

Analytical Methods: the Kidney Early Evaluation Program (KEEP) 2000-2006

Database Design and Study Participants

The Kidney Early Evaluation program (KEEP) is a free, community-based health screening program that targets populations at high risk for kidney disease. A pilot program conducted in 1997 screened almost 900 individuals and showed that targeted populations aged 18 years and older, with history of diabetes or hypertension, or with a first order relative with diabetes, hypertension, or kidney disease, were highly likely to show evidence of kidney damage, microalbuminuria, and reduced kidney function. In August 2000, the National Kidney Foundation (NKF) officially launched the KEEP program nationwide. Now in its seventh year, the program has screened more than 90,000 participants from 49 states and the District of Columbia.

General Criteria for Inclusion in KEEP Data Analysis

In this Annual Data Report, we report only eligible participants as defined elsewhere in this supplement.¹ Most analyses are descriptive. Due to missing responses by KEEP survey participants, we used the following inclusion criteria:

- In the overall analysis, we include all eligible participants.
- In analyses by any participant characteristic, we exclude subjects with missing values for that characteristic. For example, when we report participant distribution by race or by self-reported disease, we exclude participants with missing values for race or self-reported disease. We report the specific exclusions under each figure.
- For all percent distribution analyses, denominators include only eligible participants without missing data for the specific characteristics.

- In the race/ethnicity categories, racial groups are white, African American, Native American, or other in most analyses, and participants with missing values for race were excluded. Ethnicity groups are Hispanic and non-Hispanic, and participants with missing values for ethnicity were treated as non-Hispanic.
- In the age category, participants are grouped as follows: 18-30, 31-45, 46-60, 61-75, and ≥ 75 years.
- When calculating the means of biochemical measures such as blood pressure, blood glucose, estimated glomerular filtration rate (eGFR), hemoglobin, and so on, participants with missing values for these measures were excluded.
- In any analyses involving multiple participant characteristics or biochemical measures, participants with any missing values for those characteristics or measures were excluded.

Definitions

Chronic Kidney Disease

- eGFR by NKF Kidney Disease Outcomes Quality Initiative (K/DOQI) Modification of Diet in Renal Disease (MDRD), < 60 mL/min (1.00 mL/s) per 1.73 m^2 or $\text{eGFR} \geq 60$ mL/min (1.00 mL/s) per 1.73 m^2 and albumin/creatinine ratio (ACR) ≥ 30 mg/g.

GFR was estimated using the re-expressed 4-variable MDRD Study equation for calibrated serum creatinine values: $\text{GFR} = 175 \times \text{standardized } S_{\text{cr}}^{-1.154} \times \text{age}^{-0.203} \times 1.212$ [African Americans] $\times 0.742$ [women]. Detailed information is available elsewhere in this supplement.²

Chronic Kidney Disease Stages

- Stage 1: $\text{eGFR} > 90$ mL/min (1.50 mL/s) per 1.73 m^2 and $\text{ACR} \geq 30$ mg/g.
- Stage 2: $\text{eGFR} 60\text{-}89$ mL/min (1.00-1.48 mL/s) per 1.73 m^2 and $\text{ACR} \geq 30$ mg/g.

- Stage 3: eGFR 30-59 mL/min (0.50-0.98 mL/s) per 1.73 m².
- Stage 4: eGFR 15-29 mL/min (0.25-0.48 mL/s) per 1.73 m².
- Stage 5: eGFR < 15 mL/min (0.25 mL/s) per 1.73 m².

History of Diabetes

- Self-reported diabetes.
- Retinopathy.

Elevated Blood Sugar

- KEEP guideline, ≥ 127 mg/dL (7.0 mmol/L) fasting and ≥ 140 mg/dL (7.8 mmol/L) non-fasting.
- World Health Organization (WHO) guideline, ≥ 126 mg/dL (7.0 mmol/L) fasting and ≥ 200 mg/dL (11.1 mmol/L) non-fasting.

Diabetes

- Self-reported history of diabetes or retinopathy.
- Receiving medication for diabetes or insulin.
- Elevated blood sugar defined by glucose ≥ 126 mg/dL (7.0 mmol/L) fasting or ≥ 200 mg/dL (11.1 mmol/L) non-fasting.

Elevated Measured Blood Pressure

- Diabetes or CKD: systolic ≥ 130 mmHg or diastolic ≥ 80 mmHg.
- No diabetes or CKD: systolic ≥ 140 mmHg or diastolic ≥ 90 mmHg.

Hypertension

- Self-reported history of high blood pressure.
- Receiving medication for high blood pressure.

- Elevated blood pressure (JNC 7)³ defined by systolic blood pressure ≥ 130 mmHg or diastolic blood pressure ≥ 80 mmHg for persons with history of diabetes or CKD and systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg for persons without history of diabetes or CKD.

Body Mass Index Groups

- Underweight: body mass index (BMI) < 18.5 kg/m².
- Normal: BMI 18.5-24.9 kg/m².
- Overweight: BMI 25-29.9 kg/m².
- Obese: BMI 30-39.9 kg/m².
- Extremely obese: BMI ≥ 40 kg/m².

Microalbuminuria

- Positive, trace, or microalbuminuria value > 20 mg/L.

WHO Anemia

- Men: hemoglobin < 13 g/dL (130 g/L).
- Women: hemoglobin < 12 g/dL (120 g/L).

K/DOQI Anemia

- Men: hemoglobin < 13.5 g/dL (135 g/L).
- Women: hemoglobin < 12 g/dL (120 g/L).

Mean Blood Pressure(BP)

- Diastolic BP + (systolic BP – diastolic BP) / 3.

Risk Factors for Cardiovascular Disease

- BMI ≥ 30 kg/m².
- Self-reported diabetes or retinopathy.

- History of smoking.
- WHO anemia.
- Elevated blood pressure (JNC 7).

Cardiovascular Disease

- Self-reported heart attack.
- Heart bypass surgery.
- Heart angioplasty.
- Stroke.
- Heart failure.
- Abnormal heart rhythm.
- Peripheral vascular disease (only for KEEP version 2).

Abnormal Mineral Metabolism Values

Calcium and phosphorus levels were determined using the Architect c8000 (Abbott Laboratories, Abbott Park, Illinois), with Arsenazo-III dye for calcium and ammonium molybdate for phosphorus. The intact-parathyroid hormone (PTH) assay was performed using Immulite 2000 (Siemens Medical Solutions Diagnostics, Los Angeles, California), a two-site chemiluminescent enzyme-labeled immunometric assay. All lab tests were performed at Consolidated Laboratory Services (CLS), Van Nuys, California.

- Elevated PTH: > 70 pg/mL for CKD stage 3, > 110 pg/mL for stage 4, and > 300 pg/mL for stage 5 (values in ng/L are equivalent).
- Abnormal phosphorus: < 2.7 mg/dL (0.87 mmol/L) or > 4.6 mg/dL (1.49 mmol/L), stage 3 and 4; < 3.5 mg/dL (1.13 mmol/L) or > 5.5 mg/dL (1.78 mmol/L) stage 5.
- Abnormal calcium: < 8.4 mg/dL (2.10 mmol/L) or > 10.2 mg/dL (2.54 mmol/L).

Reference Tables

Tables 1-15 present total counts of eligible KEEP participants, and show prevalence of CKD, diabetes, hypertension, obesity, microalbuminuria, anemia, risk factors for CVD, and self-reported kidney disease or stones, overall and by age, sex, race/ethnicity, region, smoking status, education, insurance status, and whether a participant has a physician.

Tables 16-18.1 report counts of eligible KEEP participants with elevated PTH, abnormal calcium, and abnormal phosphorus, overall and by age, sex, race/ethnicity, region, smoking status, education, insurance status, and whether a participant has a physician.

Table 19 reports counts of eligible KEEP participants by NKF affiliate.

Tables 19.1-19.11 present total counts, prevalence, and odds ratios for KEEP participants with $eGFR < 60$ mL/min (1.00 mL/s) per 1.73 m^2 , microalbuminuria, $ACR \geq 30$ mg/g, diabetes, hypertension, diabetes and hypertension, obesity, glycemic control, blood pressure control, WHO anemia, and K/DOQI anemia. To calculate the odds ratio, we used a set of logistic regressions with all affiliates as independent variables and Florida as the reference.

Tables 19.12-19.14 report total counts, prevalence, and odds ratios for KEEP participants with elevated PTH, abnormal calcium, and abnormal phosphorus by division or region. To calculate the odds ratio, we used a set of logistic regressions with all divisions as independent variables and South Atlantic as the reference, or with all regions as independent variables and South as the reference.

References

1. Jurkovitz CT, Qiu Y, Brown WW. The Kidney Early Evaluation Program (KEEP): Program Design and Demographic Characteristics of the Population. *Am J Kidney Dis (Suppl)*: 2008
2. Stevens LA, Stoycheff N: Standardization of Serum Creatinine and Estimated Glomerular Filtration Rate in the National Kidney Foundation Kidney Early Evaluation Program (KEEP). *Am J Kidney Dis (Suppl)*: 2008
3. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, Jr., Jones DW, Materson BJ, Oparil S, Wright JT, Jr., Roccella EJ: The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA* 289:2560-2572, 2003