

V. Bone Analysis

Bone mineral weight and density by dual energy X-ray absorptiometry (DXA)

- Whole body bone mineral weight
- Whole body bone mineral density
- Head bone mineral weight
- Head bone mineral density
- Left arm bone mineral weight
- Left arm bone mineral density
- Right arm bone mineral weight
- Right arm bone mineral density
- Left rib cage bone mineral weight
- Left rib cage bone mineral density
- Right rib cage bone mineral weight
- Right rib cage bone mineral density
- Thoracic spine bone mineral weight
- Thoracic spine bone mineral density
- Lumbar spine bone mineral weight
- Lumbar bone mineral density
- Pelvic bone mineral weight
- Pelvic bone mineral density
- Left leg bone mineral weight
- Left leg bone mineral density
- Right leg bone mineral weight
- Right leg bone mineral density
- Lumbar spine 2-4 bone mineral density
- Right and left femoral neck bone mineral density
- Right and left trochanter region bone mineral density
- Right and left Ward's triangle bone mineral density

Bone mineral density

1. Dual energy X-ray absorptiometry (DXA) (Hologic QDR-4500)

Whole body bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	2389.6	324.6	283	2334.0	306.9	291	2264.4	349.4	297	2090.3	297.0	247	1934.1	347.9	53	2260.3	346.2	1171
Female	1993.8	256.7	287	1780.2	280.8	280	1571.3	238.0	270	1393.8	215.3	283	1246.4	251.7	55	1666.3	345.5	1175
Total	2190.4	352.9	570	2062.4	404.1	571	1934.4	459.1	567	1718.4	432.0	530	1583.9	458.4	108	1962.8	455.9	2346

Whole body bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
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	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	1.124	0.095	283	1.114	0.093	291	1.107	0.101	297	1.061	0.096	247	1.026	0.111	53	1.099	0.100	1171
Female	1.099	0.083	287	1.014	0.104	280	0.931	0.090	270	0.878	0.079	283	0.840	0.090	55	0.975	0.125	1175
Total	1.111	0.090	570	1.065	0.110	571	1.023	0.130	567	0.963	0.126	530	0.932	0.137	108	1.037	0.130	2346

Head bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	506.7	88.0	273	498.5	84.8	277	493.0	88.6	283	450.3	85.3	230	442.9	90.5	50	486.6	89.6	1113
Female	545.2	90.6	283	479.4	98.3	271	417.9	86.8	264	380.7	73.0	267	348.4	78.9	49	452.6	109.0	1134
Total	526.3	91.3	556	489.1	92.1	548	456.8	95.4	547	412.9	86.1	497	396.1	96.9	99	469.5	101.3	2247

Head bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	2.025	0.293	273	2.418	6.373	277	2.033	0.314	283	2.448	8.188	230	1.913	0.336	50	2.207	4.897	1113
Female	2.742	6.942	283	2.084	0.376	271	2.304	7.402	264	1.735	0.286	267	1.621	0.289	49	2.197	4.991	1134
Total	2.390	4.966	556	2.253	4.538	548	2.164	5.144	547	2.065	5.579	497	1.768	0.345	99	2.202	4.944	2247

Left arm bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	175.0	27.3	273	173.4	27.5	277	168.4	26.3	283	157.3	28.2	230	145.1	31.8	50	167.9	28.6	1113
Female	123.0	17.7	283	111.2	18.7	271	97.5	17.7	264	87.7	15.6	267	75.3	16.8	49	103.9	22.7	1134
Total	148.5	34.7	556	142.6	39.0	548	134.1	42.0	547	119.9	41.3	497	110.6	43.3	99	135.6	41.1	2247

Left arm bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.951	2.718	273	1.134	5.842	277	0.773	0.059	283	1.190	6.677	230	0.717	0.082	50	0.990	4.414	1113
Female	1.088	6.855	283	0.641	0.053	271	0.976	6.180	264	0.568	0.048	267	0.544	0.043	49	0.809	4.540	1134
Total	1.021	5.244	556	0.890	4.157	548	0.871	4.290	547	0.856	4.548	497	0.631	0.109	99	0.899	4.478	2247

Right arm bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	185.9	27.5	273	184.4	26.8	277	177.7	27.3	283	162.9	24.5	230	151.2	32.5	50	177.1	28.8	1113

Female	131.2	17.3	283	118.6	19.4	271	104.8	18.1	264	93.3	16.0	267	81.2	18.3	49	111.0	23.5	1134
Total	158.0	35.7	556	151.9	40.4	548	142.5	43.3	547	125.5	40.3	497	116.5	43.9	99	143.7	42.2	2247

Right arm bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	1.355	9.002	273	1.122	5.300	277	0.792	0.063	283	1.185	6.478	230	0.735	0.079	50	1.091	5.957	1113
Female	1.103	6.795	283	0.656	0.055	271	0.963	5.748	264	0.577	0.046	267	0.550	0.046	49	0.816	4.383	1134
Total	1.226	7.949	556	0.892	3.772	548	0.874	3.991	547	0.858	4.412	497	0.643	0.113	99	0.952	5.223	2247

Left rib cage bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	85.5	17.8	273	82.1	17.0	277	80.2	14.6	283	73.3	14.8	230	65.8	14.6	50	79.9	16.9	1113
Female	69.0	12.9	283	64.3	19.1	271	57.5	11.7	264	53.6	10.1	267	48.4	10.0	49	60.7	15.2	1134
Total	77.1	17.5	556	73.3	20.1	548	69.3	17.5	547	62.7	15.9	497	57.2	15.3	99	70.2	18.7	2247

Left rib cage bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	1.795	19.05	273	0.990	5.911	277	0.630	0.071	283	1.073	7.082	230	0.580	0.074	50	1.095	10.39	1113
Female	1.005	6.801	283	0.558	0.124	271	0.880	6.000	264	0.492	0.045	267	0.470	0.046	49	0.725	4.463	1134
Total	1.393	14.20	556	0.777	4.205	548	0.751	4.167	547	0.761	4.821	497	0.525	0.083	99	0.908	7.972	2247

Right rib cage bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	86.1	17.5	273	84.0	15.7	277	82.0	16.9	283	75.4	16.6	230	68.1	17.8	50	81.5	17.4	1113
Female	70.8	13.6	283	66.7	14.3	271	62.6	14.1	264	58.5	12.8	267	52.9	21.8	49	64.3	15.0	1134
Total	78.3	17.4	556	75.5	17.3	548	72.6	18.4	547	66.3	16.9	497	60.6	21.2	99	72.8	18.4	2247

Right rib cage bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	1.838	19.82	273	0.922	4.829	277	0.629	0.070	283	0.922	4.774	230	0.589	0.083	50	1.057	10.33	1113
Female	1.026	7.157	283	0.554	0.060	271	0.855	5.508	264	0.498	0.046	267	0.501	0.154	49	0.726	4.454	1134
Total	1.425	14.79	556	0.740	3.436	548	0.738	3.824	547	0.694	3.251	497	0.545	0.131	99	0.890	7.930	2247

Thoracic spine bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	120.7	54.7	273	120.8	27.1	277	123.4	29.6	283	111.4	28.2	230	105.3	30.0	50	118.8	37.0	1113
Female	99.9	19.6	283	91.0	18.9	271	80.6	17.2	264	75.3	15.4	267	70.2	17.8	49	86.2	20.4	1134
Total	110.1	42.0	556	106.0	27.7	548	102.7	32.4	547	92.0	28.6	497	88.0	30.3	99	102.3	33.9	2247

Thoracic spine bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	2.562	28.63	273	0.850	0.126	277	0.880	0.139	283	0.852	0.136	230	0.835	0.156	50	1.278	14.18	1113
Female	0.851	0.104	283	0.770	0.107	271	0.698	0.107	264	0.658	0.084	267	0.636	0.102	49	0.741	0.126	1134
Total	1.691	20.06	556	0.810	0.124	548	0.792	0.154	547	0.748	0.147	497	0.736	0.165	99	1.007	9.982	2247

Lumbar spine bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	59.8	13.0	273	59.1	13.8	277	61.4	15.3	283	55.2	15.8	230	53.0	16.7	50	58.8	14.8	1113
Female	56.1	10.5	283	46.2	11.0	271	38.6	10.2	264	34.2	9.7	267	31.3	10.8	49	43.4	13.5	1134
Total	57.9	12.0	556	52.7	14.1	548	50.4	17.3	547	43.9	16.6	497	42.3	17.8	99	51.0	16.1	2247

Lumbar bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.982	0.131	273	0.980	0.166	277	1.023	0.184	283	0.990	0.190	230	0.977	0.222	50	0.993	0.172	1113
Female	1.064	0.145	283	0.927	0.145	271	0.840	0.195	264	0.797	0.120	267	0.785	0.150	49	0.904	0.185	1134
Total	1.024	0.144	556	0.954	0.158	548	0.935	0.210	547	0.886	0.184	497	0.882	0.212	99	0.948	0.184	2247

Pelvic bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	239.8	53.4	273	229.9	52.0	277	219.3	52.1	283	195.1	49.1	230	171.2	47.8	50	219.8	54.9	1113
Female	205.5	45.0	283	173.5	52.1	271	145.8	33.1	264	122.5	27.4	267	105.7	30.7	49	160.1	51.9	1134
Total	222.3	52.1	556	202.0	59.2	548	183.8	57.3	547	156.1	53.2	497	138.8	51.8	99	189.7	61.1	2247

Pelvic bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	1.143	0.142	273	1.125	0.166	277	1.109	0.146	283	1.060	0.146	230	0.984	0.145	50	1.106	0.155	1113
Female	1.158	0.140	283	1.084	0.203	271	0.999	0.130	264	0.921	0.157	267	0.845	0.125	49	1.034	0.186	1134
Total	1.151	0.141	556	1.105	0.186	548	1.056	0.149	547	0.985	0.167	497	0.915	0.152	99	1.069	0.175	2247

Left leg bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	467.6	73.5	273	449.9	72.5	277	432.8	67.3	283	403.1	65.1	230	361.2	78.2	50	436.2	75.4	1113
Female	342.6	54.0	283	314.0	50.1	271	279.6	47.7	264	244.4	51.2	267	212.3	55.3	49	292.4	64.8	1134
Total	404.0	89.7	556	382.7	92.3	548	358.9	96.4	547	317.8	98.2	497	287.5	100.7	99	363.6	100.5	2247

Left leg bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	1.259	0.131	273	1.237	0.129	277	1.218	0.123	283	1.178	0.133	230	1.092	0.138	50	1.219	0.135	1113
Female	1.096	0.089	283	1.037	0.097	271	0.969	0.094	264	0.909	0.111	267	0.861	0.118	49	0.998	0.124	1134
Total	1.176	0.138	556	1.138	0.152	548	1.098	0.166	547	1.033	0.181	497	0.978	0.173	99	1.108	0.170	2247

Right leg bone mineral weight (g)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	461.6	72.9	273	446.3	69.9	277	428.0	65.9	283	397.7	63.9	230	360.0	73.0	50	431.5	73.7	1113
Female	341.4	53.0	283	312.4	49.6	271	276.6	47.9	264	243.3	50.3	267	205.9	57.0	49	290.4	64.7	1134
Total	400.4	87.5	556	380.1	90.4	548	354.9	95.3	547	314.8	95.8	497	283.7	101.3	99	360.3	98.9	2247

Right leg bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	1.237	0.124	273	1.220	0.121	277	1.203	0.119	283	1.155	0.112	230	1.085	0.127	50	1.200	0.125	1113
Female	1.101	0.129	283	1.034	0.098	271	0.975	0.251	264	0.909	0.127	267	0.850	0.108	49	1.000	0.177	1134
Total	1.168	0.144	556	1.128	0.144	548	1.093	0.225	547	1.023	0.172	497	0.969	0.166	99	1.099	0.183	2247

Lumbar spine 2–4 bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.986	0.133	284	0.988	0.151	292	1.039	0.297	297	0.997	0.186	250	0.979	0.228	53	1.002	0.206	1176

Female	1.039	0.126	288	0.914	0.151	280	0.818	0.132	272	0.785	0.129	283	0.752	0.159	55	0.884	0.169	1178
Total	1.013	0.132	572	0.952	0.155	572	0.933	0.258	569	0.884	0.190	533	0.864	0.226	108	0.943	0.197	2354

Lumbar spine 2-4 bone mineral density (percentage of Young Adult Mean (YAM))

	40 - 49yr			50 - 59yr			60 - 69yr			70 - 79yr			80yr -			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	162.0	1124	273	94.3	15.6	277	97.6	18.0	283	94.8	19.0	230	112.2	26.3	50	112.6	557.0	1113
Female	102.3	13.9	283	90.4	14.7	271	80.4	13.9	264	77.5	12.6	267	106.3	24.2	49	88.7	17.7	1134
Total	131.6	787.7	556	92.3	15.3	548	89.3	18.2	547	85.5	18.0	497	109.3	25.4	99	100.5	392.3	2247

Right femoral neck bone mineral density (g/cm²)

	40 - 49yr			50 - 59yr			60 - 69yr			70 - 79yr			80yr -			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.771	0.116	283	0.768	0.102	292	0.750	0.108	297	0.697	0.108	249	0.648	0.107	53	0.744	0.114	1174
Female	0.735	0.105	289	0.692	0.096	279	0.640	0.095	271	0.582	0.089	280	0.533	0.069	54	0.657	0.114	1173
Total	0.753	0.112	572	0.731	0.106	571	0.697	0.116	568	0.637	0.114	529	0.590	0.106	107	0.700	0.122	2347

Right trochanter region bone mineral density (g/cm²)

	40 - 49yr			50 - 59yr			60 - 69yr			70 - 79yr			80yr -			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.683	0.107	283	0.695	0.106	292	0.690	0.109	297	0.650	0.110	249	0.599	0.118	53	0.677	0.111	1174
Female	0.645	0.094	289	0.607	0.098	279	0.553	0.088	271	0.504	0.088	280	0.452	0.080	54	0.572	0.109	1173
Total	0.664	0.102	572	0.652	0.111	571	0.625	0.121	568	0.573	0.123	529	0.525	0.124	107	0.625	0.122	2347

Right Ward's triangle bone mineral density (g/cm²)

	40 - 49yr			50 - 59yr			60 - 69yr			70 - 79yr			80yr -			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.622	0.138	283	0.588	0.121	292	0.550	0.132	297	0.472	0.117	249	0.426	0.100	53	0.555	0.140	1174
Female	0.633	0.131	289	0.554	0.125	279	0.471	0.137	271	0.381	0.107	280	0.321	0.097	54	0.502	0.159	1173
Total	0.627	0.135	572	0.571	0.124	571	0.513	0.140	568	0.424	0.121	529	0.373	0.111	107	0.528	0.152	2347

Left femoral neck bone mineral density (g/cm²)

	40 - 49yr			50 - 59yr			60 - 69yr			70 - 79yr			80yr -			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.784	0.121	283	0.779	0.102	292	0.762	0.108	297	0.709	0.108	249	0.652	0.109	53	0.755	0.115	1174
Female	0.744	0.105	289	0.702	0.098	280	0.648	0.090	272	0.582	0.083	280	0.543	0.075	53	0.664	0.114	1174
Total	0.764	0.115	572	0.741	0.107	572	0.707	0.115	569	0.642	0.114	529	0.598	0.108	106	0.710	0.123	2348

Left trochanter region bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.692	0.111	283	0.706	0.106	292	0.701	0.113	297	0.661	0.113	249	0.603	0.126	53	0.687	0.114	1174
Female	0.645	0.094	289	0.611	0.099	280	0.566	0.088	272	0.510	0.085	280	0.467	0.066	53	0.578	0.106	1174
Total	0.668	0.105	572	0.660	0.113	572	0.636	0.122	569	0.581	0.125	529	0.535	0.121	106	0.633	0.123	2348

Left Ward's triangle bone mineral density (g/cm²)

	40 – 49yr			50 – 59yr			60 – 69yr			70 – 79yr			80yr –			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	0.626	0.144	283	0.581	0.120	292	0.542	0.117	297	0.472	0.118	249	0.414	0.110	53	0.551	0.139	1174
Female	0.635	0.130	289	0.554	0.121	280	0.464	0.115	272	0.373	0.098	280	0.330	0.067	53	0.500	0.154	1174
Total	0.630	0.137	572	0.567	0.121	572	0.505	0.123	569	0.420	0.118	529	0.372	0.100	106	0.525	0.149	2348