Supplemental Table 2. Prediction Equations

Supplemental Table 4a: Laboratory Prediction Equation

The laboratory prediction models includes the following predictors: UACR (mg/g), eGFR CKD-EPI (ml/min per 1.73m^2), gender and age.

Range of continuous predictors

Predictor	Minimum	Maximum
UACR (mg/g)	0.75	292.15
eGFR CKD-EPI (ml/min per 1.73m^2)	26.55	111.15
Age (years)	55	84

Prediction equation

Outcome state		Predictor	Transformation or coding	Shrunken coefficients
CKD	**Intercept**			-0.6727
	Predictors	**Albuminuria stage**[1]	microalbuminuria = 1	-0.1809
		d-UACR$_{tp}$	(d-UACR$_{tp}$+0.1)/5	-5.4497
			[(d-UACR$_{tp}$+0.1)/5]^3	4.7267
		eGFR	[(eGFR+0.1)/120]$^{-2}$	0.0890
		Gender	female = 1	0.0081
		Age	[age+0.1)/90]	-0.2088
Death	**Intercept**			-5.3823
	Predictors	**Albuminuria stage**[1]	microalbuminuria = 1	0.5402
		d-UACR$_{tp}$	(d-UACR$_{tp}$+0.1)/5	-2.0727
			[(d-UACR$_{tp}$ +0.1)/5]^3	1.5816
		eGFR	[(eGFR+0.1)/120]$^{-2}$	0.1120
		Gender	female = 1	0.5981
		Age	[age+0.1)/90]	5.3485

[1] versus normoalbuminuria = 0.

The predicted risk of an individual can be computed in the following manner:

1) Compute 'd-UACR to progression' (d-UACR$_{tp}$)[1] from UACR (mg/g) at baseline:

$$\text{d-UACR}_{tp} = \ln\left(\text{cutpoint}/\text{UACR (mg/g)}\right), \text{ with}$$

$$\text{cutpoint} = \begin{cases} 30 & \text{if } 0 \le \text{UACR (mg/g)} < 30 \\ 300 & \text{if } 30 \le \text{UACR (mg/g)} < 300 \end{cases}.$$

[1] d-UACR$_{tp}$ was defined as the difference between the participant-specific cutpoint of developing a new micro- or macroalbuminuria and UACR at baseline on the log-scale. A participant-specific cutpoint was required because new micro- or macro-albuminuria was defined by crossing the cutpoints of 30 and 300 mg/g (3.4 and 33.9 mg/mmol), respectively.

2) Compute the linear predictor for incidence or progression of CKD $lp_r(x)$:

$$
\begin{aligned}
lp_r(x) &= \beta_{r0} + \beta_{r1}x_1 + \ldots + \beta_{rj}x_j = \\
&= -0.76727\text{-}0.1809 * \text{albuminuria} - \\
&\quad 5.4497 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1\right)/5\right] + 4.7267 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1\right)/5\right]^3 + \\
&\quad 0.0890 * \left[\left(\text{eGFR} + 0.1\right)/120\right]^{-2} + 0.0081 * \text{female} - 0.2088 * \left[\left(\text{age} + 0.1\right)/90\right]
\end{aligned}
$$

3) Compute the linear predictor for death $lp_d(x)$:

$$
\begin{aligned}
lp_d(x) &= \beta_{d0} + \beta_{d1}x_1 + \ldots + \beta_{rj}x_j = \\
&= -5.3823 + 0.5402 * \text{albuminuria} - \\
&\quad 2.0727 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1\right)/5\right] + 1.5816 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1\right)/5\right]^3 + \\
&\quad 0.1120 * \left[\left(\text{eGFR} + 0.1\right)/120\right]^{-2} + 0.5981 * \text{female} - 5.3485 * \left[\left(\text{age} + 0.1\right)/90\right]
\end{aligned}
$$

4) Conditional probabilities for each outcome *y* given the predictor vector *x* are

$$
P\left(y = \text{'alive w/o renal endpoint'} \mid x\right) = \frac{1}{1 + e^{lp_r(x)} + e^{lp_d(x)}},
$$

$$
P\left(y = \text{'alive with renal outcome'} \mid x\right) = \frac{e^{lp_r(x)}}{1 + e^{lp_r(x)} + e^{lp_d(x)}} \text{ and}
$$

$$
P\left(y = \text{'death'} \mid x\right) = \frac{e^{lp_d(x)}}{1 + e^{lp_r(x)} + e^{lp_d(x)}}.
$$

Supplemental Table 2b: Clinical Prediction Equation

The clinical prediction models includes the following predictors: UACR (mg/mmol), eGFR CKD-EPI (ml/min per 1.73m^2), duration of diabetes (years), glucose (mmol/L), fasting LDL (mmol/L) , waist circumference (cm), number of antihypertensive drugs, age (years), gender, race (European, Asian, or Other), and the comorbidities peripheral artery disease (i.e. PTA , limb or foot amputation; PAD), stroke/TIA, laser therapy for diabetic retinopathy, and MACE. Comorbidity MACE, i.e. major atherosclerotic cardiac events, was defined as myocardial infarction, stable or unstable angina, CABG surgery, or PTCA/atherectomy/PCI. For number of antihypertensive drugs a score between 0 and 5 was devised, with one point for each group (RAS-blocker, calcium-channel-blocker, alpha-blocker, beta-blocker or diuretics) from which drugs were prescribed.

Range of continuous predictors

Predictor	Minimum	Maximum
UACR (mg/g)	0.75	292.15
eGFR CKD-EPI (ml/min per 1.73m^2)	26.55	111.15
Age	55	84
Glucose (mmol/L)	3.081	19.5
Fasting LDL (mmol/L)	0.8	6.097
Duration of diabetes (years)	0.0060	64.9778
Waist circumference (cm)	64.02	139

Prediction equation

Outcome state		Predictor	Transformation or coding	Shrunken coefficients
CKD	**Intercept**			-0.7382
	Predictors	**d-UACR$_{tp}$**	(d-UACR$_{tp}$+0.1)/5	-4.8303
			[(d-UACR$_{tp}$ +0.1)/5]^3	4.4693
		eGFR CKD-EPI	[(egfr+0.1)/120]$^{-2}$	0.0775
		Albuminuria stage[1]	microalbuminuria = 1	-0.2217
		Age	(age+0.1)/90	0.7529
		PAD	yes = 1	0.3621
		Glucose	[(glucose+0.1)/20]$^{-1}$	-1.1451
			ln([(glucose+0.1)/20])*[(glucose+0.1)/20]$^{-1}$	-0.5042
		Number of antihypertensive drugs	(score from 0 to 5) / 5	0.7667
		Ethnic group[3]	Asian = 1	0.3094
			Other = 1	0.2216
		Fasting LDL	[(ldl+0.1)/10]$^{-2}$	0.0069
			[(ldl+0.1)/10]^2	1.3196
		Duration of diabetes	[ln(diabduration+0.003)+6]/12	0.3271
		Stroke/TIA[2]	yes = 1	0.0865
		Gender[4]	female = 1	-0.0216
		Waist circumference	[(waist+0.1)/140]$^{-2}$	0.1080
			[(waist+0.1)/140]^3	0.9222
		MACE[2]	yes = 1	-0.1053
		Laser therapy for diabetic retinopathy[2]	yes = 1	-0.1006

[1] versus normoalbuminuria = 0.
[2] versus no = 0.
[3] versus European = 0.
[4] versus male = 0.

Outcome state		Predictor	Transformation or coding	Shrunken coefficients
Death	**Intercept**			-5.2880
	Predictors	**d-UACR$_{tp}$**	(d-UACR$_{tp}$+0.1)/5	-1.7979
			[(d-UACR$_{tp}$ +0.1)/5]^3	1.5969
		eGFR CKD-EPI	[(egfr+0.1)/120]$^{-2}$	0.0990
		Albuminuria stage[1]	microalbuminuria = 1	0.4115
		Age	(age+0.1)/90	5.1527
		PAD[2]	yes = 1	0.6782
		Glucose	[(glucose+0.1)/20]$^{-1}$	-1.4714
			ln([(glucose+0.1)/20])*[(glucose+0.1)/20]$^{-1}$	-0.6895
		Number of antihypertensive drugs	(score from 0 to 5) / 5	0.2970
		Ethnic group[3]	Asian = 1	-0.0353
			Other = 1	0.1458
		Fasting LDL	[(ldl+0.1)/10]$^{-2}$	0.0063
			[(ldl+0.1)/10]^2	2.5752
		Duration of diabetes	[log(diabduration+0.003)+6]/12	0.3132
		Stroke/TIA[2]	yes = 1	0.3867
		Gender[4]	female = 1	-0.1904
		Waist circumference	[(waist+0.1)/140]$^{-2}$	0.2402
			[(waist+0.1)/140]^3	1.3245
		MACE[2]	yes = 1	0.1769
		Laser therapy for diabetic retinopathy[2]	yes = 1	-0.0198

[1] versus normoalbuminuria = 0.
[2] versus no = 0.
[3] versus European = 0.
[4] versus male = 0.

1) and 4) as in the laboratory model.

2) Compute the linear predictor for incidence or progression of CKD $lp_r(x)$:

$$
\begin{aligned}
lp_r(x) = {} & -0.7382 - 0.2217 * \text{albuminuria} - \\
& 4.8303 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1 \right) / 5 \right] + 4.4693 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1 \right) / 5 \right]^3 + \\
& 0.0775 * \left[\left(\text{eGFR} + 0.1 \right) / 120 \right]^{-2} + 0.7529 * \left[\left(\text{age} + 0.1 \right) / 90 \right] + \\
& 0.3621 * \text{PAD} - 1.14513015 * \left[\left(\text{glucose} + 0.1 \right) / 20 \right]^{-1} - \\
& 0.5042 * \left[\left(\text{glucose} + 0.1 \right) / 20 \right]^{-1} * \ln \left[\left(\text{glucose} + 0.1 \right) / 20 \right] + 0.7667 * \text{nDrugs} / 5 + \\
& 0.3094 * \text{Asian} + 0.2216 * \text{Other} + 0.0069 * \left[\left(\text{ldl} + 0.1 \right) / 10 \right]^{-2} \\
& 1.3196 * \left[\left(\text{ldl} + 0.1 \right) / 10 \right]^2 + 0.3271 * \left[\ln \left(\text{diabduration} + 0.003 \right) + 6 \right] / 12 + \\
& 0.0865 * \text{stroke} - 0.0216 * \text{female} + 0.1080 * \left[\left(\text{waist} + 0.1 \right) / 140 \right]^{-2} + \\
& 0.9222 * \left[\left(\text{waist} + 0.1 \right) / 140 \right]^3 - 0.1053 * \text{MACE} - 0.1006 * \text{laser}
\end{aligned}
$$

3) Compute the linear predictor for death $lp_d(x)$:

$$
\begin{aligned}
lp_d(x) = {} & -5.2880 + 0.4115 * \text{albuminuria} - \\
& 1.7979 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1 \right) / 5 \right] + 1.5969 * \left[\left(\text{d-UACR}_{\text{tp}} + 0.1 \right) / 5 \right]^3 + \\
& 0.0990 * \left[\left(\text{eGFR} + 0.1 \right) / 120 \right]^{-2} + 5.1527 * \left[\left(\text{age} + 0.1 \right) / 90 \right] + \\
& 0.6782 * \text{PAD} - 1.4714 * \left[\left(\text{glucose} + 0.1 \right) / 20 \right]^{-1} - \\
& 0.6895 * \left[\left(\text{glucose} + 0.1 \right) / 20 \right]^{-1} * \ln \left[\left(\text{glucose} + 0.1 \right) / 20 \right] + 0.2970 * \text{nDrugs} / 5 - \\
& 0.0353 * \text{Asian} + 0.1458 * \text{Other} + 0.0064 * \left[\left(\text{ldl} + 0.1 \right) / 10 \right]^{-2} \\
& 2.5752 * \left[\left(\text{ldl} + 0.1 \right) / 10 \right]^2 + 0.3132 * \left[\ln \left(\text{diabduration} + 0.003 \right) + 6 \right] / 12 + \\
& 0.3867 * \text{stroke} - 0.1904 * \text{female} + 0.2402 * \left[\left(\text{waist} + 0.1 \right) / 140 \right]^{-2} + \\
& 1.3245 * \left[\left(\text{waist} + 0.1 \right) / 140 \right]^3 + 0.1769 * \text{MACE} - 0.0198 * \text{laser}
\end{aligned}
$$