

Meta-Analysis of Liver Volume Changes

Table A1. In Vivo Pediatric Liver Size Database Used in this Study

Study	N	Age (years)	Weight (kg)	Height (cm)	BSA (m ²)	Liver volume (L) ± SD	Sex	Race	Methods	Study year
ICRP (1975) ^{18§}	122	0.001	3.5	51	0.226	0.124 ± 0.026	M	NA	Autopsy	1975
	93	0.125	5.4	56.2	0.297	0.132 ± 0.027	M	NA	Autopsy	1975
	101	0.375	6.75	64.8	0.354	0.171 ± 0.035	M	NA	Autopsy	1975
	106	0.625	8.7	69.8	0.418	0.220 ± 0.044	M	NA	Autopsy	1975
	69	0.875	9.7	73.6	0.453	0.271 ± 0.053	M	NA	Autopsy	1975
	186	1.5	11.4	82	0.515	0.225 ± 0.042	M	NA	Autopsy	1975
	114	2.5	13.6	91	0.590	0.425 ± 0.074	M	NA	Autopsy	1975
	78	3.5	15.6	99	0.646	0.491 ± 0.08	M	NA	Autopsy	1975
	62	4.5	17.5	106	0.713	0.525 ± 0.082	M	NA	Autopsy	1975
	36	5.5	20	113	0.790	0.548 ± 0.082	M	NA	Autopsy	1975
	22	6.5	22	119	0.854	0.612 ± 0.089	M	NA	Autopsy	1975
	29	7.5	24.3	125	0.924	0.640 ± 0.092	M	NA	Autopsy	1975
	20	8.5	27	130.5	0.997	0.748 ± 0.11	M	NA	Autopsy	1975
	21	9.5	30	136	1.074	0.745 ± 0.11	M	NA	Autopsy	1975
	27	10.5	33	141	1.148	0.862 ± 0.13	M	NA	Autopsy	1975
	17	11.5	36.3	146	1.226	0.835 ± 0.125	M	NA	Autopsy	1975
	12	12.5	40	151	1.309	0.914 ± 0.14	M	NA	Autopsy	1975
	15	13.5	46	158	1.436	1.021 ± 0.17	M	NA	Autopsy	1975
	16	14.5	52	166	1.568	1.08 ± 0.18	M	NA	Autopsy	1975
	20	15.5	58	171	1.678	1.137 ± 0.2	M	NA	Autopsy	1975
	24	16.5	62.5	175	1.761	1.341 ± 0.25	M	NA	Autopsy	1975
	97	18	67.1	176.9	1.829	1.490 ± 0.31	M	NA	Autopsy	1975
	93	0.001	3.4	50.2	0.221	0.126 ± 0.027	F	NA	Autopsy	1975
	83	0.125	4.5	55	0.267	0.123 ± 0.026	F	NA	Autopsy	1975
	102	0.375	6.7	63.5	0.350	0.165 ± 0.033	F	NA	Autopsy	1975
	87	0.625	8.2	67.5	0.400	0.220 ± 0.044	F	NA	Autopsy	1975
	88	0.875	9.1	72	0.433	0.247 ± 0.048	F	NA	Autopsy	1975
	164	1.5	10.8	80.5	0.497	0.298 ± 0.056	F	NA	Autopsy	1975
	105	2.5	13	90	0.574	0.397 ± 0.069	F	NA	Autopsy	1975
	68	3.5	15.3	98	0.636	0.454 ± 0.075	F	NA	Autopsy	1975
	32	4.5	17.3	105	0.705	0.518 ± 0.081	F	NA	Autopsy	1975
	36	5.5	19	112	0.768	0.547 ± 0.082	F	NA	Autopsy	1975
	29	6.5	22	118	0.849	0.559 ± 0.082	F	NA	Autopsy	1975
	20	7.5	24	124	0.913	0.632 ± 0.091	F	NA	Autopsy	1975
	13	8.5	27	130	0.994	0.678 ± 0.1	F	NA	Autopsy	1975
	16	9.5	30.5	135.4	1.078	0.799 ± 0.12	F	NA	Autopsy	1975
	11	10.5	34	141	1.163	0.838 ± 0.12	F	NA	Autopsy	1975
	8	11.5	38	147	1.256	0.778 ± 0.12	F	NA	Autopsy	1975
	9	12.5	43	152.5	1.360	0.970 ± 0.15	F	NA	Autopsy	1975
	15	13.5	48	157.5	1.459	0.924 ± 0.15	F	NA	Autopsy	1975
	13	14.5	52	161	1.533	1.119 ± 0.19	F	NA	Autopsy	1975
	18	15.5	54.5	163	1.578	1.249 ± 0.22	F	NA	Autopsy	1975
	21	16.5	56	163.2	1.598	1.309 ± 0.24	F	NA	Autopsy	1975
	70	18	57.5	163.5	1.619	1.360 ± 0.28	F	NA	Autopsy	1975
ALT+DITT ^{19§}	63	0.001	3.4	50.5	0.222	0.115 ± 0.024	M	NA	Autopsy	1962
	37	0.5	7.6	66	0.380	0.278 ± 0.056	M	NA	Autopsy	1962
	34	1	10.1	75	0.466	0.370 ± 0.071	M	NA	Autopsy	1962
	24	2	12.6	87	0.557	0.426 ± 0.077	M	NA	Autopsy	1962
	27	3	14.6	95	0.624	0.472 ± 0.08	M	NA	Autopsy	1962
	26	4	16.5	102	0.676	0.514 ± 0.08	M	NA	Autopsy	1962
	27	5	19.4	112	0.775	0.551 ± 0.084	M	NA	Autopsy	1962
	20	6	21.9	119	0.853	0.583 ± 0.086	M	NA	Autopsy	1962
	16	7	24.5	126	0.932	0.616 ± 0.089	M	NA	Autopsy	1962
	13	8	27.3	131.5	1.007	0.662 ± 0.095	M	NA	Autopsy	1962
	16	9	29.9	136	1.072	0.713 ± 0.1	M	NA	Autopsy	1962

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Table A1. (Continued)

Study	N	Age (years)	Weight (kg)	Height (cm)	BSA (m ²)	Liver volume (L) ± SD	Sex	Race	Methods	Study year
Ogiu et al. (1997) ^{15*}	8	10	32.6	138	1.124	0.787 ± 0.11	M	NA	Autopsy	1962
	4	11	35.2	144	1.198	0.880 ± 0.13	M	NA	Autopsy	1962
	14	12	38.3	150	1.279	0.972 ± 0.15	M	NA	Autopsy	1962
	8	13	42.2	152	1.346	1.065 ± 0.17	M	NA	Autopsy	1962
	12	14	48.8	162	1.5	1.148 ± 0.19	M	NA	Autopsy	1962
	7	15	54.5	168	1.613	1.218 ± 0.21	M	NA	Autopsy	1962
	19	16	58.8	172	1.695	1.278 ± 0.23	M	NA	Autopsy	1962
	14	17	61.8	174	1.746	1.343 ± 0.26	M	NA	Autopsy	1962
	24	18	63.1	175	1.768	1.398 ± 0.28	M	NA	Autopsy	1962
	36	0.001	3.4	50.2	0.221	0.116 ± 0.024	F	NA	Autopsy	1962
	5	0.5	7.3	65.5	0.37	0.222 ± 0.044	F	NA	Autopsy	1962
	14	1	9.8	75	0.458	0.361 ± 0.07	F	NA	Autopsy	1962
	11	2	12.3	87	0.549	0.417 ± 0.075	F	NA	Autopsy	1962
	12	3	14.4	96	0.622	0.463 ± 0.078	F	NA	Autopsy	1962
	13	4	16.4	102	0.674	0.509 ± 0.081	F	NA	Autopsy	1962
	9	5	18.8	110.5	0.757	0.546 ± 0.084	F	NA	Autopsy	1962
	8	6	21.1	117	0.829	0.588 ± 0.087	F	NA	Autopsy	1962
	6	7	23.7	123	0.903	0.634 ± 0.092	F	NA	Autopsy	1962
	9	8	26.4	128	0.973	0.690 ± 0.099	F	NA	Autopsy	1962
	5	9	28.9	133	1.040	0.75 ± 0.11	F	NA	Autopsy	1962
	5	10	31.9	137.5	1.111	0.815 ± 0.12	F	NA	Autopsy	1962
	8	11	35.7	143	1.199	0.889 ± 0.13	F	NA	Autopsy	1962
	8	12	39.7	149	1.292	1.0 ± 0.15	F	NA	Autopsy	1962
	3	13	45	155	1.403	1.093 ± 0.17	F	NA	Autopsy	1962
	4	14	49.2	159	1.484	1.176 ± 0.19	F	NA	Autopsy	1962
	7	15	51.5	160.8	1.526	1.231 ± 0.21	F	NA	Autopsy	1962
	7	16	53.1	162	1.554	1.259 ± 0.23	F	NA	Autopsy	1962
	7	17	54	162.5	1.569	1.278 ± 0.24	F	NA	Autopsy	1962
	9	18	54.4	163	1.577	1.292 ± 0.26	F	NA	Autopsy	1962
	55	0.001	2.9	49.2	0.202	0.119 ± 0.03	M	J	Autopsy	1996
	14	0.083	4.2	54.7	0.257	0.161 ± 0.033	M	J	Autopsy	1996
	19	0.167	5.4	58.1	0.301	0.192 ± 0.032	M	J	Autopsy	1996
	16	0.25	7.2	63.6	0.364	0.24 ± 0.042	M	J	Autopsy	1996
	21	0.33	6.7	63.8	0.350	0.235 ± 0.036	M	J	Autopsy	1996
	12	0.417	7.1	65.4	0.365	0.256 ± 0.04	M	J	Autopsy	1996
	13	0.5	7.6	66.3	0.381	0.249 ± 0.031	M	J	Autopsy	1996
	11	0.583	8.9	69.9	0.423	0.302 ± 0.03	M	J	Autopsy	1996
	10	0.67	8.3	70.5	0.409	0.304 ± 0.028	M	J	Autopsy	1996
	8	0.75	9	72.2	0.431	0.346 ± 0.07	M	J	Autopsy	1996
	6	0.833	8.4	66.1	0.401	0.293 ± 0.05	M	J	Autopsy	1996
	5	0.92	8.3	72.3	0.41	0.326 ± 0.03	M	J	Autopsy	1996
	34	3	10	80.4	0.476	0.376 ± 0.06	M	J	Autopsy	1996
	16	2	11.5	85.5	0.526	0.447 ± 0.06	M	J	Autopsy	1996
	20	3	14.3	97.8	0.624	0.464 ± 0.09	M	J	Autopsy	1996
	13	4	15.6	105.4	0.676	0.564 ± 0.09	M	J	Autopsy	1996
	13	5	17.8	110.4	0.740	0.595 ± 0.11	M	J	Autopsy	1996
	8	6	19.9	115.6	0.802	0.65 ± 0.11	M	J	Autopsy	1996
	12	7	21.7	118.1	0.845	0.625 ± 0.063	M	J	Autopsy	1996
	10	8	22.8	124.5	0.896	0.763 ± 0.11	M	J	Autopsy	1996
	11	9	29.4	133.2	1.049	0.835 ± 0.11	M	J	Autopsy	1996
	12	10	29.3	135.5	1.06	0.878 ± 0.13	M	J	Autopsy	1996
	10	11	34.5	142.5	1.179	0.940 ± 0.15	M	J	Autopsy	1996
	9	12	40.7	153.5	1.335	1.029 ± 0.12	M	J	Autopsy	1996
	9	13	41.6	152.3	1.339	0.966 ± 0.14	M	J	Autopsy	1996
	9	14	50.8	163.6	1.536	1.206 ± 0.14	M	J	Autopsy	1996

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Meta-Analysis of Liver Volume Changes

Table A1. (Continued)

Study	N	Age (years)	Weight (kg)	Height (cm)	BSA (m ²)	Liver volume (L) ± SD	Sex	Race	Methods	Study year
	19	15	58.7	169.6	1.676	1.224 ± 0.28	M	J	Autopsy	1996
	21	16	58.6	169.1	1.672	1.231 ± 0.24	M	J	Autopsy	1996
	25	17	57.3	168.1	1.649	1.15 ± 0.2	M	J	Autopsy	1996
	17	18	58.2	167.2	1.653	1.115 ± 0.14	M	J	Autopsy	1996
	27	19	65.5	168.4	1.747	1.371 ± 0.25	M	J	Autopsy	1996
	44	18	62.7	167.9	1.711	1.272 ± 0.2	M	J	Autopsy	1996
	75	0.001	3.6	50.2	0.228	0.139 ± 0.035	F	J	Autopsy	1996
	12	0.083	3.8	53.2	0.240	0.15 ± 0.03	F	J	Autopsy	1996
	17	0.167	5	59	0.290	0.194 ± 0.02	F	J	Autopsy	1996
	10	0.25	6	60	0.322	0.216 ± 0.026	F	J	Autopsy	1996
	14	0.33	6.6	63.3	0.347	0.219 ± 0.031	F	J	Autopsy	1996
	15	0.417	6.4	64.8	0.344	0.219 ± 0.037	F	J	Autopsy	1996
	7	0.5	7.4	65.6	0.37	0.254 ± 0.031	F	J	Autopsy	1996
	5	0.583	7.1	68.3	0.371	0.306 ± 0.048	F	J	Autopsy	1996
	8	0.67	7.8	66.7	0.387	0.293 ± 0.05	F	J	Autopsy	1996
	10	0.75	8	72.8	0.406	0.295 ± 0.049	F	J	Autopsy	1996
	3	0.833	8.4	73.2	0.418	0.290 ± 0.027	F	J	Autopsy	1996
	3	0.92	8	71	0.402	0.347 ± 0.02	F	J	Autopsy	1996
	38	1	9.5	77.5	0.457	0.359 ± 0.06	F	J	Autopsy	1996
	21	2	11.7	86.5	0.534	0.414 ± 0.083	F	J	Autopsy	1996
	18	3	14.6	96.5	0.628	0.440 ± 0.07	F	J	Autopsy	1996
	10	4	16.3	103.2	0.678	0.529 ± 0.089	F	J	Autopsy	1996
	7	5	16.8	107.4	0.707	0.586 ± 0.13	F	J	Autopsy	1996
	9	6	19.9	114.2	0.795	0.596 ± 0.11	F	J	Autopsy	1996
	10	7	21.2	119.1	0.842	0.6 ± 0.1	F	J	Autopsy	1996
	8	8	26.9	129.3	0.988	0.772 ± 0.1	F	J	Autopsy	1996
	10	9	26.7	129.7	0.987	0.797 ± 0.14	F	J	Autopsy	1996
	4	10	33.6	140.6	1.154	0.933 ± 0.08	F	J	Autopsy	1996
	10	11	39.4	147.8	1.281	1.02 ± 0.13	F	J	Autopsy	1996
	6	12	37.4	147.5	1.251	0.993 ± 0.15	F	J	Autopsy	1996
	4	13	45.1	148.3	1.360	1.014 ± 0.1	F	J	Autopsy	1996
	6	14	52.7	157.8	1.520	1.190 ± 0.15	F	J	Autopsy	1996
	8	15	48.5	158.1	1.469	0.885 ± 0.2	F	J	Autopsy	1996
	5	16	50.5	153.4	1.462	1.05 ± 0.21	F	J	Autopsy	1996
	9	17	49.3	156	1.465	1.045 ± 0.13	F	J	Autopsy	1996
	23	18	49.3	158.3	1.481	1.132 ± 0.17	F	J	Autopsy	1996
Murry et al. (1995) ^{10†}	3	3.88	16.2	101.2	0.666	0.508 ± 0.036	U	NA	Radio	1997
	5	7.89	25.48	126.9	0.955	0.729 ± 0.16	U	NA	Radio	1997
	5	12.66	42.65	153	1.358	1.035 ± 0.041	U	NA	Radio	1997
	4	16.52	58.3	167.9	1.660	1.258 ± 0.27	U	NA	Radio	1997
Coppoletta and Wolbach (1933) ^{21§}	23	0.0041	3.1	49	0.209	0.072 ± 0.03	U	NA	Autopsy	1933
	12	0.0109	3.1	49	0.209	0.089 ± 0.03	U	NA	Autopsy	1933
	37	0.038	3.75	52	0.237	0.114 ± 0.03	U	NA	Autopsy	1933
	34	0.083	3.75	52	0.237	0.118 ± 0.03	U	NA	Autopsy	1933
	18	0.115	4.1	53	0.250	0.123 ± 0.031	U	NA	Autopsy	1933
	41	0.153	4.6	55	0.270	0.126 ± 0.035	U	NA	Autopsy	1933
	55	0.166	4.7	56	0.275	0.130 ± 0.041	U	NA	Autopsy	1933
	34	0.33	5.6	59	0.309	0.148 ± 0.042	U	NA	Autopsy	1933
	36	0.41	6.2	61	0.330	0.174 ± 0.035	U	NA	Autopsy	1933
	46	0.5	6.45	62	0.340	0.185 ± 0.05	U	NA	Autopsy	1933
	36	0.58	7.3	65	0.370	0.210 ± 0.04	U	NA	Autopsy	1933
	37	0.67	7.3	65	0.370	0.235 ± 0.051	U	NA	Autopsy	1933
	20	0.75	7.8	67	0.388	0.241 ± 0.062	U	NA	Autopsy	1933
	25	0.83	8.4	69	0.408	0.254 ± 0.056	U	NA	Autopsy	1933
	28	0.91	8.6	70	0.416	0.256 ± 0.059	U	NA	Autopsy	1933

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Table A1. (Continued)

Study	N	Age (years)	Weight (kg)	Height (cm)	BSA (m ²)	Liver volume (L) ± SD	Sex	Race	Methods	Study year
Urata et al. (1995) ^{9§}	11	1	9.37	73	0.443	0.267 ± 0.071	U	NA	Autopsy	1933
	34	1.16	9.65	74	0.452	0.281 ± 0.065	U	NA	Autopsy	1933
	32	1.33	10.47	77	0.480	0.306 ± 0.067	U	NA	Autopsy	1933
	30	1.5	10.5	78	0.484	0.319 ± 0.087	U	NA	Autopsy	1933
	19	1.67	10.65	79	0.489	0.343 ± 0.045	U	NA	Autopsy	1933
	14	1.83	11.3	82	0.513	0.352 ± 0.06	U	NA	Autopsy	1933
	28	2	11.8	84	0.530	0.365 ± 0.07	U	NA	Autopsy	1933
	53	3	12.65	88	0.560	0.387 ± 0.08	U	NA	Autopsy	1933
	19	4	15.55	99	0.645	0.478 ± 0.075	U	NA	Autopsy	1933
	19	5	17.4	106	0.711	0.552 ± 0.095	U	NA	Autopsy	1933
	53	6	17.75	109	0.732	0.594 ± 0.09	U	NA	Autopsy	1933
	42	7	21.45	113	0.786	0.630 ± 0.09	U	NA	Autopsy	1933
	26	8	22	119	0.854	0.681 ± 0.09	U	NA	Autopsy	1933
	29	9	24.75	125	0.931	0.7 ± 0.08	U	NA	Autopsy	1933
	27	10	27.1	130	0.995	0.789 ± 0.09	U	NA	Autopsy	1933
	12	11	29.5	135	1.061	0.842 ± 0.09	U	NA	Autopsy	1933
	14	12	32	139	1.121	0.867 ± 0.09	U	NA	Autopsy	1933
	3	0.47	7.45	66.9	0.378	0.237 ± 0.03	M	J	Radio	1995
	8	0.74	7.84	68.2	0.391	0.235 ± 0.03	M	J	Radio	1995
	8	1.65	10.19	79.7	0.478	0.318 ± 0.08	M	J	Radio	1995
	3	4.33	17.6	105.4	0.712	0.514 ± 0.03	M	J	Radio	1995
	4	6.46	21.35	117.7	0.837	0.565 ± 0.06	M	J	Radio	1995
	5	8.02	21.5	121.04	0.856	0.568 ± 0.09	M	J	Radio	1995
	3	10.75	33.6	138.7	1.140	0.747 ± 0.08	M	J	Radio	1995
	10	13.55	44.02	155.85	1.393	0.902 ± 0.11	M	J	Radio	1995
	10	17.36	57.65	168.9	1.656	1.122 ± 0.13	M	J	Radio	1995
Rylance et al. (1982) ^{22§}	3	0.353	6.47	65.13	0.345	0.212 ± 0.07	F	J	Radio	1995
	7	0.67	8.57	69.64	0.414	0.296 ± 0.05	F	J	Radio	1995
	3	4.5	17.75	105	0.713	0.505 ± 0.19	F	J	Radio	1995
	3	7.21	21.5	120.5	0.853	0.520 ± 0.011	F	J	Radio	1995
	3	11.5	45.05	153.6	1.386	0.920 ± 0.38	F	J	Radio	1995
	5	14.134	55.8	163.38	1.595	1.001 ± 0.14	F	J	Radio	1995
	6	17.87	51.33	159.3	1.512	0.999 ± 0.09	F	J	Radio	1995
	3	6	21.25	118	0.816	0.401 ± 0.15	U	NE	Radio	1982
	3	9	28.65	133	1.036	1.071 ± 0.2	U	NE	Radio	1982
	3	13	44	155	1.389	1.322 ± 0.23	U	NE	Radio	1982
Noda et al. (1997) ^{16§}	6	0.27	6.25	61	0.297	0.178 ± 0.08	U	J	Radio	1997
	6	1.475	11.1	81.25	0.469	0.281 ± 0.05	U	J	Radio	1997
	7	3.34	15.05	97.5	0.584	0.426 ± 0.09	U	J	Radio	1997
	10	7	23	121.5	0.891	0.597 ± 0.22	U	J	Radio	1997
	8	13.78	48.25	159.25	1.347	1.024 ± 0.21	U	J	Radio	1997
Heinemann et al. (1999) ^{11§}	17	18	63	170.75	1.610	1.114 ± 0.19	U	J	Radio	1997
	3	5	17.5	118.5	0.773	0.634 ± 0.19	M	NE	Autopsy	1999
	4	13.33	73.67	179.67	1.921	1.706 ± 0.4	M	NE	Autopsy	1999
	5	17.4	69.9	175.4	1.848	1.51 ± 0.3	M	NE	Autopsy	1999
	4	12.68	43.42	149.2	1.336	0.860 ± 0.23	F	NE	Autopsy	1999
	5	5.949	22.25	109.65	0.80	0.651 ± 0.51	F	NE	Autopsy	1999
	6	10.08	40.08	141.19	1.19	0.917 ± 0.47	F	NE	Autopsy	1999

NOTE. Age = 0 to 18 years.
Abbreviations: M, male; F, female; U, mixed sex; NA, North American; NE, Northern European; J, Japanese; Radio, radiographic or ultrasonographic method; N, number of subjects in study.
*Calculated BSA.
†Calculated HT (WT and BSA given).
‡HT from growth charts, calculated BSA.
§HT, WT, and BSA were all stated in the original publication.