

## **SUPPLEMENTARY MATERIALS**

### **LEGEND**

**Table S1. Baseline characteristics of hemodialysis patients according to daily dietary phosphorus intake scaled to 1000 kcal of energy intake.**

**Table S2. Baseline characteristics of hemodialysis patients according to daily dietary phosphorus-to-protein intake (mg/g).**

**Table S3. Association between dietary phosphorus intake and all-cause mortality in hemodialysis patients across tertiles (ref: highest tertile).**

**Table S4. Association between dietary phosphorus intake and all-cause mortality in hemodialysis patients across quartiles (ref: highest quartile).**

**Table S5. Association between lowest tertile of dietary phosphorus intake (ref: middle and highest tertiles) and all-cause mortality in hemodialysis patients across clinically relevant subgroups using expanded case-mix adjusted analyses.**

**Figure S1. Association between daily absolute dietary phosphorus intake (Panel A), phosphorus intake scaled to 1000 kcal of energy intake (Panel B), and phosphorus-to-protein ratio (Panel C) and all-cause mortality, respectively, among 415 MADRAD hemodialysis patients across tertiles.**

**Table S1. Baseline characteristics of hemodialysis patients according to daily dietary phosphorus intake scaled to 1000 kcal of energy intake.**

	Overall	Dietary Phosphorus Intake (mg/1000 kcal)		
		Tertile 1	Tertile 2	Tertile 3
<b>N (%)</b>	415	138	138	139
<b>Age (mean ± SD)</b>	55±15	55±14	55±15	56±15
<b>Male (%)</b>	55	55	52	59
<b>Black race (%)</b>	36	33	43	32
<b>Hispanic ethnicity (%)</b>	48	40	46	60
<b>Vintage (years, mean ± SD)</b>	5±4	5±4	5±4	4±4
<b>BMI (kg/m2, mean ± SD)</b>	27.6±6.6	27.5±7.2	28.5±6.7	26.9±5.6
<b>spKt/V</b>	1.7±0.3	1.7±0.4	1.7±0.3	1.7±0.3
<b>Dialysis access</b>				
AV Fistula/Graft	47	49	54	40
Catheter	11	12	8	14
Unknown	41	40	38	46
<b>Insurance</b>				
Medicare/Medicaid	75	80	73	73
Private	11	9	13	12
Other	14	12	14	16
<b>COMORBIDITIES</b>				
<b>Diabetes</b>	55	46	51	66
<b>CHF</b>	8	5	10	10
<b>CAD</b>	9	12	9	6
<b>Combined CV disease</b>	17	15	20	16
<b>LABORATORY RESULTS</b>				
<b>Serum phosphorus (mg/dL)</b>	5.1±1.5	5.1±1.5	5.1±1.5	5.0±1.4
<b>Serum albumin (g/dL)</b>	4.0±0.4	4.1±0.3	4.0±0.3	4.0±0.4

<b>nPCR (g/kg/day)</b>	1.0±0.3	1.0±0.3	1.0±0.3	1.1±0.3
<b>Serum creatinine (mg/dL)</b>	9.7±3.0	9.9±2.9	9.9±3.0	9.5±2.9
<b>DIETARY INTAKE</b>				
<b>Energy (kcal/day)</b>	998(566,1,527)	891(480,1,512)	1,108(608,1,596)	1,078(676,1,466)
<b>Protein (g/day)</b>	45(25,73)	32(19,60)	46(27,78)	53(33,80)

BMI, body mass index; AV, arteriovenous; CHF, congestive heart failure; CAD, coronary artery disease; CV, cardiovascular; nPCR, normalized protein catabolic rate.

**Table S2. Baseline characteristics of hemodialysis patients according to daily dietary phosphorus-to-protein intake (mg/g).**

	Overall	Dietary Phosphorus Intake (mg/g)		
		Tertile 1	Tertile 2	Tertile 3
<b>N (%)</b>	415	138	138	139
<b>Age (mean ± SD)</b>	55±15	54±15	56±15	56±14
<b>Male (%)</b>	55	53	62	52
<b>Black race (%)</b>	36	41	46	22
<b>Hispanic ethnicity (%)</b>	48	29	41	75
<b>Vintage (years, mean ± SD)</b>	5±4	4±4	5±4	5±4
<b>BMI (kg/m2, mean ± SD)</b>	27.6±6.6	27.2±6.7	28.6±7.1	27.0±5.7
<b>spKt/V</b>	1.7±0.3	1.7±0.3	1.7±0.3	1.8±0.4
<b>Dialysis access</b>				
AV Fistula/Graft	47	49	47	46
Catheter	11	12	9	12
Unknown	41	38	43	42
<b>Insurance</b>				
Medicare/Medicaid	75	75	73	78
Private	11	14	11	9
Other	14	12	16	14
<b>COMORBIDITIES</b>				
<b>Diabetes</b>	55	53	51	60
<b>CHF</b>	8	7	9	10
<b>CAD</b>	9	11	9	8
<b>Combined CV disease</b>	17	16	16	19
<b>LABORATORY RESULTS</b>				
<b>Serum phosphorus (mg/dL)</b>	5.1±1.5	5.3±1.4	4.8±1.4	5.1±1.6
<b>Serum albumin (g/dL)</b>	4.0±0.4	4.0±0.3	4.0±0.4	4.0±0.3

<b>nPCR (g/kg/day)</b>	1.0±0.3	1.1±0.3	1.0±0.3	1.0±0.3
<b>Serum creatinine (mg/dL)</b>	9.7±3.0	10.0±3.0	10.0±2.9	9.2±2.9
<b>DIETARY INTAKE</b>				
<b>Energy (kcal/day)</b>	998(566,1,527)	1,107(641,1,701)	938(547,1,424)	998(632,1,464)
<b>Protein (g/day)</b>	45(25,73)	60(31,93)	46(24,67)	39(22,58)

BMI, body mass index; AV, arteriovenous; CHF, congestive heart failure; CAD, coronary artery disease; CV, cardiovascular; nPCR, normalized protein catabolic rate.

**Table S3. Association between dietary phosphorus intake and all-cause mortality in hemodialysis patients across tertiles (ref: highest tertile).**

<b>Dietary Phosphorus Intake (mg/day)</b>						
	<b>Unadjusted</b>	<b>Case-mix adjusted</b>	<b>Expanded case-mix adjusted</b>	<b>Expanded case-mix+laboratory adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition+MBD adjusted</b>
	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>
<b>Tertile 1</b>	1.76(1.18,2.62)	1.69(1.12,2.54)	1.81(1.19,2.75)	1.96(1.27,3.02)	3.33(1.75,6.33)	3.35(1.76,6.39)
<b>Tertile 2</b>	1.35(0.89,2.06)	1.18(0.77,1.81)	1.24(0.81,1.91)	1.43(0.92,2.23)	2.09(1.19,3.67)	2.10(1.19,3.71)
<b>Tertile 3</b>	Reference	Reference	Reference	Reference	Reference	Reference
<b>P-trend</b>	0.005	0.011	0.005	0.002	<0.001	<0.001
<b>Dietary Phosphorus Intake Scaled to 1000 kcal (mg/1000 kcal)</b>						
	<b>Unadjusted</b>	<b>Case-mix adjusted</b>	<b>Expanded case-mix adjusted</b>	<b>Expanded case-mix+laboratory adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition+MBD adjusted</b>
	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>
<b>Tertile 1</b>	1.07(0.73,1.57)	1.24(0.83,1.84)	1.35(0.90,2.04)	1.50(0.99,2.29)	1.74(1.08,2.80)	1.73(1.07,2.80)
<b>Tertile 2</b>	0.93(0.63,1.38)	0.90(0.60,1.34)	0.91(0.60,1.37)	0.90(0.59,1.37)	0.96(0.63,1.48)	0.98(0.63,1.51)
<b>Tertile 3</b>	Reference	Reference	Reference	Reference	Reference	Reference
<b>P-trend</b>	0.733	0.335	0.185	0.078	0.033	0.034
<b>Dietary Phosphorus-to-Protein Ratio (mg/g)</b>						
	<b>Unadjusted</b>	<b>Case-mix adjusted</b>	<b>Expanded case-mix adjusted</b>	<b>Expanded case-mix+laboratory adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition+MBD adjusted</b>
	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>
<b>Tertile 1</b>	1.22(0.84,1.77)	1.16(0.77,1.74)	1.32(0.86,2.03)	1.52(0.99,2.34)	1.67(1.02,2.74)	1.65(1.00,2.72)

<b>Tertile 2</b>	0.74(0.49,1.12)	0.68(0.44,1.04)	0.80(0.51,1.24)	0.84(0.53,1.32)	0.85(0.53,1.35)	0.84(0.52,1.34)
<b>Tertile 3</b>	Reference	Reference	Reference	Reference	Reference	Reference
<b>P-trend</b>	0.308	0.436	0.166	0.045	0.037	0.044

MBD, Mineral and bone disorder.

\* Tertiles for dietary phosphorus correspond to <460, 463-<933, and 943-4992 mg/day, respectively.

\*\* Tertiles for dietary phosphorus scaled to 1000 kcal of energy intake (mg/1000 kcal) correspond to <606, 607-<736, and 737-1153 mg/1000 kcal, respectively.

\*\*\* Tertiles for dietary phosphorus-to-protein ratio correspond to intake of <13.4, 13.5-<15.93, and 15.95-57.5 mg/g, respectively.

**Table S4. Association between dietary phosphorus intake and all-cause mortality in hemodialysis patients across quartiles (ref: highest quartile).**

<b>Dietary Phosphorus Intake (mg/day)</b>						
	<b>Unadjusted</b>	<b>Case-mix adjusted</b>	<b>Expanded case-mix adjusted</b>	<b>Expanded case-mix+laboratory adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition+MBD adjusted</b>
	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>
<b>Quartile 1</b>	1.64(1.04,2.59)	1.49(0.94,2.38)	1.65(1.02,2.69)	1.93(1.16,3.20)	3.20(1.44,7.15)	3.32(1.48,7.42)
<b>Quartile 2</b>	1.24(0.76,2.03)	1.02(0.62,1.68)	1.11(0.67,1.84)	1.24(0.74,2.09)	1.89(0.91,3.93)	1.90(0.91,3.97)
<b>Quartile 3</b>	1.36(0.85,2.18)	1.14(0.70,1.84)	1.20(0.73,1.95)	1.49(0.89,2.51)	1.99(1.05,3.75)	2.05(1.08,3.90)
<b>Quartile 4</b>	Reference	Reference	Reference	Reference	Reference	Reference
<b>P-trend</b>	0.055	0.131	0.062	0.029	0.01	0.009
<b>Dietary Phosphorus Intake Scaled to 1000 kcal (mg/1000 kcal)</b>						
	<b>Unadjusted</b>	<b>Case-mix adjusted</b>	<b>Expanded case-mix adjusted</b>	<b>Expanded case-mix+laboratory adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition+MBD adjusted</b>
	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>	<b>HR (95% CI)</b>
<b>Quartile 1</b>	1.03(0.66,1.61)	1.18(0.74,1.87)	1.30(0.81,2.08)	1.51(0.93,2.46)	1.80(1.05,3.09)	1.80(1.05,3.11)
<b>Quartile 2</b>	0.98(0.63,1.54)	1.08(0.68,1.70)	1.10(0.69,1.77)	1.10(0.68,1.77)	1.22(0.74,2.02)	1.22(0.73,2.02)
<b>Quartile 3</b>	0.92(0.59,1.43)	0.89(0.57,1.39)	0.95(0.60,1.50)	0.97(0.61,1.55)	1.03(0.65,1.65)	1.03(0.64,1.64)
<b>Quartile 4</b>	Reference	Reference	Reference	Reference	Reference	Reference
<b>P-trend</b>	0.837	0.38	0.246	0.101	0.039	0.04
<b>Dietary Phosphorus-to-Protein Ratio (mg/g)</b>						
	<b>Unadjusted</b>	<b>Case-mix adjusted</b>	<b>Expanded case-mix adjusted</b>	<b>Expanded case-mix+laboratory adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition adjusted</b>	<b>Expanded case-mix+laboratory+ nutrition+MBD adjusted</b>



	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
<b>Quartile 1</b>	1.00(0.65,1.54)	0.85(0.53,1.37)	0.99(0.60,1.63)	1.11(0.67,1.85)	1.11(0.62,1.98)	1.14(0.63,2.05)
<b>Quartile 2</b>	0.82(0.52,1.28)	0.67(0.42,1.07)	0.76(0.46,1.24)	0.89(0.54,1.46)	0.89(0.53,1.50)	0.89(0.53,1.51)
<b>Quartile 3</b>	0.67(0.42,1.06)	0.55(0.34,0.88)	0.63(0.39,1.04)	0.59(0.36,0.97)	0.57(0.34,0.96)	0.59(0.35,0.99)
<b>Quartile 4</b>	Reference	Reference	Reference	Reference	Reference	Reference
<b>P-trend</b>	0.775	0.787	0.767	0.328	0.375	0.376

MBD, Mineral and bone disorder

\* Dietary phosphorus intake quartiles 1, 2, 3 and 4 correspond to dietary phosphorus intake of <370, 372-<695, 695-<1064, and 1077-4992 mg/day, respectively.

\*\* Dietary phosphorus/1000 kcal quartiles 1, 2, 3 and 4 correspond to intakes of <573, 574-<674.8, 674.9-<774, and 777-1153 mg/1000 kcal, respectively.

\*\*\* Dietary phosphorus-to-protein ratio quartiles 1, 2, 3 and 4 correspond to intakes of <12.9, 12.9-<14.6, 14.6-<17.03, and 17.03-57.5 mg/g, respectively.

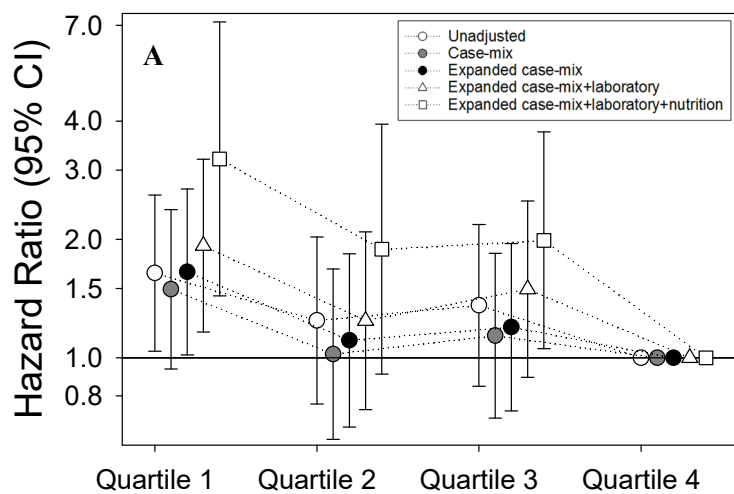
**Table S5. Association between lowest tertile of dietary phosphorus intake (ref: middle and highest tertiles) and all-cause mortality in hemodialysis patients across clinically relevant subgroups using expanded case-mix adjusted analyses.**

	DIETARY PHOSPHOROUS INTAKE		
SUBGROUPS	Tertile 1	Tertiles 2+3	p
<b>Age</b>			
<60 years	0.97(0.57,1.66)	Reference	0.03
≥60 years	2.63(1.62,4.29)		
<b>Sex</b>			
Female	1.94(1.14,3.31)	Reference	0.44
Male	1.41(0.87,2.30)		
<b>Race</b>			
Non-Black	1.79(1.11,2.91)	Reference	0.94
Black	1.57(0.90,2.72)		
<b>Hispanic ethnicity</b>			
Yes	2.79(1.56,4.98)	Reference	0.23
No	1.41(0.88,2.25)		
<b>Vintage (years)</b>			
<2	1.41(0.71,2.78)	Reference	0.62
≥2	1.60(1.04,2.46)		
<b>AV Fistula/AV Grant</b>			
Yes	2.05(1.20,3.50)	Reference	0.35
No	1.33(0.83,2.13)		
<b>Tunnel Catheter</b>			
Yes	1.38(0.37,5.18)	Reference	0.31
No	1.64(1.14,2.36)		
<b>Medicare/Medicaid</b>			
Yes	1.45(0.97,2.17)	Reference	0.4
No	2.57(1.06,6.21)		
<b>BMI (kg/m<sup>2</sup>)</b>			
<30	1.66(1.17,2.37)	Reference	0.48
≥30	2.37(1.12,5.03)		
<b>Diabetes</b>			
Yes	1.72(1.11,2.65)	Reference	0.94
No	1.45(0.76,2.77)		
<b>Combined CV Disease</b>			
	2.85(1.28,6.37)	Reference	0.22

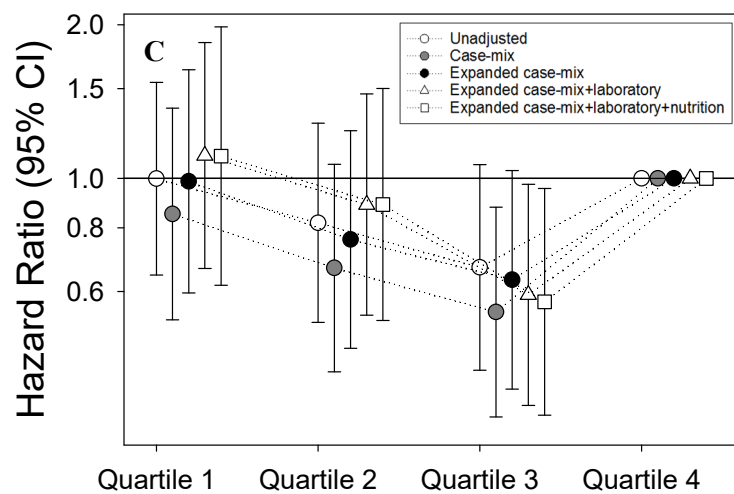
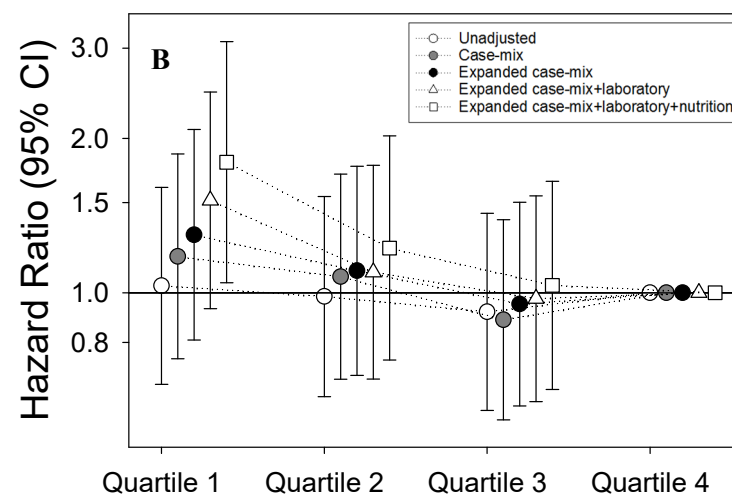
Yes No	1.44(0.96,2.16)		
<b>Serum phosphorus (mg/dL)</b> <5.5 ≥5.5	1.74(1.13,2.67) 1.44(0.73,2.86)	Reference	0.25
<b>Serum albumin (g/dL)</b> <4 ≥4	1.44(0.84,2.46) 1.91(1.14,3.20)	Reference	0.17
<b>Serum creatinine (mg/dL)</b> <9.6 ≥9.6	1.75(1.11,2.77) 1.36(0.74,2.51)	Reference	0.63
<b>nPCR (g/kg/day)</b> <1 ≥1	1.41(0.82,2.41) 2.21(1.33,3.66)	Reference	0.39
<b>spKt/V</b> <1.4 ≥1.4	3.00(1.01,8.93) 1.58(1.05,2.37)	Reference	0.97
<b>Protein (g/day)</b> <45 (median) ≥45 (median)	1.83(1.05,3.19) 11.61(1.40,96.39)	Reference	0.21

BMI, body mass index; AV, arteriovenous; CV, cardiovascular; nPCR, normalized protein catabolic rate.

**Figure S1.**



Absolute Dietary Phosphorus Intake (mg/day) Dietary Phosphorus Scaled to Energy (mg/1000 kcal)



Dietary Phosphorus-to-Protein Ratio (mg/g)