

Supplementary table 1. Difference in mean hormone concentrations with adjustment for age and race/ethnicity only, comparing NHANES 1988-1991 to 1999-2004.

	1988-1991		1999-2004		Difference	P-value
	Mean <sup>a</sup>	95% CI <sup>b</sup>	Mean <sup>a</sup>	95% CI <sup>b</sup>		
Testosterone (ng/mL)	5.47	5.31, 5.64	5.08	4.90, 5.25	-0.40	<0.01
Free testosterone (ng/mL)	0.100	0.096, 0.104	0.094	0.089, 0.098	-0.006	0.02
SHBG (nmol/L)	35.68	34.18, 37.25	32.00	30.47, 33.61	-3.68	<0.01
3 $\alpha$ -diol-G (ng/mL)	11.87	11.26, 12.51	10.25	9.78, 10.73	-1.62	<0.01
Estradiol (pg/mL)	35.59	34.13, 37.12	30.02	28.53, 31.58	-5.58	<0.01

<sup>a</sup> adjusted for age (1-year intervals) and race/ethnicity

<sup>b</sup> CI – confidence interval

Supplementary table 2. Difference in mean hormone concentrations by age group with adjustment for age and race/ethnicity only, comparing NHANES 1988-1991 to 1999-2004.

	Age years	1988-1991		1999-2004		Difference	P-value
		Mean <sup>a</sup>	95% CI <sup>b</sup>	Mean <sup>a</sup>	95% CI <sup>b</sup>		
Testosterone (ng/mL)	20-44	5.42	5.13, 5.72	4.93	4.60, 5.25	-0.49	<0.01
	45-69	5.47	5.21, 5.74	5.18	4.86, 5.49	-0.29	0.07
	70+	5.76	5.18, 6.34	5.63	5.02, 6.24	-0.13	0.47
Free testosterone (ng/mL)	20-44	0.101	0.095, 0.107	0.098	0.093, 0.104	-0.003	0.37
	45-69	0.101	0.092, 0.111	0.092	0.085, 0.099	-0.009	0.05
	70+	0.088	0.076, 0.102	0.075	0.061, 0.092	-0.013	0.07
SHBG (nmol/L)	20-44	35.37	32.82, 38.11	29.41	27.04, 31.98	-5.96	<0.01
	45-69	34.61	31.78, 37.69	34.00	30.86, 37.45	-0.62	0.67
	70+	41.24	34.50, 49.29	42.21	35.42, 50.30	0.97	0.65
3 $\alpha$ -diol-G (ng/mL)	20-44	12.07	11.20, 13.01	9.67	8.98, 10.40	-2.40	<0.01
	45-69	11.42	10.26, 12.70	10.86	9.93, 11.88	-0.56	0.38
	70+	12.03	9.93, 14.57	11.30	9.47, 13.49	-0.73	0.40
Estradiol (pg/mL)	20-44	35.23	33.27, 37.31	29.42	27.40, 31.59	-5.81	<0.01
	45-69	35.60	32.56, 38.92	31.08	28.68, 33.68	-4.51	<0.01
	70+	37.99	33.49, 43.10	29.24	25.02, 34.18	-8.75	<0.01

<sup>a</sup> adjusted for age (1-year intervals) and race/ethnicity

<sup>b</sup> CI – confidence interval

Supplementary table 3. Difference in mean hormone concentrations by race/ethnicity with adjustment for age only, comparing NHANES 1988-1991 to 1999-2004.

	Race/ethnicity	1988-1991		1999-2004		Difference	P-value
		Mean <sup>a</sup>	95% CI <sup>b</sup>	Mean <sup>a</sup>	95% CI <sup>b</sup>		
Testosterone (ng/mL)	White	5.45	5.27, 5.64	4.96	4.75, 5.17	-0.49	<0.01
	Black	5.71	5.40, 6.03	5.99	5.58, 6.40	0.27	0.28
	Mexican-American	5.30	5.16, 5.44	4.98	4.63, 5.33	-0.32	0.09
Free testosterone (ng/mL)	White	0.100	0.095, 0.104	0.092	0.087, 0.097	-0.007	0.01
	Black	0.100	0.092, 0.108	0.106	0.097, 0.115	0.006	0.28
	Mexican-American	0.099	0.095, 0.102	0.093	0.087, 0.100	-0.006	0.10
SHBG (nmol/L)	White	35.66	33.99, 37.42	31.45	29.72, 33.28	-4.21	<0.01
	Black	37.17	35.53, 38.89	35.61	32.65, 38.84	-1.57	0.38
	Mexican-American	33.31	31.71, 35.00	32.63	29.79, 35.74	-0.68	0.68
3 $\alpha$ -diol-G (ng/mL)	White	12.16	11.45, 12.92	10.33	9.76, 10.92	-1.84	<0.01
	Black	10.32	9.54, 11.16	9.98	9.35, 10.65	-0.34	0.51
	Mexican-American	10.91	10.20, 11.66	9.57	8.91, 10.29	-1.33	0.01
Estradiol (pg/mL)	White	35.21	33.49, 37.01	29.36	27.66, 31.16	-5.85	<0.01
	Black	40.73	39.04, 42.49	38.65	34.95, 42.75	-2.08	0.34
	Mexican-American	32.81	30.89, 34.84	26.16	23.80, 28.75	-6.65	<0.01

<sup>a</sup> adjusted for age (1-year intervals)

<sup>b</sup> CI – confidence interval

Supplementary table 4. Difference in mean hormone concentrations comparing NHANES 1988-1991 to 1999-2004 by race/ethnicity and age, with adjustment for age only.

		1988-1991		1999-2004		Difference	P-value
		Mean <sup>a</sup>	95% CI <sup>b</sup>	Mean <sup>a</sup>	95% CI <sup>b</sup>		
<b>White</b>							
Testosterone (ng/mL)	20-44	5.42	5.10, 5.74	4.76	4.36, 5.16	-0.66	<0.01
	45-69	5.41	5.12, 5.70	5.10	4.73, 5.46	-0.31	0.09
	≥ 70	5.81	5.23, 6.38	5.53	4.91, 6.15	-0.28	0.14
Free testosterone (ng/mL)	20-44	0.101	0.094, 0.108	0.097	0.091, 0.102	-0.004	0.17
	45-69	0.101	0.091, 0.111	0.091	0.083, 0.100	-0.009	0.09
	≥ 70	0.089	0.077, 0.103	0.073	0.058, 0.090	-0.016	0.04
SHBG (nmol/L)	20-44	35.62	32.86, 38.61	28.28	25.58, 31.26	-7.34	<0.01
	45-69	34.13	31.24, 37.29	33.69	30.30, 37.45	-0.45	0.77
	≥ 70	41.73	34.76, 50.09	42.73	35.49, 51.45	1.00	0.67
3α-diol-G (ng/mL)	20-44	12.39	11.42, 13.45	9.57	8.73, 10.48	-2.83	<0.01
	45-69	11.69	10.45, 13.09	11.09	10.02, 12.28	-0.60	0.40
	≥ 70	12.33	10.24, 14.85	11.25	9.43, 13.42	-1.08	0.22
Estradiol (pg/mL)	20-44	34.82	32.65, 37.14	28.59	26.16, 31.24	-6.24	<0.01
	45-69	35.23	31.99, 38.81	30.67	28.03, 33.55	-4.57	0.01
	≥ 70	37.69	33.06, 42.97	28.33	24.00, 33.44	-9.36	<0.01
<b>Black</b>							
Testosterone (ng/mL)	20-44	5.56	5.07, 6.05	5.95	5.41, 6.49	0.40	0.23
	45-69	6.17	5.66, 6.67	5.93	5.28, 6.58	-0.24	0.55
	≥ 70	5.11	4.31, 5.91	6.43	4.22, 8.65	1.33	0.23
Free testosterone (ng/mL)	20-44	0.100	0.091, 0.110	0.111	0.099, 0.123	0.011	0.10
	45-69	0.110	0.099, 0.122	0.101	0.089, 0.113	-0.009	0.23
	≥ 70	0.074	0.054, 0.102	0.094	0.064, 0.139	0.020	0.32
SHBG (nmol/L)	20-44	35.79	32.93, 38.91	34.82	31.23, 38.82	-0.97	0.64
	45-69	39.37	35.27, 43.94	36.26	30.93, 42.51	-3.11	0.34

	≥ 70	36.77	30.05, 45.00	35.73	27.35, 46.68	-1.04	0.82
3α-diol-G (ng/mL)	20-44	10.50	9.35, 11.79	9.83	9.03, 10.70	-0.67	0.29
	45-69	10.02	8.04, 12.49	9.81	8.74, 11.02	-0.21	0.85
	≥ 70	9.44	6.84, 13.02	12.79	7.20, 22.73	3.35	0.30
Estradiol (pg/mL)	20-44	40.59	38.11, 43.22	38.73	34.34, 43.68	-1.85	0.47
	45-69	40.50	37.45, 43.81	37.70	31.55, 45.05	-2.80	0.42
	≥ 70	41.33	34.66, 49.27	41.83	30.17, 57.99	0.51	0.94
<u>Mexican-American</u>							
Testosterone (ng/mL)	20-44	5.25	5.01, 5.50	4.84	4.39, 5.30	-0.41	0.05
	45-69	5.13	4.73, 5.52	5.05	4.29, 5.81	-0.08	0.85
	≥ 70	6.04	5.05, 7.03	6.07	5.35, 6.80	0.03	0.95
Free testosterone (ng/mL)	20-44	0.102	0.097, 0.108	0.097	0.089, 0.106	-0.005	0.21
	45-69	0.094	0.086, 0.102	0.086	0.074, 0.099	-0.008	0.25
	≥ 70	0.108	0.092, 0.128	0.103	0.088, 0.120	-0.006	0.56
SHBG (nmol/L)	20-44	31.92	29.44, 34.61	30.94	27.39, 34.94	-0.98	0.61
	45-69	34.32	31.77, 37.06	34.62	28.68, 41.79	0.31	0.93
	≥ 70	36.55	29.70, 44.98	38.30	31.75, 46.18	1.75	0.68
3α-diol-G (ng/mL)	20-44	10.98	9.89, 12.20	9.40	8.48, 10.42	-1.58	0.02
	45-69	9.94	8.64, 11.44	9.61	8.53, 10.82	-0.34	0.70
	≥ 70	14.36	9.96, 20.70	12.01	10.30, 14.00	-2.35	0.34
Estradiol (pg/mL)	20-44	32.51	30.01, 35.23	25.76	23.07, 28.76	-6.76	<0.01
	45-69	32.29	29.64, 35.17	26.60	23.17, 30.54	-5.69	0.01
	≥ 70	37.09	31.04, 44.33	27.72	22.75, 33.77	-9.38	0.01

<sup>a</sup> adjusted for age (1-year intervals)

<sup>b</sup> CI – confidence interval

Supplementary table 5. Difference in NHANES 1988-1991 and 1999-2004 mean hormone concentrations among white men ages 20-44 years, restricting to subjects with BMI within the 5<sup>th</sup> and 95<sup>th</sup> percentiles<sup>a</sup>.

	Difference <sup>b, c</sup>	P-value
Testosterone (ng/mL)	-0.15	0.38
Free testosterone (ng/mL)	-0.002	0.70
SHBG (nmol/L)	-2.20	0.10
3 $\alpha$ -diol-G (ng/mL)	-3.45	< 0.01
Estradiol (pg/mL)	-7.08	< 0.01

<sup>a</sup> BMI greater than 20.4 kg/m<sup>2</sup> and less than 36.6 kg/m<sup>2</sup>

<sup>b</sup> adjusted for age (1-year intervals), BMI, waist circumference, smoking, and alcohol use

<sup>c</sup> differences for free testosterone, SHBG, 3 $\alpha$ -diol-G, and estradiol were calculated from geometric means

Supplementary table 6. Difference in NHANES 1988-1991 and 1999-2004 mean hormone concentrations among black men, restricting to subjects with BMI within the 5<sup>th</sup> and 95<sup>th</sup> percentiles<sup>a</sup>.

	Difference <sup>b, c</sup>	P-value
Testosterone (ng/mL)	0.60	0.02
Free testosterone (ng/mL)	0.012	0.08
SHBG (nmol/L)	0.42	0.81
3 $\alpha$ -diol-G (ng/mL)	-0.74	0.18
Estradiol (pg/mL)	-1.07	0.67

<sup>a</sup> BMI greater than 19.2 kg/m<sup>2</sup> and less than 37.6 kg/m<sup>2</sup>

<sup>b</sup> adjusted for age (1-year intervals), BMI, waist circumference, smoking, and alcohol use

<sup>c</sup> differences for free testosterone, SHBG, 3 $\alpha$ -diol-G, and estradiol were calculated from geometric means