

## TECHNICAL NOTE

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# Fifteen-Year Retrospective Study of Infant Organ Weights and Revision of Standard Weight Tables

**ABSTRACT:** No recent studies of organ weights of normal infants exist. We completed a 15-year retrospective study of organ weights of normal infants who died between 1986 and 2000 in an effort to update the “normal” weight standards for infants up to one year of age. Additionally, we compared organ weights of infants whose deaths were ruled Sudden Infant Death Syndrome (SIDS) with those of other natural or non-natural causes within the same age groups, length and total body weight at autopsy, total organ weight as a percentage of total body weight, and with weight standards based on previous studies. This study included 453 autopsied infants in Kent County, Michigan, and who were referred to our facility by surrounding counties. All subjects were autopsied at Spectrum Health Blodgett Campus in Grand Rapids, Michigan.

**KEYWORDS:** forensic science, infant, organ weights, sudden infant death syndrome, autopsy

Recently, many publications have reviewed organ weights in children of different ages or compared weights of two different organs (1). Previous studies have not been limited to autopsy data but have collected data using X-ray and sonography in living infants (2). Individual organ weights have been compared with infant somatic growth, length and weight. Body mass indices have not been compared with organ weights (3).

Specific organs have been targeted for study as they compare to sex, race, and geographic location. Normal lung weights in white populations, brain weights in Danish children, and organ size in urban areas are a few examples of past research with narrowly defined criteria that attempt to determine if such factors influence organ growth (4–6). These studies are of epidemiologic interest only when compared with a set of current, normal standards in a large cross population.

A prior study compared organ weights of infants dying of SIDS with infants with other causes of death (7). This demonstrated no difference in the organ weights between the two categories.

Fetal organ weight studies are currently used to determine the gestational age of a miscarried or aborted fetus (8). Other researchers have examined the effects of maternal exposure to toxins or medications during pregnancy on infant organ growth (9).

The purpose of this study is to review prior compilations of infant organ weights and to provide normal organ weight ranges within age groups up to one year in infants from the current era. The last study of organ weights in the various age groups of infants was published 40 years ago (10).

Due to such factors as growing public awareness, better prenatal and postnatal care, nutrition, improved infant formulas, and better

parent education over past decades, weights and measures should be current before being used as the “standard” in other areas of research.

### Materials and Methods

Data were collected from 453 autopsied infants at a single institution (Spectrum Health Blodgett Campus) from 1986 through 2000. The study group ranged between neonates or stillborn to one year in age and represented a wide variety of socioeconomic backgrounds across 35 counties in Michigan.

Weights of the following organs were included in this survey: brain, heart, right lung, left lung, liver, spleen, right kidney, left kidney, and thymus. During the 15-year span of this study, all of the organs were weighed on one of two digital Ohaus Portable Standard scales, LS 5000. The weights were recorded in grams to the nearest whole number. Total body weights were obtained using a standard digital floor scale and recorded as the nearest whole number in grams. All measurements of length were made with a standard measuring stick.

Organ weights included in the investigation met strict criteria, including the review of autopsy reports and investigative reports indicating the general health of each infant. Infant ages ranged from 30 weeks’ gestation to 12 months of age, including stillborn. All subjects had autopsies within 24 hours postmortem.

Organs that were severely injured, decomposed, sustained ventilator damage, or were determined to be anatomically or pathologically abnormal such that weight would be affected, were excluded. All natural deaths that were not listed as SIDS and had a cause of death that did not affect organ weight were included in the study. In cases of disease in which a specific organ or set of organs was affected, such as in cases of pneumonia, those organ weights were omitted, leaving the remaining, unaffected, organs eligible for inclusion.

Infants with genetic disorders such as Down’s syndrome or hormonal anomalies were not included. Infants with SIDS as a cause

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of death were included as being normal in development based on previous studies; however, all SIDS organ weights were compared with non-SIDS organ weights in order to determine whether there is a significant difference between the two populations. Infants with a cause of death listed as undetermined were included only after a careful review of the circumstances leading to the death.

Organ weights, body weights, and body lengths for each infant were placed into the following groups: neonate or stillborn (at least 39 weeks in gestation) to under four weeks in weekly intervals, then from one month to twelve months in monthly intervals. Premature infants 38 weeks or less in gestation were grouped according to gestational age and age at death and then compared with the organ weights of term infants. Additional observations regarding organ weights were made based on race, gender, and total organ weight as a percentage of total body weight, length, and SIDS versus non-SIDS within the designated age groups.

Statistical analysis was completed using standard calculation methods for the mean  $\pm$  2 standard deviations. Significance between SIDS and non-SIDS groups was analyzed using the two-tailed t-test on the software StatPac for Windows (StatPac Inc., Minneapolis, MN).

**Results**

We found no significant difference between SIDS and non-SIDS infants. The results are given in Table 1. In all of the mean organ weights within each age group, the critical value was larger than the absolute t-statistic, with the exception of the brain weight mean in the 7-month group, thereby rejecting the null hypothesis that there is a difference in organ weights between the two groups. Therefore, we were able to include SIDS organ weights in the "normal" population of subjects with confidence. Further, this supports the concept that SIDS is caused by extrinsic factors rather than subtle pathologic changes in the organs.

The mean weights of infant organs of males and females less than 12 months in age had no statistically significant differences; therefore, it was not necessary to report findings by gender.

TABLE 1—Mean infant organ weights shown in SIDS and non-SIDS groups.

SIDS				non-SIDS			
Organ	Mean, g	No.	SD, g	Organ	Mean, g	No.	SD, g
NEWBORN							
Brain	NA	0	N	Brain	325	13	158
Heart	NA	0	N	Heart	18	16	10
R. Lung	NA	0	N	R. Lung	29	12	18
L. lung	NA	0	N	L. Lung	24	12	17
Liver	NA	0	N	Liver	109	16	78
Spleen	NA	0	N	Spleen	8	16	8
R. Kidney	NA	0	N	R. Kidney	11	14	8
L. Kidney	NA	0	N	L. Kidney	11	14	6
Thymus	NA	0	N	Thymus	11	16	10
1 WEEK							
Brain	543	2	544	Brain	370	2	78
Heart	15	2	8	Heart	24	2	NA
R. Lung	34	2	NA	R. Lung	NA	2	NA
L. lung	28	2	6	L. Lung	NA	2	NA
Liver	106	2	22	Liver	180	2	142
Spleen	13	2	2	Spleen	10	2	6
R. Kidney	9	2	2	R. Kidney	20	2	6
L. Kidney	10	2	16	L. Kidney	19	2	2
Thymus	10	2	16	Thymus	11	2	16

TABLE 1—Continued.

SIDS				non-SIDS			
Organ	Mean, g	No.	SD, g	Organ	Mean, g	No.	SD, g
2 WEEKS							
Brain	466	7	162	Brain	456	7	54
Heart	26	6	10	Heart	29	5	8
R. Lung	54	6	14	R. Lung	40	4	14
L. lung	51	6	14	L. Lung	29	4	18
Liver	184	7	52	Liver	167	7	54
Spleen	14	7	10	Spleen	17	7	10
R. Kidney	16	7	8	R. Kidney	17	7	8
L. Kidney	16	7	8	L. Kidney	18	7	8
Thymus	23	6	26	Thymus	21	5	32
3 WEEKS							
Brain	478	7	116	Brain	430	6	120
Heart	22	7	10	Heart	26	4	2
R. Lung	51	7	24	R. Lung	63	5	28
L. lung	41	7	22	L. Lung	52	5	30
Liver	174	7	58	Liver	180	6	98
Spleen	9	7	4	Spleen	24	6	28
R. Kidney	15	7	8	R. Kidney	20	6	18
L. Kidney	17	7	10	L. Kidney	22	6	20
Thymus	17	7	14	Thymus	18	5	22
1 MONTH							
Brain	487	43	150	Brain	492	26	120
Heart	28	43	16	Heart	26	22	10
R. Lung	56	42	26	R. Lung	53	21	28
L. lung	47	42	26	L. Lung	45	21	22
Liver	177	44	72	Liver	175	30	92
Spleen	16	44	14	Spleen	15	30	22
R. Kidney	17	44	10	R. Kidney	18	30	8
L. Kidney	17	44	10	L. Kidney	18	30	8
Thymus	22	42	18	Thymus	20	26	18
2 MONTHS							
Brain	558	80	162	Brain	608	22	248
Heart	31	79	18	Heart	31	21	18
R. Lung	60	76	32	R. Lung	67	18	48
L. lung	51	76	26	L. Lung	58	18	40
Liver	188	79	92	Liver	211	23	136
Spleen	16	79	12	Spleen	19	24	26
R. Kidney	19	80	12	R. Kidney	21	24	16
L. Kidney	19	80	10	L. Kidney	20	24	14
Thymus	30	72	24	Thymus	20	18	22
3 MONTHS							
Brain	646	66	196	Brain	672	15	274
Heart	33	69	14	Heart	35	11	12
R. Lung	66	66	30	R. Lung	69	17	30
L. lung	56	66	26	L. Lung	59	17	18
Liver	221	69	86	Liver	233	16	122
Spleen	19	69	14	Spleen	20	16	12
R. Kidney	21	69	12	R. Kidney	22	15	12
L. Kidney	21	68	12	L. Kidney	24	15	14
Thymus	32	60	28	Thymus	29	16	24
4 MONTHS							
Brain	673	31	208	Brain	734	13	240
Heart	33	30	16	Heart	33	10	14
R. Lung	69	30	39	R. Lung	90	7	34
L. lung	57	30	32	L. Lung	71	7	38
Liver	220	31	90	Liver	261	13	120
Spleen	21	31	16	Spleen	23	13	16
R. Kidney	20	30	12	R. Kidney	22	13	10
L. Kidney	20	30	12	L. Kidney	24	13	12
Thymus	30	28	28	Thymus	27	10	46
5 MONTHS							
Brain	680	17	266	Brain	687	9	280
Heart	33	16	16	Heart	35	8	18
R. Lung	69	15	40	R. Lung	68	8	30
L. Lung	55	15	36	L. Lung	58	8	32
Liver	249	17	136	Liver	240	8	134
Spleen	21	17	16	Spleen	23	9	16

TABLE 1—Continued.

Organ	SIDS			non-SIDS			
	Mean, g	No.	SD, g	Organ	Mean, g	No.	SD, g
5 MONTHS							
R. Kidney	24	17	28	R. Kidney	22	9	14
L. Kidney	28	17	34	L. Kidney	22	9	14
Thymus	27	14	42	Thymus	22	8	20
6 MONTHS							
Brain	701	9	354	Brain	839	8	290
Heart	34	9	16	Heart	41	6	14
R. Lung	74	9	48	R. Lung	69	7	42
L. Lung	62	9	36	L. Lung	60	7	32
Liver	252	9	144	Liver	322	6	72
Spleen	23	9	16	Spleen	26	8	18
R. Kidney	20	9	8	R. Kidney	24	9	12
L. Kidney	20	9	8	L. Kidney	24	9	12
Thymus	34	9	26	Thymus	30	7	24
7 MONTHS							
Brain	680	7	62	Brain	880	5	86
Heart	33	7	12	Heart	44	4	8
R. Lung	69	7	46	R. Lung	71	3	48
L. Lung	55	7	34	L. Lung	63	3	12
Liver	249	7	302	Liver	335	5	58
Spleen	21	7	38	Spleen	33	5	12
R. Kidney	24	7	10	R. Kidney	25	5	8
L. Kidney	28	7	12	L. Kidney	25	5	6
Thymus	27	5	38	Thymus	38	4	16
8 MONTHS							
Brain	858	4	176	Brain	845	4	280
Heart	46	4	8	Heart	44	4	20
R. Lung	82	4	52	R. Lung	64	3	34
L. Lung	75	4	26	L. Lung	48	3	16
Liver	322	4	12	Liver	358	4	156
Spleen	29	4	22	Spleen	32	4	22
R. Kidney	27	4	10	R. Kidney	32	4	14
L. Kidney	29	4	14	L. Kidney	29	4	10
Thymus	35	4	12	Thymus	25	2	10
9 MONTHS							
Brain	953	5	240	Brain	905	7	238
Heart	44	5	10	Heart	45	7	18
R. Lung	86	5	44	R. Lung	88	6	44
L. Lung	79	5	56	L. Lung	79	6	36
Liver	353	5	132	Liver	334	7	148
Spleen	45	5	64	Spleen	42	7	42
R. Kidney	29	5	14	R. Kidney	28	7	12
L. Kidney	30	5	14	L. Kidney	27	7	10
Thymus	27	5	22	Thymus	25	5	20
10 MONTHS							
Brain	0	0	N	Brain	988	10	280
Heart	0	0	N	Heart	47	10	20
R. Lung	0	0	N	R. Lung	89	9	48
L. Lung	0	0	N	L. Lung	76	9	30
Liver	0	0	N	Liver	369	10	166
Spleen	0	0	N	Spleen	36	9	32
R. Kidney	0	0	N	R. Kidney	30	10	12
L. Kidney	0	0	N	L. Kidney	35	10	14
Thymus	0	0	N	Thymus	28	8	34
11 MONTHS							
Brain	1060	2	142	Brain	893	6	186
Heart	54	2	16	Heart	51	7	16
R. Lung	105	2	21	R. Lung	104	6	66
L. Lung	85	2	14	L. Lung	110	6	106
Liver	430	2	198	Liver	376	7	202
Spleen	51	2	42	Spleen	36	7	16
R. Kidney	39	2	32	R. Kidney	34	7	22
L. Kidney	39	2	32	L. Kidney	34	7	24
Thymus	34	2	4	Thymus	33	7	26

TABLE 1—Continued.

Organ	SIDS			non-SIDS			
	Mean, g	No.	SD, g	Organ	Mean, g	No.	SD, g
12 MONTHS							
Brain	0	0	N	Brain	980	3	158
Heart	0	0	N	Heart	51	3	20
R. Lung	0	0	N	R. Lung	95	3	26
L. Lung	0	0	N	L. Lung	86	3	48
Liver	0	0	N	Liver	405	3	290
Spleen	0	0	N	Spleen	42	3	32
R. Kidney	0	0	N	R. Kidney	30	2	6
L. Kidney	0	0	N	L. Kidney	33	2	8
Thymus	0	0	N	Thymus	16	2	16

The standard deviations are (±) 2 SD.  
0 indicates not enough in a particular group to compile the data.

TABLE 2—Overall gender specific organ weight means (not age or gestation specific).

Organ	Gender	Mean, g	Standard Deviation, g	Sample Size, n
Brain	Male	664	180	258
	Female	620	148	175
Heart	Male	35	10	249
	Female	32	9.0	167
Right Lung	Male	69	21	236
	Female	65	19	163
Left Lung	Male	57	15	271
	Female	57	25	128
Liver	Male	233	78	265
	Female	224	81	178
Spleen	Male	22	12	265
	Female	19	10	181
Right Kidney	Male	22	8	261
	Female	20	6	181
Left Kidney	Male	23	8	260
	Female	20	7	181
Thymus	Male	30	14	233
	Female	25	12	161

The male population did, however, show slightly larger individual organ weights overall than the female population. The average male and female weights for each organ are given in Table 2.

Comparison of this study with the most recent previous study (11), 40 years ago, shows that the average weight of each organ within each age group has significantly increased. The organ weights in this study had an average increase of 6% to 100% over the previous "standard" weights. The overall birth weight and body weight at the time of death also increased.

Comparison between term and premature infant organ weights at the same age at death showed that premature infant organ weights were not significantly different by 3 weeks to 1 month of age. We found that the premature brain weight appeared to lag behind term brain weight compared with other the organ weights and seemed to be influenced by the gestational age. The brain at 30 weeks' gestation or greater showed no significant difference by the age of 2 months.

The relationship between total organ weight and total body weight seems to be independent of age. The average percentage of total organ weight to total body weight ranges between 18 and 22 regardless of age or gestation.

A series of charts has been developed to show the mean, standard deviation, highest and lowest weights, gestational weights, and the range centered about the mean for term infants in each age group and are shown in Table 3. Those entries designated "N" (not available) indicate that the sample size was too small to compare with other groups.

The authors' goal is to initiate a widespread comparative analysis of infant organ weights as they relate to those studies com-

pleted in the 1960s and compile standards that reflect current growth trends.

This study has confirmed the conclusions of other authors that there is no difference between SIDS and non-SIDS organ weights. We have found that normal infant organ weights should be updated periodically. Updated values not only lend more credence to the term "normal," but also gives a baseline for future research.

TABLE 3—Organ weights at various gestational ages grouped by age at time of death. Weights in *italic* are below the term low.

Weight in grams (g)	High*	Low*	Term	30 wks	31 wks	32 wks	33 wks	34 wks	35 wks	36 wks	37 wks	38 wks	Range with Centered Mean; Term
NEWBORN/STILLBORN TO 1 WEEK													
Brain	400	360	382			250	285	277	338		274	380	342–422
SD			40			N	N	137	105		N	N	
Heart	28	16	22			14	16	13	16		22	15	13–31
SD			9			N	N	3	5		N	N	
R.Lung	52	24	33			28	N	19	28		24	38	7–59
SD			26			N	N	8	6		N	N	
L.Lung	42	22	28			22	N	18	22		20	28	10–46
SD			18			N	N	6	4		N	N	
Liver	190	50	126			88	96	112	100		112	76	6–246
SD			120			N	N	95	18		96	N	
Spleen	20	4	10			8	8	6	7		5	4	0–22
SD			12			N	N	6	4		2	N	
R.Kidney	18	10	14			8	N	6	9		12	10	8–20
SD			6			N	N	N	2		8	N	
L.Kidney	16	10	13			10	N	6	10		12	10	9–17
SD			4			N	N	N	4		8	N	
Thymus	22	6	13			10	8	10	20		6	6	1–25
SD			12			N	N	11	6		4	N	
Birth Wt.	3685	2430	3139			1995	2280	2330	2726		2280	2360	2239–4039
SD			900			N	N	N	1173		N	N	
Death Wt.	3685	2430	3179			1995	2280	2065	2726		3140	2360	2249–4109
SD			930			N	N	748	1173		1720	N	
Length	52.1	47.6	50			43.2	41.9	43.2	48.9		49.2	48.2	46–54
SD			4			N	N	4	9		6	N	
Sample n			5			1	1	2	3		2	1	
1 WEEK													
Brain	735	350	469					N	345				N–1013
SD			544					N	N				
Heart	24	12	20					20	N				12–28
SD			8					N	N				
R.Lung	34	34	34					N	N				N
SD			N					N	N				
L.Lung	30	26	28					N	N				22–34
SD			6					N	N				
Liver	230	98	168					112	130				146–190
SD			22					N	N				
Spleen	13	12	13					6	8				12–14
SD			1					N	N				
R.Kidney	22	8	16					12	18				14–18
SD			2					N	N				
L.Kidney	20	8	15					12	18				9–21
SD			6					N	N				
Thymus	12	5	8					10	16				2–14
SD			6					N	N				
Birth Wt.	2636	2045	2341					N	2864				1505–3177
SD			836					N	N				
Death Wt.	3600	2500	3105					2450	N				2794–3416
SD			311					N	N				
Length	49.6	44	48.3					48.2	50.2				41.3–55.3
SD			7					N	N				
Sample n			3					1	1				

TABLE 3—Continued.

Weight in grams (g)	High*	Low*	Term	30 wks	31 wks	32 wks	33 wks	34 wks	35 wks	36 wks	37 wks	38 wks	Range with Centered Mean; Term
2 WEEKS													
Brain	600	345	466								460	410	352–580
SD			114								N	N	
Heart	34	20	29								24	22	19–39
SD			10								N	N	
R.Lung	64	30	47								40	50	30–64
SD			17								N	N	
L.Lung	60	22	40								30	51	24–56
SD			16								N	N	
Liver	212	126	179								164	160	123–235
SD			56								N	N	
Spleen	26	8	17								12	9	7–27
SD			10								N	N	
R.Kidney	24	12	17								18	17	8–26
SD			9								N	N	
L.Kidney	22	12	17								22	16	8–26
SD			9								N	N	
Thymus	48	6	22								36	14	0–49
SD			27								N	N	
Birth Wt.	N	N	N								N	2927	N
SD			N								N	N	
Death Wt.	5909	3200	4029								4540	3000	2710–5397
SD			1368								N	N	
Length	55.9	50.8	52.7								53.8	49.2	49.7–55.7
SD			3								N	N	
Sample n			12								1	1	
3 WEEKS													
Brain	544	390	467							350			355–579
SD			112							N			
Heart	28	15	24							24			15–33
SD			9							N			
R.Lung	84	40	61							44			37–85
SD			24							N			
L.Lung	58	26	49							30			25–73
SD			24							N			
Liver	234	110	181							132			96–266
SD			85							N			
Spleen	46	6	19							12			3–35
SD			16							N			
R.Kidney	36	12	20							10			8–32
SD			12							N			
L.Kidney	39	10	22							10			8–36
SD			14							N			
Thymus	34	4	18							14			0–40
SD			22							N			
Birth Wt.	4545	2982	3600							2586			1390–5810
SD			2210							N			
Death Wt.	4600	3000	4009							2720			3106–4912
SD			903							N			
Length	59.7	43.2	52.2							51			42.2–62.2
SD			10							N			
Sample n			11							1			
1 MONTH													
Brain	660	380	510		400	420	N			447	490	505	385–635
SD			125		N	N	N			54	35	156	
Heart	58	12	29		20	20	36			24	27	27	18–40
SD			11		N	N	N			12	6	6	
R.Lung	78	32	59		50	48	N			39	42	74	35–83
SD			24		N	N	N			15	24	28	
L.Lung	68	30	49		30	38	N			38	42	64	28–70
SD			21		N	N	N			30	11	23	
Liver	270	70	188		162	150	180			151	155	175	108–268
SD			80		N	N	N			107	13	43	
Spleen	48	6	16		8	12	14			12	12	31	3–29
SD			13		N	N	N			9	7	N	
R.Kidney	30	10	18		18	18	20			15	18	15	9–27
SD			9		N	N	N			11	4	6	

TABLE 3—Continued.

Weight in grams (g)	High*	Low*	Term	30 wks	31 wks	32 wks	33 wks	34 wks	35 wks	36 wks	37 wks	38 wks	Range with Centered Mean; Term
1 MONTH													
L.Kidney	30	10	19			18	18	24		13	18	15	10–28
SD			9			N	N	N		6	5	6	
Thymus	52	6	23			18	10	10		17	24	17	4–42
SD			19			N	N	N		13	9	10	
Birth Wt.	7227	2018	3362			1818	1450	N		3018	2877	N	1389–5335
SD			1973			N	N	N		260	412	N	
Death Wt.	6800	2300	4510			3200	3600	3800		3712	4032	4400	2261–6759
SD			2249			N	N	N		789	1472	1131	
Length	59	45.7	54			49.5	48.3	53.3		53.4	53.2	50.8	47–61
SD			7			N	N	N		5	7	.1	
Sample n			58			1	1	1		5	5	3	
2 MONTHS													
Brain	1000	460	606	520	405	452	488	560		601	523	576	423–789
SD			183	N	N	91	177	N		107	21	136	
Heart	88	20	33	24	24	20	26	40		33	32	29	15–51
SD			18	N	N	8	11	N		8	7	8	
R.Lung	112	36	67	44	30	39	52	54		60	57	60	27–107
SD			40	N	N	14	17	N		9	8	35	
L.Lung	100	30	58	36	28	45	46	50		52	4	49	24–92
SD			34	N	N	20	6	N		9	25	32	
Liver	370	120	213	36	128	131	141	165		183	203	190	113–313
SD			100	N	N	80	139	N		13	64	79	
Spleen	68	6	19	12	12	9	11	12		15	13	16	0–39
SD			20	N	N	2	3	N		17	8	14	
R.Kidney	36	10	21	15	16	12	17	18		18	15	21	8–34
SD			13	N	N	4	3	N		10	3	12	
L.Kidney	34	6	21	14	16	11	17	22		20	15	20	9–33
SD			12	N	N	2	3	N		11	8	9	
Thymus	50	2	27	20	N	9	N	N		27	30	30	4–50
SD			23	N	N	3	N	N		34	N	21	
Birth Wt.	4545	2386	3175	2018	N	1304	N	N		2756	2560	2959	2400–3950
SD			775	N	N	N	N	N		N	N	1222	
Death Wt.	8500	3100	5267	N	3600	3747	3900	4772		6450	4200	4844	2725–7809
SD			2542	N	N	1406	2546	N		5206	N	1784	
Length	68.4	50.8	57	49.5	48.2	48.7	52.1	52		57	56	54	50–64
SD			7	N	N	8		N		6	1	8	
Sample n			63	1	1	3	2	1		4	2	8	
3 MONTHS													
Brain	1000	550	704	550		517			633	648	593		518–890
SD			186	N		8			31	216	230		
Heart	54	20	36	40		30			26	31	35		23–49
SD			13	N		8			6	12	1		
R.Lung	104	42	70	52		61			66	63	63		40–100
SD			30	N		27			28	21	22		
L.Lung	90	43	59	66		53			53	53	47		38–80
SD			21	N		16			17	18	13		
Liver	340	119	239	180		168			186	221	214		135–343
SD			104	N		23			45	65	94		
Spleen	44	10	21	14		14			16	18	17		9–33
SD			12	N		17			14	17	22		
R.Kidney	34	12	23	20		17			19	21	22		10–36
SD			13	N		3			8	8	14		
L.Kidney	40	12	24	26		18			18	22	25		11–37
SD			13	N		1			11	12	13		
Thymus	84	4	33	N		28			32	41	18		8–58
SD			25	N		28			16	28	20		
Birth Wt.	3807	2670	3283	1405		1673			2314	2929	2559		2910–3656
SD			373	N		N			437	3283	489		
Death Wt.	8620	4310	6161	4460		4200			5133	5867	5100		4097–8225
SD			2064	N		566			611	1593	2553		
Length	64.7	39.4	59	49.5		52.4			55.7	59.1	57.4		47–71
SD			12	N		4			2	9	3		
Sample n			66	1		2			3	6	3		

TABLE 3—Continued.

Weight in grams (g)	High*	Low*	Term	30 wks	31 wks	32 wks	33 wks	34 wks	35 wks	36 wks	37 wks	38 wks	Range with Centered Mean; Term
4 MONTHS													
Brain	970	500	743		586			740	830	770	613	63	544–942
SD			199		N			170	N	113	129	108	
Heart	56	20	35		28			33	36	44	35	33	19–51
SD			16		N			14	N	33	15	18	
R.Lung	120	40	83		48			90	88	61	71	85	47–119
SD			36		N			N	N	31	43	59	
L.Lung	100	30	67		50			86	64	50	58	69	30–104
SD			37		N			N	N	9	28	59	
Liver	325	170	256		184			310	276	190	195	248	173–339
SD			83		N			156	N	28	55	143	
Spleen	46	12	24		20			26	16	18	24	24	8–40
SD			16		N			17	N	7	11	28	
R.Kidney	36	12	23		18			27	14	15	21	21	14–32
SD			9		N			20	N	14	10	15	
L.Kidney	38	12	24		18			26	20	15	23	22	12–36
SD			12		N			17	N	14	10	14	
Thymus	72	2	29		30			26	84	25	26	39	2–56
SD			27		N			N	N	14	21	46	
Birth Wt.	4954	2386	3324		1520			N	2784	2909	2682	2970	1720–4928
SD			1604		N			N	N	N	N	N	
Death Wt.	9400	4000	6553		4400			5789	4990	5950	5585	5880	3890–9216
SD			2663		N			1588	N	1556	2645	2328	
Length	68.6	50.8	61		60.3			58.4	63.6	62.3	55	58.9	51–71
SD			10		N			7	N	4	10	4	
Sample n			31		1			2	1	2	4	3	
5 MONTHS													
Brain	1000	400	732	790						717	731		474–990
SD			258	255						167	8		
Heart	52	22	38	35						33	28		22–54
SD			16	8						14	11		
R.Lung	108	46	77	63						71	64		41–113
SD			36	14						8	6		
L.Lung	96	34	64	54						59	52		32–96
SD			32	16						40	N		
Liver	388	135	278	264						243	192		157–399
SD			121	124						140	23		
Spleen	36	12	24	29						26	19		9–39
SD			15	8						20	8		
R.Kidney	34	14	23	28						22	17		11–35
SD			12	6						N	3		
L.Kidney	36	12	25	29						22	19		4–46
SD			21	8						N	3		
Thymus	52	6	27	28						41	18		0–55
SD			28	N						54	N		
Birth Wt.	N	N	2900	2900						2489	1901		N
SD			N	N						197	N		
Death Wt.	9070	4540	6209	6910						6180	5928		3513–8905
SD			2696	4271						2706	1336		
Length	69.8	53.3	63	62.9						61.7	61.1		55–71
SD			8	13						5	3		
Sample n			19	2						3	2		
6 MONTHS													
Brain	1050	298	801	665						700			450–1152
SD			351	127						N			
Heart	50	32	41	33						24			31–51
SD			10	8						N			
R.Lung	102	46	80	54						62			46–114
SD			34	23						N			
L.Lung	86	42	67	49						55			40–94
SD			27	20						N			
Liver	378	238	310	261						175			235–385
SD			75	88						N			
Spleen	44	15	25	28						16			8–42
SD			17	7						N			
R.Kidney	34	16	24	19						18			15–33
SD			9	2						N			





TABLE 3—Continued.

Weight in grams (g)	High*	Low*	Term	30 wks	31 wks	32 wks	33 wks	34 wks	35 wks	36 wks	37 wks	38 wks	Range with Centered Mean; Term
9 MONTHS													
Brain	1050	700	961			740			840				816–1106
SD			145			N			N				
Heart	54	34	47			36			30				39–55
SD			8			N			N				
R.Lung	112	65	93			64			58				53–133
SD			40			N			N				
L.Lung	118	55	96			54			50				57–135
SD			39			N			N				
Liver	454	270	364			264			225				253–475
SD			111			N			N				
Spleen	102	24	50			20			12				16–84
SD			34			N			N				
R.Kidney	36	20	30			18			30				20–40
SD			10			N			N				
L.Kidney	38	20	30			22			20				19–41
SD			11			N			N				
Thymus	48	20	32			48			12				14–50
SD			18			N			N				
Birth Wt.	4034	3468	3751			N			2273				N
SD			N			N			N				
Death Wt.	10000	6600	8821			16200			5200				6952–10690
SD			1869			N			N				
Length	74.9	63.5	64.9			63.4			66				57.9–71.9
SD			7			N			N				
Sample n			10			1			1				
10 MONTHS													
Brain	1170	830	961					1130					683–1239
SD			278					N					
Heart	64	38	48					38					28–68
SD			20					N					
R.Lung	135	52	92					68					43–141
SD			49					N					
L.Lung	92	50	78					56					49–107
SD			29					N					
Liver	510	250	378					300					199–557
SD			179					N					
Spleen	70	20	37					28					4–70
SD			33					N					
R.Kidney	42	22	33					36					20–46
SD			13					N					
L.Kidney	46	24	35					36					20–50
SD			15					N					
Thymus	52	6	30					14					0–64
SD			34					N					
Birth Wt.			N					1924					N
SD			N					N					
Death Wt.			9253					6200					5641–12865
SD			3612					N					
Length			70.1					64.7					58.1–82.1
SD			12					N					
Sample n			8					1					
11 MONTHS													
Brain	950	820	878				800		1030			1110	769–987
SD			109				N		57			N	
Heart	62	42	50				62		47			60	35–65
SD			15				N		4			N	
R.Lung	130	50	97				14		90			120	30–164
SD			67				N		N			N	
L.Lung	198	50	108				110		80			90	0–240
SD			132				N		N			N	
Liver	470	258	354				548		335			500	198–510
SD			156				N		71			N	
Spleen	48	28	34				46		36			65	18–50
SD			16				N		N			N	
R.Kidney	40	20	31				54		29			50	16–46
SD			15				N		3			N	

TABLE 3—Continued.

Weight in grams (g)	High*	Low*	Term	30 wks	31 wks	32 wks	33 wks	34 wks	35 wks	36 wks	37 wks	38 wks	Range with Centered Mean; Term
11 MONTHS													
L.Kidney	38	24	29				58		30			50	17–41
SD			12				N		6			N	
Thymus	54	16	32				30		35			35	1–63
SD			31				N		8			N	
Birth Wt.	N	N	N				1727		N			3977	N
SD			N				N		N			N	
Death Wt.	10000	8160	8824				12700		8000			12000	7206–10442
SD			1618				N		566			N	
Length	71.1	34.9	62.6				67.3		73.6			78.7	31.6–93.6
SD			31				N		7			N	
Sample n			5				1		2			1	
12 MONTHS													
Brain	1040	890	980										821–1139
SD			159										
Heart	60	40	51										31–71
SD			20										
R.Lung	108	82	95										69–121
SD			26										
L.Lung	114	70	86										38–134
SD			48										
Liver	550	260	405										115–695
SD			290										
Spleen	60	32	42										11–73
SD			31										
R.Kidney	32	28	30										24–36
SD			6										
L.Kidney	36	30	33										25–41
SD			8										
Thymus	22	10	16										0–33
SD			17										
Birth Wt.	N	N	4059										N
SD			N										
Death Wt.	9545	7710	8775										6870–10680
SD			1905										
Length	75	63.5	70.7										58.7–82.7
SD			12										
Sample n			3										

\* High/Low = The highest and lowest weight of the term infant. SD=  $\pm 2$  standard deviations. N = not available.

We noted that there are several interesting trends that could be the subject of further study. One such observation was that on average the African-American organ weights were less than all other races, although this group was the second largest race in the study at 16%, with Caucasians comprising 74%. This could be of great epidemiologic importance when developing pregnancy and postnatal health care education programs in urban areas.

Other observations within this study include the following: the highest rate of SIDS deaths occurred between the ages of 1 month and 2 months and that males out-numbered females almost 2:1. Premature birth did not appear to significantly affect the normal growth rate of organs after 3 weeks to 1 month of age. Of the premature organ weights that fell under the low weight of term organs, most fell within the computed range of term organ weights. Premature birth was independent of the relationship of the total organ weight to body weight percentage.

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