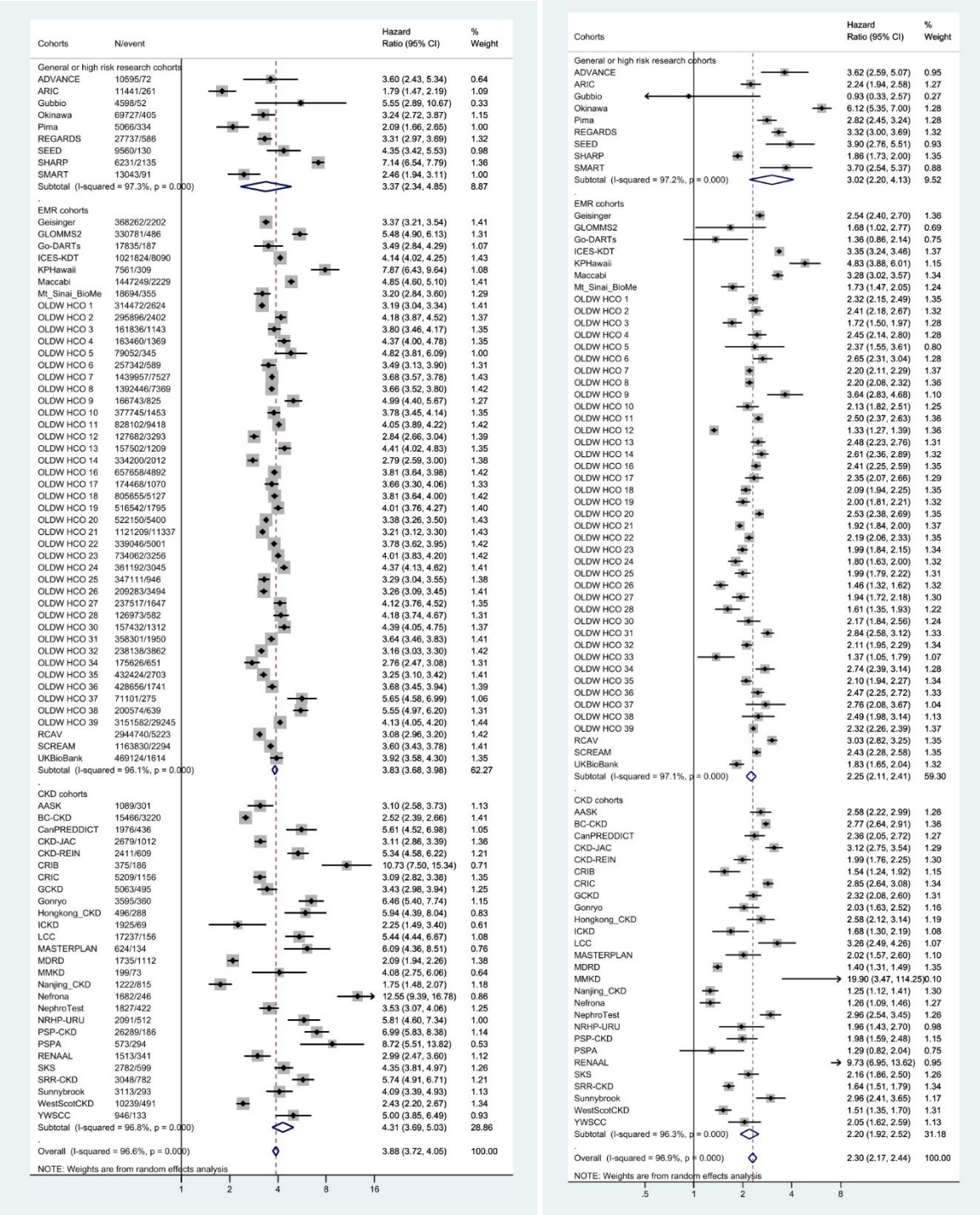
**Supplemental Figure 1. Forest plot of hazard ratios associated with kidney failure with replacement therapy, stratified into general population cohorts, electronic health record cohorts, and CKD cohorts: from the continuous model: eGFR (first panel) and albuminuria (second panel)**




*The forest plot depicts adjusted hazard ratios derived in each cohort using the continuous model depicted in Table 3. The first panel depicts the coefficient for the spline term for eGFR <60 ml/min/1,73 m2, expressed per 15

ml/min/1.73 m2 lower eGFR value. The second panel reflects the coefficient for the albuminuria coefficient, expressed per 8-fold higher albuminuria.

**N/n also included people missing albuminuria, which was modeled with an indicator variable. The median cohort % with albuminuria was 66 (6.3-100%) in the analytical eGFRcr population.

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