"My mama died from undetected kidney disease in Oct. 2002. It was only after 20 years of being treated for high blood pressure, a blood test [was done] to check on her kidneys. She went on dialysis but died a few months later. That’s why I got involved and got screened. Thank you for coming and helping us!"

KEEP Participant: Screening date, December, 2005

diabetes
hypertension
cardiovascular disease
obesity
smoking
evidence of kidney disease
family history & comorbidity intervention
The KEEP program’s primary focus is the early detection of CKD in individuals with a known history of diabetes or hypertension, or a family history of diabetes, hypertension, or kidney disease.

Over 25% of eligible KEEP participants report having diabetes or diabetic retinopathy. Rates are highest in older participants. Of the participants who report having diabetes, 38% are prehypertensive, based on criteria from the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7); the percent with self-reported diabetes increases with the severity of hypertension.

Forty-eight percent of KEEP participants who report having diabetes were found to have an elevated blood sugar, defined as a fasting glucose greater than 126 mg/dl or a non-fasting glucose exceeding 139 mg/dl.

Elevated blood pressure is more pronounced in black KEEP and NHANES participants compared to whites and people of other races, regardless of diabetic status. Elevated blood pressure occurs in 71 and 33%, respectively, of Hispanic KEEP participants with and without diabetes.

A measured glucose greater than the normal limit is nearly eight times more evident in KEEP participants who report having diabetes than in those who report no diabetes.
Self-reported diabetes in KEEP & NHANES participants, by blood pressure stage (JNC 7)

KEEP N= 53,217, age & Hispanic; 53,152, gender; 52,095, race.
by age, gender, race/ethnicity, & self-reported diabetic status

Measured glucose > normal limit in KEEP participants, by age, gender, race/ethnicity, & self-reported diabetic status

KEEP N= 53,217, age & Hispanic; 53,152, gender; 52,095, race.

Percent of KEEP & NHANES participants with self-reported diabetes, by education & insurance status, age, & race/ethnicity

KEEP N= 53,954, age & Hispanics; 50,932, race. NHANES N= 12,265.
*Sample size less than 30 or coefficient of variation not less than 30%.
Self-reported hypertension in KEEP & NHANES participants, by age, gender, & race/ethnicity


Measured glucose greater than the normal limit in KEEP and NHANES participants, by self-reported hypertension

KEEP N= 53,062. NHANES N= 9,717.

Measured glucose greater than the normal limit in KEEP & NHANES participants, by gender, race/ethnicity, & self-reported hypertension status

KEEP N= 54,996 race; 52,997, gender. NHANES N= 9,717.

Over 52% of KEEP participants report having hypertension, compared to one-quarter of individuals in the general population. Proportions of KEEP participants with self-reported hypertension increase with age, are comparable in males and females, and are slightly higher in blacks compared to whites, individuals of other races, and Hispanics. Elevated blood glucose—a measure glucose greater than the normal limit—is more evident in KEEP participants who report having hypertension compared to those not reporting the condition, and is...
most prominent in males and individuals of other races. The percent of KEEP participants with a measured blood pressure greater than Stage 1 (JNC 7) is four times higher in those who report being hypertensive, increases with age, and is highest in blacks, at 25.2%, compared to 20.17.3, and 18.2%, respectively, in whites, individuals of other races, and Hispanics. In both the KEEP and NHANES populations, and across all age and race/ethnicity groups, rates of self-reported hypertension are highest in participants with less than a high school education.
early 18% of KEEP participants report a history of cardiovascular disease (CVD), including a heart attack, bypass surgery, angioplasty, stroke, heart failure, peripheral vascular disease, or arrhythmia. Rates are most pronounced in older participants, and reach 35% in those age 75 and older. Twenty percent of white participants report having CVD, compared to 17, 15.5, and 15.1%, respectively, of blacks, individuals of other races, and Hispanics.

Nearly 27% of KEEP participants with CKD report a diagnosis of CVD, compared to 15% in those without the disease. By race/ethnicity, rates of CVD are 10–13% higher in participants with CKD compared to those not having the diagnosis. The most common risk factor for cardiovascular disease reported by KEEP participants with CKD is an elevated blood pressure—nearly 77% of participants with cardiovascular disease have associated elevated blood pressure. Rates of cardiovascular disease are highest in KEEP participants who have less than a high school education.
Reported risk factors in KEEP participants with & without cardiovascular disease

KEEP N= 41,354.

Percent of KEEP & NHANES participants with cardiovascular disease, by education & insurance status, age, & race/ethnicity

KEEP N=22,998, age: 51,382, race. NHANES N= 9,990, participants age 20 and older.

*Sample size less than 30 or coefficient of variation not less than 30%.
Percent distribution of KEEP & NHANES participants, by BMI category

KEEP N= 54,466. NHANES N=10,132.

BMI in KEEP & NHANES participants, by race/ethnicity

KEEP N= 54,466. NHANES N=10,132.

BMI in KEEP & NHANES participants, by gender & BMI category

KEEP N= 54,466. NHANES N=10,132.

BMI in KEEP & NHANES participants, by race/ethnicity

KEEP N= 55,292. NHANES N=10,132.

BMI in KEEP participants, by U.S. Census Region

KEEP N= 54,446.
KEEP & NHANES participants with self-reported diabetes or hypertension, by BMI category

KEEP N= 53,412. NHANES N= 16,127; diabetes: 9,998; hypertension.

*Sample size less than 30 or coefficient of variation not less than 50.

BMI in KEEP & NHANES participants, by measured blood pressure (JNC 7)

KEEP N= 53,412. NHANES N= 9,781.

Percent of KEEP & NHANES participants with a BMI ≥30 kg/m², by age, race/ethnicity, education, & insurance status


Over three-fourths of KEEP participants are classified as being overweight to extremely obese, compared to a 64% rate in the general population.

Of eligible KEEP participants, 80% of males and 76% of females are, at the least, overweight, and females have a higher rate of overall obesity than males, at 47 and 40%, respectively.

By race/ethnicity, over 40% of black KEEP participants are classified as obese and 12% are extremely obese, compared to 33.3 and 7.3% of whites.

By Census region, the percent of KEEP participants who are obese to extremely obese ranges from 39% in the West to 48% in the Midwest.

Obesity is more evident in participants with self-reported hypertension compared to those with self-reported diabetes—61.1% compared to 31.3%, while 56% of KEEP participants diagnosed with Stage 2 hypertension (JNC 7) have a BMI equal to or exceeding 30 kg/m².

Irrespective of insurance and educational status, the highest rates of obesity are generally found in KEEP participants age 46–60, and black participants are more prone to this condition.
3.24
Percent distribution of KEEP & NHANES participants, by smoking status

*KEEP N= 51,808. NHANES N= 10,261.*

3.25
Smoking status in KEEP & NHANES participants, by race/ethnicity

*KEEP N= 50,726. NHANES N= 10,261.*

3.26
Self-reported diabetes in KEEP & NHANES participants, by smoking status

*KEEP N= 51,336. NHANES N= 10,258, participants age 20 and older.*
Self-reported hypertension in KEEP & NHANES participants, by smoking status

KEEP N= 55,388; NHANES N= 10,137, participants age 20 and older.

CKD in KEEP & NHANES participants, by smoking status

KEEP N= 42,571. NHANES N= 8,700.

KEEP & NHANES participants with a history of smoking, by education & insurance status, age, & race/ethnicity

KEEP N= 48,920. NHANES N= 10,045.

Thirteen percent of KEEP participants report that they currently smoke, compared to 23% of the general population. Nearly 30% used to smoke, and 57.4% report never having smoked.

In the KEEP population, smoking is most common in individuals of other races. Almost 31% of those who used to smoke report having diabetes, compared to 24% who never smoked and 22% who currently smoke.

Close to 60% of KEEP participants who used to smoke report being hypertensive, compared to 51% who never smoked and 46% who currently smoke.

One-third of eligible KEEP participants who used to smoke report a diagnosis of CKD, in comparison to 28% of those who never smoked, and 24% who currently smoke.

In both the KEEP and NHANES populations, the percent of participants with a history of smoking is greatest in those with less than a high school education.
EVIDENCE OF KIDNEY DISEASE

Self-reported kidney problems in KEEP participants

*KEEP N* = 55,643.

Self-reported kidney problems in KEEP participants, by gender

*KEEP N* = 55,449.

Self-reported kidney problems in KEEP participants, by race/ethnicity

*KEEP N* = 52,435.

Self-reported kidney problems in KEEP participants, by U.S. Census Region

*KEEP N* = 55,526.

Of eligible KEEP participants, more than 4,100 report having kidney stones (8.0%), while 2.2% report having kidney problems. Kidney stones are more common in males than in females.

Eleven percent of white participants report kidney stones, compared to 4.7% and 7.6%, respectively, of blacks, individuals of other races, and Hispanics. Kidney stones are reported by 8.0% of KEEP participants living in the South and West, 7.4% in the Northeast, and 6.3% in the Midwest.

In the KEEP population, 13.5% of whites are classified as having Stage 2 CKD. Stage 2 CKD is evenly distributed in blacks, people of other races, and Hispanics, ranging from 20.4–20.7%. In NHANES participants, Stage 3 CKD is more prominent in whites, at 20.1%, followed by blacks, individuals of other races, and Hispanics, at 15.5, 14.0, and 12.0%, respectively.
3.34  
CKD in KEEP & NHANES participants, by CKD stage & race/ethnicity  
KEEP N= 12,700, NHANES N= 1,505.  
*Sample size less than 30 or coefficient of variation not less than 30%.

3.35  
CKD in KEEP & NHANES participants, by education & insurance status, age, & race/ethnicity  
KEEP N= 43,008, age, 42,240, race. NHANES N= 9,567.  
*Sample size less than 30 or coefficient of variation not less than 30%.
### FAMILY HISTORY & COMORBIDITY

#### 3.36 Risk factors in KEEP participants, by U.S. Census Region

Across all U.S. Census Regions, hypertension is the most commonly reported risk factor for KEEP participants, ranging from 47.4%–55.4%.

*KEEP N= 41,227.*

#### 3.37 Family history of diabetes, hypertension, or kidney disease in KEEP participants, by self-reported diabetic status

*KEEP N= 50,381.*

In KEEP participants, hypertension is the most commonly reported risk factor in all U.S. Census Regions, ranging from 47.4% in the West to 55.4% in the South. Proportions of diabetes are similar across all regions, ranging from 25.2–27.6%, and approaching 30% in participants with CKD.

Eighty-two percent of KEEP participants who report no diabetes have a family history of hypertension; in those with self-reported diabetes, a family history of hypertension is evident in 74%. The percent of KEEP participants with a family history of either diabetes, hypertension, or kidney disease does not appear to be related to the severity of hypertension and KEEP participant family members are more likely than KEEP participants to experience a cardiac event.

Two-thirds of KEEP participants with Stage 1 (JNC 7) hypertension report a family history of diabetes, and 80% report a family history of hypertension. And KEEP participant family members are far more likely than KEEP participants to have undergone a cardiac procedure or have experienced a cardiac event.
Family history of diabetes, hypertension, or kidney disease in KEEP participants, by measured blood pressure (JNC 7)

KEEP N= 46,994.

Family history of diabetes, hypertension, or kidney disease in KEEP participants with a family member who has had a cardiac event & who have suffered the same cardiac event as a family member

KEEP N= 53,760.

Family history of diabetes, hypertension, or kidney disease in KEEP participants, by CKD stage

KEEP N= 41,643.
3.41 KEEP participants who complete their followup forms, by year

KEEP N= 16,794.

3.42 KEEP participants who return their followup forms, by seeing a physician

KEEP N= 16,794.

3.43 Reason for seeing a physician about test results among KEEP participants who return their followup forms

KEEP N= 10,889.

3.44 Reasons why KEEP participants do not see a physician after receiving abnormal test results

KEEP N=4,758.
KEEP participants who learn they have anemia, & have a medical intervention

KEEP participants who learn they have diabetes, & have a medical intervention

KEEP participants who learn they have high blood pressure, & have a medical intervention

Intervention following the KEEP evaluation is an integral part of the KEEP program. On their study followup forms, 67% of KEEP participants report seeing a physician after the study. Of these individuals, 50% have seen a physician because of abnormal blood pressure results, while 46.8% have consulted a physician because of an abnormal urine test.

For a variety of reasons, some participants do not see a physician after receiving notification of an abnormal test; of these, 12.5% report having no insurance while 12% do not believe the visit is necessary.

In KEEP participants who learn they have anemia, 32% are placed on over-the-counter medications and 20% receive a prescription drug. Forty-two percent of participants who learn they have diabetes are told to monitor their blood sugar, while 39% undergo drug therapy; in participants who learn they have high blood pressure, 42.6% are told to monitor their blood pressure, and 47% are placed on prescription drugs.
Figure 3.1
Over 25% of eligible KEEP participants report having diabetes or diabetic retinopathy. Rates are highest in older participants.

Figure 3.4
The percent with self-reported diabetes increases with the severity of hypertension.

Figure 3.7
Proportions of KEEP participants with self-reported hypertension increase with age, are comparable in males and females, and are slightly higher in blacks compared to whites, individuals of other races, and Hispanics.

Figure 3.10
The proportion of KEEP and NHANES participants who report having hypertension is greatest in those with an elevated glucose.

Figure 3.13
Nearly 18% of KEEP participants report a history of cardiovascular disease.

Figure 3.17
Over three-fourths of KEEP participants are classified as being overweight to extremely obese, compared to a 64% rate in the general population.

Figure 3.24
Thirteen percent of KEEP participants report that they currently smoke, compared to 25% of the general population. Nearly 30% used to smoke, and 57.4% report never having smoked.

Figure 3.42
On their study followup forms, 67% of KEEP participants report seeing a physician after the study.

**JNC 7 HYPERTENSION**

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120 mmHg</td>
<td>&lt;80 mmHg</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139 mmHg</td>
<td>80-89 mmHg</td>
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<tr>
<td>Stage 1</td>
<td>140-159 mmHg</td>
<td>90-99 mmHg</td>
</tr>
<tr>
<td>Stage 2</td>
<td>160 mmHg or</td>
<td>1200 mmHg</td>
</tr>
</tbody>
</table>

**ELEVATED BLOOD PRESSURE (EBP) (JNC 7)**

- **Normal or CVD:**
  - Systolic: 210 mmHg or Diastolic: 280 mmHg
- **Prehypertension or CVD:**
  - Systolic: 2140 mmHg or Diastolic: 290 mmHg

**DIABETES**

- Self-reported diabetes
- Elevated blood sugar

**GLUCOSE GREATER THAN THE NORMAL LIMIT**

- Fasting: >166 mg/dl
- Non-fasting: >139 mg/dl

**RISK FACTORS FOR CARDIOVASCULAR DISEASE**

- Diabetes
- BMI ≥ 30 kg/m²
- Smoking history
- Anemia (WHO definition)
- Elevated blood pressure

**CVD DEFINITION: KEEP**

- Participant reporting any of the following cardiac events: heart attack, heart by-pass surgery, heart angioplasty, stroke, heart failure, stroke, PVD, or arrhythmia

**CVD DEFINITION (NHANES)**

- Participant reporting any of the following cardiac diseases: congestive heart failure, coronary heart disease, angina/angina pectoris, heart attack, or stroke

**CKD DEFINITION**

- If eGFR by K/DOQI MDRD <60 ml/min/1.73 m² or eGFR 260 ml/min/1.73 m² and abnormal albumin/creatinine ratio (ACR) ≥30 mg/g

**CKD STAGES**

- Stage 1: eGFR 299, ACR <30 mg/g
- Stage 2: eGFR 60–89, ACR 30–29 mg/g
- Stage 3: eGFR 30–59
- Stage 4: eGFR 15–29
- Stage 5: eGFR <15 or dialysis

**U.S. CENSUS REGIONS**

- NE: Northeast
- MW: Midwest
- S: South
- W: West

**BODY MASS INDEX CATEGORIES**

- UW: underweight, BMI <18.5
- N: normal, BMI 18.5–24.9
- OW: overweight, BMI 25–29.9
- OB: obese, BMI 30–39.9
- EOB: extremely obese, BMI ≥40

**EDUCATION & INSURANCE**

- <HS&NIns: Less than a high school education, & no insurance
- <HS&Ins: Less than a high school education, & insurance
- HS+&NIns: High school education or greater, & no insurance
- HS+&Ins: High school education or greater, & insurance

**CARDIA EVENT DEFINITIONS**

- HA: Heart Attack
- BPS: Heart by-pass surgery
- Angio: Angioplasty
- HF: Heart Failure
- Arrhyth: Arrhythmia
- PVD: Peripheral vascular disease