Executive Summary of the Low Birthweight Workshop 1994

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

EXECUTIVE SUMMARY

OF

WORKSHOP TO CONSIDER LOW BIRTHWEIGHT

IN RELATION TO THE REVISION OF

THE NCHS GROWTH CHARTS FOR INFANCY (BIRTH–3 YEARS)

Sponsored by the Division of Health Examination Statistics
National Center for Health Statistics
Hyattsville, MD
October 4–5, 1994

Prepared Under Professional Services Contract
(Order #0009430587; Project # NM93.3)

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Preface

The National Center for Health Statistics/Centers for Disease Control and Prevention (NCHS/CDC) has a key role in nutrition monitoring through conducting national surveys of the nutritional and health status of the U.S. population. As part of the Federal Government's Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program, NCHS/CDC also has lead responsibility to develop a core set of standardized nutritional status indicators and appropriate interpretive criteria for the general population and subgroups of the population. The assessment and interpretation of weight, recumbent length, and head circumference are critical components of this core nutritional status package for infancy. The third National Health and Nutrition Examination Survey (NHANES III) was specifically designed to oversample infants and children ages 2 months–5 years to revise the NCHS/CDC growth charts.

At a workshop convened by the Division of Health Examination Statistics, NCHS, held on December 13–14, 1992, a set of near-unanimous recommendations was made concerning details of the proposed revision of the 1977 NCHS/CDC growth charts. At that Workshop, there was considerable discussion concerning the possible exclusion of data for low birthweight (LBW) infants when the charts for children ages birth–3 years are revised.

A special workshop to address these divergent views was organized and sponsored by the Division of Health Examination Statistics, NCHS. This Low Birthweight Workshop was held at NCHS and in College Park, MD, on October 4–5, 1994. The intent of this Workshop was to provide an opportunity for a free exchange of opinions, that, in combination, would help NCHS staff to make a decision regarding the possible exclusion of data from LBW infants during the revision of the 1977 NCHS/CDC Growth Charts. Consequently, the Workshop participants considered a wide range of topics and did not attempt to reach a consensus or to make firm recommendations.

The participants were experts selected for their knowledge of infant growth, particularly the growth of LBW infants. They discussed conceptual and logistical aspects of the possible exclusion of data for LBW infants from the revised charts and the implications of this decision for clinicians, those who work in assistance programs, and research workers. In evaluating these implications, they considered the availability of new growth charts for preterm LBW infants. A list of participants and guests at the Workshop is given in appendix A. The presentations and discussions at this Workshop are the subject of this Executive Summary.

Contents

Glossary

AGA	=	appropriate birthweight for gestational age
CDC	=	Centers for Disease Control and Prevention
GAA	=	gestation-adjusted age
IHDP	=	Infant Health and Development Program
LBW	=	low birthweight (less than 2,500 grams)
LMP	=	last menstrual period
NCHS	=	National Center for Health Statistics
NHANES I, II, and III	=	the first, second, and third National Health and Nutrition Examination Surveys, respectively
NICHD	=	National Institute of Child Health and Development
SGA	=	Low birthweight for gestational age
SSI	=	Social Security Supplemental Income Program
VLBW	=	very low birthweight (less than 1,500 grams)
WIC	=	Special Supplemental Food Program for Women, Infants and Children

The 1977 NCHS/CDC growth charts for infancy (birth–3 years)

The 1977 NCHS/CDC growth charts for birth to 3 years, which will be referred to as the growth charts for infancy, included selected percentiles (5th, 10th, 25th, 50th, 75th, 90th, and 95th) for weight, recumbent length, head circumference, and weight-for-recumbent length (Hamill et al., 1977, 1979). These data had been recorded in the Fels Longitudinal Study between 1929 and 1974. It was recognized that this data set was not ideal for the purpose, but it was considered to be the best available at the time. The number of children with growth data, within each gender, ranged from 142 to 496 at 10 ages from birth to 3 years for the variable (length or head circumference) with the smallest number of data points. These infants were almost all white, and generally from middle-class families in southwestern Ohio. The sample included 6.9 percent LBW infants (birthweight less than 2,500 grams), but only one infant had a birthweight less than 1,500 grams. Infants were not excluded on the basis of prematurity or birthweight, but the data from four sets of triplets and from a few infants with serious diseases, e.g., trisomy 21, were not used. Empirical percentiles were obtained at each scheduled age and these percentile levels were smoothed across age using cubic splines with knots at 6 and 18 months for weight, at 9 and 24 months for recumbent length, and at 72 and 90 cm for weight-for-recumbent length. The Fels Study is described more fully elsewhere (Guo et al., 1991; Roche, 1992).

U.S. data available for infancy in 1994

Data collection in the third National Health and Nutrition Examination Survey (NHANES III) ended in October 1994, but it will be some time before all the data are ready for analysis. This survey will provide data from 3 months to 3 years whereas the second National Health and Nutrition Examination Survey (NHANES II) did not include infants younger than 6 months and the first National Health and Nutrition Examination Survey (NHANES I) did not include infants younger than 12 months. It was noted that many very low birthweight (VLBW) infants (birthweight less than 1,500 grams) would still be hospitalized at 2–3 months after birth; therefore, many of these infants would not have been included in the NHANES III examination sample. The samples available from NCHS surveys and from the Iowa and Fels studies combined are given in appendix B. The Fels data set is described above. The Iowa sample included 1,142 white infants who were born at term with normal birthweights (Fomon, 1993; Nelson et al., 1989). These infants were born between 1965 and 1987; 414 of them were breast-fed. They were measured at 7 ages from 8 to 112 days after birth; a subset (N = 139) had additional measurements at 140, 168, and 196 days. Other data sets for U.S. infants and some major foreign data bases are described in appendix C. Comparisons among these data sets and the revised infant growth charts may be useful.

Revisions of the infancy charts recommended by the 1992 Growth Chart Workshop

Taking into account a previous decision that any revised charts would be prepared primarily for application in the United States, the 1992 Growth Chart Workshop (Roche, 1994) made the following recommendations concerning the revision of the 1977 infancy charts:

- that these revisions should, as far as possible, be based on national data from U.S. surveys, including the national distribution of birthweights;
- that NCHS should attempt to develop and conduct a national or broadly representative study of early infant growth;

- that in the absence of such an infant growth study, data from the Iowa studies be used from birth to 3 months when there is a lack of NCHS data and data from the Iowa studies and the Fels Longitudinal Study be used from 3 to 6 months with gradual merging of these data sets to NCHS data;
- that ages at NCHS examinations be used;
- that the variables in the 1977 charts be retained, but that the 3rd and 97th percentiles be added if the sample size justifies this; and
- that attention be given to minimizing any disjunctions between the infancy charts and those for older children.

NCHS convened a workshop in Hyattsville (February 10, 1994) to plan a multi-site study of early infant growth. The study was not conducted because it was impossible to obtain the necessary funds.

The prevalence of low birthweight

The accepted definition of low birthweight (LBW) is a birthweight less than 2,500 grams, while the term very low birthweight (VLBW) is applied when the birthweight is less than 1,500 grams The Advance Report of Final Natality Statistics for 1991 show the prevalence of LBW is 7.1 percent for all races combined. The prevalence is high among black (13.6 percent) and Puerto Rican infants (9.4 percent), but is 5.1 to 7.3 percent among other U.S. racial and ethnic groups (Mexican Americans, 5.6 percent; Cubans, 5.6 percent; Japanese, 5.9 percent; American Indians, 6.2 percent; Hawaiians, 6.7 percent; other Asians and Pacific Islanders, 6.7 percent; Filipinos, 7.3 percent). The prevalence of VLBW is 1.3 percent for all ethnic groups combined (0.9 percent among white and 2.9 percent among black infants). These ethnic differences are not explained by the educational status of the mother, but they are related to prematurity, which is more common among black (18.7 percent) than among white (8.9 percent) infants.

While LBW infants are a minority of the total population of infants, they constitute an important group because of their excess mortality and high prevalence of morbidity and developmental handicaps and because LBW infants need special care particularly soon after birth. In many ways, they are not part of the "normal" population.

The inclusion/exclusion of data from LBW infants when revising the NCHS/CDC growth charts for infancy

The points raised are stated, followed by a summary of the discussion relative to each point.

The considerations that favor the inclusion of data from LBW infants when the infancy charts are revised include the following:

(i) The NCHS/CDC charts should describe the total U.S. population. The 1977 NCHS/CDC charts for older children described the total U.S. population after the exclusion of those who were institutionalized, living on military bases, or without a place of residence. Those with diseases were probably underrepresented. Some other growth charts of infants that are used clinically are based on samples from which LBW infants have been excluded (Prader et al., 1988; Roede & Van Wieringen, 1985; Sempé, 1979), but Tanner et al. (1966a, b) and Karlberg et al. (1976) did not exclude any infants when constructing growth charts.

(ii) The analysis of secular trends will be less difficult. It will not be possible to analyze secular trends using the revised NCHS/CDC charts for infancy, whether or not data from LBW infants are included, because the 1977 charts were based on data from the Fels Longitudinal Study. Future analyses of secular trends during infancy, using NCHS data, should be based on comparisons of descriptive statistics among NCHS surveys using a consistent procedure for the inclusion/exclusion of infants.

(iii) If LBW infants were excluded, infants with other conditions or diseases that limit growth should be excluded. It is impossible to identify all such children in the NCHS data sets because few diagnostic laboratory tests were performed, and data would be required for the duration of the diseases and the effectiveness of their treatment. If this step were implemented, the growth of children with diseases would necessarily be judged relative to the revised charts for healthy children, except for children with a few specific conditions, e.g., trisomy 21, Turner's syndrome, for which there are disease-specific growth charts (Cronk et al., 1988; Palmer et al., 1992; Ranke et al., 1983).

(iv) If data for LBW infants were excluded, data for infants with large birthweights should be excluded also; 10.6 percent of birthweights are more than 4,000 grams. This has statistical appeal and it is known that the infants with large birthweights remain large to at least 4 years (Binkin et al., 1988; Ounsted et al., 1982; Scott et al., 1982). There is, however, less concern about the welfare of large infants than about those who are small. Furthermore, if data from infants with large birthweights were omitted, the expectation is that their growth would be judged relative to reference data for such infants; such reference data are not available.

(v) The exclusion of data from LBW infants would change the NCHS/CDC growth charts from being reference data to resembling standards. A set of reference data describes the status of a defined population. A value for an individual should be within the normal range of the reference data (5th–95th percentiles) and the distribution of values for a sample of children should match the distribution in the reference data if the children come from the same population as that used to develop the reference. A growth standard describes what the growth status should be in the absence of genetic or environmental limiting factors. Either a reference or a standard can be used to judge the growth of children, but when a standard is used it is commonly implied that the growth status of each child should match the median of the standard. This ignores the variations among children in their genetic potentials for growth. While either a set of reference data or a standard can be used effectively in clinical practice and in many types of research, a standard is not useful for the analysis of secular trends. Indeed, by definition, a standard should not change across time.

(vi) LBW infants were not excluded from the 1977 NCHS/CDC charts for infancy. This is not an important point because the revised infancy charts will be based mainly on NCHS data, not data from the Fels Longitudinal Study.

(vii) Pooling of data from NHANES I, NHANES II, and NHANES III would be impossible if a decision were made to exclude data from LBW infants because such infants cannot be identified in the NHANES I and NHANES II data bases. This is true for identification based on birth certificates, but maternal reports of birthweights are available for NHANES I and NHANES II. A considerable literature, summarized in appendix D, indicates that these reports are highly accurate. The logistics of excluding LBW infants from the data bases likely to be used is considered in the section called “Procedures to exclude LBW infants from the data sets likely to be used.”

(viii) If data for LBW infants were excluded from birth to 3 years, the disjunctions between the infancy charts and those for older children would be increased. This assumption is correct, but the disjunctions will be minimized by overlapping the data sets from 2 to 4 years with gradual down-weighting of the infancy data with increasing age.

(ix) If data from LBW infants were excluded from the revised growth charts for infancy, more black than white infants would be excluded. This is true, but the sample weights would adjust the data for black infants proportional to their representation in the U.S. population of infants with normal birthweights. If data for LBW infants were excluded from the revised growth charts for infancy, the growth of a larger proportion of black than of white infants would be assessed using growth charts specific for LBW infants. The sample weights for the revised infancy charts would reflect the proportion of black infants in the U.S. population of LBW infants.

(x) Application of the NCHS/CDC growth charts for infancy would be more difficult if data from LBW infants were excluded because knowledge of the birthweight of the infant would be required to select the appropriate growth chart (low birthweight; normal birthweight). The data in appendix D show that, in general, this is not an important problem if a maternal report can be obtained. Such reports may be less reliable or unavailable when the mothers are immigrants, of Hispanic ancestry, in poor health, and when the infant is brought to a clinic by a caregiver other than the mother. If the birthweight is unknown, and in the absence of a report that the infant was kept in a neonatal intensive care nursery, the growth status of the infant should be judged using the NCHS/CDC growth charts; charts specific to LBW infants should not be used.

Other considerations might favor the exclusion of data from LBW infants when the NCHS/CDC charts are revised. These include the following:

(i) LBW infants differ in growth status from term infants of normal birthweight even after the chronological ages are adjusted for gestational age. Most of the relevant literature includes separate analyses for those LBW infants who are appropriate in birthweight for gestational age (AGA) and those with low birthweights for gestational age (SGA). The median values of weight, recumbent length, and head circumference for LBW infants are very low—at the 5th–10th percentile until 9 months in the study by Ernst et al. (1983) and 2.5 to 3.0 S.D. below the mean until 2 years in the study by Karniski et al. (1987). The 90th percentile values for weight of VLBW boys (less than 1,250 grams) are about equal to the NCHS medians until 3 years (Casey et al., 1991). Therefore, it could be argued that data from LBW infants should be excluded during the revision of the NCHS/CDC growth charts until some age after 3 years. Such a decision would not be practical because the growth charts for LBW infants do not extend beyond 3 years.

Some differences from normal in the growth patterns of LBW infants have been reported, but these are generally small. Martell et al. (1978) reported more rapid growth to 2 years for AGA and SGA infants than for term infants of normal birthweight. Dunn et al. (1986), found slower growth in weight from 18 to 28 months in SGA infants, in comparison with term infants of normal birthweight, but recumbent length and head circumference increased more rapidly than in term infants from 15 to 28 months. Casey et al. (1991) found growth in weight of VLBW infants was slow compared with the NCHS/CDC reference data from 3 to 36 months, but an opposite pattern for birth to 9 months was reported by Binkin et al. (1988). Hack et al. (1984) reported that VLBW infants grow more rapidly than normal to about 8 months, but in extremely LBW infants (less than 750 grams) (Hack et al., 1994), there is still a growth deficit at 8 years (Hack et al., 1994).

(ii) Some clinicians already use special charts for LBW infants. It was stated that neonatologists use such charts, but general pediatricians and family practitioners use the regular NCHS/CDC growth charts and usually do not adjust for gestational age when evaluating an infant born preterm. This failure to use charts that are specific for LBW infants may reflect the limitations of the charts that have been readily available. The charts in common use, together with the recently released Infant Health and Development Program (IHDP) charts, are described in appendix E and examples of the IHDP charts are included as appendix F. Also, selected percentiles (5th, 50th, 95th) from the IHDP charts for boys are compared with the NCHS/CDC charts in appendix G. The summaries in appendix E make it clear that only the charts of Brandt (1978) and those from the IHDP can be considered for recommendation. Irrespective of the set of charts selected, it is recommended that new charts for LBW infants be developed after there have been substantial changes in the management of these infants. Even the recent IHDP charts are based on births that occurred almost 10 years ago.

(iii) The use of separate sets of charts for LBW infants and for the general population of infants, excluding LBW infants, would increase the sensitivity of growth status evaluation for the identification of infants at risk. Many infants in less than the 5th percentile for weight, length, or head circumference on the NCHS/CDC charts are LBW infants and not term infants of normal birthweight with nutritional problems or diseases that retard growth. If data from LBW infants were excluded during the revision of the NCHS/CDC growth charts, and if the latter were assessed using reference data for the appropriate birthweight stratum, then 5 percent of the VLBW infants, 5 percent of the LBW infants, and 5 percent of the term infants with normal birthweights would be expected to have values in less than the 5th percentile for the growth-related variables in the charts. Term infants of normal birthweight who are growing slowly would be more likely to be identified than is the case when the present NCHS/CDC charts are used for all infants. Similar considerations apply at the upper ends of the distributions. The total number of infants classified as more than the 95th percentile for a particular growth measure would remain the same whether the NCHS/CDC charts are used alone or in combination with charts that are specific for LBW infants. However, the use of the two sets of charts would increase the sensitivity of the process.

The position is less clear in regard to weight-for-length. The IHDP data are being analyzed to obtain weight-for-length reference data for VLBW and LBW infants. This relationship may be almost the same for these infants as for term infants of corresponding length. The IHDP data for VLBW and LBW infants will, however, extend the range of recumbent lengths for the outlying weight-for-length percentiles on the current NCHS/CDC charts from 55 cm to 48 cm at the 5th percentile level and from 55 cm to 53 cm at the 95th percentile level. This will allow the categorization of more very small infants on the basis of weight-for-length than is possible with the present NCHS/CDC charts.

During the discussion, it was asked whether 2,500 grams is the best cutoff level for categorization to LBW and normal birthweight. This choice is justified by common usage in the United States and abroad. Any level chosen is somewhat arbitrary, but it must delineate differences in growth and in clinical management. Furthermore, the chosen level must match the cutoff levels of the growth charts for LBW infants. These levels are 1,500 grams for the charts of Brandt (1978) and 1,500 and 2,500 grams for the IHDP charts. It was shown by Casey et al. (1991) that the differences in growth status among three groups of preterm infants categorized by birthweight (less than 1,250 grams; 1,251–2,000 grams; and 2,001–2,500 grams) were significant from birth to 3 years for all variables analyzed in boys and for head circumference in girls, but the differences for weight after 24 months or for length after 18 months were not significant in girls.

The application of two sets of charts for each gender in clinical settings, assistance programs, and research

Irrespective of whether special charts are used for LBW infants, gestation-adjusted ages (GAA) should be used when plotting growth data for those born before term. Brandt (1978) claimed this should be done until 2 years after term for weight, 3.5 years after term for stature, and 1.5 years after term for head circumference, but Elliman et al. (1992) have shown that these adjustments should be continued to 7 years for stature. Those who adjust chronological ages for gestational ages at birth commonly stop these adjustments at 12 months after term when they cease using the chart of Babson and Benda (1976).

Logistics. With separate sets of charts for LBW infants and for term infants of normal birthweight, the evaluation of growth status during infancy would become slightly more complex. Consequently, clinics, WIC Centers (Special Supplemental Food Program for Women, Infants and Children) or other care centers where growth status is assessed would have to store alternative charts, but the total number of charts used would remain the same. For a particular infant, the appropriate chart would be chosen at the first examination when the adjustment for gestational age at birth would be calculated.

The assignment of some infants to a LBW group could be difficult. Many immigrant mothers do not know the birthweights of their children, partly because some are born at home. The settings (neighborhood health centers, public health departments, municipal hospitals) that serve families with a high prevalence of LBW infants are the places most likely to be dependent on reported data for birthweight and gestational age. Maternal recall of birthweight is generally accurate, but the accuracy may be less in groups with a high prevalence of LBW (mothers who are unmarried, black, multiparae, or have little education). If birthweight is not known, these mothers are likely to know if the infant was kept in an intensive neonatal care nursery or was kept in a hospital for an extended period. Consequently, all VLBW infants and most LBW infants should be identified readily. If the gestational age is not known, but the reported birthweight is less than 2,500 grams, the chronological age cannot be adjusted for a known gestational age. The data for such an infant should be plotted on a chart for VLBW or LBW infants using reported data to assign a gestational age on the basis of birthweight. For example, using the data of Amini et al. (1994) that are provided in appendix M, a singleton infant with a birthweight of 1,500 grams would be assigned a gestational age of 30 weeks. A similar estimate would be made using the data of Wilcox et al. (1994). Other data based on the estimation of gestational ages from ultrasound are available (Secher et al., 1986). Data for twins relating birthweights to gestational ages have been published by Arbuckle and Sherman (1989, appendix N) and data for triplets are also available (Elster et al., 1991; appendix O). The assignment of a gestational age to a twin or triplet infant should be made using the weight of the largest infant in each set. The growth status of preterm LBW twins should be assessed using LBW charts because twins grow like preterm LBW infants who are AGA.

Within the United States, the LBW chart in most common use is that of Babson and Benda (1976), but some U.S. medical centers use the Gairdner and Pearson (1971) chart. The IHDP charts (Casey et al., 1991) have only just become available and those of Brandt (1978) have not been generally available outside Europe. The IHDP charts are preferred to those of Brandt for the growth assessment of LBW infants because they are derived from U.S. infants, the sample is larger (985 vs 107), the data are more recent (1985 vs 1967–75), there is a choice of birthweight categories (less than 1,500 grams, 1,501–2,500 grams vs less than 1,500 grams), and the IHDP charts are from a sample that is diverse in geographic location and demographic characteristics.

It was suggested that single charts that extend from birth to 5 years be developed for use in WIC clinics. These charts would be for VLBW infants, LBW infants, or the general population to 3 years. However, the values from 3 to 5 years would be those for the general population. Disjunctions between the data for infancy and those for older children could be reduced by merging procedures.

Possible effects within clinics. Growth charts are used in clinical practice to identify children whose attained growth and growth patterns warrant further medical or nutritional evaluation that may lead to intervention. A clinician identifies a child as being at risk using statistical criteria and then evaluates possible current and future deficits in function and health. Low postnatal weight in LBW infants may be an important indicator of poor health and nutrition of the infant and of social problems in the family including the abuse of alcohol, tobacco, or drugs. Low postnatal weight can be associated with impaired immunocompetence and linear growth in the short term and reductions in adult stature and developmental/socioaffective competence in the long term.

The use of charts for LBW infants, in combination with revised NCHS/CDC charts that exclude data for LBW infants, would lead to more accurate identification of growth problems in preterm LBW infants and in term infants of normal birthweight. At present, some LBW infants are put into foster care because of their small size compared with the general population. Such errors would be avoided by the use of charts specific for LBW infants. Because about 7 percent of all infants have low birthweights, it is likely that the exclusion of data from LBW infants in the revised charts would cause very small changes in most percentile levels, but slightly larger changes in the lower percentile levels. To obtain an approximate estimate of these changes, empirical percentiles were calculated from Fels data with and without the exclusion of data from LBW infants (appendix P). The exclusion of LBW infants caused only small changes in the 5th and 10th percentile values but, as expected, these changes were larger for the 5th percentile than for the 10th percentile and they were larger for weight than for recumbent length and head circumference.

The use of separate charts for LBW infants until age 3 years, after which their growth would be plotted on the NCHS charts, could lead to a need to explain the changes in percentiles likely to be encountered. For example, a VLBW boy at the median for weight on the IHDP chart at 3 years GAA would weigh 13.3 grams. Assuming he was born at a gestational age of 28 weeks, and that a correction is not made for this after 3 years, his weight would be at about the 20th NCHS percentile. As another example, a LBW boy born at a gestational age of 36 weeks might be at the median level for weight at 3 years GAA on the IHDP chart but slightly above the 25th percentile on the NCHS charts.

Possible effects on eligibility for assistance programs. The present WIC funding is sufficient to provide assistance to all applicants younger than 2 years. There is some rationing of funds from 2 to 5 years that, in part, is based on abnormal growth. If the same cutoff levels are applied, the number of children identified with abnormal growth would not change, but the selection would be more accurate if separate sets of charts were used for LBW infants and for term infants of normal birthweights. Similar considerations apply to the Supplemental Social Security Income Program (SSI) that helps families of infants or children with disabilities. The medical criteria for eligibility include growth impairment, which is based on changes in stature percentiles or a sustained level below the 3rd percentile.

Possible effects on research. The potential to perform effective research would not be reduced by the use of two sets of growth charts. It would be necessary, however, for those who analyze data using percentiles derived from the NCHS/CDC charts to take account of the population used in the revised charts. If data for LBW infants are excluded during the revision of the NCHS/CDC growth charts and the research sample does not include LBW infants, the comparison should be with the revised charts. If LBW infants are included in the research sample, the percentiles for these infants should be calculated using growth charts that are specific for LBW infants.

Procedures to exclude LBW infants from the data sets likely to be used

Birth certificates are not available for NHANES I and NHANES II subjects, but the mothers of subjects aged up to 6 years were asked the birthweights of their children and whether the infants were born prematurely. Consequently, exclusions from NHANES I and NHANES II would have to be based on these maternal reports. The data in appendix D show these reports are highly accurate for birthweight, but less accurate for gestational age. Maternal reports of birthweights in NHANES II (1976–80) indicated the prevalence of LBW was 6.5 percent, which is similar to the prevalence from the Final Natality Statistics for the same years. When the basis for exclusion is the maternal recall of birthweight and gestational age is unknown, data for some term infants of low birthweight may be excluded, but the number is likely to be small. In NHANES III, the mothers of subjects up to 6 years of age were asked the birthweights and whether the birthweight was more than 5 ½ lb (2,500 grams) or more than 9 lb (4,100 grams). They were also asked the duration of any newborn care in an intensive care unit, premature nursery, or any other type of special care facility.

The NHANES III mothers also gave permission for access to the birth certificates of subjects aged up to 6 years. The current National "Certificate of Live Birth," which was introduced in 1989, provides date of birth, last menstrual period (LMP), birthweight, and gestational age at birth (appendix Q). Birth certificates will also be needed for the period 1985–89 when the recording of gestational ages on birth certificates varied among the states. Most states used LMP and the physician's estimate, some used LMP only, and a few did not record gestational age.

The birth certificates for NHANES III subjects up to the age of 6 years will be used to exclude data for preterm LBW infants. Birth certificates will be available for almost all NHANES III infants, but there will be some nonresponse and some bias in the nonresponse. A lack of information for birthweight is very uncommon, but it occurs occasionally with Mexican Americans partly due to language problems. Almost 15 percent of birth certificates lack information for gestational age. If it were decided to exclude preterm LBW infants from NHANES III when revising the infancy charts, infants of LBW, but unknown gestational age, would also be excluded. Twins are not always recorded as such on the birth certificate if one twin died as a fetus. Twins are usually born preterm with LBW and grow after birth like preterm AGA infants except that growth may be slightly slower in monozygotic twins who tend to have congenital anomalies.

The National Institute of Child Health and Human Development (NICHD) has begun collaborative work with NCHS to retrieve the birth certificates for subjects in NHANES III up to the age of 6 years (N = 9,000). It is expected that the merging of birth certificate data with NCHS data will be complete about January 1996[a]. This merging will allow the identification of preterm LBW infants and also facilitate analyses relating to the later status of preterm LBW infants in a national sample, the influence of ethnic and socioeconomic factors on outcomes, the development of normative data for the total U.S. population to 6 years and for specified ethnic groups according to risk profiles at birth, and comparisons between maternal and proxy reports of risk factors at birth with observed data.

If it is decided to use data from the Iowa studies and the Fels Longitudinal Study for the period from birth to 6 months, the exclusion of LBW infants from these data sets will not present a problem. All the infants in the Iowa studies had birthweights more than 2,500 grams; the birthweights for individual infants are available. Preterm LBW infants in the Fels Longitudinal Study can be identified.

Summary and recommendations

The scope of this workshop was restricted to the revision of the NCHS/CDC growth charts for infancy (birth–3 years) with special reference to the exclusion of data for LBW infants when these revisions are made. These infants can be omitted from the NHANES III data base using birth certificates and it can be done for NHANES I and NHANES II using maternal reports of birthweights, which are generally accurate. If these data were omitted, the growth status of LBW infants would be assessed using growth charts specific for such infants. Recently, charts from the Infant Health and Development Program (IHDP) have become available; these charts are better than those used previously.

Considerable attention was directed to the possible effects of excluding data for LBW infants when revising the NCHS/CDC growth charts. The effects considered were related to logistic aspects of screening for unusual growth status, the number of infants categorized as unusual, and the accuracy of such categorization. These and other effects were considered in relation to clinical settings, assistance programs and research. The present process by which unusual growth in infancy is recognized is imperfect and any modified process will also be imperfect. However, the use of separate charts for LBW infants and for term infants of normal birthweight would provide more accurate assessments of growth status.

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[a] This work was completed in late 1997.

This workshop did not attempt to develop a consensus statement or set of recommendations, but numerous aspects of the general topic were discussed. The present summary of these discussions should help NCHS to make an early decision about this important matter.

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List of Appendixes

APPENDIX A

NCHS Workshop to Consider Low Birthweight in Relation to the Revision of the NCHS Growth Charts For Infancy (Birth–3 years)

October 4–5, 1994

List of Participants and Guests

COCHAIRPERSONS:

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APPENDIX B

Approximate sample sizes within each gender available for infancy (birth–3 years)

Source	Ages	Number
NHANES I	each 6 months; 1–3 years	125–150
NHANES II	6–12 months	177
	each 6 months; 1–3 years	165–200
NHANES III*	3–6 months	460
	6–12 months	580
	each 6 months; 1–3 years	324–366
Iowa plus Fels*	each month; birth–12 months	167–786
Total number of data points for all those above*	0–6 months	3,037
	6–12 months	3,162
	18–24 months	1,034
	24–30 months	664
	30–36 months	664

*The sample sizes for these surveys are for weight and recumbent length.

APPENDIX C

Data Bases for Infant Growth

Note: The Fels Study and the Iowa Studies are described in "The 1977 NCHS/CDC graph charts for infancy (birth–3 years)" and "U.S. data available for infancy in 1994" sections, respectively.

I. U.S. Data

a. Berkeley Growth Study (Bayley & Davis, 1935). These are serial data for 61 infants (healthy, born at term) measured in the early 1930's with good quality control. The measurements were made at 1-month intervals from 1 to 12 months, at 15 and 18 months, and then each 6 months to 3 years.

b. Binns et al. (unpublished). These authors analyzed data from 2,024 white infants who were healthy and born at term with birthweights of 2,000 grams or more. The data were collected at private pediatric clinics in the Chicago area. The infants were measured monthly from 1 through 12 months, but there was considerable attrition (about 30%) and there are fewer data points at 3, 5, 7, 8, 10, and 11 months than at other ages. There were data for black infants, but due to high attrition and questionable data quality, these infants were excluded. There are also some data for Hispanic Americans (total of blacks and Hispanic Americans = 550). The data quality was fair for the white infants.

c. Child Research Council, Denver (McCammon, 1970). These charts are based on data from 334 white infants born 1927–66. They were measured serially at 11 ages from birth to 3 years. Data quality was excellent. About 80 of each gender were measured at each age.

d. Darling Study (Dewey et al., 1992). This was a small study to compare growth and health in breast-fed and formula-fed infants. They enrolled 144 infants at birth of whom 80 remained in the study at 18 months. These infants, who were born at term with normal birth weights, were measured monthly from birth to 18 months. The group was 85% white (non-Hispanic). Data quality was not documented.

e. Infant Health Survey (1991). This set of data is unpublished, but is available on tape. The data were obtained from medical records for 5,000 infants from birth to 3 years. Of this sample, 30% were low birthweight (LBW) infants. The relevant variables are weight, recumbent length, and head circumference.

f. Kaiser Permanente Study. (Wingerd et al., 1971). These authors reported serial data from more than 15,000 infants from birth to 2 years for whom there were 105,642 examinations. The sample was middle class (60% white, 23% black) and enrolled in a prepaid medical care program. Evidence of quality control was not reported, and the data for recumbent length and stature were combined. The reported tabular data could be useful for ethnic comparisons.

g. National data for birthweights. These are available from NCHS Natality Surveys and are based on birth certificates and measurements in hospitals. These national data could be used to anchor the curves for weight at birth; the other variables could be adjusted up to 3 years for the national distribution of birthweights. Alternatively, the actual distributions of birthweights for the data sets to be used could be retained to anchor the curves.

h. Pomerance (1979). Pomerance reported short-term serial data from 3,995 infants, almost all white, examined in a pediatric practice in New York City. Data quality was not reported.

i. Ross National Survey (Ryan & Martinez, 1987). In this cross-sectional study, data were collected from 1,100 infants aged 7 to 13 months (746 white, 354 black) who were selected by multistage sampling to be nationally representative. All the infants were born at term and weighed 2,500 grams or more at birth. Quality control was good.

II. Foreign Data

a. Karlberg et al. (1976). In this serial study, Swedish infants born in 1975 were examined eight times from 1 month to 3 years. The number at each age for each gender was 81–86. There were no exclusions.

b. Lindgren et al. (1994). These authors reported mixed longitudinal data from 2,760 children measured in Child Health Centers in Stockholm. These measurements were made from 1980 to 1986 at ages birth to 6 years. There were 10–15 examinations of each child. They excluded twins, those born preterm, and those with serious diseases.

c. Prader et al. (1989). Serial data from 413 Swiss infants measured at 8 ages from 1 month to 3 years. The number at an age is 35–172 for each gender.

d. Roede & van Wieringen (1985). These data are from a cross-sectional study of Dutch infants after the exclusion of ethnic minorities. They excluded LBW infants and those with diseases that might affect growth. In each gender, they measured 120 at 1–3 months, 170 at 3–6 months, 150 at 6–12 months, and 150 at 1–3 years.

e. Russo & Zaccagni (1993). Serial data from 680 Italian infants measured 9 times from birth to 3 years. There were no exclusions for prematurity or LBW.

f. Sempé (1979). This is a report of serial data from 496 French infants measured at 8 ages from birth to 3 years. The number at each age for each gender is 148–257. They excluded LBW infants and those with large birthweights (> 4,700 grams) or pathological conditions.

g. Tanner et al. (1966a, b). Serial data from 80 English children of each gender measured in 1952–54. Apparently none were excluded. They were measured at 12 ages from birth to 3 years. The number examined at any specific age was not reported.

APPENDIX D

Accuracy of Maternal Recall of Birthweight (courtesy of Deborah A. Frank, M.D.)

Article	Number	Sample	% Under-reporting (>100 grams)	% Over-reporting (>100 grams)	Accurate for >/< 2,500 grams	Factors related to less accuracy	Factors not related to less accuracy
Axelsson & Rylander (1984)	745	Sweden (University employees; interviewed 0–7 years after birth	16 % (3.6 %)	11.6 % (3.1 %)	NR	NR	solvent exposure
Burns et al. (1987)	127	Iowa (interviewed 16 years after birth)	25 % (23 %)	28 % (17 %)	98 %	lighter children over-reported; heavier under-reported; as parity increases, recall accuracy decreases	interval since birth; age of recall; mother's body size; child's size
Gayle et al. (1988)	46,637	Tennessee WIC 1975–84; singletons 80% white; interviewed 0–5 years after birth	22.6 %	6.8 %	96% even in least accurate groups	mothers overestimate weight of low weight infants, preterm, low Apgar, < high school education, black, single, <18, grand-multiparity	child's age
Hoekel-man et al. (1976)	59	Rochester, NY; mothers of 9-month-olds	32 %		NR	nonwhite	gender

Accuracy of Maternal Recall of Birthweight (courtesy of Deborah A. Frank, M.D.)—Con.

Article	Number	Sample	% Under-reporting (>100 grams)	% Over-reporting (>100 grams)	Accurate for >/< 2,500 grams	Factors related to less accuracy	Factors not related to less accuracy
Little (1986)	369	Seattle middle class HMO; prenatal patients interviewed 1–12 months after birth	9%		NR (12% misclassified gestational age)	NR	NR
Tilley et al. (1985)	3,650	U.S. 3,078 girls DES-exposed; 572 not DES-exposed; > 10 years following girl's birth; middle class white	NR		94 %	lack of exposure to DES	NR
Wilcox et al. (1991)	104	NR	32% accurate ± 100 grams		95 %	none	age; parity; ethnicity; years since birth; child's neonatal problems

NR is not reported; WIC is Special Supplemental Food Program for Women, Infants and Children; HMO is health maintenance organization; DES is diethylstilbestrol.

NOTES: Cartwright & Smith (1979) reported data from a random sample of UK mothers (N = 131) who were interviewed 2–3 months after birth. Of these mothers, 15% did not know the dates of their last menstrual periods and a further 12% knew them to the month only. The recalled birthweights were accurate to within 0.5 lb for 82 % of cases. Goddard et al. (1961). In consecutive visits to a pediatric clinic, 68% of 25 mothers reported birthweight with an error less than ± 1 oz. The children were aged 5–6 years at the time of the recall. Seidman et al. (1987) obtained maternal recall data 0–4 years after birth from grand multiparae (> 6 births, N = 185). They found a mean error of 56 grams (SD, 113 grams). The errors were positively related to birthweight but were not related to the age or education of the mothers. Other data from Cartwright & Smith (1979), Haggard et al. (1960), Pyles et al. (1935), and Robbins (1963) support the general accuracy of maternal recall of birthweight.

APPENDIX E

Growth Charts for Preterm VLBW and LBW Infants

Babson and Benda (1976). The data from 26 weeks to term used by these authors came from Usher & McLean (1969) who measured 300 infants at birth. The data from term to 2 years are from the study by Wingerd (1970) and data for 1 to 10 years were obtained from the Child Research Council in Denver, Colorado (McCammon, 1970). Therefore the data after term are from general samples of infants and children. The data were pooled for the two genders and the way in which the data sets were combined was not reported. The charts present the means ± 1 standard deviation and ± 2 standard deviations from 26 weeks gestional age (GA) to 1 year GA in one chart (appendix H) and from 1 to 10 years in another chart (appendix I). This second chart is for a general population of children, but it is considered here to reduce possible confusion. It is emphasized that the data after term in both charts are from general samples and that most of those for LBW infants were recorded in 1959.

Brandt (1978). Brandt reported data from preterm VLBW infants (birthweight <1,500 grams) born in Germany between 1967 and 1975. The sample included 64 AGA and 43 SGA infants in addition to a comparison group of 80 term infants of normal birthweight. The infants were measured each week or each 2 weeks until term, then each month to 1 year, then each 3 months to 2 years. She presents gender-specific charts with the 3rd, 10th, 25th, 50th, 75th, 90th, and 97th percentiles for weight and recumbent length (32 weeks GA–2 years gestation-adjusted age (GAA)), and for head circumference (32 weeks GA–18 months GAA) that are included as appendix J and selected percentiles from Brandt (1978) are compared with NCHS percentiles in appendix K.

Gairdner and Pearson (1971). These authors published sex-specific growth charts that give the 10th, 50th, and 90th percentiles in relation to a logarithmic age axis from 28 weeks GA to 24 months GAA (appendix L). Data for weight and recumbent length from 32 weeks to term were obtained from a report by Tanner and Thompson (1970) for Aberdeen infants and corresponding data for weight from 28 weeks GA to term were obtained from Babson (1970). The Babson preterm data were taken from Usher & McLean (1969) and are for genders combined. It is not clear whether Babson had access to the raw data, but the charts for boys and girls differ close to term. The source of the preterm head circumference data is unclear. The data after term were obtained from reports of general populations in the Harvard Growth Study and in England (Nelson, 1964; Tanner et al., 1966a, b).

Infant Health and Development Program. (IHDP). Charts in a format suitable for clinical use have recently become available from the IHDP, but relevant reports appeared earlier (Casey et al., 1990, 1991; Ross Laboratories, 1994). This program was a serial study of 985 preterm LBW infants born in late 1984 or 1985 at eight sites in the United States. The enrollment process ensured that one-third had birthweights ≤ 2,000 grams and two-thirds had birthweights 2,001–2,500 grams. These proportions are close to those from national estimates (Ventura et al., 1994). Black infants were overrepresented in the sample compared with the total national population, particularly in the subgroups with birthweights < 1,250 grams. This overrepresentation is much less marked if considered in relation to the population of U.S. mothers with VLBW or LBW infants. It is not clear whether ethnic groups of VLBW and LBW infants differed in postnatal growth within birthweight groups. There was an overrepresentation of mothers with less than a high school education, although low educational attainment is common nationally among the mothers of VLBW and LBW infants. This may be important because postnatal growth of VLBW and LBW infants is related to the socioeconomic status of the family (Lipper et al., 1981; Qvigstad et al., 1981; Ross et al., 1990; Srivastava et al., 1978).

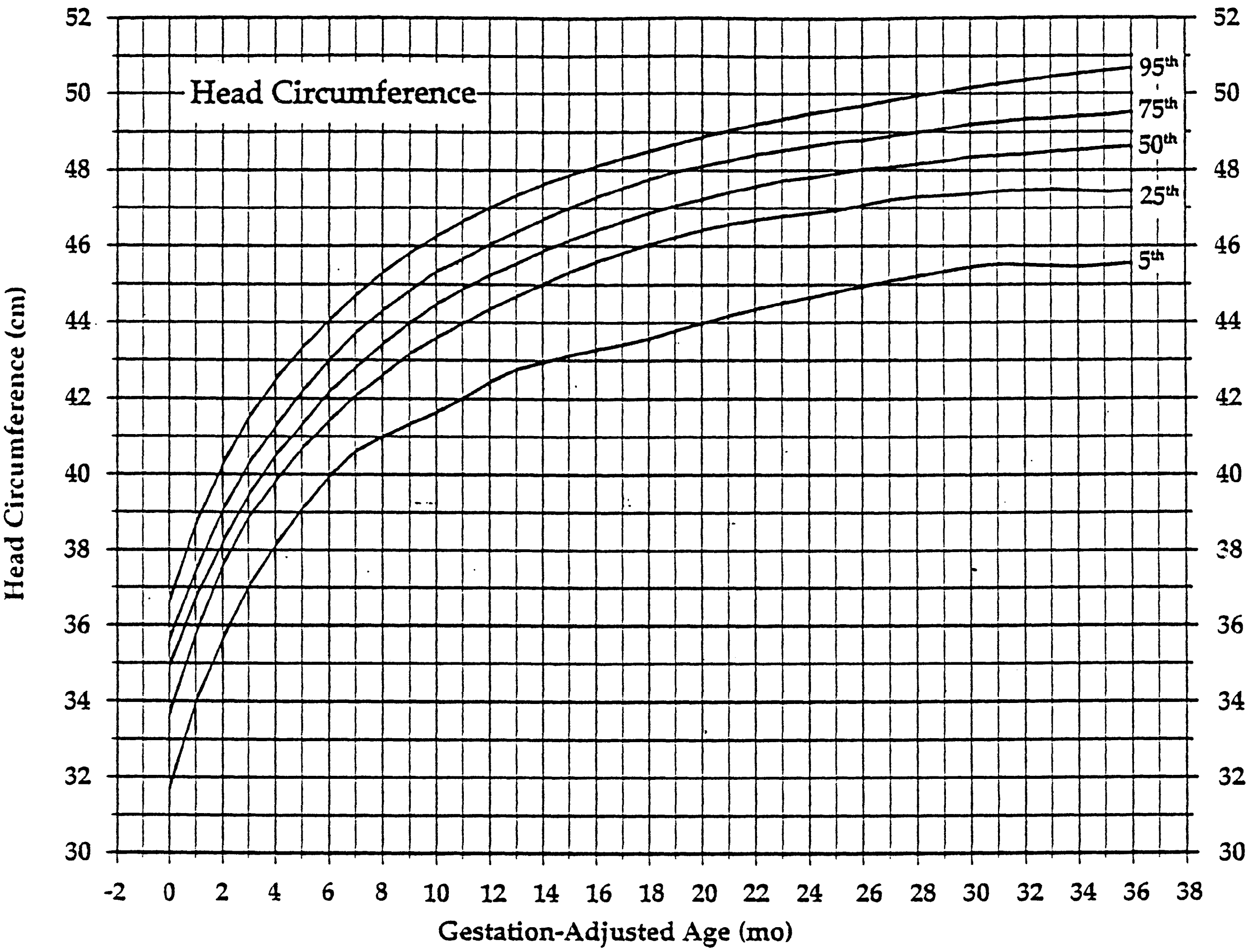
The following groups of infants were excluded from the IHDP sample: triplets and quadruplets, died within 48 hours after birth, received oxygen for more than 90 days, hospitalized for more than 60 days after term, neural tube defect, severe neurologic abnormality, severe sensory defect, chromosomal anomaly syndrome, or maternal abuse of drugs or alcohol (Casey et al., 1990).

The infants were separated to two strata by birthweight (< 1,500 grams; < 1,501–2,500 grams). They were measured at birth and at term and then at seven ages to 3 years (GAA). The gender-specific charts for weight, recumbent length, and head circumference for each birthweight stratum extend to 3 years GAA with the curves beginning at 37 weeks GA for weight and at term for recumbent length and head circumference. There was a high prevalence of failure-to-thrive (17.5%) when the criteria used were (i) clinical concern, (ii) weight < 5th percentile of the NCHS/CDC charts at two or more examinations after adjusting for gestational age, and (iii) weight velocity less than the median (Casey et al., 1994; Kelleher et al., 1993; Roche & Himes, 1980). The term "failure-to-thrive" was applied in the absence of clinical concern if both other criteria were met.

The IHDP charts should be regarded as reference data, not standards. New growth charts for VLBW and LBW infants will be needed as changes occur in the clinical management of these infants.

Other Neonatal Growth Charts. Other growth charts for preterm VLBW and LBW infants are designed for use in neonatal nurseries. Typically these are for weight only and do not extend beyond 60 days after term (Brosius et al., 1984; Dancis et al., 1948; Fitzhardinge, 1975; Jaworski et al., 1974; Wright et al, 1993).

IHDP Growth Percentiles: VLBW Premature Girls[1,2]



Growth of very-low-birth-weight (VLBW, ≤ 1500 g) and low-birth-weight (LBW, 1501 to 2500 g) premature (≤ 37 weeks, GA) infants differs from that of normal-birth-weight term infants during infancy and early childhood. Because these infants may not catch up to term infants in growth during the early years, their growth should be compared to that of premature infants of similar birth weight.

The growth percentiles presented here are based on a large sample of infants enrolled in the Infant Health and Development Program (IHDP).[1,2] Some infants most likely to experience growth problems from biologic or environmental causes, premature infants with birth weight greater than 2500 g, and small-for-gestational-age term infants were excluded.[1] Study infants, however, are probably typical of premature infants who receive modern neonatal intensive care.

References

1. The Infant Health and Development Program: Enhancing the outcomes of low-birth-weight, premature infants. *JAMA* 1990:263(22):3035-3042.
2. Casey PH, Kraemer HC, Bernbaum J, et al: Growth status and growth rates of a varied sample of low birth weight, preterm infants: A longitudinal cohort from birth to three years of age. *J Pediatr* 1991;119:599-605.

IHDP studies were supported by grants from the Robert Wood Johnson Foundation, Pew Charitable Trusts, and the Bureau of Maternal and Child Health, US Department of Health and Human Services. These graphs were prepared by SS Guo and AF Roche, Wright State University, Yellow Springs, Ohio. IHDP, its sponsors, and the investigators do not endorse specific products.

Instructions for Use

1. Measure and record weight, length, and head circumference.
2. Calculate gestation-adjusted age by subtracting Adjustment for Prematurity in weeks from postnatal age in weeks. Adjustment for Prematurity equals 40 weeks minus GA. For example, at 12 wk postnatal age, an infant born at 30 wk GA would be 2 wk (0.5 mo) gestation-adjusted age.
3. Plot data at the gestation-adjusted age on the appropriate graph.
4. When possible, plot serial data on the same graph to permit detection of change in growth percentiles with age.

Interpretation

These graphs permit comparison of a VLBW premature girl's growth relative to current reference data. Further investigation may be indicated when the plotted measurements are markedly different from the 50th percentile, or growth percentile changes rapidly.

APPENDIX F

IHDP Growth Percentiles: VLBW Premature Girls[1,2]

(≤1500 g BW, ≤37 wk GA)

Name ____________________

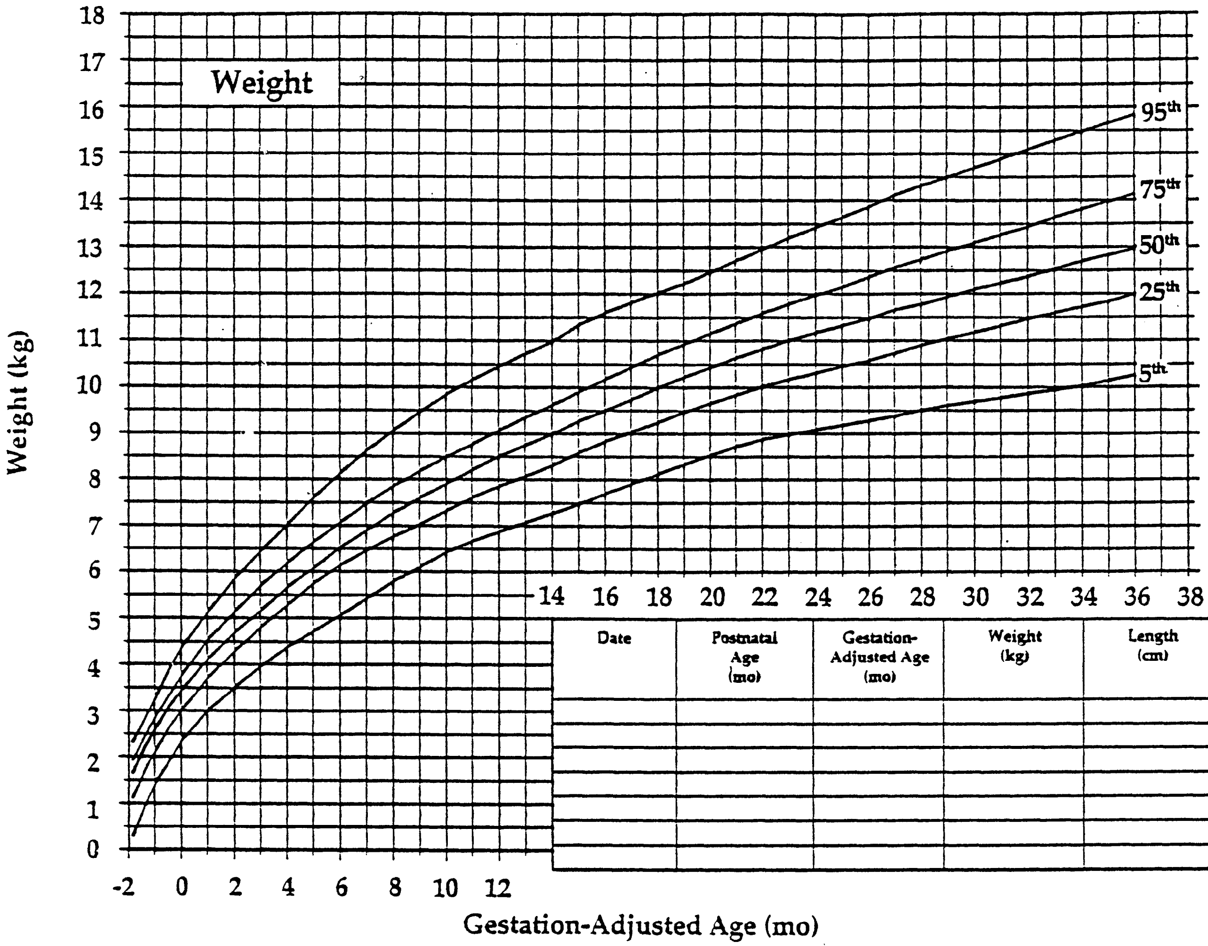
Record # ____________________

ROSS PEDIATRICS

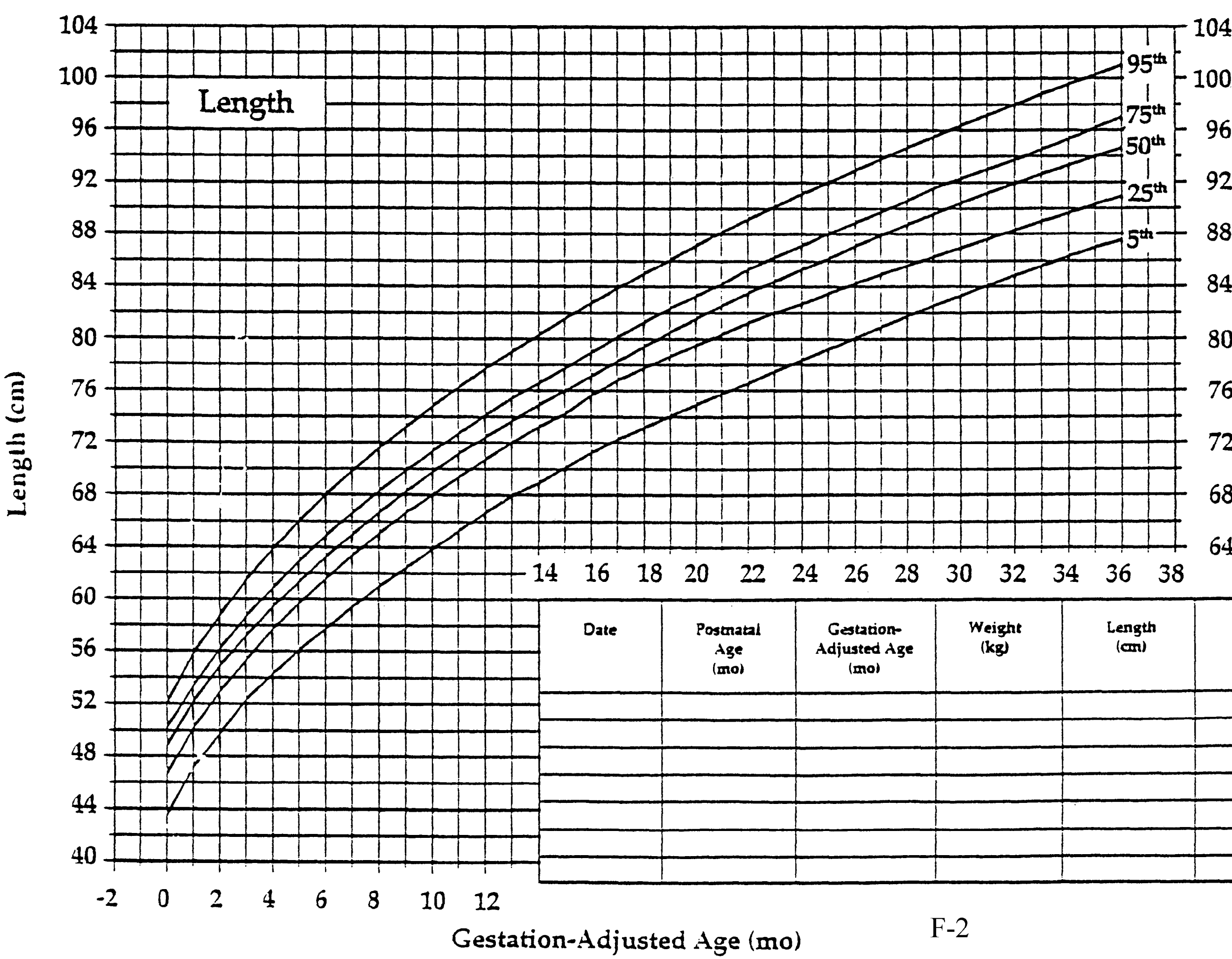
Birthweight (BW): ________ g

Gestational Age (GA): ________ wk

Adjustment for Prematurity (40 wk - GA): ________ wk



Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)



Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)

IHDP Growth Percentiles: LBW Premature Boys[1,2]

(1501 to 2500 g BW, ≤37 wk GA)

Name________________________________

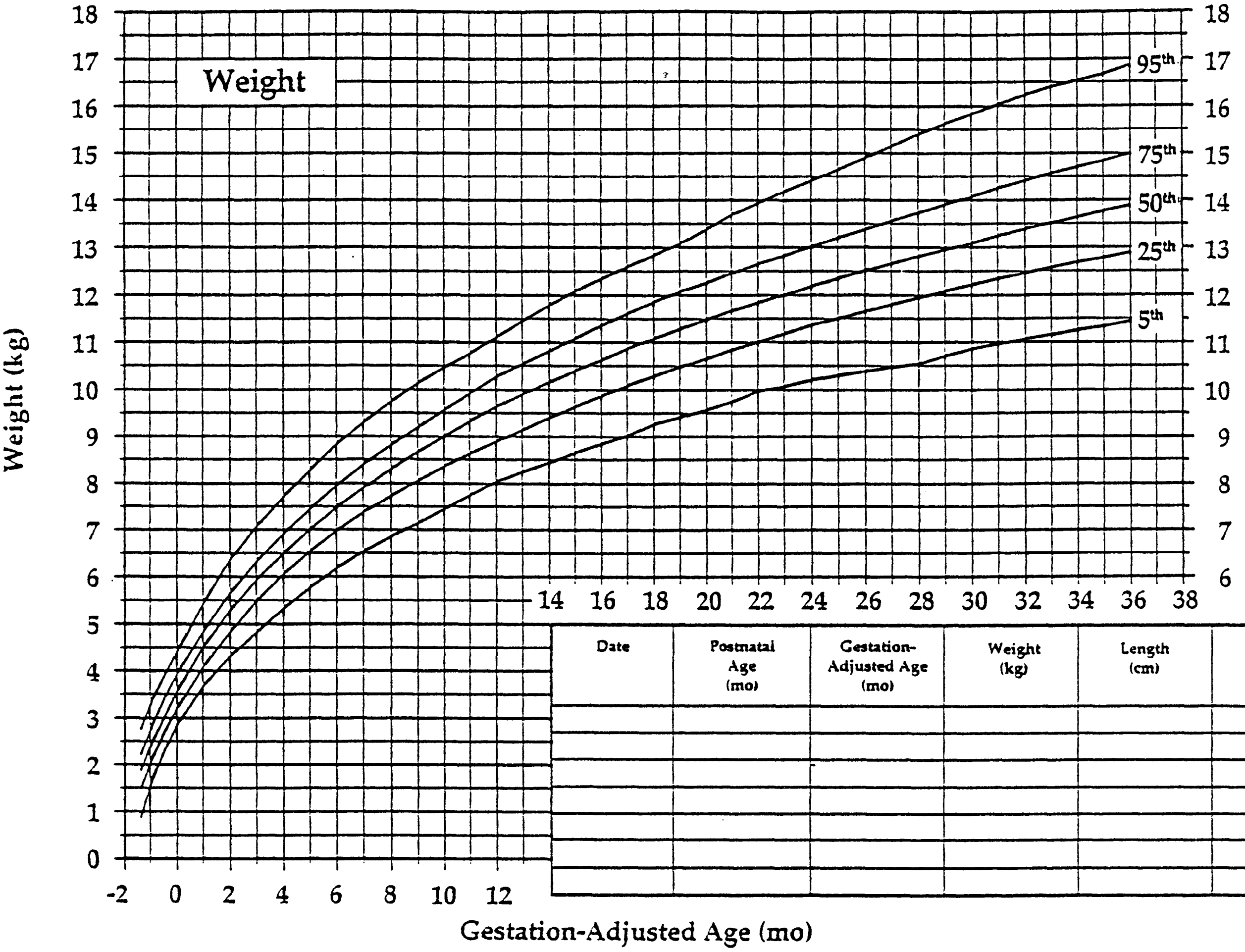
Record #______________________________

ROSS PEDIATRICS

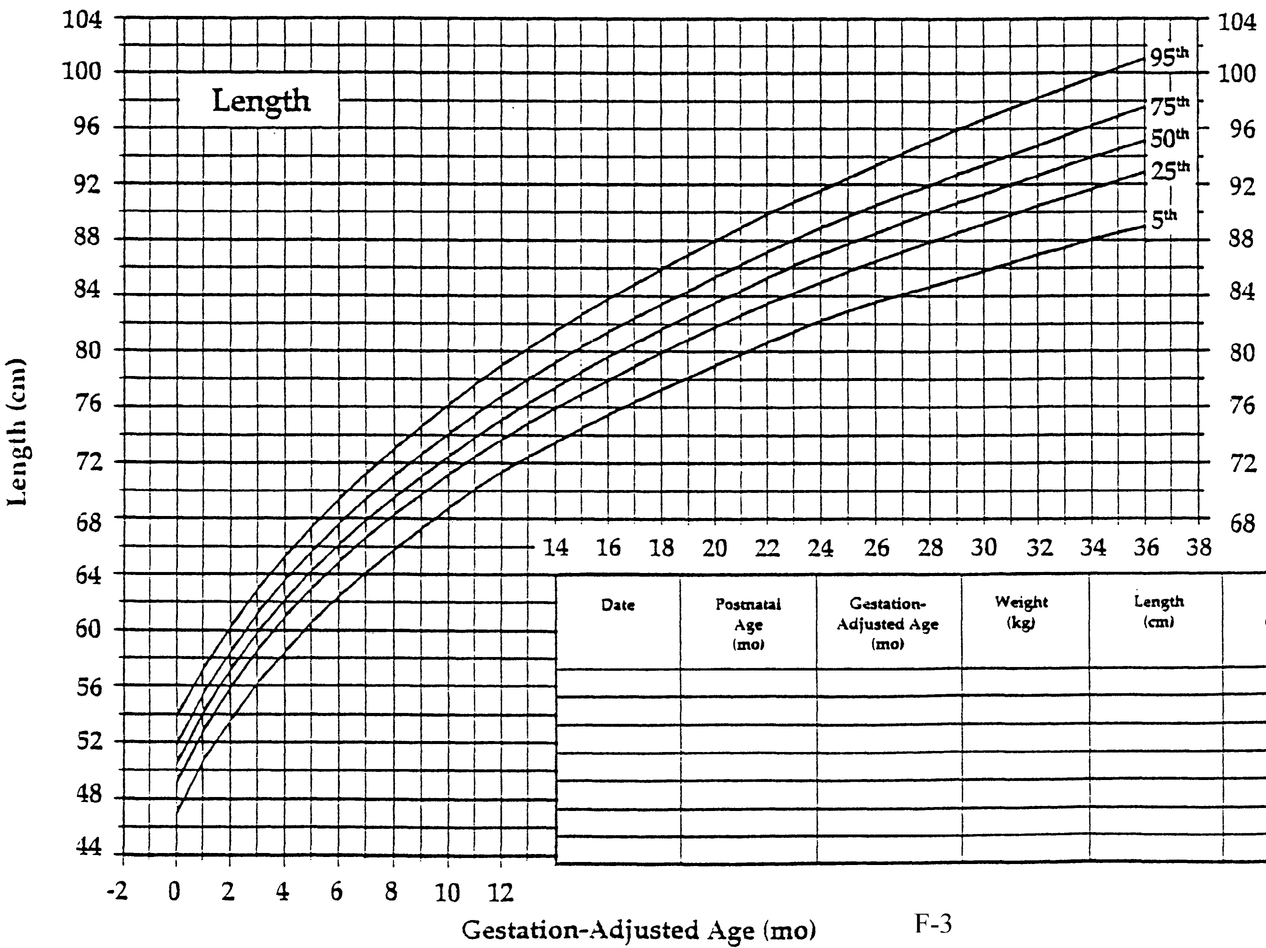
Birthweight (BW): __________ g

Gestational Age (GA): __________ wk

Adjustment for Prematurity (40 wk - GA): __________ wk

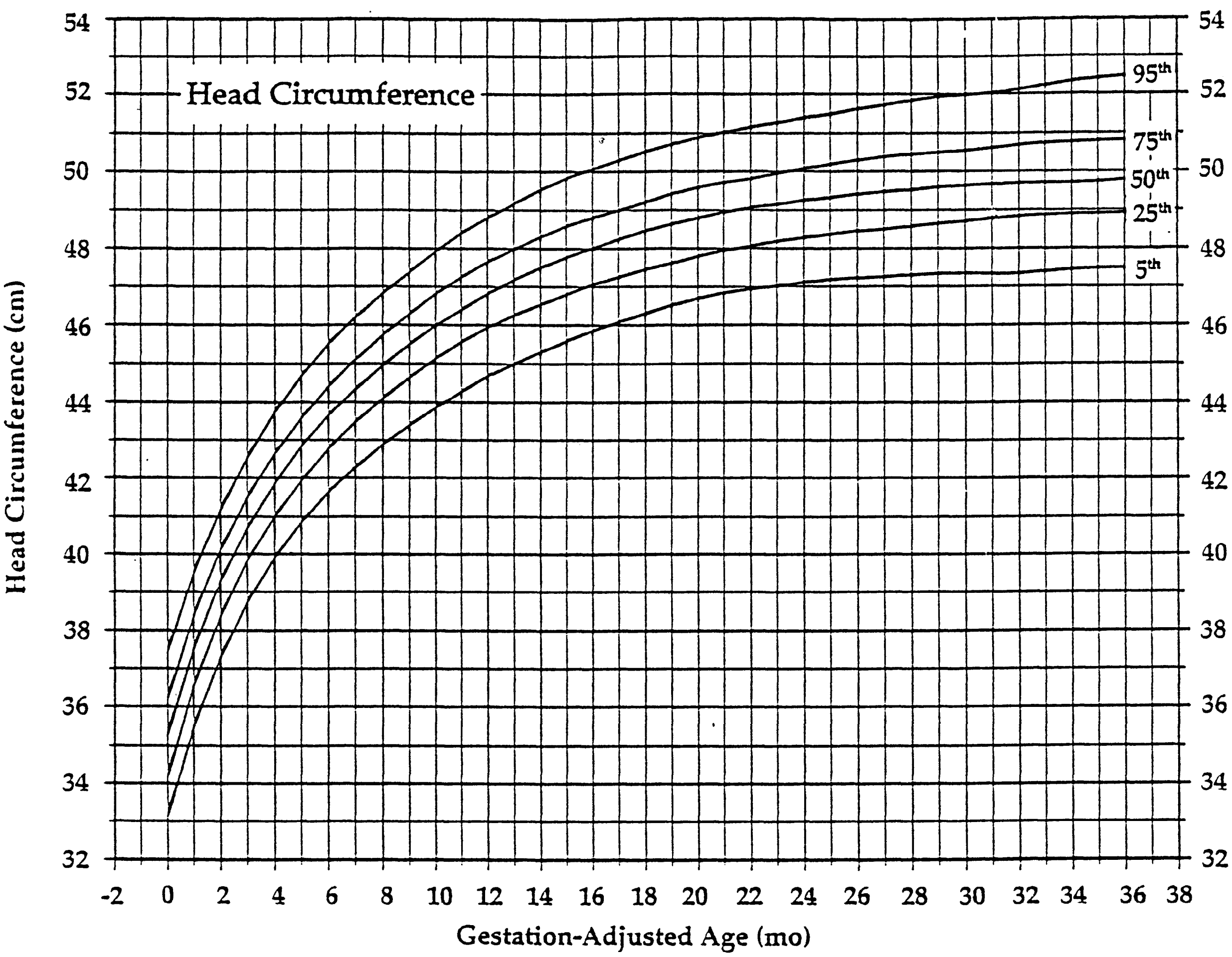


Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)



Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)

IHDP Growth Percentiles: LBW Premature Boys[1,2]



Growth of very-low-birth-weight (VLBW, ≤ 1500 g) and low-birth-weight (LBW, 1501 to 2500 g) premature (≤ 37 weeks, GA) infants differs from that of normal-birth-weight term infants during infancy and early childhood. Because these infants may not catch up to term infants in growth during the early years, their growth should be compared to that of premature infants of similar birth weight.

The growth percentiles presented here are based on a large sample of infants enrolled in the Infant Health and Development Program (IHDP).[1,2] Some infants most likely to experience growth problems from biologic or environmental causes, premature infants with birth weight greater than 2500 g, and small-for-gestational-age term infants were excluded.[1] Study infants, however, are probably typical of premature infants who receive modern neonatal intensive care.

Instructions for Use

1. Measure and record weight, length, and head circumference.
2. Calculate gestation-adjusted age by subtracting Adjustment for Prematurity in weeks from postnatal age in weeks. Adjustment for Prematurity equals 40 weeks minus GA. For example, at 12 wk postnatal age, an infant born at 30 wk GA would be 2 wk (0.5 mo) gestation-adjusted age.
3. Plot data at the gestation-adjusted age on the appropriate graph.
4. When possible, plot serial data on the same graph to permit detection of change in growth percentiles with age.

Interpretation

These graphs permit comparison of a LBW premature boy's growth relative to current reference data. Further investigation may be indicated when the plotted measurements are markedly different from the 50th percentile, or growth percentile changes rapidly.

References

1. The Infant Health and Development Program: Enhancing the outcomes of low-birth-weight, premature infants. *JAMA* 1990;263(22):3035-3042.
2. Casey PH, Kraemer HC, Bernbaum J, et al: Growth status and growth rates of a varied sample of low birth weight, preterm infants: A longitudinal cohort from birth to three years of age. *J Pediatr* 1991;119:599-605.

IHDP studies were supported by grants from the Robert Wood Johnson Foundation, Pew Charitable Trusts, and the Bureau of Maternal and Child Health, US Department of Health and Human Services. These graphs were prepared by SS Guo and AF Roche, Wright State University, Yellow Springs, Ohio. IHDP, its sponsors, and the investigators do not endorse specific products.

A7222/AUGUST 1994

ROSS PRODUCTS DIVISION
ABBOTT LABORATORIES
COLUMBUS, OHIO 43215-1724

LITHO IN USA

IHDP Growth Percentiles: VLBW Premature Boys[1,2]

(≤1500 g BW, ≤37 wk GA)

Name____________________

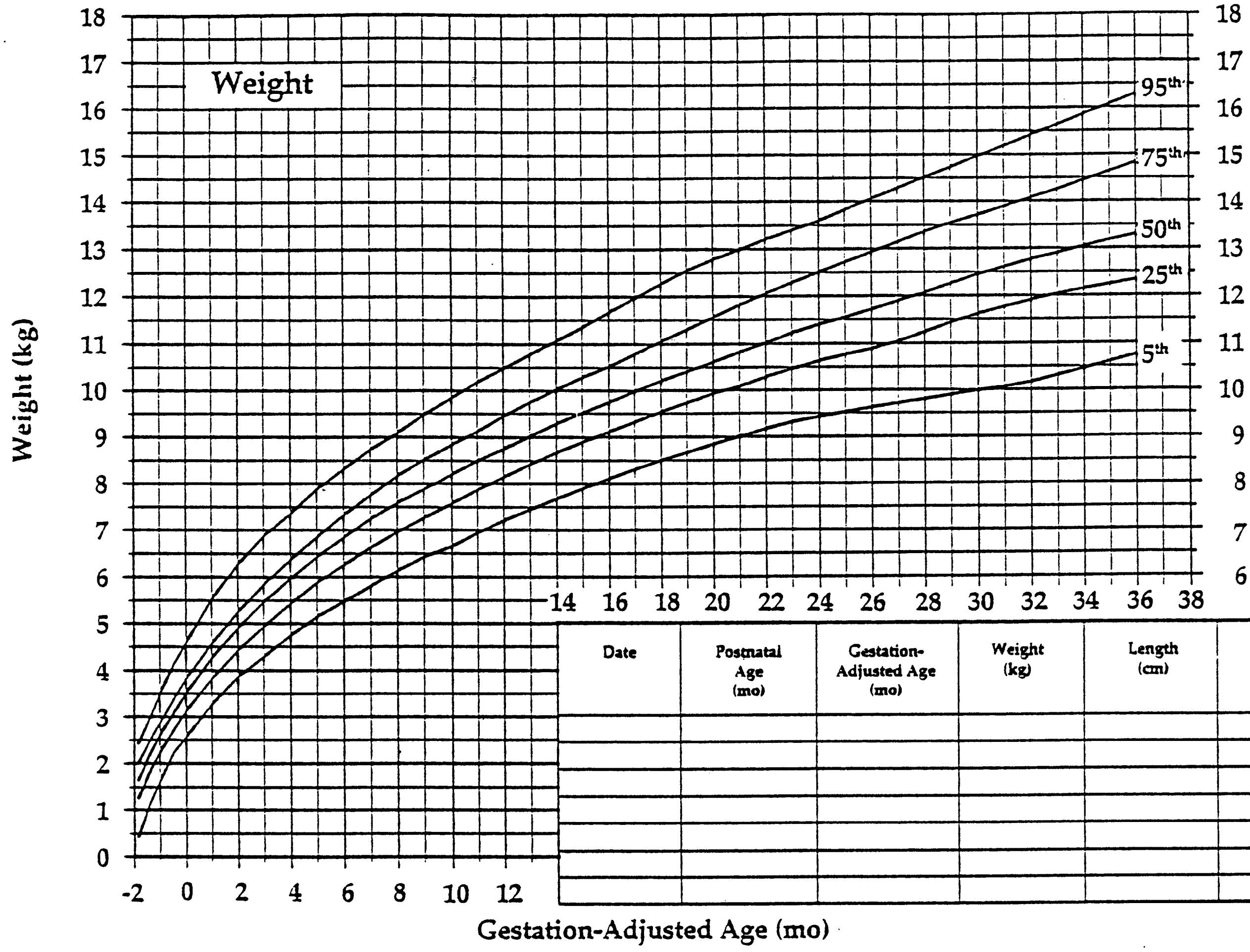
Record #____________________

ROSS PEDIATRICS

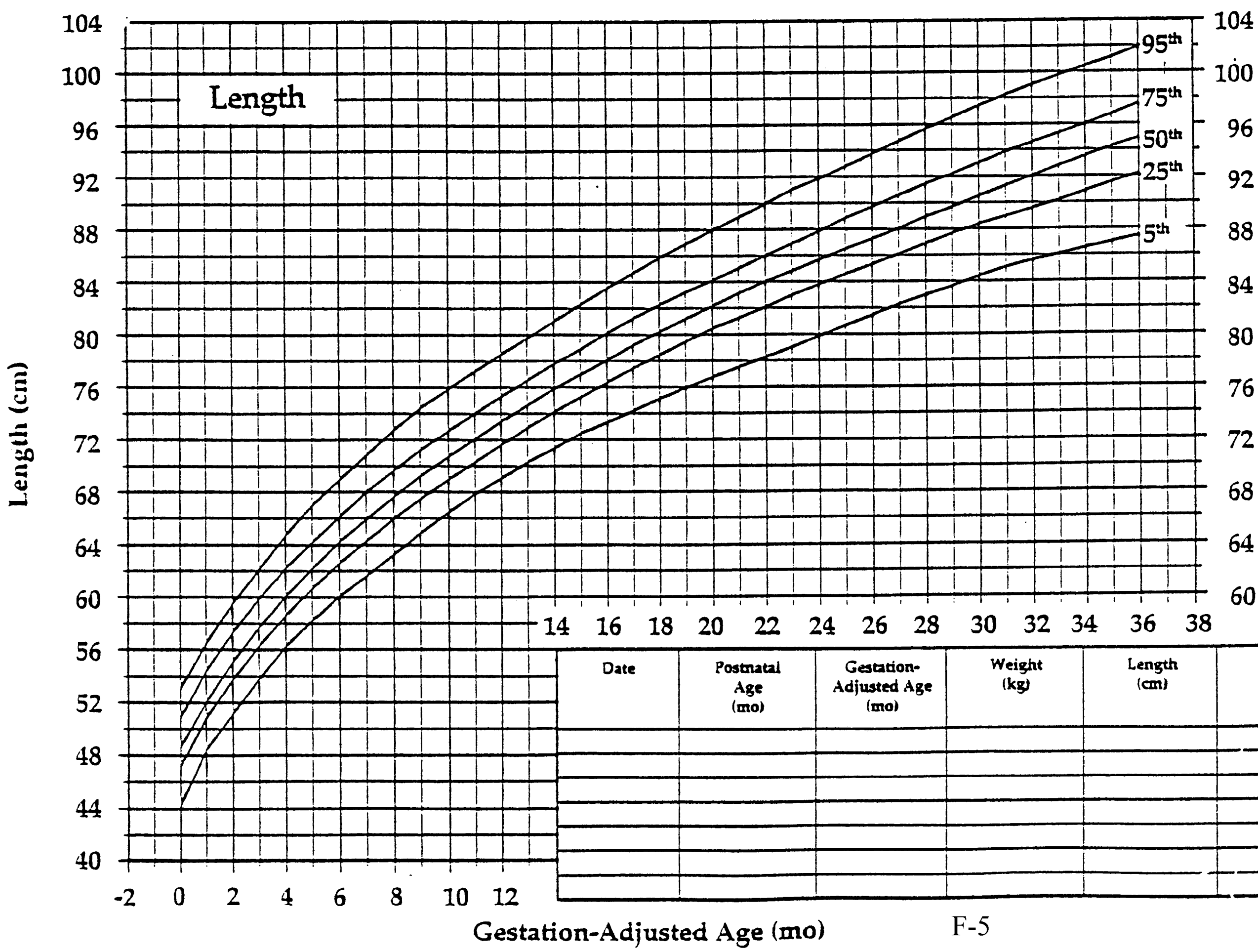
Birthweight (BW): ________ g

Gestational Age (GA): ________ wk

Adjustment for Prematurity (40 wk - GA): ________ wk

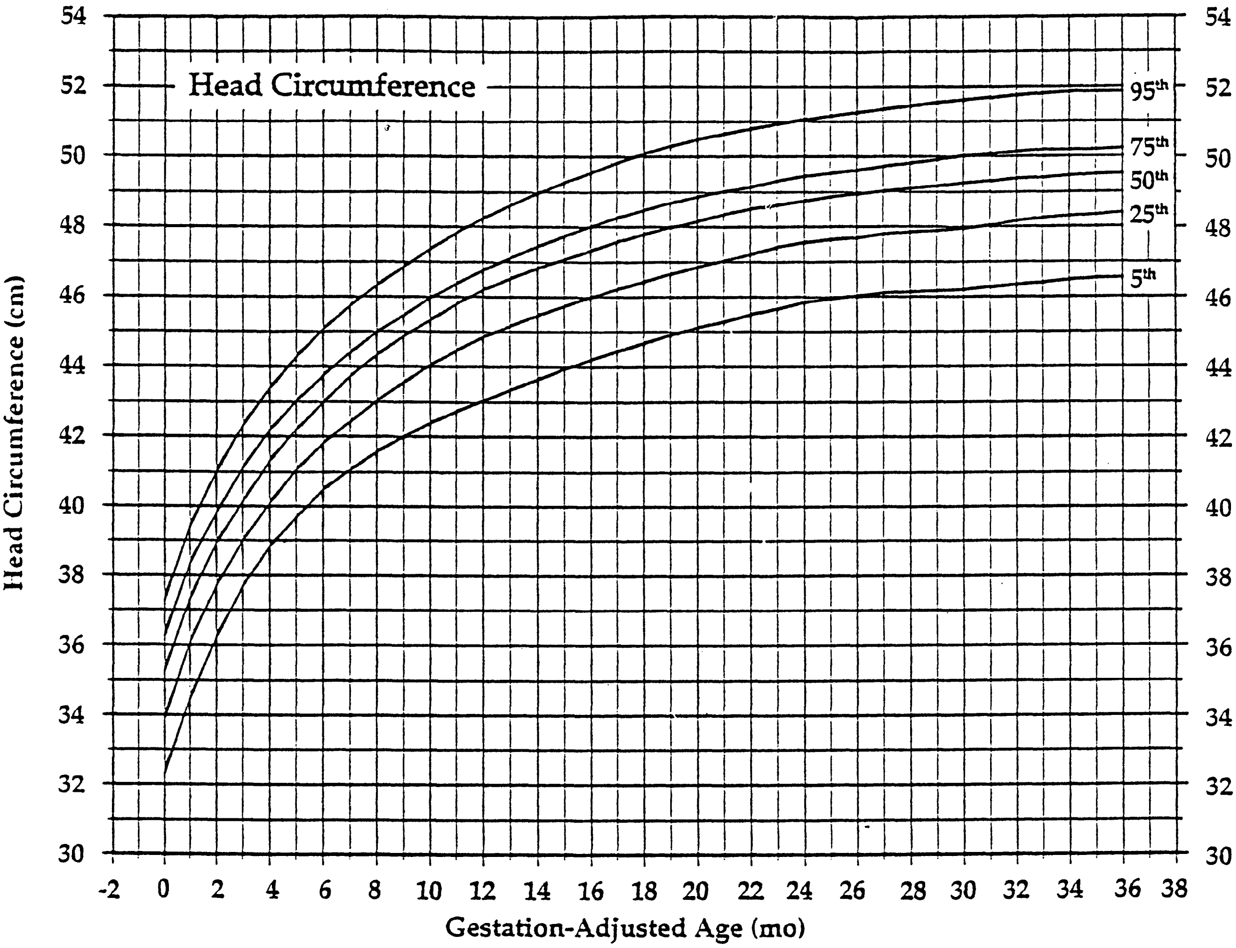


Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)



Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)

IHDP Growth Percentiles: VLBW Premature Boys[1,2]



Growth of very-low-birth-weight (VLBW, ≤ 1500 g) and low-birth-weight (LBW, 1501 to 2500 g) premature (≤ 37 weeks, GA) infants differs from that of normal-birth-weight term infants during infancy and early childhood. Because these infants may not catch up to term infants in growth during the early years, their growth should be compared to that of premature infants of similar birth weight.

The growth percentiles presented here are based on a large sample of infants enrolled in the Infant Health and Development Program (IHDP).[1,2] Some infants most likely to experience growth problems from biologic or environmental causes, premature infants with birth weight greater than 2500 g, and small-for-gestational-age term infants were excluded.[1] Study infants, however, are probably typical of premature infants who receive modern neonatal intensive care.

References

1. The Infant Health and Development Program: Enhancing the outcomes of low-birth-weight, premature infants. *JAMA* 1990;263(22):3035-3042.
2. Casey PH, Kraemer HC, Bernbaum J, et al: Growth status and growth rates of a varied sample of low birth weight, preterm infants: A longitudinal cohort from birth to three years of age. *J Pediatr* 1991;119:599-605.

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Instructions for Use

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3. Plot data at the gestation-adjusted age on the appropriate graph.
4. When possible, plot serial data on the same graph to permit detection of change in growth percentiles with age.

Interpretation

These graphs permit comparison of a VLBW premature boy's growth relative to current reference data. Further investigation may be indicated when the plotted measurements are markedly different from the 50th percentile, or growth percentile changes rapidly.

IHDP Growth Percentiles: LBW Premature Girls[1,2]

(1501 to 2500 g BW, ≤37 wk GA)

Name______________________________

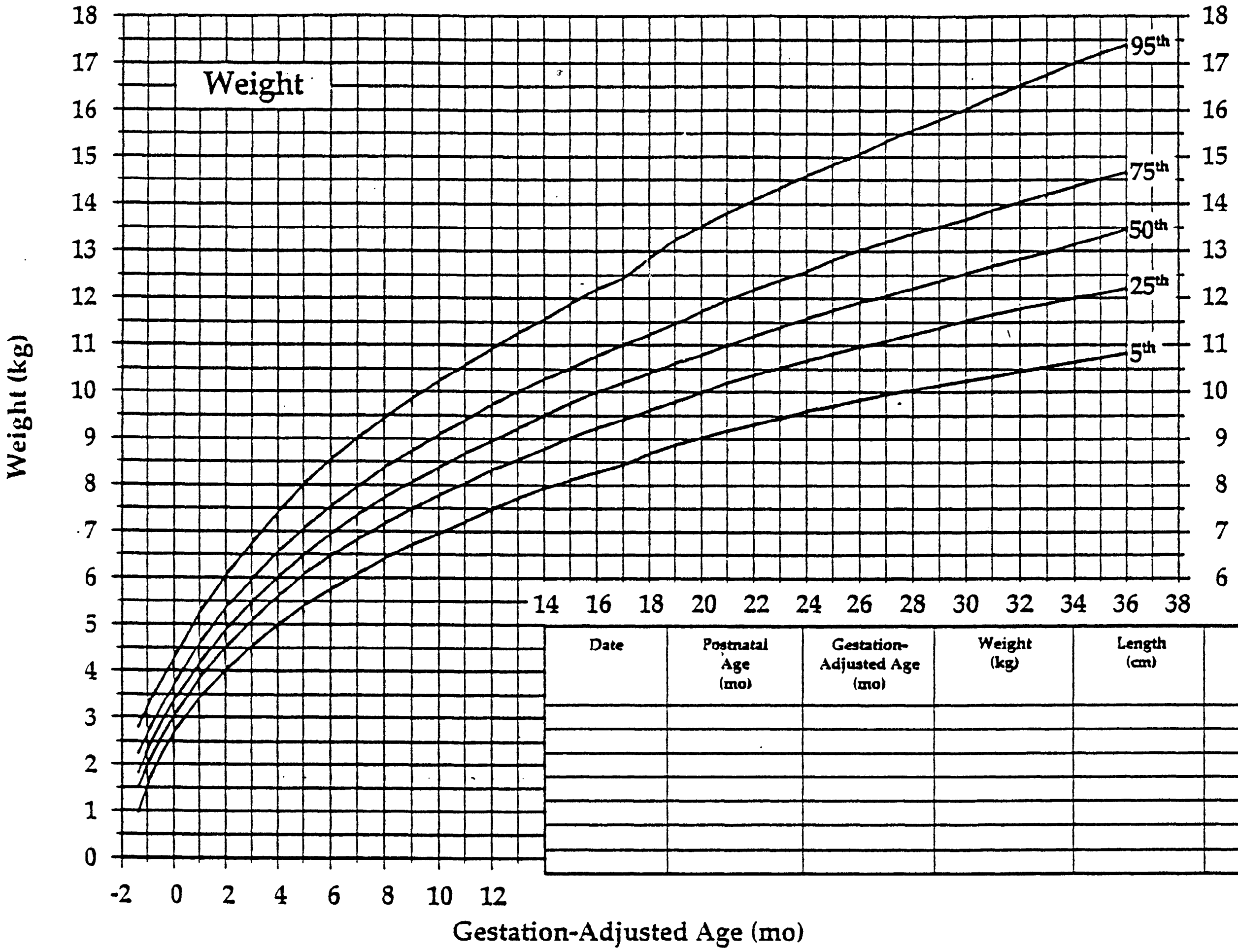
Record #____________________________

ROSS PEDIATRICS

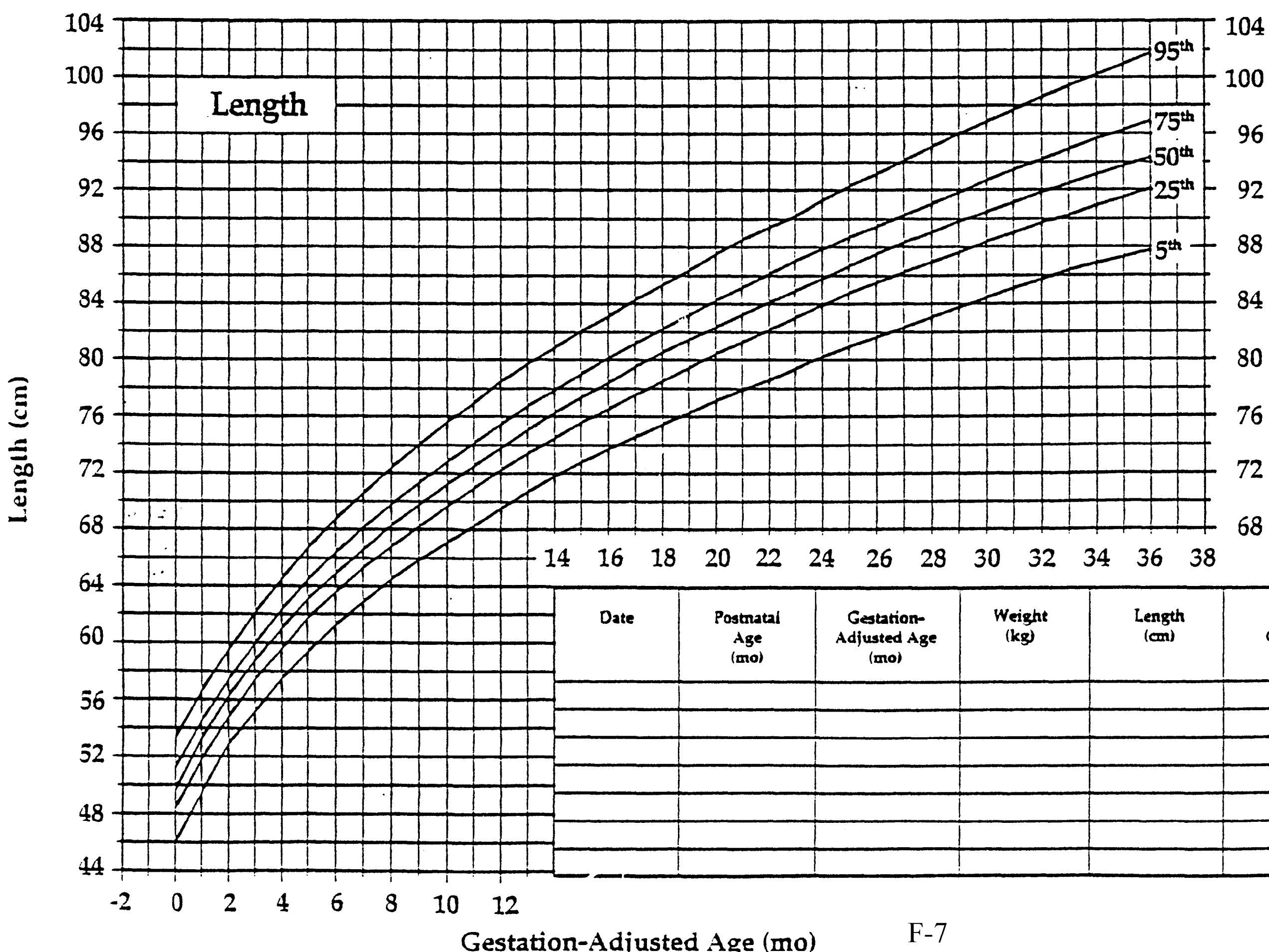
Birthweight (BW): __________ g

Gestational Age (GA): __________ wk

Adjustment for Prematurity (40 wk - GA): __________ wk

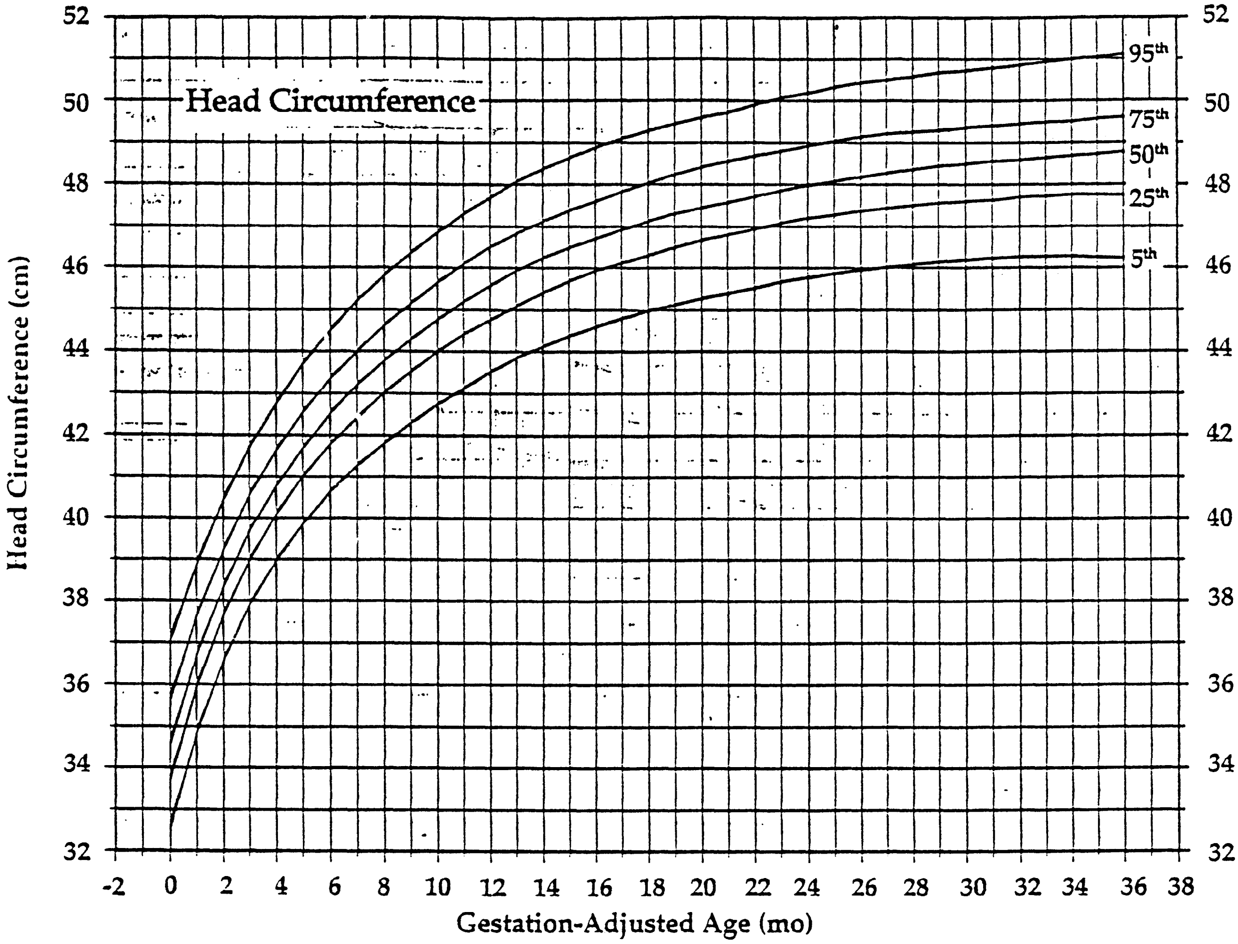


Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)



Date	Postnatal Age (mo)	Gestation-Adjusted Age (mo)	Weight (kg)	Length (cm)	Head Circum (cm)

IHDP Growth Percentiles: LBW Premature Girls[1,2]



Growth of very-low-birth-weight (VLBW, ≤ 1500 g) and low-birth-weight (LBW, 1501 to 2500 g) premature (≤ 37 weeks, GA) infants differs from that of normal-birth-weight term infants during infancy and early childhood. Because these infants may not catch up to term infants in growth during the early years, their growth should be compared to that of premature infants of similar birth weight.

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3. Plot data at the gestation-adjusted age on the appropriate graph.
4. When possible, plot serial data on the same graph to permit detection of change in growth percentiles with age.

Interpretation

These graphs permit comparison of a LBW premature girl's growth relative to current reference data. Further investigation may be indicated when the plotted measurements are markedly different from the 50th percentile, or growth percentile changes rapidly.

References

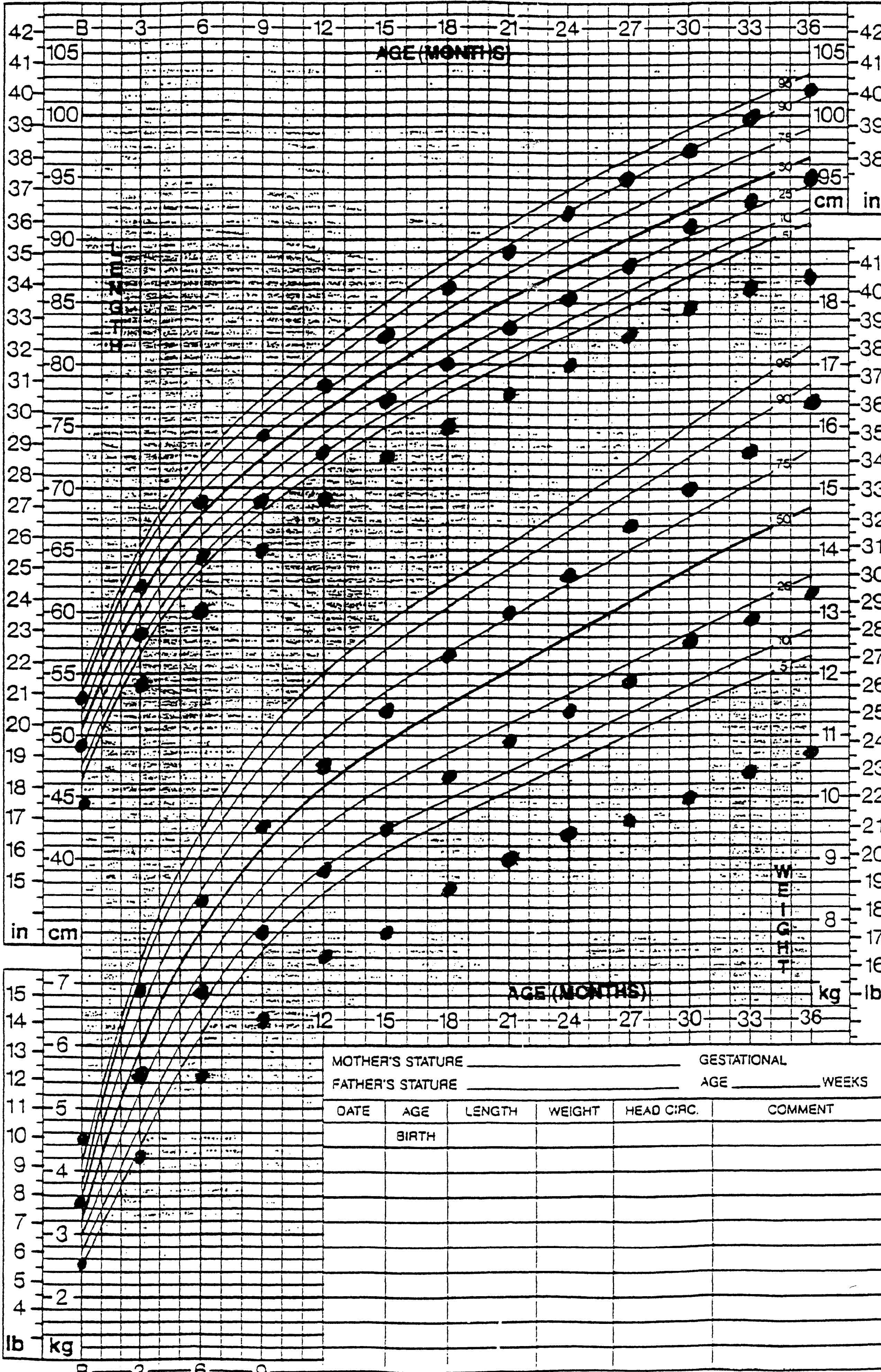
1. The Infant Health and Development Program: Enhancing the outcomes of low-birth-weight, premature infants. *JAMA* 1990;263(22):3035-3042.
2. Casey PH, Kraemer HC, Bernbaum J, et al: Growth status and growth rates of a varied sample of low birth weight, preterm infants: A longitudinal cohort from birth to three years of age. *J Pediatr* 1991;119:599-605.

IHDP studies were supported by grants from the Robert Wood Johnson Foundation, Pew Charitable Trusts, and the Bureau of Maternal and Child Health, US Department of Health and Human Services. These graphs were prepared by SS Guo and AF Roche, Wright State University, Yellow Springs, Ohio. IHDP, its sponsors, and the investigators do not endorse specific products.

BOYS: BIRTH TO 36 MONTHS
PHYSICAL GROWTH
NCHS PERCENTILES*

APPENDIX G

NAME VLBW-IHDP RECORD # 5-50-95



Ross Growth & Development Program

MOTHER'S STATURE ____________ GESTATIONAL

FATHER'S STATURE ____________ AGE ________ WEEKS

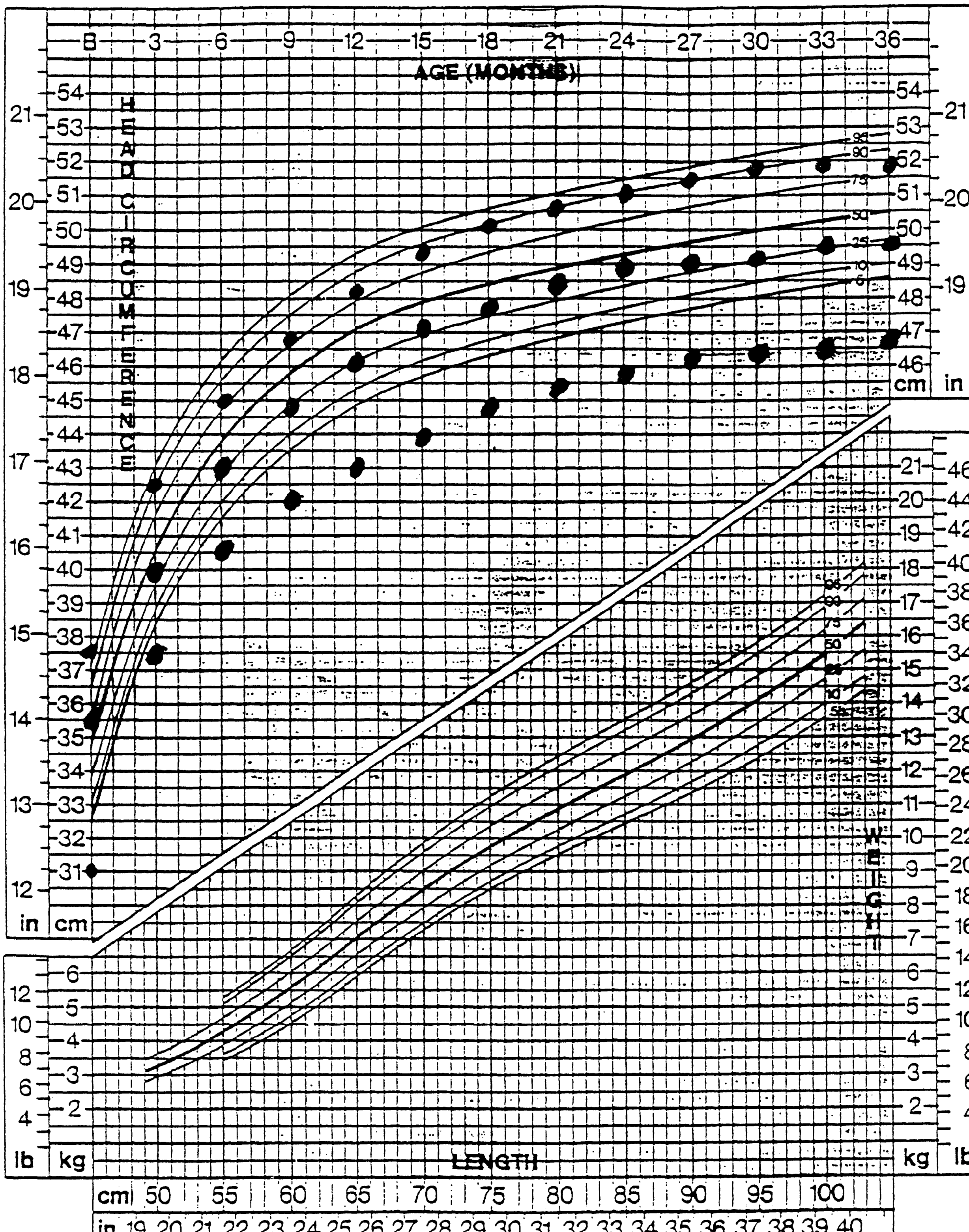
DATE	AGE	LENGTH	WEIGHT	HEAD CIRC.	COMMENT
	BIRTH				

*Adapted from: Hamill PVV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM: Physical growth: National Center for Health Statistics percentiles. AM J CLIN NUTR 32:607-629, 1979. Data from the Fels Longitudinal Study, Wright State University School of Medicine, Yellow Springs, Ohio.

APPENDIX G

BOYS: BIRTH TO 36 MONTHS
PHYSICAL GROWTH
NCHS PERCENTILES*

NAME VLBW - IHDP RECORD # 5-50-95

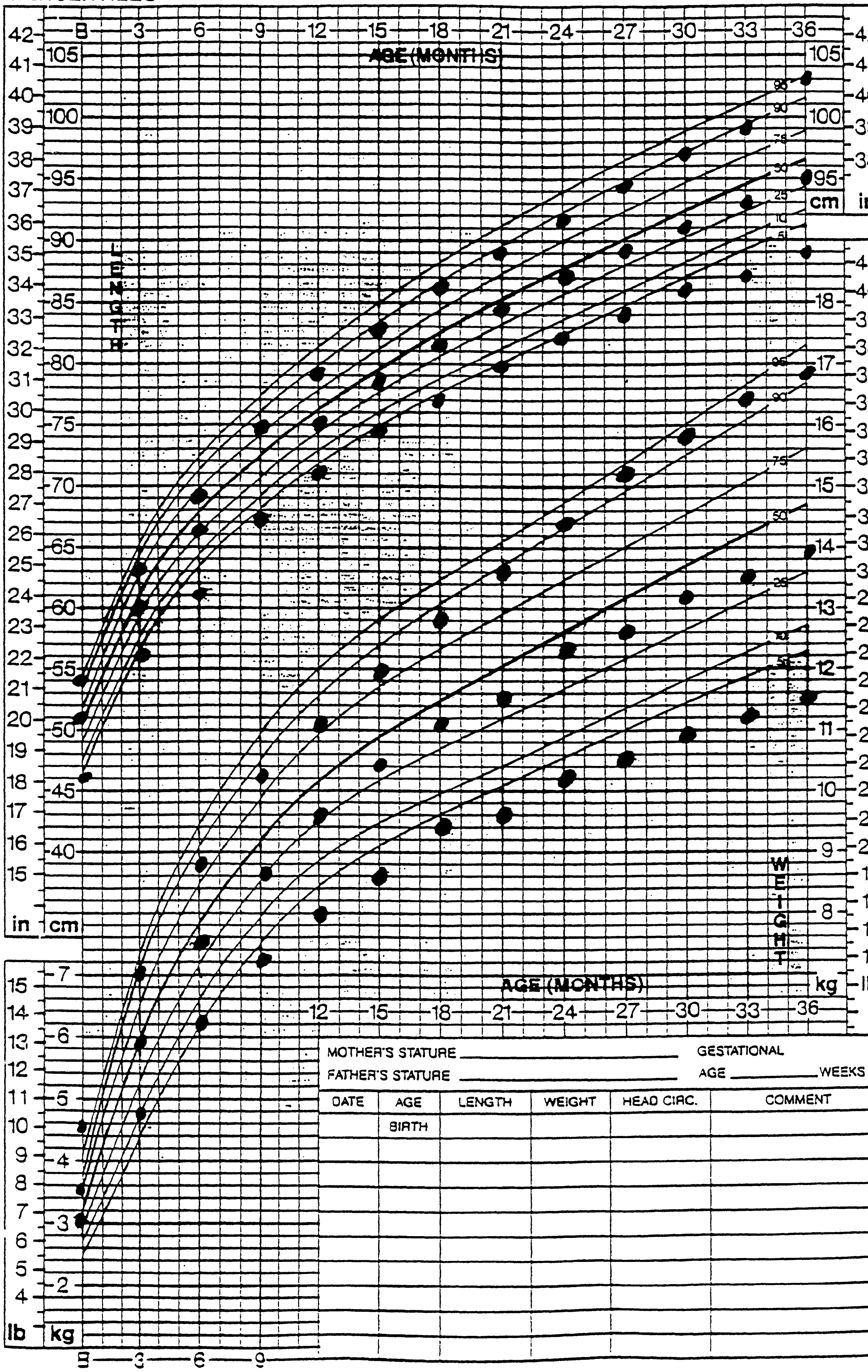


*Adapted from: Hamill PVV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM: Physical growth: National Center for Health Statistics percentiles. AM J CLIN NUTR 32:607-629, 1979. Data from the Fels Longitudinal Study, Wright State University School of Medicine, Yellow Springs, Ohio.

DATE	AGE	LENGTH	WEIGHT	HEAD CIRC.	COMMENT

BOYS: BIRTH TO 36 MONTHS APPENDIX G
PHYSICAL GROWTH
NCHS PERCENTILES*

NAME LBW-IHDP RECORD # 5-50-95



MOTHER'S STATURE ______ GESTATIONAL

FATHER'S STATURE ______ AGE ______ WEEKS

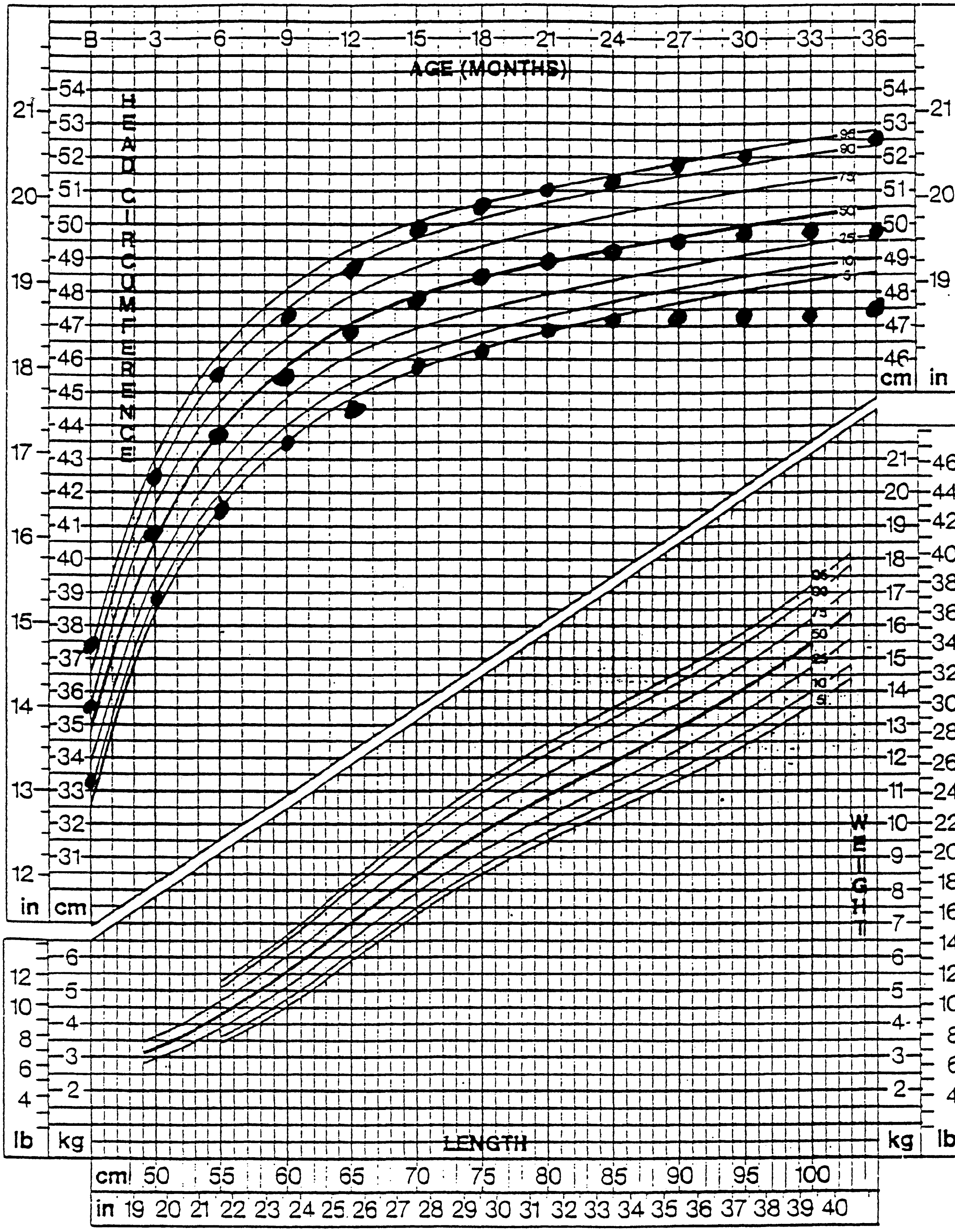
DATE	AGE	LENGTH	WEIGHT	HEAD CIRC.	COMMENT
	BIRTH				

*Adapted from: Hamill PVV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM: Physical growth: National Center for Health Statistics percentiles. AM J CLIN NUTR 32:607-629, 1979. Data from the Fels Longitudinal Study, Wright State University School of Medicine, Yellow Springs, Ohio.

APPENDIX G

BOYS: BIRTH TO 36 MONTHS PHYSICAL GROWTH NCHS PERCENTILES*

NAME LBW-IHDP RECORD # 5-50-95



*Adapted from: Hamill PVV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM: Physical growth: National Center for Health Statistics percentiles. AM J CLIN NUTR 32:607-629, 1979. Data from the Fels Longitudinal Study, Wright State University School of Medicine, Yellow Springs, Ohio.

DATE	AGE	LENGTH	WEIGHT	HEAD CIRC.	COMMENT

APPENDIX H

GROWTH RECORD FOR INFANTS

in relation to

GESTATIONAL AGE AND FETAL AND INFANT NORMS

(combined sexes)

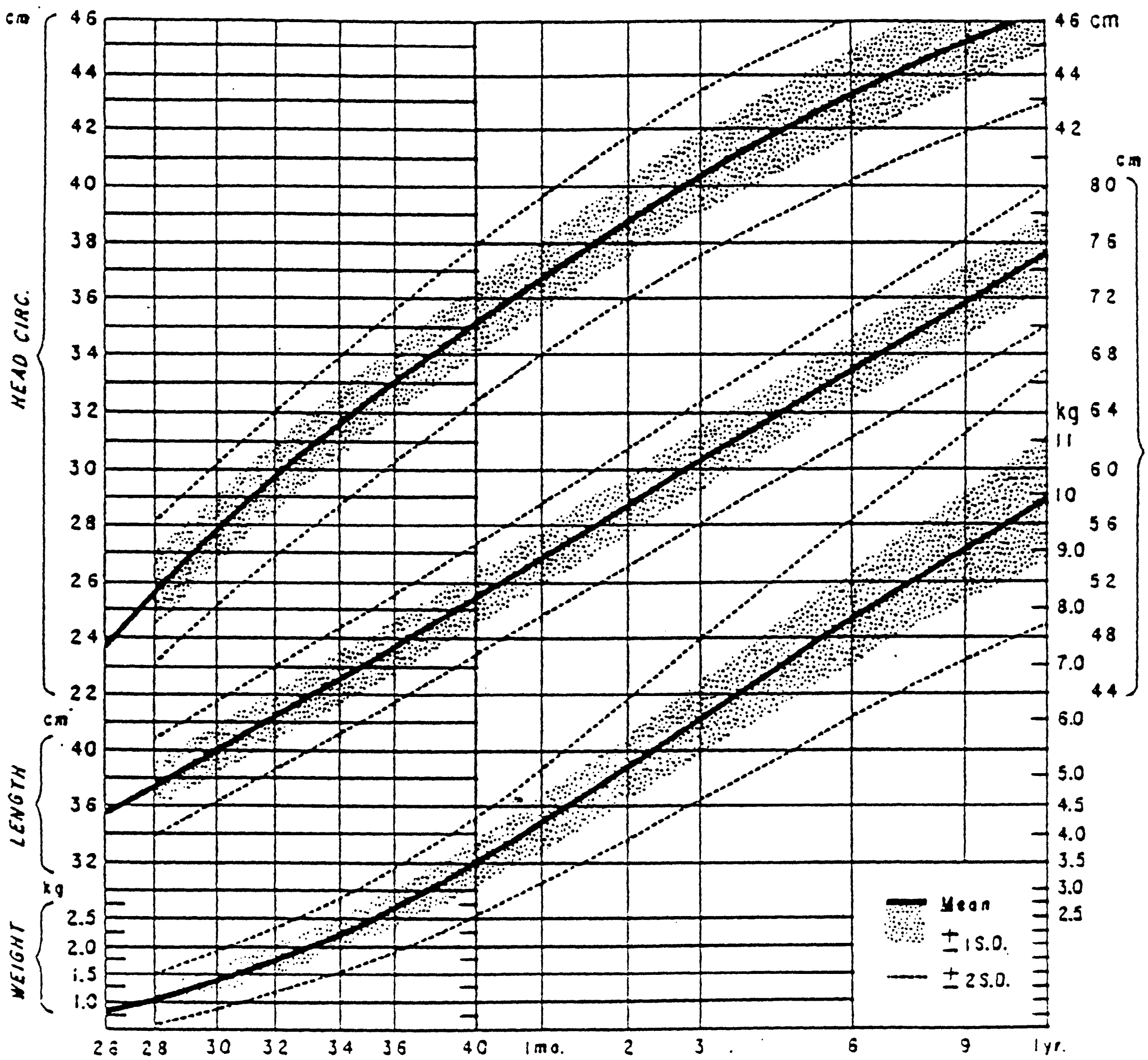


Fig 1. A fetal-infant growth graph for infants of varying gestational ages to be used for plotting growth from birth until one year of age after "term" has been reached. See text.

Babson & Benda, 1976

APPENDIX I

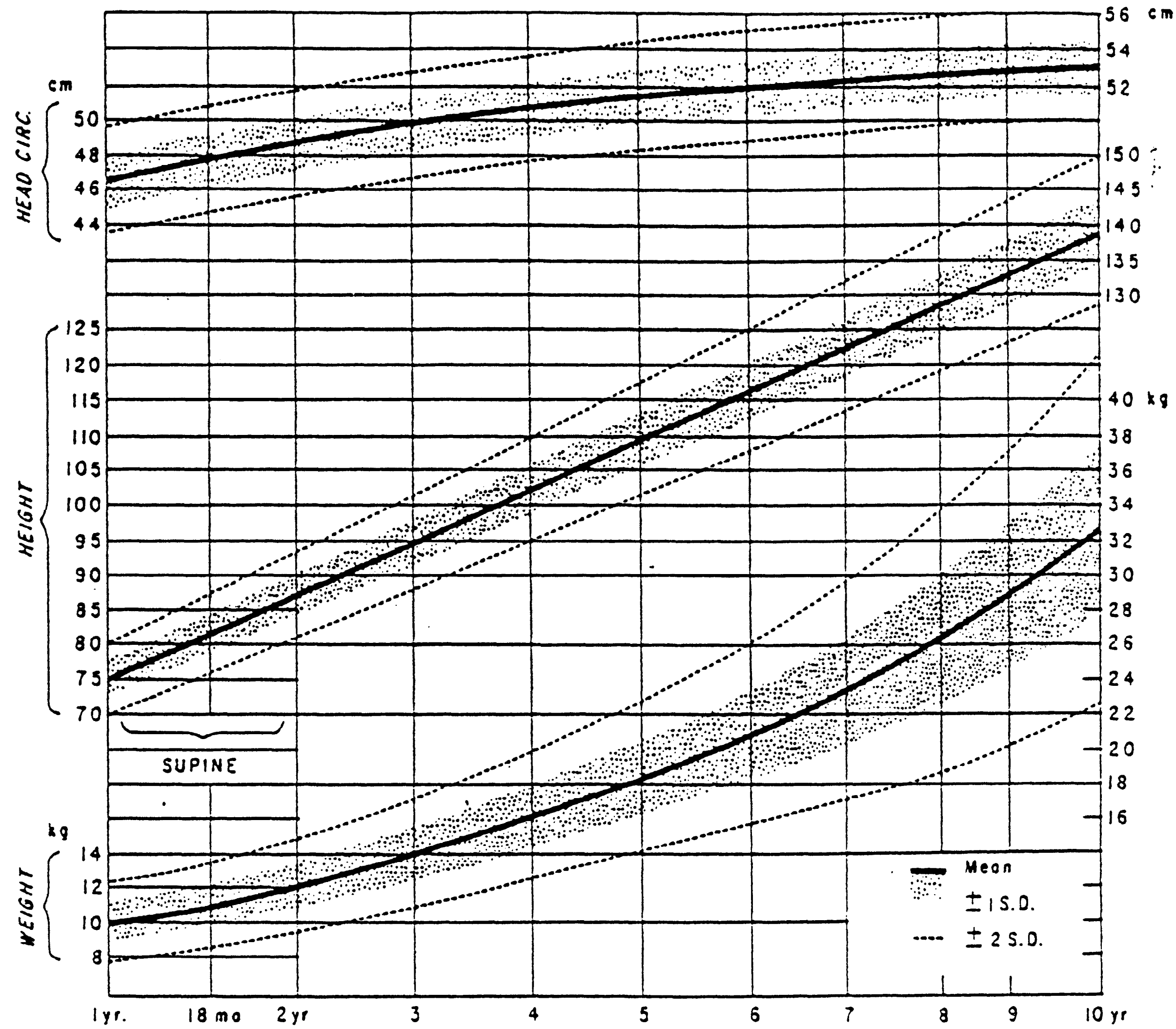
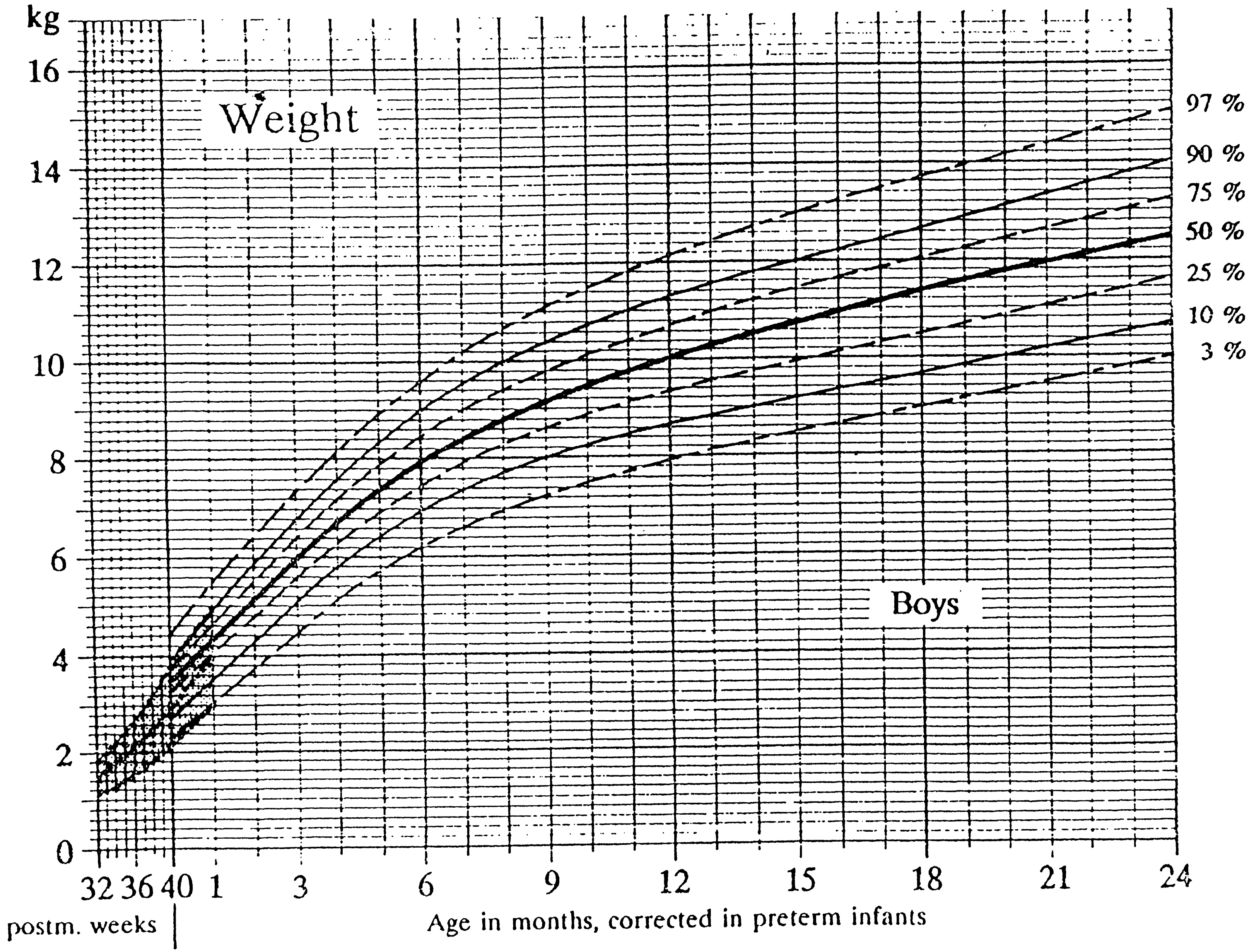
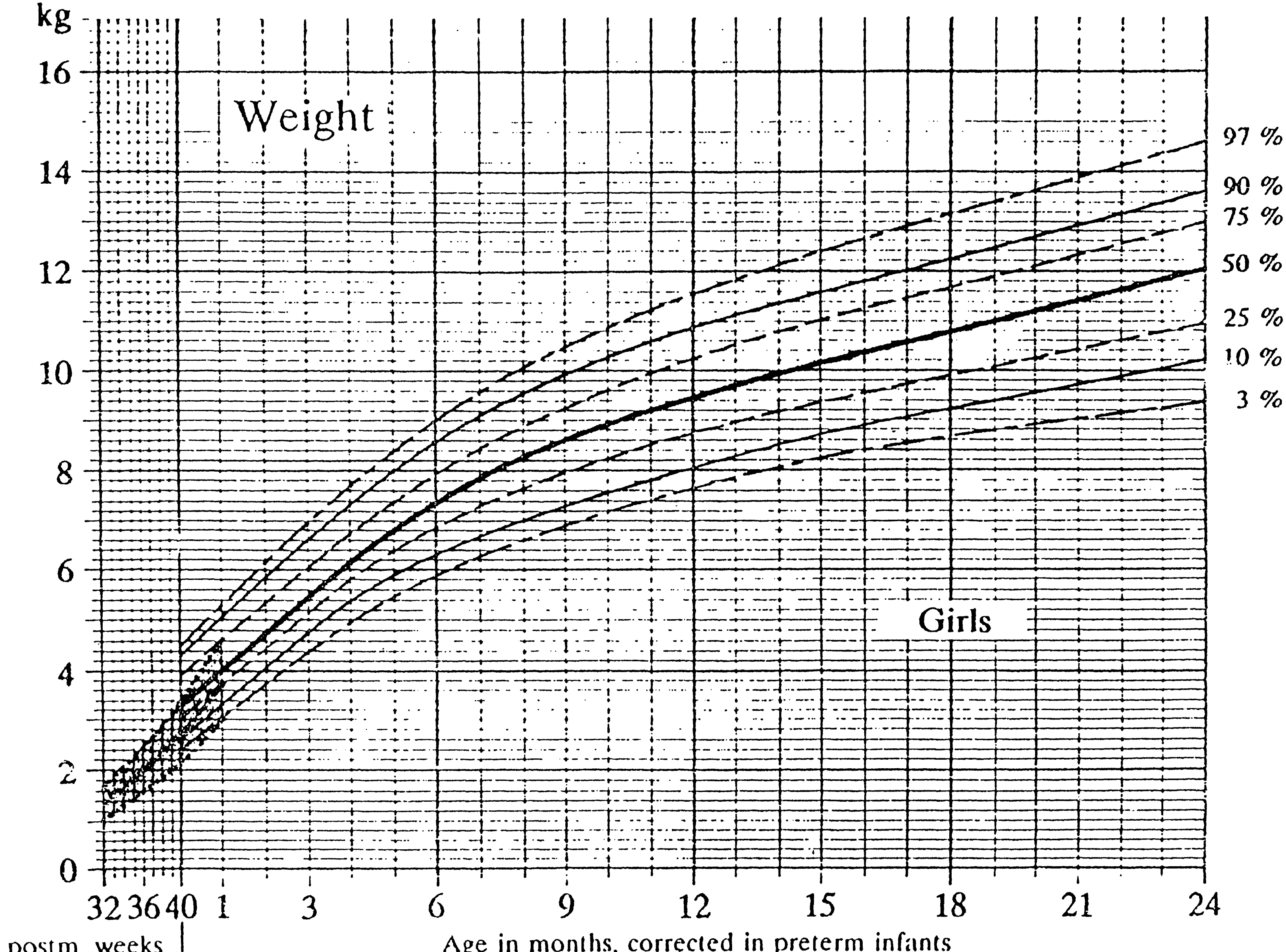


Fig. 2. A growth graph applicable to boys and girls from one to ten years for charting growth in three measurements until the adolescent spurt begins.

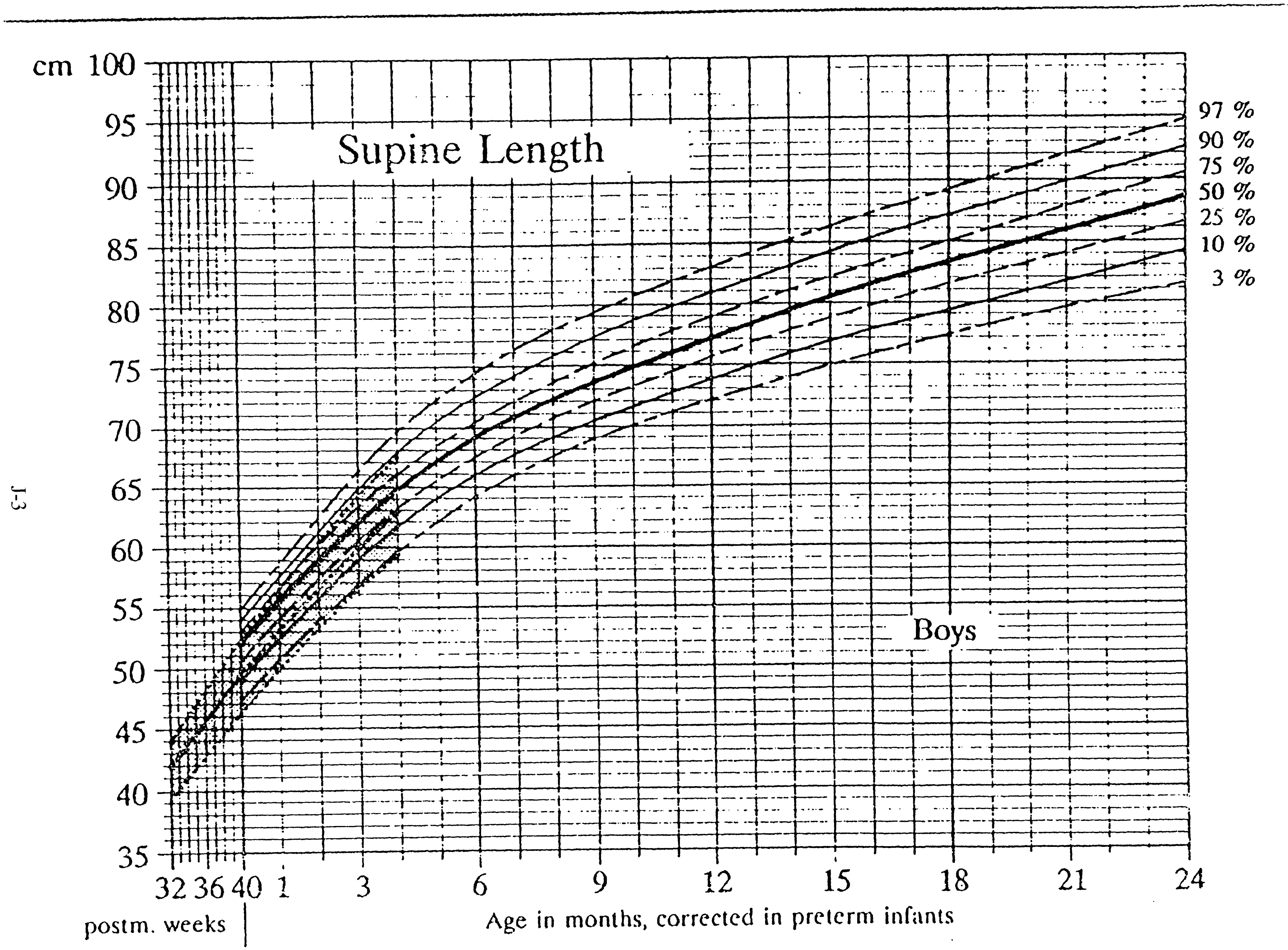
Babson & Benda, 1976


kg
16
14
12
10
8
6
4
2
0
Weight
97 %
90 %
75 %
50 %
25 %
10 %
3 %
Boys
32 36 40 1 3 6 9 12 15 18 21 24
postm. weeks
Age in months, corrected in preterm infants

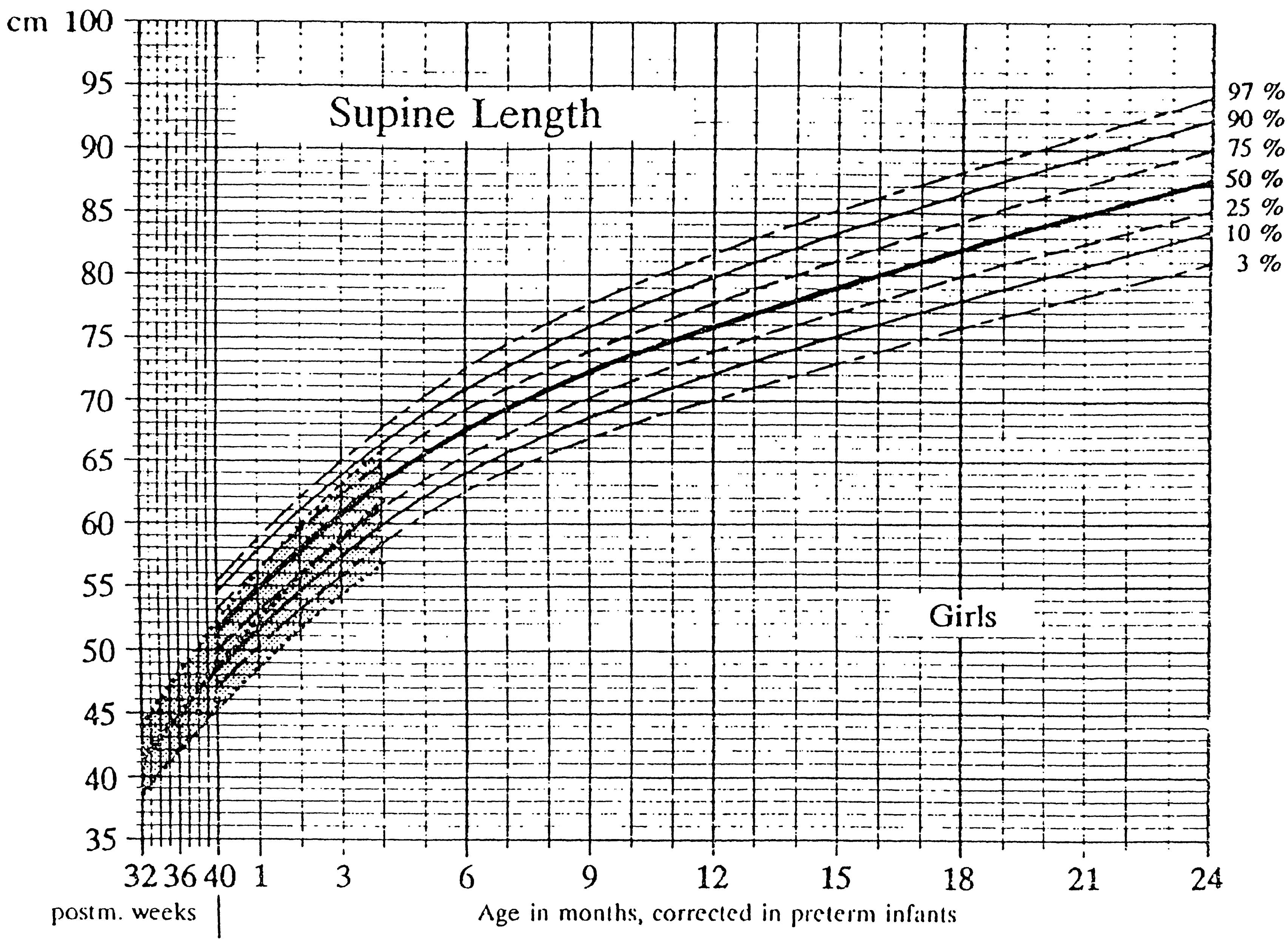
Brandt (1978)


kg
16
14
12
10
8
6
4
2
0
Weight
97 %
90 %
75 %
50 %
25 %
10 %
3 %
Girls
32 36 40 1 3 6 9 12 15 18 21 24
postm. weeks
Age in months, corrected in preterm infants

Brandt (1978)


Supine Length
cm 100
95
90
85
80
75
70
65
60
55
50
45
40
35
97 %
90 %
75 %
50 %
25 %
10 %
3 %
Boys
32 36 40 1 3 6 9 12 15 18 21 24
postm. weeks
Age in months, corrected in preterm infants

Brandt (1978)


cm
100
95
90
85
80
75
70
65
60
55
50
45
40
35
Supine Length
97 %
90 %
75 %
50 %
25 %
10 %
3 %
Girls
32 36 40 1 3 6 9 12 15 18 21 24
postm. weeks
Age in months, corrected in preterm infants

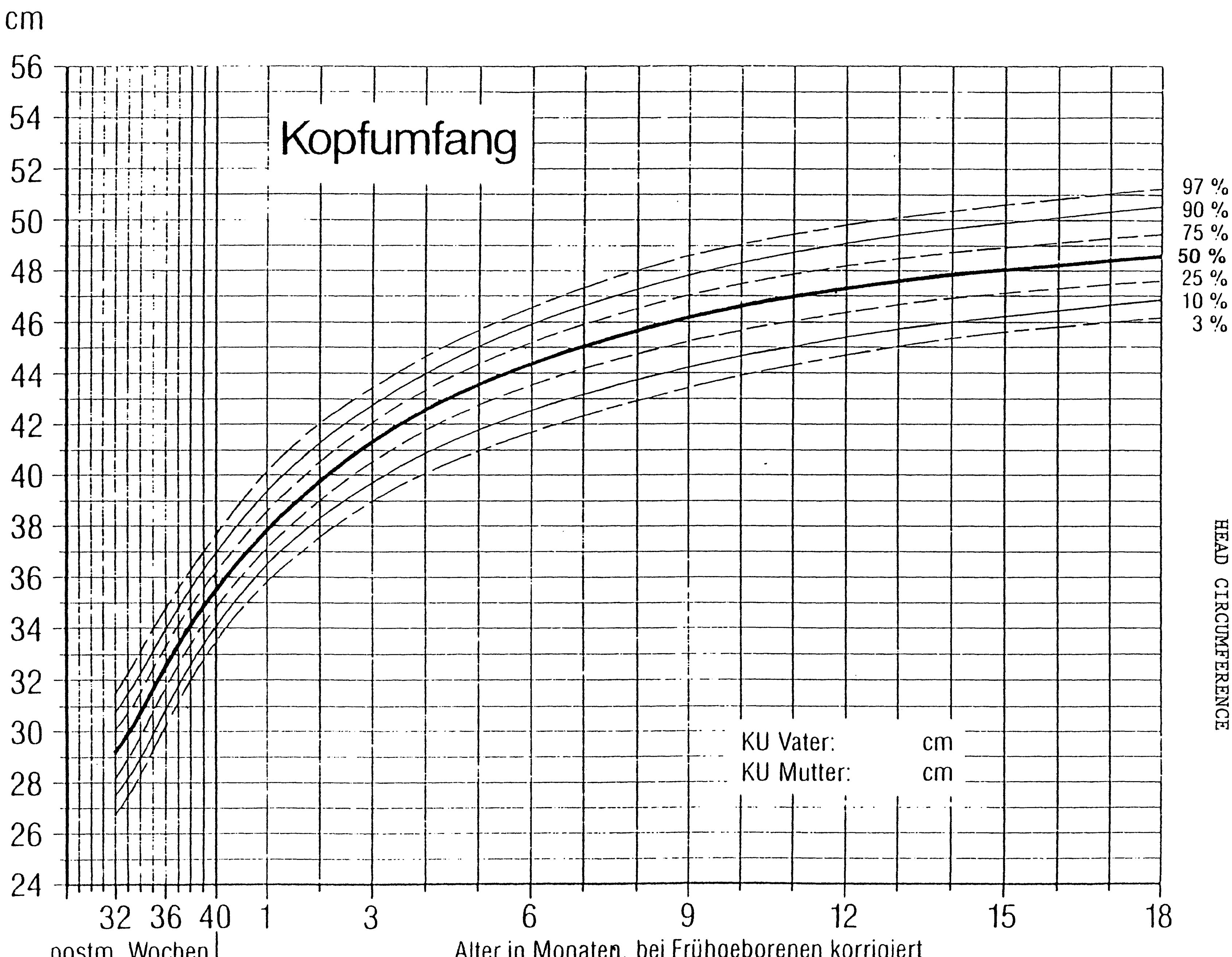
Brandt (1978)

Wachstumskurve in Perzentilen
Kopfumfang – Jungen, 0–18 Monate
- Erläuterungen siehe Rückseite -

APPENDIX J Brandt (1978)

Name
Geb.-Datum
1. Untersuchungstermin

HEAD CIRCUMFERENCE



Brandt (1978)

Ingeborg Brandt: Human Growth, 2. Aufl., Bd. 1, Developmental Biology, Prenatal Growth. Hrsg.: F. Falkner und J.M. Tanner. Plenum Press, New York 1986; Der Kinderarzt 10, 185–188 (1979) (mit Genehmigung des Verlages)

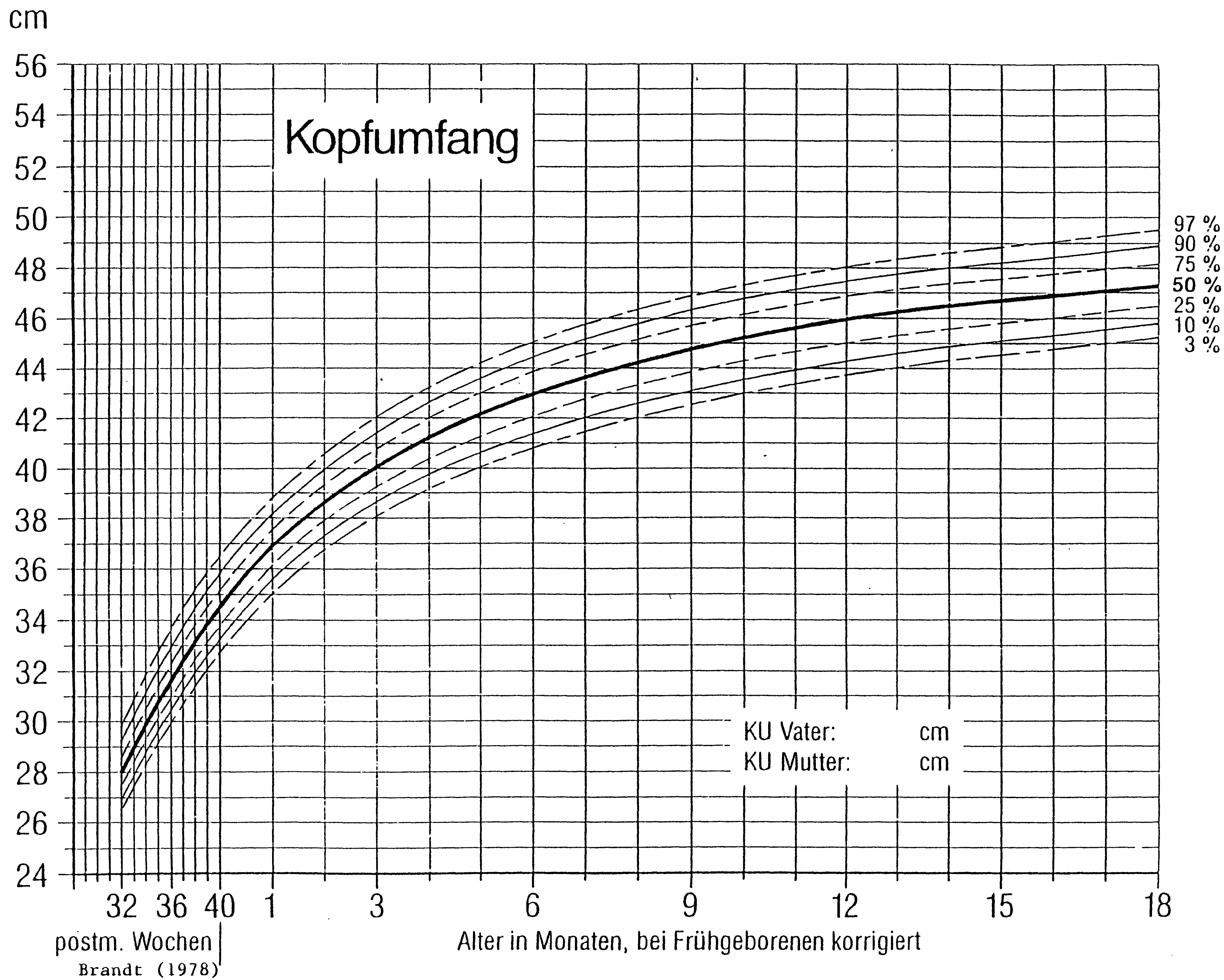
milupa MEDICAL SERVICE PROGRAM

Wachstumskurve in Perzentilen
Kopfumfang – Mädchen, 0–18 Monate
- Erläuterungen siehe Rückseite -

APPENDIX J Brandt (1978)

Name ______
Geb.-Datum ______
1. Untersuchungstermin ______

HEAD CIRCUMFERENCE



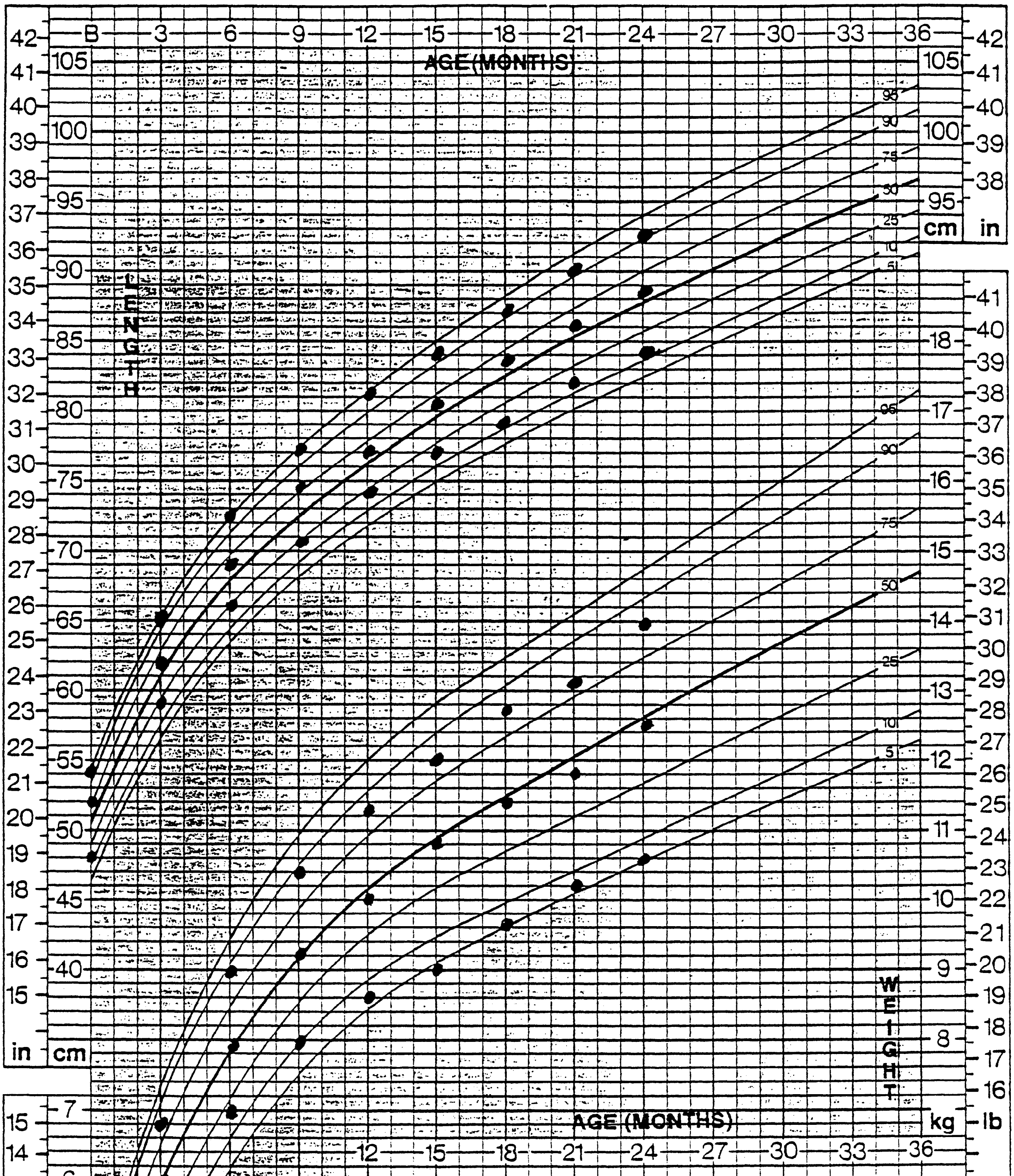
Ingeborg Brandt: Human Growth, Bd. 2, Postnatal Growth. Hrsg.: F. Falkner und J.M. Tanner.
Plenum Press, New York 1978; Der Kinderarzt **10**, 185–188 (1979) (mit Genehmigung des Verlages)

milupa MEDICAL SERVICE PROGRAM J-6

BOYS: BIRTH TO 36 MONTHS
PHYSICAL GROWTH
NCHS PERCENTILES*

APPENDIX K

NAME BRANDT 10-50-90 RECORD # ______



MOTHER'S STATURE ______ GESTATIONAL
FATHER'S STATURE ______ AGE ______ WEEKS

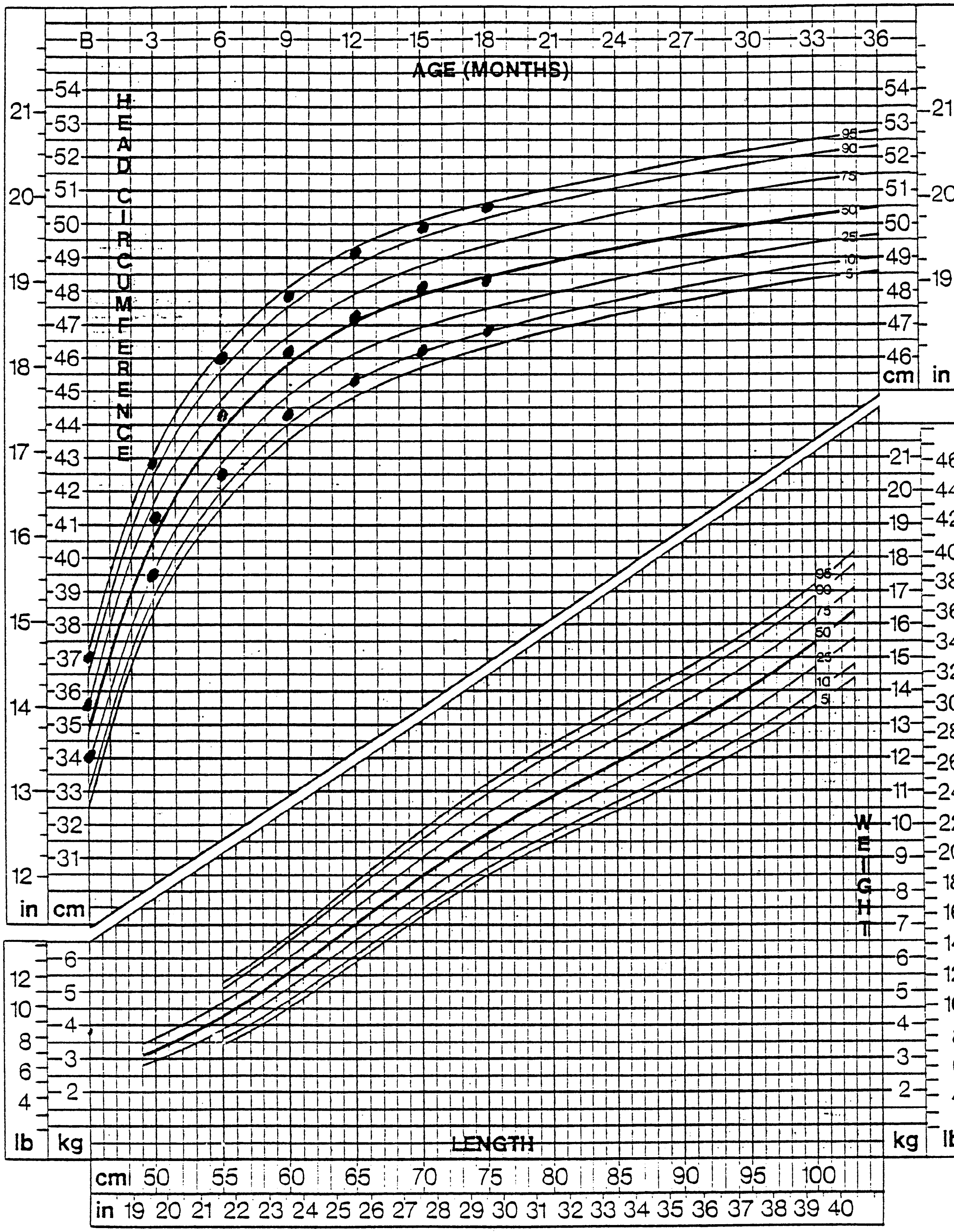
DATE	AGE	LENGTH	WEIGHT	HEAD CIRC.	COMMENT
	BIRTH				

*Adapted from: Hamill PVV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM: Physical growth: National Center for Health Statistics percentiles. AM J CLIN NUTR 32:607-629, 1979. Data from the Fels Longitudinal Study, Wright State University School of Medicine, Yellow Springs, Ohio.

BOYS: BIRTH TO 36 MONTHS
PHYSICAL GROWTH
NCHS PERCENTILES*

APPENDIX K

NAME BRANDT-10-50-90 RECORD #



*Adapted from: Hamill PVV, Drizd TA, Johnson CL, Reed RB, Roche AF, Moore WM: Physical growth: National Center for Health Statistics percentiles. AM J CLIN NUTR 32:607-629, 1979. Data from the Fels Longitudinal Study, Wright State University School of Medicine, Yellow Springs, Ohio.

DATE	AGE	LENGTH	WEIGHT	HEAD CIRC.	COMMENT

ROSS LABORATORIES
COLUMBUS, OHIO 43216
DIVISION OF ABBOTT LABORATORIES, USA

APPENDIX L

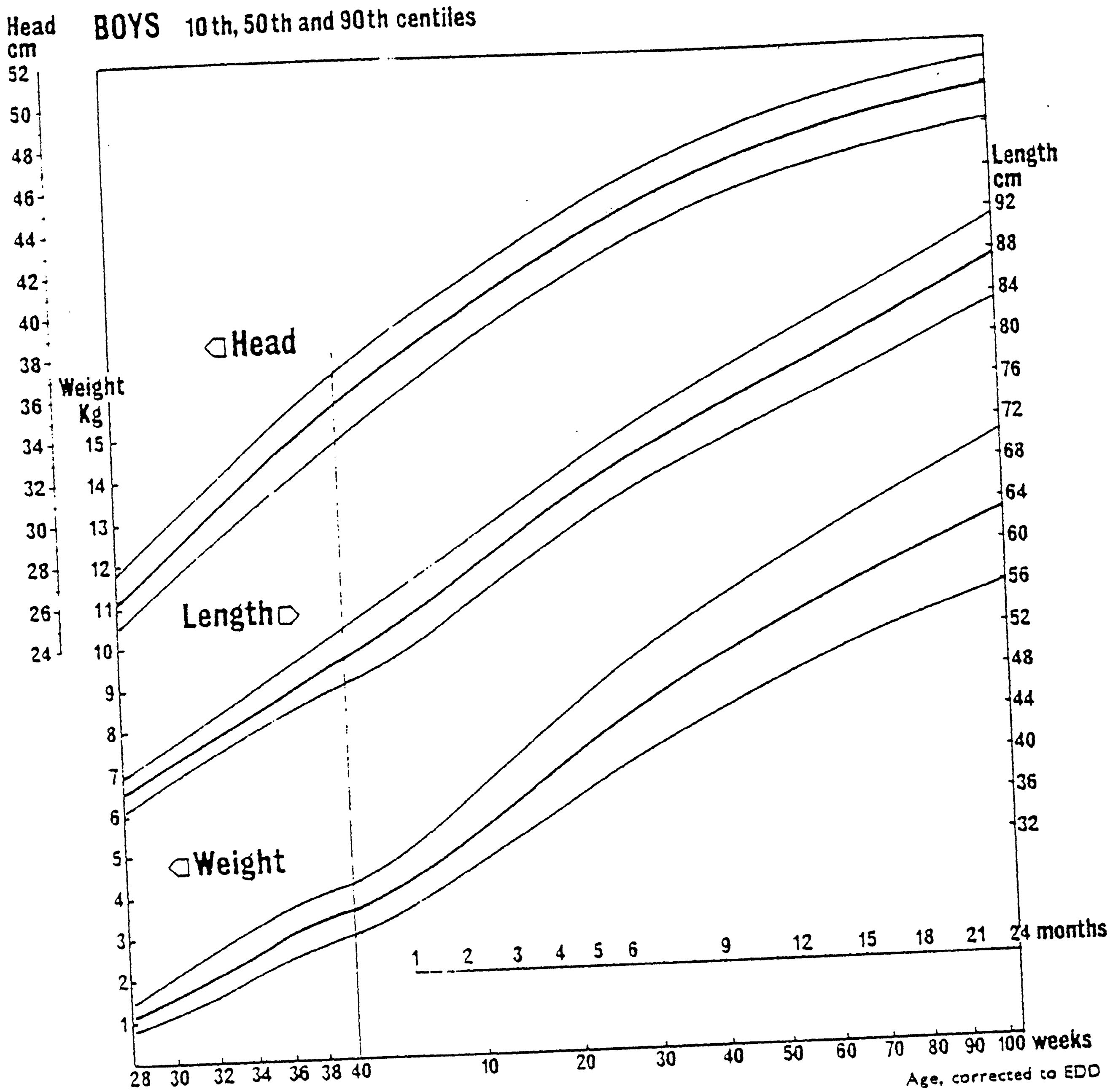


FIG. 1.—*Growth chart for boys.*

Gairdner & Pearson, 1971

A Growth Chart for Premature and Other Infants

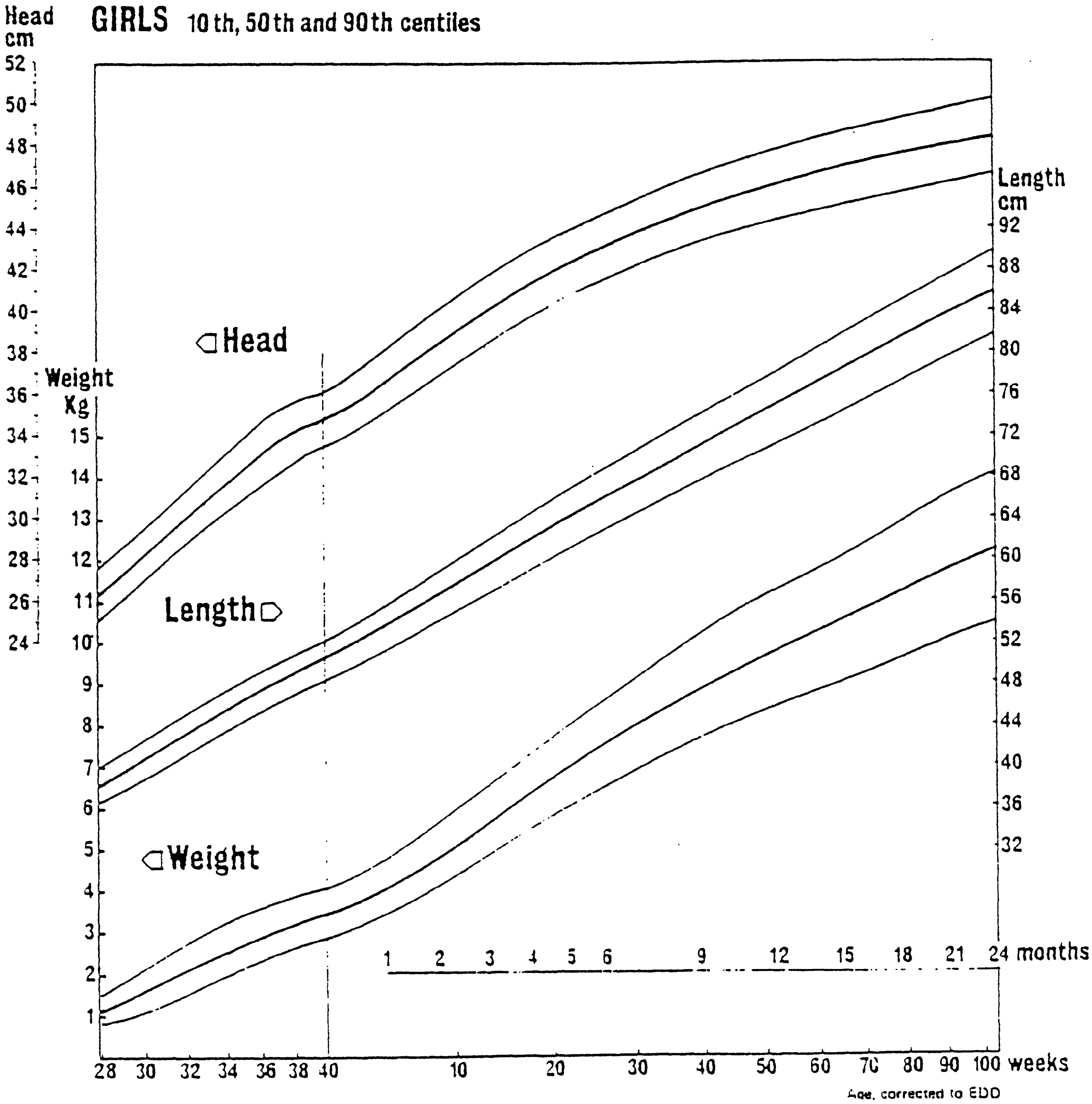


FIG. 2.—*Growth chart for girls.*

Gairdner & Pearson, 1971

APPENDIX M

Percentiles of birth weights for singleton infants born in Cleveland, OH, from 1975-1992 by gestational age, ethnicity and gender

Gestational age (wk)	*N*	Percentiles of weight (g) 10	50	90	95% predictive interval for median
24	152	560	670	1065	±64.4
25	190	590	760	1240	±58.4
26	224	670	898	1400	±55.9
27	226	730	1000	1500	±55.3
28	313	815	1170	1840	±55.5
29	301	1010	1360	2370	±55.7
30	406	1160	1560	2530	±55.6
31	472	1270	1700	2620	±55.3
32	662	1410	1865	2755	±55.0
33	747	1555	2080	2825	±55.0
34	1050	1765	2300	3030	±55.0
35	1410	2000	2515	3220	±55.0
36	2375	2150	2700	3350	±55.0
37	3641	2340	2890	3540	±55.0
38	6997	2510	3060	3655	±55.6
39	9785	2660	3180	3775	±55.7
40	16,289	2785	3320	3910	±55.5
41	7163	2880	3430	4040	±55.4
42	3623	2945	3520	4160	±55.9
43	601	2930	3560	4240	±58.4
44	101	3020	3500	4200	±64.4

from Amini et al. (1994)

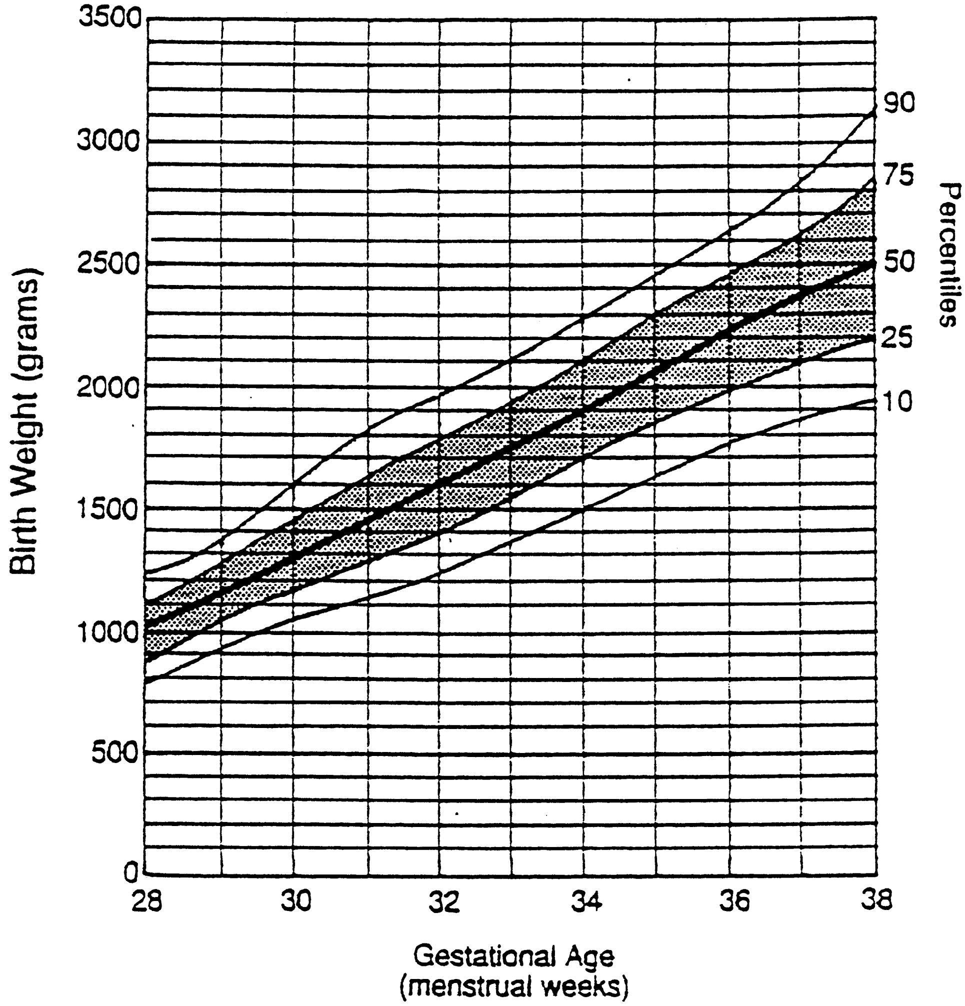
APPENDIX N

Percentiles of birth weight for live twins born in Canada in 1986 by gender and gestational age

Gestational	Black male				Black female				White male				White female			
age (wk)	*N*	10	50	90	*N*	10	50	90	*N*	10	50	90	*N*	10	50	90
24	41	560	660	850	33	585	645	840	34	520	658	1100	28	550	695	980
25	40	595	720	970	41	580	740	1020	51	600	800	1200	51	600	780	1110
26	59	700	860	1080	48	600	900	1200	56	680	940	1480	46	620	903	1370
27	46	730	1000	1480	40	690	973	1408	63	780	1025	1620	57	700	960	1600
28	80	825	1210	1850	68	875	1143	1620	85	795	1185	2010	66	750	1100	1810
29	71	1030	1340	2300	64	960	1338	2395	78	1030	1400	2540	62	1120	1419	2260
30	86	1240	1635	2540	92	1170	1570	2450	105	1200	1610	2645	93	1055	1480	2460
31	95	1300	1755	2660	97	1250	1650	2600	136	1280	1700	2760	110	1300	1660	2585
32	151	1430	1900	2740	143	1370	1810	2780	177	1405	1928	2840	137	1420	1810	2640
33	156	1585	2120	2870	168	1465	2050	2825	205	1640	2100	2935	159	1515	2040	2780
34	252	1850	2320	3060	243	1760	2200	3020	256	1780	2318	3060	212	1680	2200	2940
35	308	2045	2545	3150	343	1995	2480	3150	333	1940	2580	3340	316	1960	2478	3190
36	525	2160	2740	3320	621	2095	2630	3180	539	2153	2765	3500	486	2170	2710	3330
37	916	2340	2880	3430	848	2280	2810	3380	789	2410	2980	3660	730	2313	2875	3560
38	1605	2520	3040	3600	1630	2420	2940	3500	1582	2580	3180	3780	1457	2520	3055	3645
39	2167	2670	3180	3720	2167	2580	3060	3640	2190	2770	3310	3900	2133	2660	3175	3760
40	3483	2778	3310	3890	3472	2680	3180	3740	3959	2915	3450	4050	3666	2810	3320	3900
41	1448	2860	3400	3960	1440	2760	3280	3880	1770	3000	3585	4180	1805	2900	3425	4010
42	774	2920	3478	4080	686	2820	3318	3900	972	3080	3690	4300	856	3015	3540	4220
43	164	2860	3560	4210	126	2790	3340	3940	135	3180	3760	4380	129	2970	3530	4180
44	26	3180	3650	4250	31	2980	3280	4130	20	3125	3580	4515	19	3000	3500	4000

from Arbuckle & Sherman (1989)

APPENDIX O



Neonatal birth weight as a function of gestational age for 3321 live-born triplet infants.

from Elster et al. (1991)

APPENDIX P

An example of the effects of empirical percentiles of excluding data from LBW infants

An example of the effects of excluding data from LBW infants on empirical percentiles is shown in the following table. Using data from the Fels Longitudinal Study, percentiles for weight, recumbent length, and head circumference were calculated for genders combined. For Set A, data for all infants was used; for Set B, infants with birthweights less than 2,500 grams were excluded. Only one infant had a birthweight <1,500 grams.

	Percentiles 1 month			Percentiles 3 months		
	Number	**5**	**10**	**Number**	**5**	**10**
Weight (kg)						
Set A	599	3.23	3.40	623	4.54	4.82
Set B	544	3.34	3.53	559	4.68	4.90
Recumbent Length (cm)						
Set A	567	50.4	51.4	592	56.3	57.4
Set B	514	50.9	51.7	530	57.0	57.8
Head Circumference (cm)						
Set A	563	35.0	35.3	586	38.0	38.5
Set B	512	35.1	35.5	526	38.0	38.5

The differences in percentile levels between sets A and B are small, but appear more marked for weight than for recumbent length or head circumference. Note that the prevalence of LBW infants was about 9%. In the *Vital and Health Statistics,* Series 11–No. 165 report that describes the NCHS/CDC growth charts (Hamill et al., 1977), the prevalence of LBW infants in the Fels Study is given as 4.6% (footnote to page 2). This is incorrect because the denominator used was the total sample and not the number with birthweights. In a footnote to page 8 in the Series 11–No. 165 report, it is stated that the prevalence is 7.9%. The correct figure is 6.9%.

APPENDIX Q

U.S. STANDARD

TYPE/PRINT IN PERMANENT BLACK INK FOR INSTRUCTIONS SEE HANDBOOK

LOCAL FILE NUMBER

CERTIFICATE OF LIVE BIRTH

BIRTH NUMBER

CHILD

1. CHILD'S NAME *(First, Middle, Last)*
2. DATE OF BIRTH *(Month, Day, Year)*
3. TIME OF BIRTH M
4. SEX
5. CITY, TOWN, OR LOCATION OF BIRTH
6. COUNTY OF BIRTH
7. PLACE OF BIRTH: ☐ Hospital ☐ Freestanding Birthing Center ☐ Clinic/Doctor's Office ☐ Residence ☐ Other *(Specify)* ____
8. FACILITY NAME *(If not institution, give street and number)*

CERTIFIER/ ATTENDANT

9. I certify that this child was born alive at the place and time and on the date stated.

   Signature ▶

10. DATE SIGNED *(Month, Day, Year)*
11. ATTENDANT'S NAME AND TITLE *(If other than certifier) (Type/Print)*

    Name ____

    ☐ M.D. ☐ D.O. ☐ C.N.M. ☐ Other Midwife

    ☐ Other *(Specify)* ____

12. CERTIFIER'S NAME AND TITLE *(Type/Print)*

    Name ____

    ☐ M.D. ☐ D.O. ☐ Hospital Admin. ☐ C.N.M. ☐ Other Midwife

    ☐ Other *(Specify)* ____

13. ATTENDANT'S MAILING ADDRESS *(Street and Number or Rural Route Number, City or Town, State, Zip Code)*

DEATH UNDER ONE YEAR OF AGE Enter State File Number of death certificate for this child

14. REGISTRAR'S SIGNATURE ▶
15. DATE FILED BY REGISTRAR *(Month, Day, Year)*

MOTHER

16a. MOTHER'S NAME *(First, Middle, Last)*

16b. MAIDEN SURNAME

17. DATE OF BIRTH *(Month, Day, Year)*
18. BIRTHPLACE *(State or Foreign Country)*

19a. RESIDENCE—STATE

19b. COUNTY

19c. CITY, TOWN, OR LOCATION

19d. STREET AND NUMBER

19e. INSIDE CITY LIMITS? *(Yes or no)*

20. MOTHER'S MAILING ADDRESS *(If same as residence, enter Zip Code only)*

FATHER

21. FATHER'S NAME *(First, Middle, Last)*
22. DATE OF BIRTH *(Month, Day, Year)*
23. BIRTHPLACE *(State or Foreign Country)*

INFORMANT

24. I certify that the personal information provided on this certificate is correct to the best of my knowledge and belief.

    Signature of Parent or Other Informant ▶

INFORMATION FOR MEDICAL AND HEALTH USE ONLY

	25. OF HISPANIC ORIGIN? (Specify No or Yes—If yes, specify Cuban, Mexican, Puerto Rican, etc.)	26. RACE—American Indian, Black, White, etc. *(Specify below)*	27. EDUCATION *(Specify only highest grade completed)* Elementary/Secondary (0-12)	College (1-4 or 5+)
MOTHER	25a. ☐ No ☐ Yes Specify:	26a.	27a.	
FATHER	25b. ☐ No ☐ Yes Specify:	26b.	27b.	

28. PREGNANCY HISTORY *(Complete each section)*

LIVE BIRTHS *(Do not include this child)*		OTHER TERMINATIONS *(Spontaneous and induced at any time after conception)*
28a. Now Living Number ____ ☐ None	28b. Now Dead Number ____ ☐ None	28d. Number ____ ☐ None
28c. DATE OF LAST LIVE BIRTH *(Month, Year)*		28e. DATE OF LAST OTHER TERMINATION *(Month, Year)*

MULTIPLE BIRTHS Enter State File Number for Mate(s) LIVE BIRTH(S)

FETAL DEATH(S)

29. MOTHER MARRIED? (At birth, conception, or any time between) *(Yes or no)*
30. DATE LAST NORMAL MENSES BEGAN *(Month, Day, Year)*
31. MONTH OF PREGNANCY PRENATAL CARE BEGAN—First, Second, Third, etc. *(Specify)*
32. PRENATAL VISITS—Total Number *(If none, so state)*
33. BIRTH WEIGHT *(Specify unit)*
34. CLINICAL ESTIMATE OF GESTATION *(Weeks)*

35a. PLURALITY—Single, Twin, Triplet, etc. *(Specify)*

35b. IF NOT SINGLE BIRTH—Born First, Second, Third, etc. *(Specify)*

36. APGAR SCORE

36a. 1 Minute

36b. 5 Minutes

37a. MOTHER TRANSFERRED PRIOR TO DELIVERY? ☐ No ☐ Yes If Yes, enter name of facility transferred from:

37b. INFANT TRANSFERRED? ☐ No ☐ Yes If Yes, enter name of facility transferred to:

APPENDIX Q (continued)

38a. MEDICAL RISK FACTORS FOR THIS PREGNANCY
(Check all that apply)

- Anemia (Hct. <30/Hgb. <10) .... 01 ☐
- Cardiac disease .... 02 ☐
- Acute or chronic lung disease .... 03 ☐
- Diabetes .... 04 ☐
- Genital herpes .... 05 ☐
- Hydramnios/Oligohydramnios .... 06 ☐
- Hemoglobinopathy .... 07 ☐
- Hypertension, chronic .... 08 ☐
- Hypertension, pregnancy-associated .... 09 ☐
- Eclampsia .... 10 ☐
- Incompetent cervix .... 11 ☐
- Previous infant 4000+ grams .... 12 ☐
- Previous preterm or small-for-gestational-age infant .... 13 ☐
- Renal disease .... 14 ☐
- Rh sensitization .... 15 ☐
- Uterine bleeding .... 16 ☐
- None .... 00 ☐
- Other ________ 17 ☐ *(Specify)*

38b. OTHER RISK FACTORS FOR THIS PREGNANCY
(Complete all items)

- Tobacco use during pregnancy .... Yes ☐ No ☐
  - Average number cigarettes per day ____
- Alcohol use during pregnancy .... Yes ☐ No ☐
  - Average number drinks per week ____
- Weight gained during pregnancy ____ lbs.

39. OBSTETRIC PROCEDURES
(Check all that apply)

- Amniocentesis .... 01 ☐
- Electronic fetal monitoring .... 02 ☐
- Induction of labor .... 03 ☐
- Stimulation of labor .... 04 ☐
- Tocolysis .... 05 ☐
- Ultrasound .... 06 ☐
- None .... 00 ☐
- Other ________ 07 ☐ *(Specify)*

40. COMPLICATIONS OF LABOR AND/OR DELIVERY
(Check all that apply)

- Febrile (>100°F. or 38°C.) .... 01 ☐
- Meconium, moderate/heavy .... 02 ☐
- Premature rupture of membrane (>12 hours) .... 03 ☐
- Abruptio placenta .... 04 ☐
- Placenta previa .... 05 ☐
- Other excessive bleeding .... 06 ☐
- Seizures during labor .... 07 ☐
- Precipitous labor (<3 hours) .... 08 ☐
- Prolonged labor (>20 hours) .... 09 ☐
- Dysfunctional labor .... 10 ☐
- Breech/Malpresentation .... 11 ☐
- Cephalopelvic disproportion .... 12 ☐
- Cord prolapse .... 13 ☐
- Anesthetic complications .... 14 ☐
- Fetal distress .... 15 ☐
- None .... 00 ☐
- Other ________ 16 ☐ *(Specify)*

41. METHOD OF DELIVERY *(Check all that apply)*

- Vaginal .... 01 ☐
- Vaginal birth after previous C-section .... 02 ☐
- Primary C-section .... 03 ☐
- Repeat C-section .... 04 ☐
- Forceps .... 05 ☐
- Vacuum .... 06 ☐

42. ABNORMAL CONDITIONS OF THE NEWBORN
(Check all that apply)

- Anemia (Hct. <39/Hgb. <13) .... 01 ☐
- Birth injury .... 02 ☐
- Fetal alcohol syndrome .... 03 ☐
- Hyaline membrane disease/RDS .... 04 ☐
- Meconium aspiration syndrome .... 05 ☐
- Assisted ventilation <30 min .... 06 ☐
- Assisted ventilation ≥30 min .... 07 ☐
- Seizures .... 08 ☐
- None .... 00 ☐
- Other ________ 09 ☐ *(Specify)*

43. CONGENITAL ANOMALIES OF CHILD
(Check all that apply)

- Anencephalus .... 01 ☐
- Spina bifida/Meningocele .... 02 ☐
- Hydrocephalus .... 03 ☐
- Microcephalus .... 04 ☐
- Other central nervous system anomalies *(Specify)* ________ 05 ☐
- Heart malformations .... 06 ☐
- Other circulatory/respiratory anomalies *(Specify)* ________ 07 ☐
- Rectal atresia/stenosis .... 08 ☐
- Tracheo-esophageal fistula/ Esophageal atresia .... 09 ☐
- Omphalocele/ Gastroschisis .... 10 ☐
- Other gastrointestinal anomalies *(Specify)* ________ 11 ☐
- Malformed genitalia .... 12 ☐
- Renal agenesis .... 13 ☐
- Other urogenital anomalies *(Specify)* ________ 14 ☐
- Cleft lip/palate .... 15 ☐
- Polydactyly/Syndactyly/Adactyly .... 16 ☐
- Club foot .... 17 ☐
- Diaphragmatic hernia .... 18 ☐
- Other musculoskeletal/integumental anomalies *(Specify)* ________ 19 ☐
- Down's syndrome .... 20 ☐
- Other chromosomal anomalies *(Specify)* ________ 21 ☐
- None .... 00 ☐
- Other ________ 22 ☐ *(Specify)*

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