A FINAL REPORT OF THE

STATE PERINATAL SERVICES ADVISORY COUNCIL ON

THE HIGH RATE OF INFANT MORTALITY IN VIRGINIA

TO

THE GOVERNOR

AND

THE GENERAL ASSEMBLY OF VIRGINIA

HOUSE DOCUMENT NO. 11

COMMONWEALTH OF VIRGINIA
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EXECUTIVE SUMMARY

As requested by House Joint Resolution #218 (1981), the State Perinatal Services Advisory Council has conducted a two year study to identify factors related to Virginia's high infant mortality rate.

The Council's review of Virginia's current perinatal health statistics revealed the following significant findings:

- In 1981, Virginia's infant mortality rate of 12.6 per 1,000 live births was worse than that of 31 other states in the nation.
- Virginia's infant mortality rate has exceeded the national rate for the past 11 years, with the exception of the year 1978.
- Virginia's perinatal mortality rate, according to the most recent national data, has exceeded the national rate during the period 1970-78.
- In Virginia, almost 85% of the infant deaths under one week of age occur in low birth weight newborns (5 lbs., 8 oz. or less). The chances for surviving the first week of life decrease as the birth weight decreases.
- In Virginia, approximately 70% of all natural fetal deaths 28 weeks gestation and over were of low weight. It is also significant that 30% of the fetal deaths were at least 36 weeks gestation and weighed more than 5 lbs., 8 oz.; this is an unacceptably high proportion of deaths occurring in term-sized fetuses.

Because low weight is an underlying factor in most newborn deaths under one week and in natural fetal deaths of 28 weeks gestation and over, the Council concludes that weight is the most significant factor in pregnancy outcome; if low birth weight can be prevented, an infant's chances for survival will be dramatically improved. The Council's analysis of birth and infant death data revealed that mothers having the following characteristics are at greater risk of delivering a low birth weight infant:

- No prenatal care received
- Not married to the father of the infant
- Nonwhite
- Under eighteen years of age
- Less than a high school education

Specifically, mothers with any one of these characteristics are 2-4 times as likely to deliver a low birth weight infant than mothers without such characteristics. Among these characteristics, no prenatal care received is the most significant factor; mothers who receive no prenatal care are 4 times as likely to deliver a low birth weight infant than mothers who receive care. Although other factors such as economic status, nutrition, smoking, and medical complications are recognized as also influencing pregnancy outcome, the Council's identification of factors was limited to an assessment of the data available on birth, death, and fetal death certificates.

An assessment of the current perinatal care system, including family planning, prenatal, labor and delivery, and newborn services was conducted to identify deficiencies which may contribute to Virginia's high infant mortality. The following problems, not in order of priority, were significant among those identified as hindering the obtainment of quality care by expectant mothers and newborns and contributing to poor pregnancy outcome and infant survival.

- Difficulty in getting the teenager into the health care system prior to beginning of sexual activity or early in pregnancy.

- Limited accessibility of special tests and diagnostic procedures for at-risk pregnant women receiving care in health department prenatal clinics.

- Lack of continuity of care at time of delivery for many low-income prenatal patients who are unable to secure a delivering physician and/or hospital prior to time of delivery.

- Inadequate educational services for the public, patients, and providers.

- Nurse shortages in neonatal intensive care units.

- Lack of a formal system of regionalized care, including no formal designation of regional centers, and no formal mechanisms for referral of patients, for newborn transport, or for patient and provider education.

Based on findings of the assessment of health status and the perinatal care system, the Council determined that a reduction in infant mortality will be achieved primarily by prevention of low birth weight births and by increasing the chances of survival for those low birth weight infants that are born. The Council recommends that these two goals be accomplished through the following strategies:

1. Ensure availability and accessibility of prevention services, such as family planning, and education programs for patients/consumers, health care practitioners, and the public.

2. Ensure availability and accessibility of both routine and high risk prenatal, labor and delivery, and newborn services.

Since the successful implementation of these strategies depends upon the further development of a formal regionalized perinatal care system in Virginia, the Council presents specific recommendations for the development of such a system. Recommendations are directed to the Department of Health and other agencies of state government, to the private sector provider organizations, and to regional centers that are to be designated to coordinate care in their regions. Significant among the recommendations are the following:

- The Department of Health should assume the lead responsibility for developing and implementing educational and public information programs to promote awareness of specific perinatal health problems, the need for perinatal care, and the impact of lifestyle risk factors on the outcome of pregnancy. Specifically, all public school systems should be

strongly encouraged to implement family life education curriculum. Educational efforts should be carried out in cooperation with the Department of Mental Health and Mental Retardation, the Department of Education, regional perinatal centers, local health departments, Community Services Boards, and other private and public agencies involved in perinatal care.

- The Department of Health, through its local health departments, should be responsible for identifying those low-income maternity patients and their newborns who are receiving inadequate prenatal, delivery, and routine newborn services. For such patients, the Department should, if financially feasible, establish formal contractual arrangements with local providers who are available and willing to contract for provision of adequate care.

- The Department of Health should expand the existing neonatal hospitalization program to ensure that reimbursement for neonatal special care, both intensive and intermediate, is adequate to cover the cost of care provided.

- The Department of Health should develop and implement a process for formal designation of regional perinatal centers in Virginia, with priority attention directed toward the establishment of an intermediate level perinatal referral center having neonatal transport capabilities, for the far Southwest area of the state (Perinatal Region I).

- Professional organizations represented on the Perinatal Council should strongly encourage their respective private sector providers of perinatal care to utilize the patient care guidelines recommended by the Council concerning assessment of risk, referral and transport practices, and inpatient and ambulatory care for mothers and newborns.

- Designated regional perinatal centers should provide high risk perinatal care and ensure that transport, education, and consultation services are available within their regions.

Based on an analysis of the current cost of providing adequate perinatal services within Virginia, the Council estimates that an additional $13.2 million would be required annually to ensure that a regionalized system of care is in place and that the proposed recommendations summarized above can be implemented. It is the Council's firm belief that the expenditure of such funds in a manner consistent with this report's recommendations will result in significant improvements in the health status and health care system for Virginia's mothers and newborns. Accordingly, the Council recommends that the Governor and the Virginia General Assembly designate perinatal care as a major priority for new funding and should support increased appropriations, over time, for perinatal services. The Council recommends that appropriations for perinatal care be phased in over a four year period based on the following priorities and timetable:

Item	FY 85	FY 86	FY 87	FY 8
Maternal and Child Health Services				
1. Establishment of intermediate level perinatal referral center in Southwest Virginia with support for neonatal transport system.	$ 294,000* 35,900**	$ 35,900**	$ 35,900**	$
2. Implementation of provider/patient education programs by regional centers and public awareness programs by Department of Health.	581,900	581,900	581,900	58
3. Establishment of financial contracts between local health departments and local providers for provision of prenatal and delivery services, to be administered by the Department of Health.	1,847,400	3,694,800	5,542,200	7,38
4. Expansion of existing neonatal hospitalization program to ensure support for hospitals providing neonatal intensive and intermediate care.	1,213,800	2,721,750	3,935,600	5,149,0
TOTAL ADDITIONAL FUNDING***	$3,973,000	$7,034,350	$10,095,600	$13,156,0

*Operating Support (The $294,000 required for fiscal years 86, 87, and 88 are included in the figures for item number 4.)
**Transport System
***Totals may not add due to rounding

A FINAL REPORT BY THE

STATE PERINATAL SERVICES ADVISORY COUNCIL

ON THE HIGH RATE OF INFANT MORTALITY

IN VIRGINIA

(HJR #218)

SUBMITTED TO THE

GOVERNOR AND THE GENERAL ASSEMBLY OF VIRGINIA

RICHMOND, VIRGINIA

November, 1982

To: Honorable Charles S. Robb, Governor of Virginia,
and the General Assembly of Virginia

INTRODUCTION

A. Statement of Authorization

Through House Joint Resolution #218, the 1981 General Assembly directed the State Perinatal Services Advisory Council, in cooperation with the Departments of Health and Welfare, to conduct a two-year study of the high rate of infant mortality in Virginia. The resolution follows:

HOUSE JOINT RESOLUTION NO. 218

Requesting the State Perinatal Services Advisory Council, in cooperation with the Departments of Health and Welfare, to study the high rate of infant mortality in Virginia.

WHEREAS, there is serious concern about the slackening decline in the infant mortality rate in the United States, which in 1979 was 13.0 percent; and

WHEREAS, in 1979 Virginia had the sixteenth highest infant mortality rate of all the states in the nation; and

WHEREAS, socioeconomic and biological factors are believed to be the primary contributors to neonatal and postneonatal deaths; and

WHEREAS, a lack of medical knowledge about the important events occurring prenatally and at birth that affect the viability of the infant impedes the precise classification of the causes of death; and

WHEREAS, it is recognized that prenatal care is a critical factor in the well-being of the infant and the mother, and that it lessens the incidence of fetal death; and

WHEREAS, the high rate of infant mortality in this Commonwealth suggests that many expectant mothers do not receive this vital medical care; and

WHEREAS, early intervention can significantly improve the chances of survival of infants in this State, assist in the modification in the list of the causes of death, improve the detection of the specific determinators of infant death, and enhance preventive measures; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the State Perinatal Services Advisory Council, in cooperation with the Departments of Health and Welfare, is requested to study the high rate of infant mortality in Virginia. The agencies shall consider the relationship of housing, nutrition, level of income, education, ethnicity, and other demographic factors, the supply of adequately trained medical personnel, and the availability and obtainment of medical care by expectant mothers to the high rate of infant mortality.

The Council shall submit to the House Committee on Health, Welfare and Institutions and the Senate Committee on Education and Health an interim report in December 1981, and a final report to the Governor and the General Assembly no later than December 1, 1982.

This report is the Final Report submitted to the Governor and the General Assembly. The Interim Report was submitted during the 1982 session of the House Committee on Health, Welfare and Institutions, and the Senate Committee on Education and Health.

B. Process for Development of HJR #218 Final Report

Upon assignment of HJR #218, it was determined that the requirements of the resolution would be met most logically through coordination with the Council's legislative mandate to develop a State Plan for Perinatal Services. To further meet the requirements of HJR #218, a Department of Welfare representative was appointed by the Commissioner of Welfare to assist the Council in the study. Early in 1981, the Council formed subcommittees in the following areas: Family Planning/Maternal, Neonatal, Transportation, Education, and Data. Preliminary findings and recommendations of the subcommittees were contained in the Interim Report, submitted to the two health committees during the 1982 session.

In December 1981, the Council formed new subcommittees to address priorities of the second year of study. Subcommittee findings and recommendations were reported to the full Council in May 1982. To encourage ultimate acceptance and successful implementation of the Council's recommendations, the Council distributed drafts of both the Interim and Final Reports to a broad range of provider and consumer organizations. Comments received from these groups were reviewed by the Council and were incorporated, where appropriate, in this Final Report.

II. ASSESSMENT OF PERINATAL HEALTH STATUS IN VIRGINIA

A. Trends and Current Status

Perinatal health is the health of the pregnant woman and her infant (born and unborn) prior to, during, and following birth. The current status of perinatal health in Virginia is described in this section of the report. Since death is the most extreme and well-defined outcome resulting from poor health, and since mortality data are collected on a statewide basis, the analysis of perinatal health relies heavily on mortality as a measure of outcome. Obviously, poor perinatal health has serious consequences other than death; for example, mental retardation results from many conditions before, during, and after birth. Thus, the significance of Virginia's relatively high infant mortality extends beyond the tragic loss of life. Significant findings from a review of available data are discussed below.

1. Virginia Ranks 32nd in Nation in Terms of Infant Mortality

Infant mortality[1] reflects the death of infants under one year of age. The infant mortality rate in Virginia is worse than that of 31 other states in the nation.

The Virginia mortality rate has exceeded the U.S. rate for the past eleven years, with the exception of the year 1978 (see Appendix D, Figure 1). In 1981, Virginia's infant mortality rate was 12.6 per 1,000 live births, as compared to a national rate of 11.8[2].

2. Virginia's Perinatal Mortality Rate Exceeds The National Rate and the Rates Vary Among Perinatal Regions within Virginia

Infant mortality is generally accepted as an indicator of health status and general living standards. However, perinatal mortality, which includes natural fetal deaths 28 weeks gestation and over and infant deaths under one week of age, is a more relevant indicator of pregnancy outcome, since it more specifically reflects circumstances and the events surrounding the time of birth, including the characteristics of the mother and problems within the perinatal care system.

The inclusion of natural fetal deaths 28 weeks gestation and over within the perinatal mortality rate is significant; the fetus 28 weeks gestation or over, if born alive, has a high probability of survival, and most natural fetal deaths in the last three months of gestation are potentially preventable by proper health care.

A review of perinatal mortality rates for Virginia from 1970-1980 reveals a continuing decline in the rate throughout this period from 25.2 per 1,000 live births in 1970 to 14.3 in 1980. During the same time period, the nation's experience was consistently better than the Commonwealth's (see Appendix D, Table 2). An analysis of the 1980 perinatal mortality rates by perinatal regions reveals a wide discrepancy, with rates ranging from 9.8 to 17.7.

3. Most Infant Deaths Under One Week of Age Occur in Low Birth Weight Newborns

Low birth weight infants are those weighing 2500 grams (5 lbs., 8 oz.) or less at birth, regardless of the period of gestation. In 1978 (the most recent year of national data), Virginia's rate of low birth weight (73.7 per 1000 live births) was worse than 33 other states. Studies reveal that low birth weight infants have a higher rate of death under one week of age than normal birth weight infants. Similarly, among natural fetal deaths of 28 weeks gestation and over, the death rate among low birth weight fetuses is higher than that for fetuses over 5 lbs., 8 oz.

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[1] See Appendix A for definitions

[2] Although 1981 data on infant deaths in Virginia is reflected in this rate, the remainder of the analysis in this report is based on 1980 data which was the most recent available at the time the Council's analysis was conducted.

Although low birth weight infants represent only a small perce of Virginia's total 1980 live births (7.6%), they constitute the portion (84.3%) of the infant deaths under one week of age (hebdo deaths.)[1] As Table 3 (Appendix D) indicates, among low birth infants, the chances for surviving the first week of life become s as the birth weight decreases. In 1980, low birth weight inf Virginia were 59 times more likely to die than normal weight infant

4. Most Natural Fetal Deaths 28 Weeks Gestation and Over Were Le than 2501 Grams

Almost 66% of the natural fetal deaths 28 weeks gestation an were of low weight (less than 2501 grams or under 5 lbs., 8 oz.) Appendix D, Table 4). It is significant that 30% of the fetal dea were at least 36 weeks gestation and weighed more than 5 lbs., 8 oz. high proportion of natural fetal deaths occurring in term-sized fet who would have likely survived if born alive, suggests that there may serious deficiencies in Virginia's health care delivery system.

5. Birth Weight is the Most Significant Factor in Pregnancy Outcom

Because low weight is an underlying factor in most newborn dea under one week and in natural fetal deaths of 28 weeks gestation over, birth weight itself is a measure of the outcome of pregnancy, therefore an important factor for study. Additionally, low birth wei is an important factor for study since low birth weight infants t survive may be more likely to suffer from physical and mental handic than normal weight newborns. Although advances in intensive care h reduced the incidence of mortality and morbidity in low birth weig infants, some evidence indicates that very low birth weight infants (l than 1,000 grams) who survive are more likely to experience hea problems including visual impairment, mental retardation, developmen delay, neurological impairment, and learning problems.[2]

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[1] 32 newborn deaths under one week were excluded from the data because they we considered to be medically unpreventable.

[2] Maureen Hack, A.A. Fanaroff, and I.R. Merkatz, "The Low Weight Infant - Evoluti of a Changing Outlook". New England Journal of Medicine, November 22, 1979, p 1165.

"Numerous Visual, CNS Defects Seen in Infants Less than 1000 Grams." Pediatric News, March 1981, p. 18.

Low birth weight merits special study because the social, medical, and economic factors which influence low birth weight can be identified and subsequently publicized with the intent of preventing low birth weight infants and reducing perinatal mortality. For example, in Virginia, the Department of Mental Health and Mental Retardation and several local health departments are coordinating community based public education campaigns on these subjects. Finally, low birth weight is a significant indicator for study because studies of the cost of perinatal care reveal that low birth weight in newborns is a major factor in increasing the average cost of care.[1]

B. Identification of Factors Related to Perinatal Mortality and Low Birth Weight

A thorough examination of data collected on 1979-1980 birth and death certificates and 1980 fetal death certificates for Virginia residents was conducted to identify factors, as outlined in HJR #218, contributing to the high incidence of perinatal mortality and low birth weight. Data on the certificates relating to demographic factors, health practices during pregnancy, and maternal history were examined. Specifically, a review of data pertaining to age, race, education, marital status, prenatal care received, parity, and previous fetal deaths revealed that certain relationships exist between these variables and perinatal deaths and low birth weight births. However, these relationships do not necessarily imply cause and effect. Significant findings in regard to each of the variables are discussed below. Although medical complications are also recognized as influencing pregnancy outcome, the Council's identification of factors was limited to an assessment of the data available on birth, death, and fetal death certificates.

1. Demographic Factors

a. Age

For 1980, the proportion of infant deaths under one week varies significantly with the age of the mother, with infants born to women under 18 years of age experiencing the highest rate, (11.9) and infants born to women age 36 and older having the second highest rate (10.6) (see Appendix D, Table 5). The natural fetal death rate was highest for women age 36 and older. Infants born to mothers under age 18 also had the highest rate of low birth weight (116.0) (see Appendix D, Table 6). It can be concluded that perinatal outcome is significantly influenced by the age of the mother.

b. Race

A review of infant mortality rates by race in Virginia for the past decade reveals that the proportion of white infant deaths to nonwhite infant deaths is similar to the national experience. For each year, the rate for nonwhite births has been higher than the rate for white births, although in Virginia the magnitude of the

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[1]Ciaran S. Phibbs, Ronald L. Williams, and Roderic H. Phibbs, "Newborn Risk Factors and Costs of Neonatal Intensive Care". Pediatrics, Vol. 63, No. 3, September 1981, p. 313.

difference has been decreasing. In 1970, the infant mortality rate for nonwhite infants was 16.1 higher than the rate for white infants. In 1975, the difference was 10.5 and by 1980 the difference had narrowed to 7.3. The 1980 infant mortality rate for nonwhite infants was about the same as the 1970 rate for white infants.

In Virginia in 1980, the rate of death for infants under one week of age born to nonwhite mothers (12.0) was almost twice the rate for infants born to white mothers (6.8) (see Appendix D, Table 7). There was a small difference between the groups for natural fetal deaths. The nonwhite low birth weight rate was twice the rate for white infants (see Appendix D, Table 8).

The difference in white and nonwhite mortality rates and low weight births is not believed to be related to race per se, but to the underlying differences in factors such as socioeconomic status, age, education, and the amount of prenatal care received.

c. Education

The rate of death for infants under one week varies with the education of the mother. Infants born to mothers with less than a twelfth grade education had a higher rate (10.9) than infants born to mothers with a twelfth grade education or more (7.0) (see Appendix D, Table 9). This finding is consistent for natural fetal deaths also. Infants born to mothers with less than a twelfth grade education were twice as likely to be of low birth weight as infants born to mothers with more education (see Appendix D, Table 10). In summary, mothers with at least a twelfth grade education are more likely to have better pregnancy outcomes than those with less education, in terms of both lower infant mortality and higher infant birth weight. Although the effect of mother's age may be thought to explain these findings, this relationship remains constant, even when controlling for the age of the mother.

d. Economic Status

National studies have shown a much higher percentage of low birth weight infants among low-income families. For example, in one study of 19 large cities, the percent of low weight infants born to mothers residing in areas of poverty (as determined by area income) was on the average two percent higher than the percent of low birth weight infants born to mothers residing in nonpoverty areas.[1] For Virginia, the lack of specific data on family income for all live births makes the study of the relationship between income and low birth weight or perinatal mortality difficult. General comparisons between income levels and the rate of low birth weight by jurisdiction in Virginia have been made. Although the areas with higher incomes (or lower poverty percentages) generally had a lower incidence of low birth weight, no statistically significant differences were found.

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[1]Stephanie J. Ventura, Selma M. Taffel, and Ernell Spratley. Selected Vital and Health Statistics in Poverty and Nonpoverty Areas of 19 Large Cities, United States, 1969-71. Series 21, No. 26, (Washington: National Center for Health Statistics, 1975) p. 26.

e. Marital Status

In Virginia in 1980, nearly one out of every five mothers was not married to the father of the infant. An infant born to a mother who was not married to the father of the child was twice as likely to experience death in under one week of age (13.4) as an infant born to a mother who was married to the father (6.8) according to Table 11 (Appendix D). A similar difference, although smaller, occurs among natural fetal deaths. An infant born to a mother who is not married to the father is also much more likely to be of low birth weight (see Appendix D, Table 12). While it is apparent from these data that there is a relationship between the marital status of the mother and perinatal mortality and birth weight, marital status cannot be isolated from other variables such as age, race, or economic status.

f. Housing

A review of the literature indicates that there has been very little research on the effects of housing upon perinatal deaths and low birth weight. The few published studies have examined the relationships in developing countries.

Data on housing are not collected on the Virginia birth certificate, death certificate, or fetal death certificate. For the purpose of this report, a comparison was made between housing and perinatal mortality rates for each planning district in Virginia. Housing data for 1976 were obtained from a document published in 1977 entitled "Virginia Housing Needs Assessment" which was distributed by the Office of Housing, Commonwealth of Virginia. The percentage of total households with housing needs was determined for each planning district. Need was based on such items as lack of one or more plumbing facilities and overcrowded living conditions.

Each planning district was ranked according to its perinatal mortality rate (1980) and housing needs percentage. A comparison of the rankings by means of a statistical test indicated no relationship between the perinatal mortality rate and housing needs.

2. Health Practices During Pregnancy

a. Prenatal Care Received

A review of the literature revealed that low birth weight and perinatal mortality appear predictable by the number of prenatal visits made (adjusted for gestational age) and the trimester when prenatal care is initiated.[1] Virginia data seem to substantiate this statement. Infants born to mothers who received no prenatal care had the highest rate of death under one week (60.0). This was almost eight times higher than infants whose mothers had any

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[1]Bernard Guyer, Lee Ann Wallach, and Sharon L. Rosen, "Birth-Weight Standardized Neonatal Mortality Rates and the Prevention of Low Birth Weight: How Does Massachusetts Compare With Sweden?" New England Journal of Medicine, Vol. 306, No. 20, May 20, 1982, p. 1233.

prenatal care (7.5) (see Appendix D, Table 13). Of the women who had a natural fetal death, those who did not receive prenatal care had a natural fetal death rate almost five times higher than those women who did receive prenatal care. Mothers who did not receive any prenatal care were over three times as likely to have a low birth weight infant (see Appendix D, Table 14). These findings clearly indicate that prenatal care is a significant factor affecting perinatal mortality and the birth weight of the infant as well as more long term disabilities known to be associated with low birth weight such as mental retardation.

b. Nutrition

Although Virginia data are lacking, national studies reveal that nutrition seems to be associated with low birth weight.[1] Specifically, one source has estimated that inadequate nutrition accounts for 65% of low birth weight in white infants and for 57% in black infants. Although this estimate may be overstated, the study clearly indicates that severe nutritional deprivation is associated with low birth weight.[2]

c. Smoking

A strong relationship between maternal smoking during pregnancy and reduced birth weight has been documented by several studies. Basically, infants of smokers weigh 150 to 250 grams less than infants born to nonsmokers, with reduction in weight from the norm being greater for heavier smokers than for moderate smokers. According to one source, discontinuing smoking among pregnant women, reducing the duration of smoking prior to pregnancy, and preventing the initial onset of smoking could potentially facilitate a significant reduction in low birth weight rates. Specifically, low birth weight rates could theoretically be reduced by an estimated 21 to 39% through the discontinuation of smoking by pregnant women.[3] Since information on maternal smoking is not collected on Virginia birth, death, or fetal death certificates, its effect on low birth weight and perinatal mortality in Virginia cannot be examined.

d. Alcohol

The effect of alcohol consumption on low birth weight and perinatal mortality has not been established. Alcohol consumption during pregnancy has been related to abnormalities[4] occurring

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[1] Eileen Kennedy, James E. Austin, and C. Peter Timmer. Cost/Benefit and Cost/Effectiveness of WIC (unpublished report, Harvard University).

Agnes C. Higgins, "Nutritional Status and the Outcome of Pregnancy." The Journal of the Canadian Dietetic Association, Volume 37, 1976.

[2] Guyer, Wallach, and Rosen, p. 1282.

[3] Ibid.

[4] S. K. Clarren, and D. W. Smith. "The Fetal Alcohol Syndrome." New England Journal of Medicine, Vol. 298, p. 1063.

during the prenatal and postnatal periods, such as retarded growth and delayed development of the central nervous system, including mental retardation. A particular pattern of these abnormalities and others is classified as the fetal alcohol syndrome and appears in about three to five live births per 1000. Since information on alcohol consumption during pregnancy is not collected on Virginia birth, death, and fetal death certificates, further analysis of the effects of maternal alcohol consumption on low birth weight and perinatal mortality is not possible.

3. Maternal History

a. Previous Live Births (Parity)

Infants born to mothers with no previous live births had the highest rate (16.1) of death under one week of age. This rate was approximately 16 times the rate for mothers with at least one previous live birth. Women with three or more previous live births had the highest rate of natural fetal deaths (see Appendix D, Table 15). Similarly, infants born to mothers with three or more previous births had the highest rate of low birth weight (see Appendix D,Table 16). As these findings indicate, the level of parity is different as it affects deaths under one week and as it affects natural fetal deaths and low birth weight.

b. Previous Fetal Deaths

In Virginia, a fetal death is death caused by an induced abortion or the death prior to the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of the pregnancy. For 1980, infants born to women with one or more previous fetal deaths had a higher rate (11.9) of death under one week than infants born to women with no previous fetal deaths (7.0) (see Appendix D, Table 17). Women with one or more previous fetal deaths also had a somewhat higher rate of natural fetal deaths. Infants born to these women also had a higher rate (89.9) of low birth weight than infants born to women with no previous fetal deaths (71.4) (see Appendix D, Table 18). Previous fetal deaths, as an aspect of the mother's history, is a factor worthy of further analysis to determine its relationship with perinatal mortality and low birth weight.

c. Multiple Births

In Virginia for 1980, pregnancies that resulted in twins or triplets accounted for 1.9% of the live births. Infants born to mothers with multiple pregnancies have a much higher rate of death under one week and low birth weight than infants born to mothers with single pregnancies. Women with multiple pregnancies also have a higher natural fetal death rate. The rate of death under one week for infants born to mothers with multiple pregnancies (54.4) was seven times the rate for women with single pregnancies (7.1) (see Appendix D, Table 19). Women with multiple pregnancies had a natural fetal death rate (27.2) five times the rate for women with single pregnancies (5.3).

In terms of low birth weight, infants born to mothers with multiple pregnancies had a low birth weight rate (533.6) eight times the rate for infants born to mothers with single pregnancies (66.5) (see Appendix D, Table 20). It should be noted that of the low birth weight twins and triplets, over half weighed at least 2001 grams or 4 lbs. 7 oz. Although multiple pregnancies are an uncommon event, they are disproportionately represented in both the number of perinatal deaths and the number of low birth weight infants.

C. Analysis of Factors Relating to Low Birth Weight

1. Overview

Examination of the previous section clearly indicates the need for further analysis of low birth weight because of its significant effect on perinatal outcome. There is a strong relationship between low birth weight and infant deaths under one week, with the mortality rate increasing as birth weight decreases . Implicitly, if low birth weight can be prevented, an infant's chances for survival and subsequent good health will be improved. An analysis of the factors affecting low birth weight will assist in a better understanding of how to prevent low weight births. In this section, the seven factors which were found to be associated with perinatal deaths and low birth weight births are analyzed in greater detail in order to gain a perspective on the extent of their influence on low birth weight.

2. Interaction of Individual Factors

The individual factors of age, race, education, marital status, prenatal care, previous live births, and previous fetal deaths have been analyzed (see Appendix E for a complete description). These factors have been incorporated into a statistical procedure, which identifies paticular characteristics of each factor that are likely to result in the delivery of a low birth weight infant. This relative risk analysis has the advantage of determining the strength of the relationship between the characteristic and the risk of delivering a low birth weight infant. The following is a list of the characteristics likely to result in delivery of a low birth weight infant in descending order of influence:

Characteristic of Mother	Adjusted Relative Risk
No Prenatal Care Received	3.8
Not Married to the Father of the Infant	2.4
Nonwhite	2.1
Under 18 Years of Age	2.0
Less than a High School Education	1.9
Age 36+	1.4
Age 18-25	1.4
One or More Previous Fetal Deaths	1.3
No Previous Births	1.2
3 or More Previous Births	1.2

Each of these characteristics is an important indicator of low birth weight and thus of the infant's chances for survival. Based on this analysis, it has been determined that mothers with any one of the first five characteristics (no prenatal care received, not married to the father of the infant, nonwhite, under 18 years of age, and less than a high school education) are two to four times as likely to deliver a low birth weight infant as mothers without such characteristics. Among these characteristics, no prenatal care received is the most significant factor; mothers who receive no prenatal care are four times as likely to deliver a low birth weight infant than mothers who receive care. In order to examine the interactions of these factors, the indicators were placed into two groups and a further step in the relative risk analysis was conducted. Prenatal care, marital status, race, and education comprised the first group. Age, previous live births, and previous fetal deaths made up the second group. The detailed analysis is presented in Appendix F. Significant among the findings from this additional analysis is that the factors of prenatal care and race continue to be highly associated with the likelihood of delivering a low birth weight infant. Specifically, mothers who receive no prenatal care and who are nonwhite experience a higher rate of delivering low birth weight infants than any other group of mothers.

This application of the relative risk analysis shows that the likelihood of delivering a low birth weight infant increases with the presence of certain easily identifiable characteristics. The identification of these characteristics allows for the targeting of educational efforts and/or services to women who would benefit from such efforts. In the next section, further efforts to enhance targeting are made by the analysis of the geographic distribution of low birth weight.

D. Regional Analysis of Perinatal Health Status

Low birth weight, as an indicator of perinatal health status, has been analyzed on a regional basis to identify areas having the highest rates. Identification of these areas can allow for a targeting of limited resources for perinatal care.

Low birth weight rates and related indicators of perinatal health status were compiled for each perinatal region. Specific data by perinatal region are presented in Appendix G, Table 1. Two perinatal regions in particular were fairly consistent in having worse rates for each indicator than the other regions. Perinatal Regions 6 (Central) and 7 (Eastern) had the highest rates of low birth weight, (83.3 and 87.3 per 1000 births respectively). They also had the highest rates of total teenage pregnancy episodes and the second and third highest rates of infant mortality. These two perinatal regions accounted for 47 percent of the Virginia resident births in 1980.

In order to gain a more precise understanding of perinatal health status on a regional basis, the perinatal indicators were applied to each planning district. The specific indicators, by planning district are presented in Appendix G, Table 2. To promote reliability, an average for five years was employed in computing the rate of low birth weight. The range of weighted low birth weight rates was from 59.1 to 92.9 per 1000 births. The five planning

districts with the highest rates were located in Perinatal Regions 6 (Central) and 7 (Eastern). Other perinatal indicators for these planning districts, such as perinatal mortality rates and infant mortality rates, were not consistently higher than in the other planning districts. A risk factor analysis was performed on each of these five planning districts to gain insight into the contribution of particular factors to low birth weight rates. Factors used in this analysis included those utilized in the statewide analysis, that is, age, race, education, marital status, prenatal care received, parity, and previous fetal deaths. In general, the characteristics that were identified as having high adjusted relative risks on a statewide basis were also associated with high risk in the planning districts. One characteristic in particular was consistent; no prenatal care.

E. Summary

The Council's review of the indicators of perinatal health status in Virginia has revealed some disturbing findings. Specifically, these include: (1) Virginia's infant mortality rate (12.6 per 1000 live births in 1981) exceeded that of 31 other states; (2) Virginia's perinatal mortality rate has been consistently worse than the national experience during the period 1970-1980 and there is a wide variance in perinatal mortality rates among the seven perinatal regions (9.8-17.7); (3) Virginia's rate of low birth weight (73.7 per 1000 live births) is worse than 33 other states; (4) a low birth weight (less than 2501 grams) infant in Virginia is 59 times more likely to die than a normal weight infant; (5) about one-third of the natural fetal deaths (fetal deaths other than induced abortions, 28 weeks gestation and over) in Virginia are not low weight (under 2501 grams) and were at a gestational age that indicated good chances for survival; and (6) low birth weight is associated with a number of health problems and developmental impairments, notably mental retardation.

Consistent with these findings, the Council has concluded that reduction in the rate of low birth weight is an important priority in reducing the mortality and subsequent morbidity of infants in Virginia. Accordingly, the Council assessed factors associated with the likelihood of delivering a low birth weight infant. The Council's analysis revealed that mothers with any one of the following characteristics are two to four times as likely to deliver a low birth weight infant than mothers without such characteristics: no prenatal care received, not married to the father of the infant, nonwhite, under eighteen years of age, and less than a high school education. Among these characteristics, no prenatal care received is the most significant factor; mothers who receive no prenatal care are four times as likely to deliver a low birth infant than mothers who receive care. Other factors considered such as economic status, nutrition and smoking, appear to influence birth weight but their affect could not be substantiated or measured in Virginia because of a lack of data specific to the state. Discussion of the types of services and programs required to effect changes in the perinatal health status in Virginia is presented in the following sections of the report.

III. IDENTIFICATION OF PROBLEMS WITHIN THE PERINATAL CARE SYSTEM

The perinatal care system encompasses a continuum of maternal and newborn care beginning prior to conception and concluding with neonatal care. Perinatal services include family planning, prenatal, labor and delivery, and newborn

services. The regional development of these services is essential in ensuring improvement in pregnancy outcome. Regionalization can be defined as the linking of the various obstetrical and newborn services so that the appropriate level of maternal and infant care is available when needed.

A formal regionalized system of perinatal care does not currently exist in Virginia. Efforts to establish such a system have been initiated by the Perinatal Council, with much support from the Virginia Chapter of the American Academy of Pediatrics, Virginia Section of the American College of Obstetricians and Gynecologists, State Health Department, and the member hospitals of the Virginia Hospital Association. In this report, the Council has assessed the current perinatal care system as it compares to a regionalized system, and has identified problems which hinder the ability of expectant mothers and newborns to obtain quality care and which contribute to poor pregnancy outcome. Specifically, the Council has examined family planning services, prenatal care, inpatient care for mothers and newborns, education services, transportation and consultation services, and manpower availability. A discussion of the major problems identified and recommendations to improve the system follows.

A. Family Planning Services

The relationship between receiving family planning services and the improvement in selected health status outcomes has been well documented.[1] Specifically, the rate of low birth weight infants and the rate of newborn deaths will be reduced when women in childbearing years have adequate services to avoid unintended pregnancies and to provide early and continuous prenatal care.

Both national and Virginia statistics indicate that women under age 18 represent a group more likely to deliver infants that are of low birth weight and that do not survive the first month of life. In addition, teenagers who continue pregnancy show a lower utilization of prenatal services when compared to other women.[2] This affects pregnancy outcome as reflected in a higher incidence of medical complications such as toxemia, anemia, prolonged or premature labor and delivery, and cesarean section.[3] These factors are complicated by and perhaps attributable to other characteristics of this age group, including a greater probability of single marital status, divorce, unemployment, welfare, dependency and school drop-out.[4]

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[1] Jean Pakter and Frieda Nelson, "Factors in the Unprecedented Decline in Infant Mortality in New York City" (New York Academy of Medicine, 1974; reprinted from Bulletin of the New York Academy of Medicine, Second Series, Vol. 50, No. 7, 1974).

[2] Alan Guttmacher Institute, Family Planning Services: Focus for State Initiative, 1976.

[3] Alan Guttmacher Institute.

[4] Southwest Virginia Health Systems Agency, Inc., Health Systems Plan for Southwest Virginia, Second Edition, January, 1979.

[1] Department of Health, Education, and Welfare, "National Guidelines for Health Planning" (Draft 4Z CFR, Part 121, Sub-part B) July 6, 1979.

Recent data prepared by the Virginia Division for Children, which was based on a survey of 2,296 families in the Commonwealth, revealed that almost one-third of the children over the age of twelve reported having sexual intercourse and that 42% of those sexually active teenagers do not use any type of birth control method. The Alan Guttmacher Institute Report estimates that on a national basis only 40% of teenagers 15-19 at risk of pregnancy used family planning services. Consequently, efforts must be directed toward ensuring the availability and accessibility of family planning services for this group.

The Council's review of the incidence of teenage pregnancy in Virginia in 1980 by planning districts reveals a range of rates from 51.1 per 1000 population to 109.5; the statewide teenage pregnancy rate is 80.5.[1] Eight of the twenty-two planning districts showed rates higher than the state average. Teenage pregnancy rates by planning districts are presented in Appendix G, Table 2.

The Council's assessment of family planning services available for teenagers revealed that federally or state supported family planning services are currently being offered in every county and independent city within Virginia. The primary provider of service is the local health department; however, private organizations such as Planned Parenthood also provide family planning services in some communities. The Council determined that although availability and accessibility problems affect the utilization of family planning services by some teenagers, other factors exist which also may influence utilization. Among those factors identified by the Council are:

1) Difficulties exist in getting the teenager into the health care system prior to the beginning of sexual activity and early in pregnancy.

2) Family life education[2] is not currently offered in all public schools in Virginia. However, consistent with the passage of House Joint Resolution #284 by the 1981 General Assembly, which encourages use of the family life education curriculum in Virginia's public schools, it is strongly recommended that all school systems initiate such programs.

3) Services have been traditionally directed toward the female, excluding male involvement in family planning.

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[1]Teenage pregnancy rates include live births, natural fetal deaths, and induced abortions occurring to women under 20 years of age.

[2]Family life education is defined within Family Life Education-Curriculum Guidelines as "those educational concepts and experiences that influence attitudes toward family living, personal relationships, sexual development, and other aspects of human sexuality. It should help develop knowledge of physical, emotional, and social growth and maturation, understanding of individual needs, and the ability to make decisions. It should involve an examination of male and female roles in society and their relationship to each other."

In consideration of the high rate of teenage pregnancies in Virginia and of the problems cited above, the Council determined that community awareness and personal awareness on the part of the teenager are two priorities for intervention. Accordingly, the Council recommends that educational programs be developed to inform communities, especially local school boards, of the extent of problems associated with teenage pregnancy. In addition, the Council encourages the direct provision of perinatal education and counseling services for pregnant teenagers. These activities, both community and patient education programs, should be coordinated by local health departments in cooperation with other local organizations such as Community Services Boards, Planned Parenthood organizations, Associations for Retarded Citizens, and local private provider organizations. Finally, the Council recommends that communities which do not currently have curricula of family life education within the public school system should be identified and, accordingly, should be strongly encouraged to initiate such curriculum.

B. Prenatal Care Services

1. Availability and Accessibility of Prenatal Services for Indigent Women

Prenatal care services are provided to indigent women in Virginia by both private and public sector providers in a variety of settings, including local health departments, private physicians' offices, and outpatient clinics of hospitals. Because of the lack of data available pertaining to services provided through the private sector, the Council's assessment of prenatal care services for indigent women was limited to an examination of services provided by local health departments. In 1980, approximately 25,000 women sought prenatal services in health department clinics.

In assessing the availability and accessibility of prenatal services provided by local health departments, the Council relied heavily upon the State Department of Health's Maternity Services Survey of all local health departments, conducted in November 1981. According to this survey, 124 of the 136 health departments in the state offer routine prenatal services for low risk patients; services for the moderate to high risk patients are not usually provided. Of those health departments not offering routine prenatal care, most are located in the Western and Southwestern perinatal regions. Most of the health departments not providing prenatal services report that the cooperation of private physicians or hospital clinics has made the provision of services at the health department unnecessary. One health department indicated that prenatal services were not available because of lack of funds.

Findings from this survey also revealed that routine prenatal services are generally financially accessible to indigent women through the health departments. Approximately 90% of the health departments serve at least 95% of the women who present for care. Financial eligibility for services is determined according to the State Board of Health approved sliding fee scale. Fifty-four percent of the health departments report that everyone is eligible, while the remaining health departments indicate that only lower categories are accepted, or a limit is placed on the upper income level of the D category. Although routine

prenatal services are financially accessible, special tests and diagnostic procedures (e.g. glucose tolerance test, amniocentesis, ultrasound) for moderate to high risk health department maternity patients are frequently financially and geographically inaccessible.

Because of the limited scope of special tests and diagnostic procedures available at the health department clinics, in many cases intermediate risk patients must travel great distances to regional centers, where the most sophisticated diagnostic and therapeutic care is provided, to receive the essential care. The Department's survey revealed that most health departments utilize the regional centers as their only referral source for identified at-risk patients. Visiting a distant regional center for prenatal care is problematic for the patient for several reasons. First, the patient may not be able to secure transportation to the regional center, or the travel arrangements may be costly and inconvenient. Secondly, the patient may feel uncomfortable being treated in unfamiliar surroundings. Finally, a high level of patient motivation is needed in order for the patient to seek care when faced with these obstacles. Patients who must visit a regional center for prenatal care may be less likely to follow through with their treatment plan if such obstacles are present.

Based on the findings from this survey, the Council concludes that, generally, routine low risk, uncomplicated prenatal care is available to indigent women through the health departments and the patient's inability to pay is not a barrier to receiving routine care. However, special prenatal services for moderate to high risk health department maternity patients are unavailable and often inaccessible either because of the travel distances to high risk providers or because of the patient's inability to pay for such services.

In addition to reviewing the findings of the Health Department's survey the Council also compared the scope of local health department services to proposed minimum "Guidelines for the Delivery of Prenatal Care in Ambulatory Settings" (see Appendix H). These guidelines were developed by the Council based on a review of standards developed by the States of Maryland and North Carolina, and the standards developed by the American College of Obstetricians and Gynecologists. (Comparison with private sector providers was not possible due to lack of inventory data).

The Council's review indicated that although the health departments meet most of the proposed guidelines, a few exceptions to the guidelines exist. First, according to the Department's survey of local health departments, twenty-seven percent of the health departments do not provide in-house or purchase immediate blood sugar testing (blood glucose) for their patients. Secondly, the Department's survey indicates that only eleven percent of the health departments provide ultrasound in-house or purchase ultrasound for identified at-risk patients. Finally, some health departments do not have a fully qualified obstetrician in-house or available through a contractual arrangement. The survey reveals that thirty-eight percent of the health department prenatal clinics are staffed by a board certified or eligible obstetrician.

The findings of the Maternity Services Survey suggest that current resources available to local health departments are not adequate to ensure the full range of services for moderate and high risk indigent patients. In order to facilitate improvements, the Council recommends that resources be directed toward ensuring the appropriate medical personnel and appropriate scope of services for prenatal patients seeking services through the health department. Specifically, the Council encourages local health departments to identify those low-income maternity patients who are receiving inadequate prenatal care and for such patients, if financially feasible, establish formal contractual arrangements with local providers for the provision of adequate care. The Council believes that if the appropriate services and medical personnel were available, either in-house or through contractual arrangements with local providers, then more intermediate risk patients could be treated in their own communities with consultation from regional centers.

As an additional approach to ensuring that, to the extent possible, all women are treated in their own communities, the Council recommends the establishment of satellite clinics (within existing physical facilities) to serve intermediate risk maternity patients. The establishment of such intermediate risk capabilities would thus reduce the need for and expense of travel to regional centers. The Council recognizes that establishment of such capabilities would require the provision of new or redistribution of existing manpower and equipment resources. The Council also recommends that the proposed "Guidelines for the Delivery of Prenatal Care in Ambulatory Settings" (see Appendix H) be employed by all providers of ambulatory prenatal care; specifically, that these guidelines be used in public health settings and be promoted within the private sectors.

2. Identification of the High Risk Maternity Patient

The need for early identification of the high risk prenatal patient has been identified by the Council as deserving priority attention. Studies have shown that identification of the medically high risk maternity patient early in pregnancy and provision of the appropriate consultation and prenatal care can be of significant benefit in improving perinatal outcomes and reducing maternal mortality and morbidity. Consultation may include telephone contact between referring and consulting physicians regarding patient management or single or multiple prenatal visits for ambulatory care at an intermediate care center or regional center.[1] According to published data, it is possible to anticipate as many as two-thirds of high risk newborns through careful prenatal assessment.[2]

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[1]Committee on Perinatal Health, Toward Improving the Outcome of Pregnancy (New York: The National Foundation-March of Dimes, 1977), p. 26.

[2]American College of Obstetricians and Gynecologists, Standards for Ambulatory Obstetric Care (USA: The American College of Obstetricians and Gynecologists, 1977), p. 6.

To determine if all maternity patients are currently being assessed for pregnancy risk factors, the Council conducted an inventory of current risk criteria in use in the State. Based on this inventory of risk assessment practices, the Council discovered that various types of risk criteria and risk assessment systems are being used and concluded that patients are not being systematically assessed for risk factors in all areas of the State. Additionally, in those areas where patients are assessed, the interpretation of "high risk" varies.

According to the Health Department's survey of local health departments, all local departments have a process for identifying medically at-risk patients. In the majority of health departments, the process is based upon the judgment of the care provider and established written criteria. The written criteria utilized vary among the health departments. In 27% of the health departments, the process is based solely on the judgment of the care provider.

Use of uniform risk criteria would facilitate effective transfer and consultation between health department clinics, private sector physicians, hospitals, and regional centers by establishing a common "language" among all providers. In order that the use of uniform risk assessment criteria and patient care guidelines may be assured on a statewide basis, the Council developed "Prenatal Risk Assessment and Patient Care Guidelines" (see Appendix I). These classification criteria are already being used in several areas of the State. The guidelines classify patients according to level or risk, and indicate the appropriate level of medical personnel needed to manage the patient in each classification. The Council strongly recommends that the use of these guidelines by both public and private sector providers be encouraged.

C. Inpatient Care

1. Availability of Inpatient Maternity and Newborn Services for Indigent Patients

According to the Health Department's survey of local prenatal services, routine low risk, uncomplicated prenatal care appears to be available to most indigent patients; however, a problem exists when the same woman is ready to deliver and 1) there is a shortage of qualified obstetrical physicians to assume responsibility for the patient 2) there is no pediatric coverage for the newborn or 3) there is no source of payment, or only partial payment for the hospital or physician. The Survey revealed that in certain areas of the State, private physicians and/or hospitals refuse indigent women for delivery services. Being refused care locally, these women are transported, in some cases considerable distances, and at risk to the patient, to regional center hospitals, both private and state supported, where the infant is delivered. In such situations, continuity of care is compromised as the patient has not, in many instances, made a prior arrangement with or been examined by the delivering physician. In addition, no arrangement has been made for pediatric coverage for the newborn. In fact, Survey results indicate that in at least half of the health departments, the prenatal patients do not have any prior contact with the delivering physician.

The Council has identified the continuity of intrapartum and neonatal care for indigent patients as being seriously inadequate and recommends that this problem be addressed both locally and on a statewide basis. To facilitate improvements, the Council strongly encourages the Department of Health, through its local health departments, to assume responsibility for identifying those low-income maternity patients and their newborns who are receiving inadequate delivery and routine newborn services, and for such patients, if financially feasible, to establish formal contractual arrangements with local physicians and hospitals who are available and willing to contract, for the provision of adequate care. Arrangements should be made with local physicians and hospitals during the prenatal phase, based on a specific fee schedule for ambulatory and inpatient services, that would ensure that physicians and hospitals received financial compensation for services rendered. Although limited funding may not allow remuneration of the customary charge for services, such arrangements would at least provide for reasonable compensation to cover part of the cost of the services provided. With such arrangements in place, the provision of inpatient care to indigent patients could be specifically planned during the prenatal period, thereby promoting the receipt of quality care at time of delivery for maternity patients, and their newborns.

2. Availability of Neonatal Special Care

Neonatal special care includes intensive care provided primarily in regional centers and intermediate care provided by regional centers and non-regional center hospitals which receive newborn referrals from other hospitals. Currently, there are six regional centers in the state which provide neonatal intensive and intermediate care. Two of the centers are state supported while the remaining four are non-state supported hospitals. According to the 1980 Annual Survey of Medical and Nursing Facilities, there were 12 non-regional center hospitals providing intermediate neonatal care within a separately designed special care unit. The following table presents a comparison of the current total number of intermediate and intensive care stations by perinatal region with the estimated need or excess.

COMPARISON OF EXISTING NEONATAL STATIONS (INTERMEDIATE AND INTENSIVE) WITH ESTIMATED NEED BASED ON GUIDELINES OF STATIONS PER LIVE BIRTHS BY PERINATAL REGION, 1980

	Number of Stations Needed Based on Guidelines[1]		Total Current Stations[2]		Number of Stations in Excess/(Needed)	
Perinatal Region	Intr.	Intn.	Intr.	Intn.	Intr.	Intn.
I Southwest	10	4	2	0	(8)	(4)
II Western	16	6	11	6	(5)	0
III Southside	17	6	8	6	(9)	0
IV Piedmont	23	8	15	10	(8)	2
V Northern	32	11	24	12	(8)	1
VI Central	49	17	16	12	(33)	(5)
VII Eastern	71	24	42	23	(29)	(1)
STATE	218	76	118	69	(100)	(7)

[1]Guidelines: Number of stations based on guidelines of three intermediate and one intensive station per 1000 live births as adjusted by the low birth weight rate as a variance of 80 LBW births per 1000 live births, 1980. (Number of live births and LBW births (2500 grams or less) by place of occurrence, 1980). These guidelines are consistent with the recommendations of the American Academy of Pediatrics as presented in Standards and Recommendations for Hospital Care of Newborn Infants. Current high occupancy rates in existing units suggest that these numbers may be inappropriate; this may possibly be attributed to the transport of infants across regional boundaries.

[2]Number of stations (by level) reported within neonatal special care unit.

Note: Currently, the intensive care unit in the Piedmont region serves the intensive care needs of Region I through air transport.

SOURCE: 1980 Annual Survey of Medical and Nursing Facilities Services.

Based on the this data the Council concludes that there is a problem with the availability of intermediate and intensive neonatal beds in the state. Because of the shortage of beds in neonatal intensive care units, many newborns must travel great distances within the state as well as travel out of state to receive the necessary special care.

Several factors exacerbate the current shortfall of intermediate and intensive care beds. First, although beds may exist, there is a shortage of necessary nursing staff at some hospitals. This shortage prevents staffing of beds at necessary nurse/patient ratios. Further analysis of nursing shortages is presented in the section of this report which addresses availability of perinatal manpower. A second factor contributing to the unavailability of neonatal intensive care beds is the inappropriate use of intensive care beds by patients who no longer require such intensive care. Convalescing newborns who could be moved to intermediate care beds are often maintained in the intensive care unit. This occurs because of a lack of the necessary intermediate care beds at the center or at community hospitals and due to lack of transportation back to the community hospital. A third issue confronted by regional centers and which indirectly impacts the availability of neonatal intensive care is the referring of newborns to the centers only because of the patient's lack of a payment source. Since neonatal intensive care

is very expensive and since Medicaid and Maternal and Child Health programs allow for only limited reimbursement for such care, many indigent patients are inappropriately referred to regional centers who in turn must provide care for which there is little or no compensation. The Council has identified this as an issue which has a potential impact on the total availability of neonatal intensive care should any of the centers be forced to shut down a neonatal unit due to extensive financial losses over time. The Council has conducted a survey of the actual cost of neonatal special care units in regional centers and estimates that on a statewide basis a financial "loss" of approximately $4.7 million is being incurred by such units in regional centers. Using similar assumptions, the Council estimated that non-regional center hospitals providing intermediate care were incurring "losses" up to $1.1 million annually. The Council concludes that if the adequate number of stations and the adequate reimbursement mechanisms were in place, inappropriate referrals to regional centers would be reduced and the over demand for intensive care stations would be eased. Further discussion of these costs is presented in Section IV of this report.

3. Guidelines for Inpatient Obstetrical and Newborn Care

Minimum standards of inpatient obstetrical and newborn care are necessary to ensure that all hospitals which are providing routine prenatal care are providing quality care. Currently, the Rules and Regulations governing the licensure of hospitals provide minimal standards for provision of maternity and newborn care. The Council, however, has determined that standards for licensure fall short in many of the essential aspects for quality care that all hospitals should meet if they elect to provide routine maternity or newborn services. Accordingly, the Council has developed "Guidelines for Inpatient Obstetrical and Newborn Care" (see Appendix J), which indicates the standards which should be met by hospitals providing routine obstetrical and newborn care but which are not necessarily linked to minimal requirements for licensure. Some of the standards proposed by the Council currently appear in the hospital licensure rules and regulations. The Council will further study its proposed standards to determine those which should appropriately be included as minimal requirements for hospital licensure. Currently, not all hospitals in the State meet the Council's proposed guidelines.

Although most high risk mothers can be cared for at hospitals meeting the Council's proposed "Guidelines for Inpatient Obstetrical and Newborn Care," (see Appendix J) patients with conditions which require advanced newborn support may need to be referred to other hospitals for more sophisticated care. Accordingly, the Council has developed "Guidelines Concerning Maternal Transfer" and "Guidelines for Neonatal Special Care" (see Appendices K and L). Except for unusual maternal conditions, most maternal referrals to a hospital with more than routine facilities are based on a fetal indication and a need for advanced capabilities for the newborn. Therefore, the need for referral to a more advanced hospital should be based on the capabilities of the nursery of the referring hospital. A hospital whose nursery exceeds the requirements for basic care will likely be able to manage some of these patient conditions and, consequently, some transfers may not be necessary.

To provide guidelines on the required capabilities for hospitals providing advanced neonatal support, the Council identified eight newborn conditions which require more than basic perinatal resources and identified the capabilities, equipment, and personnel requirements necessary to adequately manage such conditions. Use of these guidelines in conjunction with those for provision of basic care would allow hospitals to assess their capabilities for handling certain high risk maternal and newborn conditions.

D. Educational Services

The Council has identified perinatal education services as serving an important role in improving pregnancy outcome. Education is a process that requires time to facilitate behavior changes that will ultimately result in healthier mothers and infants in Virginia. Educational programs can be designed to affect knowledge, attitudes, skills, and medical care practices for specific target populations. Perinatal educational programs should be directed toward the following target populations: 1) providers of perinatal services (inpatient and outpatient pediatric and obstetric care providers in the private sector and public health departments); 2) patient/consumers (including pregnant women, women of childbearing age, men, and high risk groups such as pregnant teenagers, pregnant women over age 35, and women who have a child with a developmental disability or delay); and 3) public (including youth, parents, teachers, and support others).

Provider education is aimed at providing the necessary training to prepare perinatal professionals for their job responsibilities and to continuously update them on new techniques in the field. Regional centers, community hospitals, and health departments provide preparatory and continuing education programs for their personnel. Both the American Academy of Pediatrics and the National Committee on Perinatal Health encourage regional centers to assist community hospitals in providing provider education for their staff. Similarly, "Criteria and Standards for Regional Perinatal Centers," (see Appendix C) developed by the Council, specifies that the regional center has major responsibility for providing preparatory and continuing education services for perinatal health care professionals in its geographic area. This would include provider education services for private providers, community hospitals, and for regional center personnel. Outreach education services may be provided by the center directly or through a contractual arrangement with another center.

An assessment of the current status of provider education services reveals that there are frequent but sporadic offerings of the traditional one-to-two-day conferences. Many of these conferences are directed toward regional center nurses and physicians. The Perinatal Continuing Education Program (PCEP) curriculum developed at U. Va., is a prominent provider education program being implemented in the State. This program has been evaluated extensively and improvement in patient care has been documented.[1] The Perinatal Continuing Education Program is coordinated by regional centers and based at each community hospital, with participation by all of the hospital's perinatal health care providers. Fifty-four of the seventy-two

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[1]John Kattwinkel et al, "Improved Perinatal Knowledge and Care in the Community Hospital Through a Program of Self-Instruction," Pediatrics, Vol. 64, Oct. 1979, pp. 451-458.

hospitals providing maternity services in the State have participated in this program. Four regional centers are currently participating in the program and are assisting community hospitals in their regions with staff training programs, as well as providing education for their own staffs. However, these efforts are limited by the personnel and funds available to the regional centers for such activities. Although previously most regional centers employed staff to coordinate provider education for their regions, many such staff positions have been terminated because of reduced funding. Other regional centers have expressed interest in participating in the PCEP, both for training of their own staffs as well as assisting in the training of community hospital staffs. However, the participation of these centers has been limited by their lack of resources. The Council determined that each regional center should have a coordinator to ensure the implementation and evaluation of continuing education programs for providers within its specified area.

The Council's assessment of provider education services also revealed that not all pertinent perinatal content areas are being addressed by existing programs. Efforts to develop new programs to address additional content areas have been limited by the absence of development funds for such activities. Therefore, the Council concluded that a mechanism, such as a competitive grant process, should be established to allow the development and evaluation of innovative provider education programs at regional centers in subject areas not currently being addressed.

Patient/consumer perinatal education is aimed at providing information and instruction to pregnant women (according to level of risk, as identified by medical risk factors, socio-economic risk factors, and lifestyle risk factors), and to women of childbearing age, with the intent of facilitating behavior changes that will result in improved pregnancy outcome. The health status section of this report reveals the importance of receiving perinatal care in preventing low birth weight births and infant deaths. Similarly, other health care practices, such as nutrition, smoking, and alcohol use may have an impact on pregnancy outcome for Virginia women. Effective strategies in preventing low birth weight births must utilize educational programs to bring about patient health care practices that will result in improved outcomes.

The content of educational programs for pregnant women must be carefully developed to meet both the physical and emotional needs of the patient. The program should include components to address the patient's specific medical needs as determined by the "Prenatal Risk Assessment and Patient Care Guidelines" (see Appendix I). Similarly, the patient's mental health status should be assessed, providing an opportunity for discussion of issues likely to cause stress. The pregnant woman may experience stress caused by anxiety about pregnancy, or by marital, family, or financial problems.[1] Teenage mothers facing unemployment or considering dropping out of school may experience even greater stress. Finally, the mother of a high risk newborn may require emotional support as well as specialized instruction in caring for her infant. Educational programs designed to meet the physical and emotional needs of pregnant women and new mothers will facilitate behavior conducive to improved pregnancy outcomes.

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[1]The American College of Obstetricians and Gynecologists, Standards for Obstetric-Gynecologic Services (Washington, DC. The American College of Obstetricians and Gynecologists, 1982) p. 15.

Patient/consumer perinatal education is provided by hospitals, private providers, health departments, and other community organizations. "Guidelines for the Delivery of Prenatal Care in Ambulatory Settings," (see Appendix H) developed by the Council, specifies that a patient educational program should be presented by ambulatory care providers. According to the Maternity Services Survey, individual prenatal education is provided in all local health departments providing prenatal services and group prenatal education is provided in 78% of the health departments providing prenatal services. While these local health departments report providing prenatal education, there has been no systematic evaluation of the programs offered in terms of content or quality or in regard to their impact on the client population.

A complete inventory of all community organizations and agencies currently providing patient/consumer perinatal education does not exist. No doubt, certain gaps in services, as well as duplication of efforts, exist in the provision of education services. Currently, there is no agency or organization responsible for the coordination and evaluation of such programs within the perinatal regions. Therefore, the Council determines that each regional center should have a coordinator for patient education programs, to assume this responsibility for its geographic area. It should be emphasized that each regional center will require two coordinators, one for the coordination of patient/consumer education, and the other for the implementation of provider education.

Public perinatal education programs are directed toward creating an awareness of the specific perinatal problems in Virginia, and the need for community services necessary for improved pregnancy outcomes. Such programs are essential in securing local support and resources for perinatal services.[1] Public education programs are provided by a multitude of agencies and community organizations, including local health departments, schools, community mental health centers, and voluntary agencies such as the Red Cross, Planned Parenthood, and March of Dimes. A statewide mental retardation prevention effort is presently being conducted, with many of these agencies and organizations involved in public education activities. Although public education programs exist, there is no single designated organization responsible for guiding the efforts in informing the public about Virginia's high infant mortality rate. The Council recommends that the Department of Health, in cooperation with the Department of Mental Health and Mental Retardation, assume this responsibility to ensure an on-going statewide information campaign is conducted.

E. Transportation and Consultation Services for High Risk Infants and Mothers

1. Maternal Transfer

Currently, high risk obstetric patients are transported to perinatal centers for inpatient care by private automobile or ambulance, and the expertise of attendants may vary from friend or family member to physician, depending on the clinical situation. For ambulance

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[1] Florence E. F. Barnes, ed., Ambulatory Maternal Health Care and Family Services: Policies, Principles, Practices (American Public Health Association, 1978), pp. 79-80.

transports, an Emergency Medical Technician with certificate is the usual attendant. The decision regarding the means of transport and the needed equipment is made by the referring and receiving physicians.

Although the ability of the patient to pay is often the underlying reason for referral to a regional center, as discussed previously, the decision to transfer a maternity patient should be based on the capabilities required for anticipated newborn conditions and upon the capabilities of the referring hospital. In general, if it has been determined that the newborn will require advanced treatment, it is preferable to transfer the maternity patient prior to delivery rather than transporting the infant following delivery. Once the decision to transfer has been made, it is essential that transportation be implemented with the appropriate vehicle, equipment and personnel according to the transfer risk involved. Therefore, the Council has developed "Guidelines Concerning Maternal Transfer" (see Appendix K) to assist the referring and receiving physicians in determining the appropriate mode of transfer and personnel required. These guidelines contain criteria for assessing risk of transport, depending on patient conditions and distance from the perinatal center. However, if the requirements for personnel or transport times specified in these guidelines cannot be met then the maternal transfer should not be implemented. In these instances, consideration should be given to initiating neonatal transport as appropriate. Although the Council recognizes the importance of maternal transfers in appropriate situations, it recommends that, where practical, the responsibility for such transfers be assumed by existing local rescue squads in consultation with regional centers and the patient's physician. In geographically remote areas of the state, such as the Southwest, ground transport may be impractical for transporting a high risk maternity patient long distances or over mountainous terrain. Therefore, the Council concludes that the development of a maternal air transfer system for such areas would be beneficial.

2. Neonatal Transport

To ensure appropriate transport of high risk newborns to the appropriate care centers, an effective air and ground transportation system is essential. An assessment of the current ground transport system in the State indicates that five of the seven perinatal regions have specially equipped emergency ground vehicles and equipment standards for a Class D vehicle (Neonatal Life Support vehicle) as described in the "Rules and Regulations Governing Emergency Medical Services". Northern Virginia (Fairfax Hospital) uses a standard ambulance and a mobile equipment unit for transport and maintains a team of specially trained transport personnel. Southwest Virginia (Region I) has no suitable transport system. When other regions are unable to provide transport for sick newborns in the Southwest Region, the newborns either remain in their hospital of birth for care, or are transferred elsewhere using a local rescue squad vehicle and a transport isolette, which is not an acceptable means of transporting critically ill newborns over long distances. It is significant to note that the Southwest Region does not have intensive care capabilities within the region and relies primarily on Roanoke Memorial Hospital and the University of Virginia Medical Center for assistance. Therefore, the absence of a suitable transportation system in the Southwest Region is particularly problematic.

An assessment of the present air transport system in Virginia reveals that no statewide system currently exists for the transport of newborns. The University of Virginia is the only regional center providing air transport for infants and has mostly transported infants from the far southwest part of the State. Although this has been beneficial, difficulties still exist in this system, including the long travel distance, overcrowding of facilities at the University of Virginia, and time response factors.

Selecting and training well-qualified transport personnel is of utmost importance to the transport outcome. The Council surveyed each regional center to determine the composition of its transport team. It was discovered that there was a wide variance as to the type of personnel used, and that it generally depended on the resources available. The following types of staffing were reported as being used: 1) physician/nurse teams, 2) nurse/Emergency Medical Technician or nurse/Respiratory Therapist teams, 3) specially trained nurses whose primary responsibility is transport, and 4) a large pool of staff nurses who have additional training in neonatal transport.

Few regions have a coordinator who is responsible for education of the transport team, maintenance of the vehicle, data collection, and evaluation of the system. To ensure that the appropriate personnel are present to manage newborns during transfer, the Council developed and encourages use of "Minimal Requirements of Neonatal Transport Personnel", (see Appendix M) which defines the minimal requirements for the transport personnel.

3. Reverse Transport

The issue of reverse transport is critical to an effective perinatal system and primarily relates to returning convalescing high risk newborns to the referring hospital from the regional center. As mentioned previously, there are many instances where infants who are convalescing from illness could be returned to their referring hospital to alleviate crowding of intensive care nurseries and to "free up" nursing staff and space at the perinatal center for infants with acute illness. Reverse transport would also be beneficial to the family, eliminating the need for costly travel to a regional center.

Although reverse transport for convalescing newborns would result in the most appropriate utilization of specialized staff and facilities, several factors deter this practice. First, transport of convalescing newborns may require a specialized vehicle and the cost of such transport is not covered by third party payors. Second, local physicians may be unwilling to receive and care for convalescing high risk newborns because of their lack of experience and information regarding the care of them. Finally, in the case of Medicaid patients, and some private insurance patients, the length of stay in intensive care units within a regional center often exceeds the limited number of reimbursable days (21 days in the case of Medicaid patients). In such cases, because of limited third party compensation, the referring hospital is reluctant to admit the convalescing newborn.

The Council recognizes these barriers to implementing an effective reverse transport system. Accordingly, it recommends that steps be taken to correct such conditions in order that expensive resources of intensive

care units be reserved for the most critically ill newborns and that convalescing newborns and their families be treated in an appropriate setting in closer proximity to their own communities.

The existence of a high risk newborn consultation and referral service is essential to an effective transport system for newborns. Currently, in Virginia, an informal telephone consultation and referral network exists between physicians and hospitals. However, because of difficulties previously described, frequent delays in finding a "bed" for seriously ill newborns occur, thus often delaying transport. Therefore, the Council determined that there is a need for the establishment of a statewide neonatal consultation and referral network "hotline".

F. Manpower Availability

An adequate supply of perinatal manpower is essential to ensure that medical care is available for mothers and infants. In assessing manpower availability, the Council examined the supply of registered nurses (RNs), OB/GYNs, pediatricians, and child health physicians. Specific findings are described below.

1. Supply of Registered Nurses

Nurse shortages exist nationwide as evidenced by the 90,000-100,000 vacant nurse positions existing in hospitals across the nation.[1] Registered nurse shortages, in terms of vacant RN positions in hospitals, existed in Virginia in 1978 and 1980, as indicated by the surveys conducted by the Virginia Hospital Association in those two years.[2] The Annual Survey of Hospitals revealed that in 1980 there was an overall registered nurse shortage of 7% in hospitals across the state providing maternity services.[3] A survey of hospitals in Perinatal Regions I (Southwest) and IV (Piedmont) conducted by the Council in February-March 1982 revealed that registered nurse vacancies vary markedly among hospitals, with some hospitals experiencing slight shortages, while others having extreme shortages. The majority of hospitals reported that they have difficulty, some on a continuous basis and others at times, in filling RN vacancies. Because of the difficulties in recruiting RNs, some hospitals have temporarily placed LPNs in existing RN vacancies.

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[1]Matt Clark, et al, "An Acute Shortage of Nurses," Newsweek (September 22, 1980), pp. 93-95.

[2]Virginia Hospital Association Committee on Nursing, "Analysis of 1978 Nursing Survey Questionnaire, Part III," August, 1979.

Virginia Hospital Association Committee on Nursing, "Changes in Registered Nurse Salaries and Shortages, 1978 to 1980," (Enclosure to September 24, 1980 memo).

[3]Based on number of full-time and part-time RNs on the payroll and "Number of RN positions under recruitment" (These were assumed to be vacancies). Excludes MCV, which did not respond to the question on the Annual Survey of Hospitals.

Based on the survey results, the recently approved rules and regulations for hospital licensure regarding perinatal care[1] will exacerbate the existing difficulties in filling RN vacancies. The majority of the hospitals in Region I (Southwest) reported that they would need additional positions to meet the new licensure requirement and the majority of hospitals in Region IV (Piedmont) reported that it would be either difficult or impossible to meet the requirement without securing additional positions. The Council was not able to conclusively determine the extent of RN shortages related to the provision of obstetrical and newborn care because of the common practice of cross staffing in these units. Also, efforts to determine obstetrical RN shortages were hindered by the lack of an established recommended nurse to patient ratio for the provision of quality obstetrical care.

A survey of the six regional center neonatal intensive care units in the state conducted by the Council in the Spring, 1982 revealed that four of the units were currently experiencing difficulties related to the staffing of registered nurses. These four units provided data indicating the extent of their problem.[2] Two centers reported an RN turnover rate of 42%. Registered nurse vacancy rates reported by two of the centers were 18% and 22%. A comparison of the required nursing care hours for the provision of quality of care to the actual hours available and hours provided in the units for three of the units revealed the following: 72% of the required hours were provided in one center, 75% in another center, and 91% in the third unit. One unit reported that due to the lack of necessary nursing care hours available, it maintained only 64% occupancy of its beds from July-December, 1981. Thirty percent of referrals to this unit were taken to other centers, one-fourth of which were located out of state.

Nursing shortages related to the provision of neonatal intensive care can have serious consequences. Lack of optimum nurse staffing results in lowered quality of care, transfer of infants to centers located outside their community and out of state, and ultimately, a potentially increased infant morbidity and mortality. The Council determined that the severe RN shortage in the NICUs is a serious problem and strongly urges that immediate attention be directed toward reducing RN vacancy and turnover rates and promoting the effective and efficient utilization of nurses working in the unit. As a means of accomplishing this goal, the Council recommends that a new nursing classification, the "Perinatal Nurse Clinician" be developed. This new classification would represent a promotional opportunity, based on clinical expertise and not requiring additional academic degree(s), for nurses providing direct patient care in high risk delivery services and neonatal intensive care units. Only those nurses certified under NAACOG Certification Corporation should be considered eligible for this position. It is hoped

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[1] Requires at least 1 RN in an occupied newborn nursery and at least 1 RN in an occupied post partum unit.

[2] Not all units reported vacancy rates and turnover rates. Reported vacancy rates, turnover rates, and nursing care hours required/provided may have been calculated differently among the units and for different time periods.

that this opportunity for clinical advancement will encourage such nurses to say at the bedside. In addition, the Council urges the development of an educational program to train a new specialist, the "biomedical technician". Advances in neonatal intensive care have resulted in the use of more technical equipment in the unit for newborn monitoring, respiratory support and fluid management. This, in turn, has led to an increasingly larger proportion of the nurse's time being spent in the monitoring of such equipment, with less time available for direct patient care. The biomedical technician would perform duties related to the monitoring of such equipment, thereby allowing more of the nurse's time to be devoted, appropriately, to direct patient care.

The Council's assessment of RN staffing related to the provision of health department care revealed that the health departments are not experiencing difficulty in recruiting RNs. However, the health departments are having difficulty in securing the needed budgeted RN positions.

2. Supply of Physicians

The Council's study of physician availability focused on an assessment of the supply of OB/GYNs and pediatricians, the primary providers of perinatal care. The Council determined that every hospital in the State providing maternity services should have at least one OB/GYN and pediatrician on its "active staff" who are board certified or eligible. Such staffing ensures that the appropriate medical care is available to every mother and infant before, during and following delivery. An inventory of all hospitals in the State providing maternity services conducted in the Spring, 1982 revealed that nine hospitals in the state do not currently meet the Council's recommended standards. These hospitals are among the smaller hospitals providing maternity services (in terms of total births) and although the hospitals are located in all regions of the state, the majority are located in the Southwest and Western regions.

The Council also utilized the following physician-to-population ratios as general indicators of availability: 1 OB/GYN per 11,000 population and 1 child health physician[1] per 2,500 children aged 0-17 years. Application of these guidelines on statewide basis indicated that there appears to be a sufficient number of OB/GYN and child health physicians to provide the needed services. In fact, an excess of 85 OB/GYNs and 349 child health physicians was revealed. Region V (Northern) shows the greatest excess of OB/GYNs and greatest degree of excess of child health physicians. Region I (Southwest) shows the greatest shortage of OB/GYNs and least degree of excess of child health physicians. Analysis of the findings on a regional and planning district level reveals the expected maldistribution, with, generally, more

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[1]The number of child health physicians is the number of pediatricians plus ¼ of the number of family practitioners and general practitioners, as defined by the American Academy of Pediatrics on page 6 of Current Distribution and Trends in the Location Pattern of Pediatricians, Family Physicians and General Practitioners Between 1976 and 1979. (Draft, Working Paper #4, December, 1981, Peter P. Budetti, Phillip R. Kletke, and John P. Connelly).

concentration of OB/GYNs and child health physicians in the more highly populated areas and less concentration in the lower population density areas. On a city/county level, it is evident that a number of counties do not have an ob/gyn while others show excesses. Also a number of cities and/or counties do not have a pediatrician and several counties do not have a child health physician. Utilizing these physician-to-population guidelines reveals a projected excess of 222 OB/GYNs and 500 child health physicians in 1986.[1]

Physician shortages, as identified by the local health departments in the Maternity Services Survey, were also considered by the Council. Health departments in all regions of the State indicated the need for additional physicians for either the provision of prenatal care or delivery services or for both. Considering both prenatal and delivery services, it appears that the greatest need for physicians exists in the Southwest and Eastern regions.

Finally, the Council assessed the availability of a neonatologist and an OB/GYN perinatal specialist at the regional centers to determine compliance with the Council's proposed "Criteria and Standards for Regional Perinatal Centers" (see Appendix C).[2] The assessment revealed that each regional center meets the standard recommended by the Council in regard to neonatologists. However, in regard to OB/GYN perinatal specialists, the regional center serving Perinatal Region III does not meet the recommended standard.

The Council's examination of physician availability indicated that although there is no overall statewide shortage of ob/gyns or child health physicians, underserved areas do exist. To ensure the necessary physician manpower is available in all areas of the state, the Council encourages the Department of Health, in cooperation with regional health systems agencies and local providers, to participate more actively in the placement of National Health Service Corps physicians in areas experiencing ob/gyn or pediatric manpower shortages or in areas having hospitals that provide maternity services that do not have the appropriate physician coverage.

The Council's assessment of registered nurse and physician supply indicated that the Southwest region of the state showed the greatest manpower needs. Specifically, the following findings were revealed: 1) in 1980 the greatest degree of registered nurse shortage in hospitals in Virginia providing maternity services existed in the Southwest Region;

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[1]See Appendix N for description of methodology used in the physician-to-population analysis.

[2]The standard specifies that each regional center should have a board eligible or certified neonatologist and a board certified obstetrician with special training and interest in fetal and maternal medicine. A board certified obstetrician with special training in fetal and maternal medicine includes either a physician certified in maternal-fetal medicine or a physician practicing maternal-fetal medicine the majority of the time. Ideally, this obstetrician should be a board certified perinatologist. However, this is not currently feasible at all regional centers.

2) nine hospitals in the State currently do not have both an OB/GYN and a pediatrician on their active staff; the region showing the largest number of such hospitals was the Southwest Region; 3) the health departments indicated that the Southwest Region was one of the areas showing the greatest need for more physicians for the provision of prenatal and delivery services; and 4) the physician-to-population assessment revealed that although no overall statewide shortage exists, the greatest shortage of OB/GYNs and the smallest excess of child health physicians exist in Southwest Region. Clearly, these findings indicate that the registered nurse and physician manpower needs of the Southwest Region should be a priority in planning services for the State.

G. Network of Regional Centers

Throughout the previous sections of this report references have been made to the role and responsibilities of regional perinatal centers in providing the necessary support for both patient care and non-patient care components of a perinatal care system. The existence of such centers has been recognized in all national studies as key to implementing a perinatal care system and has been identified as a priority concern within the current Virginia State Health Plan as developed by the Statewide Health Coordinating Council. The functions of a regional center should include not only the provision of medical services for intensive care newborns and high risk maternity patients, but also the responsibilities for: 1) consultation services to other hospitals within the region, 2) coordination of transportation services for maternal and newborn patients, 3) continuing education services for perinatal health care professionals, and 4) evaluation of the effectiveness of perinatal care for the region.

Although official designation of regional centers has not occurred, the Council has taken several steps leading to such a designation process. The first of these steps has been the identification of perinatal regions. Identification of geographic regions for delivery of perinatal services is of primary importance in establishing a regionalized system of care. The Council emphasizes that such boundaries do not and should not preclude referrals across regions nor should they restrict patient or physician choice in terms of where to receive care. The major purpose of regional boundaries is planning for coordinated perinatal services based on current practice patterns. The State Perinatal Council undertook an analysis of neonatal transfer data and 1980 patient origin data for recorded live births. Using these data plus based on considerations of geographic accessibility and existing perinatal resources, seven perinatal regions have been identified. These regions are depicted on the map in Appendix B.

The Council has also developed criteria and standards for regional centers which have been approved by the State Board of Health as part of the State Medical Facilities Plan (see Appendix C). These criteria and standards should be reviewed for appropriateness, revised as necessary, and should then serve as a basis for designation of centers.

Finally, the Council has prepared estimates of the resources required by a regional center to support the provision of medical care and to provide the necessary education and transport services. These estimates are presented in Section IV of this report.

The Council believes that official designation of regional perinatal centers by the Department of Health should occur and that a process for this designation be developed. Although six of the seven perinatal regional have hospitals which serve as referral centers and which have the capabilities, or potential to develop such capabilities, for serving as a regional center, the far southwest portion of the state (Perinatal Region I) does not currently have a facility which serves in this capacity. The Council recommends that in the designation process, priority attention be given to addressing the unique needs of Perinatal Region I in establishing a regional center for that area.

IV. COST OF PERINATAL CARE

The cost-effectiveness of perinatal care has been documented in numerous national studies.[1] An analysis of recent state data reveals that a potential annual savings of $49.8 million in state expenditures for long term institutionalization for mental retardation could be realized with the adequate provision of perinatal care. (See Appendix O) Similarly, Alabama officials estimate that "for every dollar that is spent on prevention of infant mortality and handicapping conditions through Medicaid, the state will save between $5 and $10 in long-term institutional care for the severely retarded and day care for the mildly retarded."[2] Despite its long-term cost-effectiveness, high risk perinatal care is expensive in the short term, and, as indicated in this report, is needed most often by those who are least able to pay for it. The Council believes that adequate funding of perinatal care will result in significant improvements in the health status and health care for Virginia's mothers and newborns.

This section of the report presents estimates of the costs associated with the provision of perinatal care in the Commonwealth. In addition to direct patient care, these estimates include the cost to provide support for a regional transport system and for perinatal education. Based on these estimates, the Perinatal Council has identified the level of additional funding required to support an effective regional perinatal system and to improve perinatal mortality and morbidity statistics in Virginia.

A. Cost of Neonatal Special Care

In this section of the report, data on the cost of neonatal special care, both intermediate and intensive care, are presented. The intensive care cost data are based on the Perinatal Council's survey of five hospitals in the state providing neonatal intensive care (data from a sixth hospital were not available in detail but have been factored in the totals where indicated). The data are based on a six month period (Jan. 1, 1981 through June 30, 1981) and have been annualized for purposes of the report. Although there are several limitations of the data, which are derived from Medicaid cost reports, the aggregate figures are reasonable in terms of documenting the total cost of neonatal intensive care and the current financial problems of hospitals

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[1] "The Costs and Effectiveness of Neonatal Intensive Care: Case Study #10", Office of Technology Assessment, Congress of the United States, Washington, DC, August 1981.

[2] "Treating Low-Income Mothers Cost Effective, MDs Tell Congress", American Medical News, August 14, 1981.

engaged in the provision of such care. It should be pointed out that this survey does not include cost for physician services which some studies have documented to be as high as 16% of the total costs.[1] While only the significant findings are presented in this report, some detailed tables are presented in Appendix P. References to specific tables are cited in parentheses throughout the text.

Based on this study, the total cost for neonatal intensive care in 1981 was $17,337,776, representing approximately 73% of total charges which amounted to $23,642,938 (Table 1, Appendix P). If adjusted to include the sixth hospital, these figures become $20,116,404 and $27,448,500 respectively. The average cost per patient day was $436 with a range from $221 to $493. The average cost per admission was $8,495 and the average length of stay was 19.5 days. In comparing data by payment source, it was found that patients who had no insurance or were supported by a state or local payment program (Medicaid, Maternal and Child Health Hospitalization, state/local hospitalization) had longer lengths of stay. Patients in this latter category averaged 22.5 days while Blue Cross and commercially insured patients averaged only 17.3 days (Table 2, Appendix P). This longer length of stay for these patients may be explained by the fact that this group of indigent patients are more likely to have higher risk conditions; plus the likelihood of an early discharge in diminished when 1) community hospitals are less willing to accept an admission with no payment source or whose payment source has "run out" and/or 2) discharge to the home is less feasible given the socioeconomic situation. The average cost of a patient covered by commercial insurance was approximately $4,300 while costs for Medicaid patients were approximately $10,600.

A comparison of reimbursement by payment source for five of the six centers is presented below.

REIMBURSEMENT BY PAYOR

	Patient Days	Patient Day %	Reimbursement	Reimbursement %
Blue Cross	11,924	30.0	$ 5,854,912	44.0
Medicaid	8,334	20.9	2,179,857	16.4
MCH and SLH	4,696	11.8	669,780	5.0
Commercial Insurance	8,626	21.7	4,184,261	31.4
Self Pay	6,225	15.6	430,834	3.2
TOTAL	39,805	100.0%	$13,319,644	100.0%

This table illustrates the fact that private and commercial third party payors reimburse a disproportionate share of the benefits. Blue Cross and other commercial insurers incur 51.7% of the patient load but pay for 75.4% of the services. State and local payment systems pay for 32.7% of the patients and reimburse for only 21.4% of the total. It is also worth noting that these same state and local payment systems incur 49.1% of the write-offs and contractuals (Table 3, Appendix P).

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[1] Ciaran S. Phibbs, Ronald L. Williams, and Roderic H. Phibbs, "Newborn Risk Factors and Costs of Neonatal Intensive Care", Pediatrics, Vol, 68, No. 3, September 1981.

A comparison of total costs to reimbursement is presented in the following table.

COMPARISON OF COST TO REIMBURSEMENT

	Total Reimbursement	Total Cost	Dollars Cost Shifted to Non Neonatal Patients
Blue Cross	$ 5,854,912	$ 5,172,375	$ 682,537
Medicaid	2,179,857	3,584,306	(1,404,449)
MCH and SLH	669,780	2,213,667	(1,543,887)
Commercial Insurance	4,184,261	3,662,894	521,367
Self Pay	430,834	2,704,534	(2,273,700)
Subtotal	$13,319,644	$17,337,776	($4.018.132)
6th Hospital	2,134,955	2,778,628	(643,737)
TOTAL	$15,455,599	$20,116,404	($4,660,805)
Reimbursement/Patient Day		$ 335	
Cost/Patient Day		436	
Unreimbursed Cost/Patient Day		101	

Of the payor classifications, only those covered by Blue Cross or other commercial insurance actually paid more than cost. Medicaid, although it reimburses at its definition of allowable costs, only covers patients through the first 21 days of stay. As many other studies have shown, reimbursement for neonatal intensive care is significantly below the cost. For this study, costs exceed reimbursement by over $4 million; factoring in patient days for the sixth hospital raises this differential to approximately $4.7 million on an annual basis.

In comparing reimbursement to charges (Table 3 in Appendix Q), it was found that the average charge per patient day ($594) as compared to the average reimbursement per patient day ($335) results in total write-offs (bad debts and contractuals) of $12 million. In order to continue neonatal programs, hospitals must shift the costs to private patients, a practice commonly referred to as cost-shifting.

In summary, the data collected from the Council's survey of intensive care units have revealed that, annually, 23% of total hospital costs for neonatal intensive care are not reimbursed. On a per patient day basis, this amounts to $101 of unreimbursed cost per patient day. From this information, the Council concludes that an estimated $4.7 million is required to support the existing neonatal intensive care units in the Commonwealth in order that such units can continue to provide the necessary care to the most seriously at-risk newborns.

In addition to the cost of providing neonatal intensive care, the Council also has attempted to estimate the cost of providing neonatal intermediate care in non-regional center hospitals. It is the Council's belief that unless there is adequate reimbursement for newborns treated in hospitals having intermediate care capabilities, all such newborns having no payment source would be inappropriately referred to regional centers, thus exacerbating the financial viability of regional center units plus placing an undue demand on the limited number of stations in regional centers.

In arriving at its cost estimates, the Council assumed, based on national trends, that 4% of all births occurring at non-regional center hospitals (exclusive of Perinatal Region I) having intermediate care capabilities would

require intermediate care. (The Council assumed that admissions for intermediate care within these hospitals would originate from in-born deliveries, not referrals from other hospitals.) Multiplying this number (587) times the average length of stay (19.5) and the average "loss" per patient day ($101) (based on the Council's survey of intensive care units), the Council concludes that approximately $1,155,466 annually is required to support the provision of intermediate care in non-regional center hospitals in Virginia.

As identified previously in this report, a major problem in the perinatal system in the state is the lack of a regional center or referral center serving the population in the far southwest (Perinatal Region I). Since the figure of $1.1 million only represents the resources required for intermediate care in hospitals exclusive of Region I, the Council believes that an additional amount would be required to support the development of a referral center(s) at the intermediate level in Perinatal Region I. The additional amount to support such a center(s) is approximately $294,000. This amount is derived from the following formula:

# Births by Place of Occurrence 1980 (Perinatal Region I)	x	% of Risk For Intermediate Care	x	Average Length of Stay	x	Unreimbursed Cost Per Patient Day	=	Needed Resources
3713	x	4%	x	19.5	x	101/pt. day	=	$294,010

This annual amount of $294,000 is based on the assumptions that the unit will operate with the same pattern of reimbursement as the existing centers and that the most intensive care infants will continue to be referred to another center with intensive care capabilities. The amount of $294,000 represents operating costs and does not include capitalization and start up costs for space renovation, purchase of equipment, and training of new personnel.

In summary, the additional resources required to support neonatal special care, both intensive and intermediate, have been estimated to be approximately $6.2 million. The breakdown is as follows: $4.7 million for neonatal intensive care, $1.1 million for intermediate care in non-regional center hospitals and $294,000 for an intermediate referral center in Perinatal Region I (Southwest).

B. Cost of Maternity and Routine Newborn Services for Indigent Patients

In order to determine the amount of financial resources required to pay for obstetric and newborn services for low income patients, the Council has developed estimates of the number of low income births, the average cost per delivery and per nursery stay, the amounts reimbursed by third party payment sources, and the resulting unpaid balance which must be charged to the patient. The detailed analysis is presented in Appendix Q with the summary of findings presented below.

The Council estimates that in 1981 approximately 23,200 births occurred to low income women (below 150% of the Federal poverty level). Based on an average cost per hospital delivery of $1,268.66, the total hospital costs for deliveries to low income women was $29,432,912. Using actual data from the Maternal and Child Health Hospitalization Program, State and Local

Hospitalization Program, and Medicaid, and estimating the number of births ... private insurance and self pay patients, the Council estimates that low inc... patients are responsible for approximately $8 million of delivery costs f... which no reimbursement source is available. The table below presents ... summary of the Council's analysis (footnotes for the table are presented ... Appendix Q).

ESTIMATED BIRTHS AND EXPECTED SOURCES OF PAYMENT,
LOW INCOME FAMILIES, 1981

Primary Third Party Coverage	Estimated Number of Births	Hospital Charges Before Allowances		
		Total (1)	Third Party	Patie...
Total	23,200 (2)	$29,432,912	$21,293,302	$8,139,...
No 3rd Party	4,942 (3)	6,269,718	-0-	6,269,...
SLH	492 (4)	624,181	305,705 (4)	318,...
MCH	528 (5)	669,852	598,074 (5)	71,...
VMAP	5,575 (6)	7,072,779	7,072,779	-0-
Private	11,663 (7)	14,796,382	13,316,744	1,479,...

In summary, the Council has identified a major gap in the perinatal system as the failure of many women to receive adequate prenatal and delivery services. A primary factor contributing to this inadequate care is the patients' inability to pay for such care, especially at the time of delivery. Based on the above analysis, the Council estimates that approximately $8.1 million is needed to ensure the financial accessibility to appropriate maternity care, including both prenatal and delivery services, for all low income women.

C. Cost of Neonatal Transport System

A major component of a regional perinatal system is transport capabilities for newborns and high risk mothers. The issue and problems surrounding appropriate transport are discussed previously in this report. This section of the report presents the costs associated with providing neonatal transport in the state. Data on maternal transports and associated costs were not available for analysis and are thus not addressed in this section of the report. As previously discussed in the section of the report which addresses maternal transfers, the Council believes that, where practical, the existing system of emergency rescue squads should be responsible for meeting the needs for maternal transfer for high risk mothers.

In developing cost estimates for a neonatal transport system, the Council employed operating cost data generated by the University of Virginia and applied them to actual utilization data supplied by the six hospitals serving as referral centers for neonatal transports. On a statewide basis, the annual operating costs for a neonatal transport system are approximately $482,660 with an average cost per transport of $528.00. The data are presented in the following table.

COSTS OF NEONATAL TRANSPORTS IN VIRGINIA, 1981

Regional Center	Total # Neonatal Transports 1981	Average Round Trip Mileage	Average Time Per Transport	Total Mileage	Total # Hours	Costs		
						Mileage	Personnel	Total
Roanoke Memorial	78	135.9	6.3	10,600.2	491.4	34,450.65	27,027	61,477.65
Virginia Baptist	96	110	4.9	10,560	470.4	34,320	25,872	60,192.00
Univ. of VA-air*	55		8.6		473	40,108.25	26,015	173,225.50
ground	129	148	6.35	19,092	819.2	62,049	45,053	
Medical College of Virginia	315	53.1	3.0	16,726.5	945	54,361.13	51,975	106,336.13
Fairfax Hospital	35	60	2.0	2,100	70	6,825	3,850	10,675
Childrens Hospital of the King's Daughters**	206	38	4.0	7,828	824	25,441	45,320	70,761
Total State	914							$482,660.66

NOTES: *The University of Virginia operates air transport for a major portion of Southwest Virginia; cost per trip is $729.25.

**An additional 164 transported from Norfolk General.

Based on a three month study of the Newborn Emergency Transportation System (NETS) at the University of Virginia, average cost figures are as follows: cost per mile = $3.25, cost per hour = $55.00.

As pointed out in this report, a major gap in the statewide transport system is the lack of adequate neonatal transport for the far southwest portion of the state (Perinatal Region I). Since operating costs for neonatal transport were included in the previous neonatal cost figures for the six existing regional centers, the Council has identified that additional funds for neonatal transport should be directed toward the Southwest region.

In preparing an estimate of resources required for ensuring adequate transport capabilities in the Southwest, the Council applied the average cost per transport (528) times the number of actual transports (68) from all community hospitals in Perinatal Region I which occurred in 1980. Using this approach, the Council estimates that $35,904 on an annual basis would be required to support the operation of the neonatal transport system for Perinatal Region I. It should be pointed out that this amount does not include the capital costs for equipment purchase.

D. Cost of Perinatal Education

As previously discussed, a major responsibility of regional centers is perinatal education for providers and patients in their respective regions. In developing cost estimates for this educational component, the Council adapted budget figures for the Perinatal Continuing Education Program (PCEP) developed and implemented by the University of Virginia. The suggested budget for a comprehensive education program is presented below.

SUGGESTED BUDGET REGIONAL PERINATAL CENTER
COMPREHENSIVE EDUCATIONAL COMPONENT

	% time	
Personnel		
Physician	10%	5,000
Nurse Educator	100%	20,000
Health Education Coordinator	100%	17,000
Secretary	50%	5,000
		47,000
Fringe Benefits	20% salaries	9,400
		56,400
Travel		
Coordinators Training Workshop Mileage/Lodging/Meals		2,100
Staff Mileage/Lodging/Meals		1,400
		3,500
Supplies		
Office		500
Educational (Films, models, textbooks)		12,000
		12,500
Contractual		
Printing, media, etc.		4,000
Operating Expenses (telephone, postage, xeroxing)		2,500
		$78,900

It is estimated that seven (7) Regional Perinatal Centers are needed to address this health issue statewide. Each Center would be developed uniquely and budgets would be planned accordingly. Using the suggested budget, the Council concludes that $551,900 would be required to fund a comprehensive education program component on a statewide basis.

In addition to the provider and patient education aspects which are the primary responsibilities of the regional centers, a major element of perinatal education is community awareness and information. As recommended in the section of this report which discusses education services, the Department of Health should have the primary responsibility for coordinating the various community agencies and directing their efforts in a statewide public awareness campaign on the benefits of good perinatal care. Resources required by the Department to undertake such a task are estimated to be $30,000. Current public education efforts sponsored by the Department of Mental Health and Mental Retardation, Community Services Boards, and Associations for Retarded Citizens operate with minimal, one time only grant support. These programs should be continued, at minimal additional cost to the Commonwealth.

E. Summary and Conclusions

This section of the report has presented estimates of the resources required to support a regional perinatal system, including direct patient care, transport, and education. The Council believes that such resources are necessary to ensure that all components of the system are in place in order to appropriately respond to the issues and problems identified in this report. A summary of the required resources are as follows:

RESOURCES REQUIRED FOR A REGIONAL PERINATAL SYSTEM
FOR VIRGINIA

PATIENT CARE:		
Neonatal Care		
Neonatal Intensive Care		$ 4,700,000
Neonatal Intermediate Care		1,155,460
Referral Center for Perinatal Region I		294,010
Maternity Care (prenatal, delivery and normal newborn)		8,139,610
	Subtotal	$14,289,086
TRANSPORT SYSTEM:		
Neonatal Transport for Perinatal Region I[1]		$ 35,904
Maternal Transport[2]		-0-
	Subtotal	$ 35,904
EDUCATION COMPONENT:		
Provider/Patient Education by Regional Centers		$ 551,900
Public Awareness Campaign by Department of Health		$ 30,000
	Subtotal	$ 581,900
	TOTAL RESOURCES	$14,906,890

[1]Resources required for neonatal transport for Regions II-VII are included under resources required for patient care.
[2]The Council assumes that existing appropriations for local rescue squads should be used to support the needs of a maternal transport system.

The Council believes that the estimated need for resources in the amount of $14,906,890 annually is reasonable and is consistent with the amounts appropriated for perinatal care in other states which have established perinatal systems. When reduced by the amount of $1,750,000, which, during the 1982 General Assembly session, was appropriated for fiscal year 1984 for the purposes of neonatal intensive care and high risk maternity services, the total annual amount needed for perinatal care is approximately $13.2 million.

The Council recognizes that funding for perinatal care must be viewed in light of the other needs and priorities in the Commonwealth; however, the Council firmly believes that the long term benefits accrued as a result of improving the care provided to newborns and expectant mothers justify the level of financial investment. As previously pointed out in this report, the cost-effectiveness of providing adequate perinatal care, in terms of the potential savings in state expenditures for long-term institutionalization for mental retardation, has been demonstrated. (See Appendix O).

V. CONCLUSIONS AND RECOMMENDATIONS

The State Perinatal Services Advisory Council has assessed the factors which are related to the high infant and perinatal mortality rates in Virginia. Based on its study, the Council has determined that low birth weight of the newborn is the major predictor of subsequent mortality and morbidity. Such findings are consistent with previous studies conducted on a national basis and in other states. In examining factors which contribute to the probability of delivering a low birth weight infant the Council identified five major characteristics of the

...ter as having significant relationship with pregnancy outcome. ... characteristics are: receipt of prenatal care, race, age, marital status, ... education. Specifically, from its analysis the Council concludes that expec... mothers who receive no prenatal care, are nonwhite, are less than 18 years of ... have less than a high school education, and who are not married to the fathe... ... infant are two to four times as likely to deliver a low birth weight in ... than are mothers without these characteristics. Although national studies ... show certain health practices during pregnancy, such as nutrition, smoking, ... use of alcohol, are also related to low birth weight, reliable Virginia data wo... not available to document this relationship.

The Council's assessment of current perinatal care services provided in ... State revealed that certain gaps and deficiencies exist. Many elements that ... critical to the existence of a regionalized system of perinatal care requi... further development, improved coordination, and additional financial suppor... Based on its analysis of perinatal costs, the Council estimates that approximate... $18.2 million in additional resources are required annually to ensure that ... regional system of care is in place and that specific recommendations ... improving the current system can be implemented in order that improved perinat... statistics be realized.

The extent to which the combined forces of prevention and treatment wi... continue to improve perinatal health status in the future has been we... documented. Specifically, in several states where neonatal intensive care ... regionalized perinatal programs have been initiated and funded, accelerated rate... of decline in selected perinatal statistics have been realized.[1] In order t... improve such statistics for Virginia, the Council has formulated recommendations... for addressing the needs for developing a formal system of regionalized care. These recommendations are focused on educational services and community based programs aimed at identifying women at high risk and ensuring their access to adequate medical care before, during, and after pregnancy. In addition, the recommendations point toward the need for improved clinical and support services aimed at preventing low birth weight babies and at increasing the chances for survival of those low weight infants who are born. In summary, the Council's recommendations cover a broad range of services; their successful implementation is dependent upon cooperative actions of both private and public sector providers and upon the appropriate level of financial support.

The recommendations presented below are organized, for the most part, by the primary actor(s) responsible for their implementation. Where possible, the recommendations have been grouped according to the type of service or problem being addressed. The resources required for implementation are incorporated within the legislative action requesting additional appropriations.

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[1] Telephone interviews with officials in the states of North Carolina, Wisconsin ... Arizona.

Arizona Department of Health Services, 1980 Arizona Vital Health Statistics, pp. ..., 94.

Wisconsin Department of Health and Social Services, Division of Health, Bureau of Health Statistics, Public Health Statistics, 1979, p. 17.

OMMENDATIONS OF THE COUNCIL

1. In order to increase public and local community awareness of perinatal health problems, the Department of Health, in cooperation with the Department of Mental Health and Mental Retardation, the Department of Education, regional perinatal centers, local Community Services Boards, and appropriate private sector provider organizations, should:

   a. Develop and conduct a media campaign to educate the public about the specific perinatal health problems in Virginia, including the extent of teenage pregnancy. Specifically, it is recommended that the Department:

      - implement appropriate segments of the "Healthy Mothers, Healthy Babies"[1] media campaign to promote awareness of need for prenatal care and the potential impact of lifestyle risk factors on pregnant women. The campaign should be directed toward those women identified as being most likely to deliver low birth weight infants.

      - request the Governor to designate a specific month for "Healthy Mothers, Healthy Babies" and to assist in media events to gain visibility for the program. Assistance should be secured from community agencies and organizations, including State and community libraries, in developing and implementing a health information campaign during the month.

      - develop and coordinate a statewide plan for prenatal information distribution, including such mechanisms as Health Fairs.

      - develop an inventory of community agencies and organizations providing a variety of patient/consumer educational programs which are related to perinatal risk factors.

   b. Designate an educational planning committee with representation from programs such as Special Supplemental Food Program for Women, Infants and Children (WIC), Health Education-Risk Reduction (HERR), Family Planning, and High Blood Pressure Control. The purpose of this committee would be to coordinate the efforts of these programs to strengthen their educational impact on improving pregnancy outcome.

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[1] A national coalition for Healthy Mothers, Healthy Babies has been established with representatives from 20 national organizations and government agencies. One of the objectives of this group is to make available resources and materials for use in public education campaigns. The Virginia State Health Department will receive current information via a newsletter and staff representation on the national steering committee.

c. Assist local health departments in developing strategies and educational material for informing communities about the extent of teenage pregnancy. These efforts should be coordinated with and supportive of the coalitions formed by local Community Services Boards and Associations for Retarded Citizens to promote public education for mental retardation prevention. Communities which do not have family life education within public schools should be identified and strongly encouraged to initiate such curriculum.

2. In order to ensure availability and accessibility of quality medical care, including prenatal, obstetric, and neonatal care for women and their newborns, especially those with low incomes, the Department should:

a. Through its local health departments, identify those low-income maternity patients and their newborns who are receiving inadequate prenatal, delivery, and routine newborn services. For such patients, the Department should, if it is financially feasible, establish formal contractual arrangements with local providers who are available and willing to contract for the provison of adequate care.

b. Direct local health departments to employ "Prenatal Risk Assessment and Patient Care Guidelines" and "Guidelines for the Delivery of Prenatal Care in Ambulatory Settings" (as proposed by the Council).

c. Direct resources of the Maternal and Child Health Block Grant to services which can prevent or reduce the incidence of low birth weight infants, including prenatal care, family planning, patient education and nutrition to ensure such services are available for indigent women in the State. These resources should be targeted to the groups most likely to deliver low birth weight infants.

d. Expand the existing neonatal hospitalization program to ensure that reimbursement for neonatal special care, both intensive and intermediate, is adequate to cover the cost of care provided.

e. Promote the use of "Guidelines for Inpatient Obstetrical and Newborn Care", "Guidelines for Neonatal Special Care" and "Minimal Requirements of Neonatal Transport Personnel" (as proposed by the Council) in all hospitals providing newborn and maternity care. Utilize the inpatient obstetrical, newborn and neonatal special care guidelines in the review of new services under the certificate of public need program.

f. Participate more actively in the placement of National Health Service Corps physicians in areas experiencing OB/GYN and/or pediatric manpower shortages and in areas with hospitals providing maternity services that do not currently have appropriate physician coverage.

3. In order to improve the availability and the type of perinatal personnel within Virginia, the State Perinatal Services Advisory Council strongly advises:

a. The State Board of Nursing to study the need for placing more emphasis on the perinatal/neonatal intensive care clinical aspect of the nursing education curriculum.

b. The Virginia Community College System to develop an educational program to train a new specialist, the "biomedical technician." This specialist would perform equipment monitoring functions in the neonatal intensive care unit that are currently being performed by nurses, thereby allowing nurses to devote, appropriately, more time to direct patient care.

c. All regional centers to develop a new nursing classification, the "Perinatal Nurse Clinician". For the two existing State-funded perinatal referral centers, Medical College of Virginia and University of Virginia, this new classification would be developed by the Department of Personnel and Training. The Perinatal Nurse Clinician classification would create a promotional step in a clinical ladder for nurses giving direct patient care in high risk delivery services and neonatal intensive care units, thereby encouraging nurses to stay at the bedside.

d. The regional Health Systems Agencies, in cooperation with local hospitals and providers, to develop strategies for recruiting OB/GYN and pediatric physicians in areas of need.

e. The Virginia Hospital Association to implement the following:

- Determine the extent to which the recommendations of the inactive nurse study are being implemented in hospitals providing maternity services. Hospitals identified as not implementing the recommendations should be encouraged to do so. Particular emphasis should be placed on encouraging hospitals to provide child care services for employees on a 24-hour basis and to provide flexible working hours.

- Study those hospitals which have implemented the recommendations to determine if registered nurse recruitment has improved and turnover decreased.

In order to promote the delivery of quality perinatal care and regionalization of such care, professional organizations represented on the Perinatal Council should distribute and strongly encourage their respective private sector providers of perinatal care to utilize the following guidelines, as proposed by the Council:

a. "Prenatal Risk Assessment and Patient Care Guidelines".

b. "Guidelines for the Delivery of Prenatal Care in Ambulatory Settings".

c. "Guidelines for Inpatient Obstetrical and Newborn Care".

d. "Guidelines for Neonatal Special Care".

e. "Guidelines Concerning Maternal Transfer".

f. "Minimal Requirements of Neonatal Transport Personnel".

5. To further the development of regionalization of perinatal care, the Department of Health should develop and implement a process for formal designation of regional perinatal centers in Virginia with priority attention being directed toward the establishment of an intermediate level perinatal referral center for the far Southwest area of the State (Perinatal Region I) having neonatal transport capabilities. Designated regional centers should:

   a. Provide high risk perinatal care and ensure that transport, education, and consultation services are available within the region.

   b. Provide a designated coordinator responsible for the planning, implementation, and evaluation of provider and patient/consumer education programs in the geographical area of responsibility. Such programs should include information on the following: the most recent management of high risk obstetrical and neonatal conditions, the targeted groups of women most likely to deliver low birth weight infants, use of transport for at-risk patients, and the benefits of receiving quality prenatal care.

   c. Include neonatal intensive care training within the continuing education programs for non-registered nurse personnel, such as licensed practical nurses, lab technicians, respiratory therapists and bioengineers in order to promote the efficient and effective utilization of nurse personnel in the neonatal intensive care unit.

   d. Work cooperatively to initiate the establishment of a statewide neonatal consultation and referral network "hotline" and bed registry.

LEGISLATIVE ACTIONS

In order that sufficient resources are available to support and implement the above recommendations, the Virginia General Assembly should:

   a. Identify perinatal care as a major priority for new funding and should increase appropriations, over time, for perinatal programs to the level of resources identified in this report. The Council recommends that appropriations for perinatal care be phased in over a four year period based on the following priorities and timetable:

Item	FY 85	FY 86	FY 87	FY 88
Maternal and Child Health Services				
1. Establishment of intermediate level perinatal referral center in Southwest Virginia with support for neonatal transport system.	$ 294,000* 35,900**	$ 35,900**	$ 35,900**	$ 35,900**
Implementation of provider/patient education programs by regional centers and public awareness programs by Department of Health.	581,900	581,900	581,900	581,900
3. Establishment of financial contracts between local health departments and local providers for provision of prenatal and delivery services, to be administered by the Department of Health.	1,847,400	3,694,800	5,542,200	7,389,600
4. Expansion of existing neonatal hospitalization program to ensure support for hospitals providing neonatal intensive and intermediate care.	1,213,800	2,721,750	3,935,600	5,149,500
TOTAL ADDITIONAL FUNDING***	$3,973,000	$7,034,350	$10,095,600	$13,156,900

*Operating Support (The $294,000 required for fiscal years 86, 87, and 88 are included in the figures for item number 4.)
**Transport System
***Totals may not add due to rounding

b. Identify perinatal services as priority for funding within existing state programs such as the State and Local Hospitalization Program and the Medical Assistance Program.

c. Continue to monitor the improvements in the perinatal care system and the resources required to implement such a system through regular reports from the State Health Department and the State Perinatal Services Advisory Council.

APPENDIX A

DEFINITIONS OF TERMS

Fetal Death = Death caused by an induced abortion or the death prior to the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy

Hebdomadal Death = An infant death under one week of age

Infant Mortality Rate =

$$\frac{\text{Number of deaths under one year of age} \times 1{,}000}{\text{Total number of live births}}$$

Live Birth = The complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy, which after such expulsion or extraction, breathes, or shows any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached

Low Birth Weight Rate =

$$\frac{\text{Number of live births under 2501 grams} \times 1{,}000}{\text{Total number of live births}}$$

Natural Fetal Death = A fetal death that is not an induced abortion

Natural Fetal Death Rate =

$$\frac{\text{Number of natural fetal deaths} \times 1{,}000}{\text{Total number of live births} + \text{Number of natural fetal deaths}}$$

Neonatal Mortality Rate =

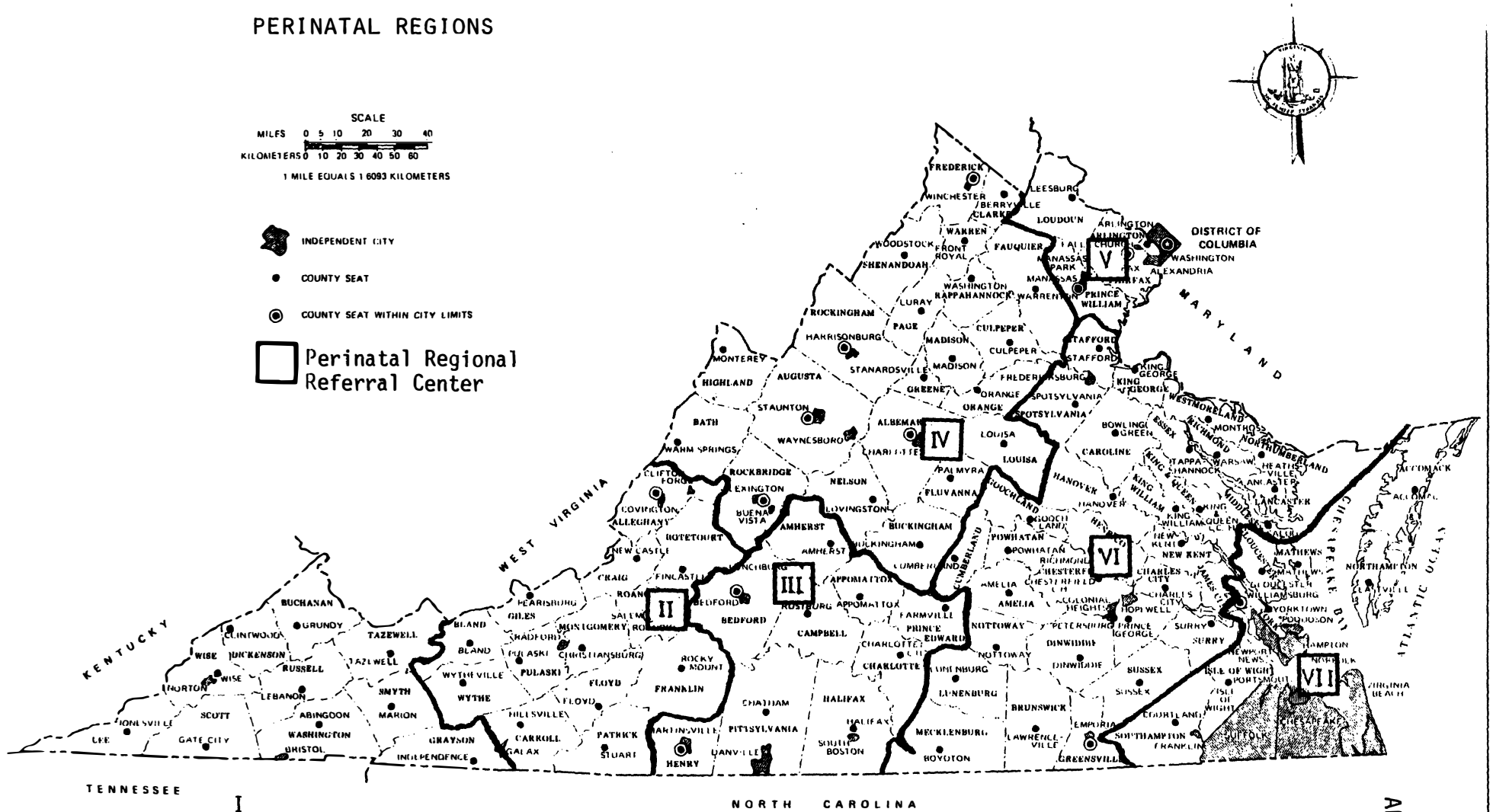
$$\frac{\text{Number of deaths under 28 days of age} \times 1{,}000}{\text{Total number of live births}}$$

Perinatal Mortality Rate =

$$\frac{(\text{Number of deaths under one week of age} + \text{number of fetal deaths 28 weeks and over gestation}) \times 1{,}000}{\text{Total number of live births} + \text{number of fetal deaths 28 weeks and over gestation}}$$

COMMONWEALTH OF VIRGINIA

PERINATAL REGIONS



APPENDIX B

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APPENDIX C

CRITERIA AND STANDARDS FOR REGIONAL PERINATAL CENTERS*

1.0 DEFINITION OF TERMS

A Regional Perinatal Center provides the most sophisticated diagnostic and therapeutic techniques available to deal with high risk prenatal care, high risk delivery, and neonatal intensive care. Subspecialty staff, advanced equipment, medical education, consultation, and emergency transport mark the activities of these centers.

Perinatal Regions will be identified by the State Perinatal Council so that reasonable access into the system of perinatal care will be provided for all residents of the region. Regions will be identified based on the standards concerning service area size for a Regional Center and/or geographic accessibility factors.

A Regional Center must contain a high risk maternity unit including prolonged antepartum capabilities within critical care delivery suites. A Regional Center also must contain a Neonatal Special Care Unit (NSCU) as defined within section 4.0 of the 1979 State Medical Facilities Plan (SMFP). Such a unit within a Regional Center must contain a full continuum of care: continuing, intermediate, and intensive (see section 4.0, 1979 SMFP, for definitions of types of care.)

One Regional Center will be designated to serve the whole region and be the focal point of the region's activity. The Regional Center has the major responsibility and obligation for providing 1) consultation services to other hospitals within the region, 2) coordination of transportation services for maternal and newborn patients, 3) preparatory and continuing education services for perinatal health care professionals, and 4) evaluation of the effectiveness of perinatal care for the region.

2.0 SPECIFIC CRITERIA AND STANDARDS

Each Regional Perinatal Center should demonstrate its capability of meeting and complying with the following criteria and standards:

Criteria	Standards
I. AVAILABILITY	
A. Service Capacity in Planning Area	
1. Service Area Size	The service area size for a Regional Perinatal Center may be expressed in terms of the number of annual live births for the region. National

*These criteria and standards will be reviewed and revised, as necessary, prior to the formal designation of regional centers.

studies have suggested that 8,000 - 12,000 births generate an economic base adequate to support a tertiary perinatal center. It is recommended for Virginia that an extension of this range, either higher or lower, be justified in light of current physician referral patterns, geographic accessibility factors, population density of the area being served, and existing perinatal resources. As it is demonstrated that the resources of the Regional Center are not adequate to serve an increasing volume of births or are inefficiently utilized in serving a diminishing population, alternative courses of action should be considered as follows:

a. designation, within a region, of referral centers having capabilities for providing intensive high risk services while retaining educational, consultation, transport, and evaluation responsibilities at the Regional Center.

b. examination of current referrals into the Regional Center in order to redirect the less intensive referrals to other hospitals in the region, while reserving the more intensive patients for the regional center; or

c. establishment of an additional region for which a new Regional Center must be designated.

d. redistricting regional boundaries in order to redistribute births.

2. Number of Regional Centers per Region

There should be only one designated Regional Perinatal Center per region. (Note this does not limit the number of neonatal special care units or high risk obstetrical referral services.)

B. Rates of Service Utilization:

Occupancy Levels

The recommended annual occupancy rate for an obstetrical unit within a Regional Center is 75 percent.

The recommended annual occupancy rate for a neonatal special care unit (including intermediate and intensive care bassinets) within a Regional Center is 85 percent.

II. ACCESSIBILITY

A. Geographic Accessibility

A Regional Perinatal center should be within two hours usual driving time of the residents within its service area. For those counties which are beyond the two hour driving time and for which there is no facility qualified as a Regional Perinatal Center, alternative systems should be in place e.g. emergency transport mechanisms for high risk referrals (air transport) or mobile perinatal teams for providing services to high risk maternal patients at sites more accessible to patients.

III. QUALITY

A. Unit Size

A high risk maternity unit within a Regional Center should contain a minimum of two OB intensive care beds and five long term antepartum beds.

A single neonatal special care unit in a Regional Perinatal Center should contain a minimum of 15 stations. (not including continuing care stations).*

B. In-Service Training and Continuing Education

Each Regional Center should develop a curriculum for in-service training and conduct the following in-service education efforts:

*Exceptions may be necessary for regions with low numbers of births (see Section 2.0 I.A. 1)

1) monthly training classes for all personnel in the Center's inpatient or outpatient service areas;

2) monthly perinatal conferences to present:

   a) all cases of maternal or infant morbidity and mortality

   b) all cases of patients transported from one center to another and reasons for transfer

   c) problems in program development

   d) maintenance of coordination between hospitals within region of responsibility.

C. Outreach Education

Each Regional Center should assure that educational services are provided to perinatal health care professionals within its region according to the following guidelines:

1) designate a small multidisciplinary group to be responsible for the planning and provision of education services.

2) plan courses for all personnel involved in patient care.

3) involve personnel of all component hospitals in the region in the planning of courses.

4) evaluate educational services to determine their effectiveness.

D. Availability of Qualified Personnel

Physician and Nursing services must meet the minimum standards as set forth in the Rules and Regulations for the licensure of general and special hospitals (as revised to

include Maternity Hospitals). In addition, it is recommended that each Regional Perinatal Center provide in its obstetric and newborn services the following staff:

1) Obstetric

a) a director who is a board certified obstetrician gynecologist.

b) a board certified obstetrician with special training and interest in fetal and maternal medicine.

c) an anesthesiologist with special training and experience in obstetrical anesthesia should be available.

d) an anesthesiologist or nurse anesthetist with experience in obstetrical anesthesia should be available at all times.

e) a majority of physicians doing deliveries that are board eligible or certified in obstetrics and gynecology.

f) Nursing personnel to include:

-In the intensive care area-a minimum of 12-24 RN nursing hours per patient per day.

-In the delivery area-two registered nurses (RNs) or one RN and one licensed practical nurse (LPN) with special training and experience for each four labor beds.

-In the recovery area-one RN or one LPN for every three obstetric beds.

-In the patient housing unit-one RN and one LPN per 12-16 beds.

2) Newborn Service

a) a director who is a board certified pediatrician.

b) a board eligible or board certified neonatologist.

c) In the Intermediate Care Area:

-6-12 licensed nursing hours per patient per day

d) In the Intensive Care Area:

-12-24 licensed nursing hours per patient per day

3) Obstetric and Newborn Services

It is recommended that each Regional Center provide for both the obstetric and newborn services:

a) A medical social worker familiar with the family problems arising from severe illness in a mother or her newborn baby.

b) A nutritionist or registered dietician familiar with maternal and newborn dietary therapy.

E. Availability of Adequate Patient Review Processes

Each Regional Perinatal Center must evaluate the quality of care provided by the center and its related services by:

1) appointing and maintaining a small but multi-disciplinary committee for critical confidential review of all cases of maternal, fetal neonatal mortality morbidity.

2) conducting such a review on a monthly basis.

3) making known to the responsible physician or nurse the findings of this review when that is advisable in the judgement of the committee.

4) introducing into the didactic training and into monthly conferences topics related to observed management problems.

5) submitting to the Director of Newborn Services or Perinatal Services quarterly statistical and financial reports which may be required.

6) collecting any data required to conduct the overall program evaluation.

7) cooperating with administration or other facilities in an effort to evaluate the services within the region.

F. Facilities/Equipment

It is required that each Regional Perinatal Center comply with the minimal standards for facilities and equipment as required within the Rules and Regulations for the Licensure of general and special hospitals in Virginia (as revised).

In addition, it is recommended that the obstetric unit and neonatal special care unit be located within the same facility or that there be physical, ready access between units e.g. tunnels and other such means.

CONTINUITY

A. Adequacy of Policies Governing the Mechanics of Making Referrals and Consultations

It is recommended that:

1) physicians in each Regional Perinatal Center develop with physicians from other hospitals within the region a list of conditions which when diagnosed in another facility represent indications for consultation; and that such list will be based on minimal guidelines prepared by the State Perinatal Council.

2) each Regional Perinatal Center refer to another facility any gravida or newborn who requires a subspecialty capability not present in the Regional Center;

3) each Regional Center refer back to the referring facility any mother or newborn who required prolonged hospitalization but not sophisticated observation or subspecialty care;

4) physicians referring to a Regional Center be offered options for transferring a high-risk mother and/or infant as follows:

   a) they can refer the patient to the center for total care; or

   b) they can apply for a special category of Regional Center admitting privileges established to allow referring physicians to follow their patients to the Regional Center and participate in the delivery and/or care of infant. It is suggested that such special admitting privileges require that a Regional

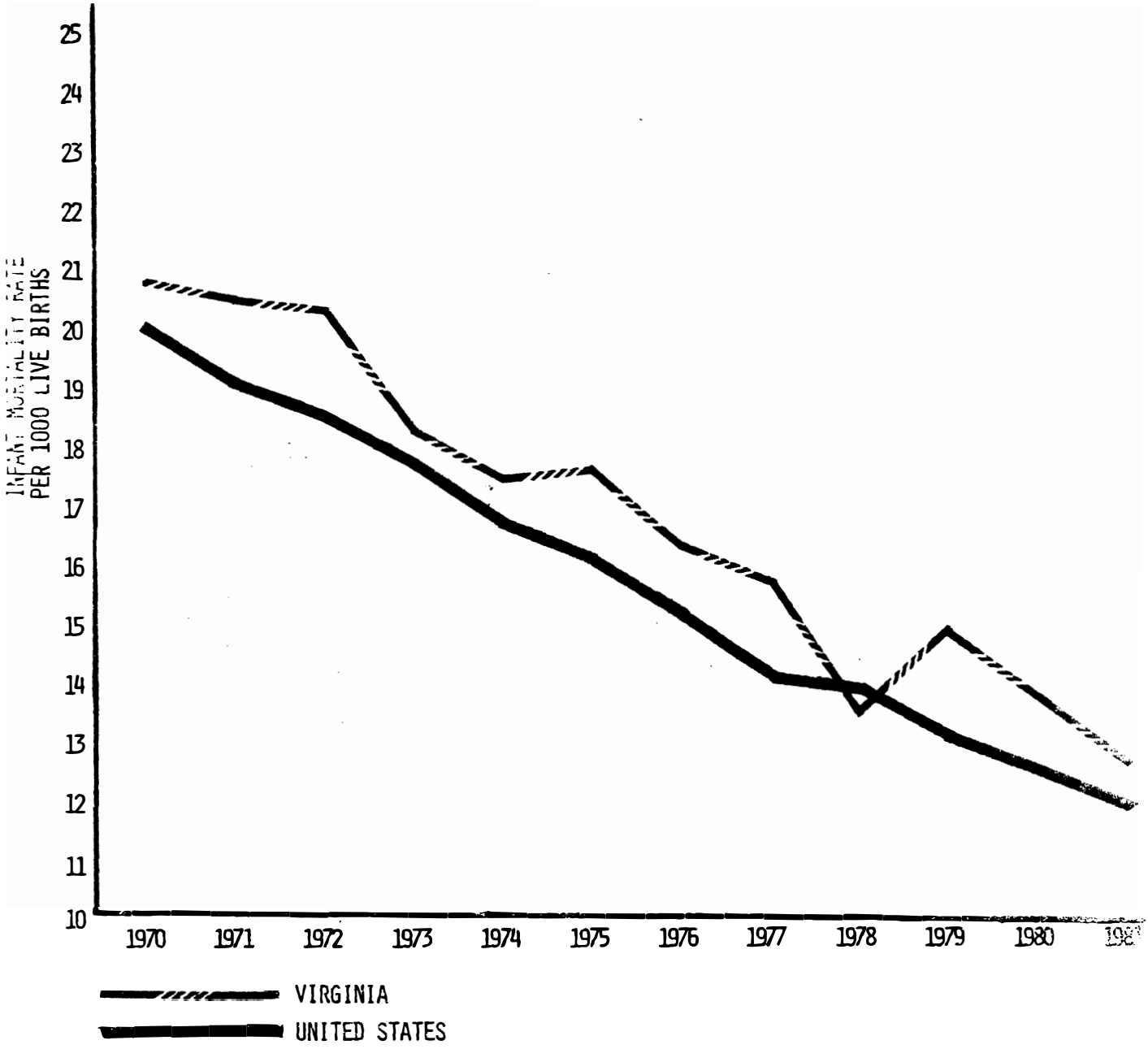
Center perinatal specialist be consulted and that regional center care protocols be followed.

5) each Regional Perinatal Center develop, in association with all transportation units in its region, a system to provide expeditious transport of mothers and newborns from one center to another in accordance with state standards for emergency transport vehicles.

APPENDIX D

FIGURE 1

INFANT MORTALITY RATES
VIRGINIA AND U.S., 1970-1981*



SOURCE: DATA FROM: CENTER FOR HEALTH STATISTICS, STATE DEPARTMENT OF HEALTH.

MONTHLY VITAL STATISTICS REPORT, NATIONAL CENTER FOR HEALTH STATISTICS (NATIONAL DATA).

*PROVISIONAL DATA FOR 1980 AND 1981 NATIONAL INFANT MORTAILITY RATE.

TABLE 2
PERINATAL MORTALITY RATE: U.S. AND
VIRGINIA PERINATAL REGIONS*
1970-1980

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
U.S.	23.0	21.7	21.2	20.1	18.9	17.7	16.7	15.4	14.6	NA	NA
Virginia	25.2	23.8	24.0	21.9	20.6	19.6	18.3	17.0	15.0	15.3	14.
Perinatal Regions											
I Southwest	28.1	30.4	27.1	25.4	23.0	22.7	20.3	18.4	16.9	18.2	16.
II Western	24.9	22.8	25.3	24.2	19.9	23.8	22.0	17.7	15.5	15.5	14.
III Southside	29.3	31.5	26.0	27.6	27.7	18.6	22.3	19.3	19.8	20.9	15.
IV Piedmont	25.0	22.8	24.8	17.5	20.4	16.4	14.5	15.6	13.7	15.2	12.
V Northern	19.6	17.1	17.6	15.2	15.8	15.9	14.6	10.4	10.9	10.6	9.
VI Central	28.5	24.6	27.5	22.1	22.9	21.9	20.7	20.7	17.8	17.6	17.
VII Eastern	25.5	24.7	24.1	24.6	19.9	19.9	17.9	18.3	14.6	14.7	15.

*See map in Appendix B
NA - not available
SOURCE: Monthly Vital Statistics Report, National Center for Health Statistics (national data).
Data from Center for Health Statistics, State Department of Health

TABLE 3
PERINATAL MORTALITY BY WEIGHT OF FETUS OR INFANT
VIRGINIA, 1980

Weight of Fetus or Infant	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths[b]		Perinatal Deaths	
	#	%	#	Rate[c]	#	Rate[c]	#	Rate
Less Than 1 lb. 2 oz. (< 500 grams)	125	0.2	12	87.6	106	773.7	118	791.9
1 lb. 2 oz.-2 lbs. 3 oz. (500-999 grams)	406	0.5	44	97.8	261	580.0	305	677.8
2 lbs. 4 oz.-3 lbs. 4 oz. (1000-1499 grams)	512	0.7	70	120.2	55	94.5	125	214.8
3 lbs. 5 oz.-4 lbs. 6 oz. (1500-1999 grams)	1,119	1.4	51	43.5	39	33.3	90	76.9
4 lbs. 7 oz.-5 lbs. 8 oz. (2000-2500 grams)	3,754	4.8	67	17.5	36	9.4	103	26.9
Over 5 lbs. 8 oz. (2501 grams and more)	72,421	92.4	128	1.8	101	1.4	228	3.1
TOTAL	78,423[d]	100.0	453[e]	-	643[f]	-	1,096	-

[a] 28 weeks and more
[b] A hebdomadal death is an infant death under one week of age
[c] Per 1000 live births + natural fetal deaths
[d] Includes 86 unknowns
[e] Includes 81 unknowns
[f] Includes 45 unknowns, excludes 32 hebdomadal deaths due to causes determined to be unpreventable
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 2

NATURAL FETAL DEATHS 28 WEEKS AND MORE BY WEEKS GESTATION, VIRGINIA, 1981

Weeks Gestation	Total		Less Than 1 lb. 2 oz. (≤500 grams)		1 lb. 2 oz.- 2 lbs. 3 oz. (500-999 grams)		2 lbs. 4 oz.- 3 lbs. 4oz. (1000-1499 grams)		3 lbs. 5 oz.- 4 lbs. 6 oz. (1500-1999 grams)		4 lbs. 7 oz.- 5 lbs. 8 oz. (2000-2500 grams)		Over 5 lbs. 8 oz. (2501 grams or more)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
28	38	10.2	6	50.0	13	29.6	16	22.9	2	3.9	1	1.5	0	0.0
29	17	4.6	0	0.0	8	18.2	7	10.0	2	3.9	0	0.0	0	0.0
30	23	6.2	1	8.3	6	13.6	12	17.1	3	5.9	1	1.5	0	0.0
31	7	1.9	1	8.3	2	4.6	2	2.9	1	2.0	0	0.0	1	0.8
32	25	6.7	2	16.7	5	11.4	6	8.6	7	13.7	4	6.0	1	0.8
33	18	4.9	0	0.0	4	9.1	8	11.4	1	2.0	4	6.0	1	0.8
34	22	5.9	1	8.3	1	2.3	6	8.6	9	17.7	4	6.0	1	0.8
35	22	5.9	0	0.0	1	2.3	4	5.7	6	11.8	6	9.0	5	3.9
36	42	11.3	0	0.0	2	4.6	1	1.4	9	17.7	14	20.9	16	12.5
37	28	7.6	0	0.0	0	0.0	7	10.0	3	5.9	6	9.0	12	9.4
38	22	5.9	0	0.0	1	2.3	0	0.0	0	0.0	10	14.9	11	8.6
39	14	3.8	0	0.0	0	0.0	0	0.0	2	3.9	4	6.0	9	7.0
40	62	16.7	0	0.0	1	2.3	1	1.4	5	9.8	11	16.4	44	34.4
41	10	2.7	0	0.0	0	0.0	0	0.0	1	2.0	0	0.0	9	7.0
42	19	5.1	1	8.3	0	0.0	0	0.0	0	0.0	2	3.0	16	12.5
43	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
45	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
47	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
TOTAL	372[a]	100.0	12	100.0	44	100.0	70	100.0	51	100.0	67	100.0	128	100.0

[a]372 + 81 unknowns = 453 total cases SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 5
PERINATAL MORTALITY BY AGE OF MOTHER*
VIRGINIA, 1980

Age of Mother	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths		Perinatal Deaths	
	#	%	#	Rate[b]	#	Rate[b]	#	Rate
Below 18	4,578	5.8	31	6.7	55	11.9	86	18.7
18-25	38,025	48.5	197	5.2	326	8.5	523	13.7
26-35	33,120	42.2	177	5.3	224	6.7	401	12.0
36+	2,691	3.4	44	16.1	29	10.6	73	27.7
TOTAL	78,423[c]	100.0	453[d]	-	643[e]	-	1,096	-

*Chi Square Test significant at .05 level.
[a]28 weeks and more
[b]Per 1000 live births + natural fetal deaths
[c]Includes 9 unknowns
[d]Includes 4 unknowns
[e]Includes 9 unknowns, excludes 32 deaths
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 6
LOW BIRTH WEIGHT BY AGE OF MOTHER*
VIRGINIA, 1980

Age of Mother	All Live Births		Low Weight Births		Low Weight Births per 1000 Live Births
	#	%	#	%	
Below 18	4,578	5.8	531	9.0	116.0
18-25	38,025	48.5	3,102	52.4	81.6
26-35	33,120	42.2	2,051	34.7	61.9
36+	2,691	3.4	231	3.9	85.8
TOTAL	78,423[a]	100.0	5,916[b]	100.0	-

*Chi Square Test significant at .05 level
[a]Includes 9 unknowns
[b]Includes 1 unknown
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 7
PERINATAL MORTALITY BY RACE OF MOTHER*
VIRGINIA, 1980

Race of Mother	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths		Perinatal Deaths	
	#	%	#	Rate[b]	#	Rate[b]	#	Rate
White	58,047	74.0	308	5.3	399	6.8	707	12.1
Non-white	20,376	26.0	145	7.1	246	12.0	391	19.1
TOTAL	78,423	100.0	453	-	643[c]	-	1,096	-

*Chi Square Test significant at .05 level
[a]28 weeks and more
[b]Per 1000 live births + natural fetal deaths
[c]Excludes 32 deaths
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 8
LOW BIRTH WEIGHT BY RACE OF MOTHER*
VIRGINIA, 1980

	All Live Births		Low Weight Births		Low Weight Births per 1000 Live Births
	#	%	#	%	
	58,047	74.0	3,404	56.7	58.6
	20,376	26.0	2,512	43.2	123.3
	78,423	100.0	5,916	100.0	-

* Test significant at .05 level
Data from Center for Health Statistics, State Department of Health

TABLE 9
PERINATAL MORTALITY BY EDUCATION OF MOTHER*
VIRGINIA, 1980

	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths		Perinatal Deaths	
	#	%	#	Rate[b]	#	Rate[b]	#	Rate
	19,552	25.0	111	5.6	214	10.9	325	16.5
	58,653	75.0	223	3.8	410	7.0	633	10.8
	78,423[c]	100.0	453[d]	-	643[e]	-	1,096	-

* Test significant at .05 level
a and more
b Live births + natural fetal deaths
c 218 unknowns
d 119 unknowns
e 89 unknowns, excludes 32 deaths
Data from Center for Health Statistics, State Department of Health

TABLE 10

LOW BIRTH WEIGHT BY EDUCATION OF MOTHER*
VIRGINIA, 1980

	All Live Births		Low Weight Births		Low Weight Births per 1000 Live Births
	#	%	#	%	
	19,552	25.0	2,066	35.1	105.7
	58,653	75.0	3,820	64.9	65.1
	78,423[a]	100.0	5,916[b]	100.0	-

* Test significant at .05 level
a 218 unknowns
b 89 unknowns
Data from Center for Health Statistics, State Department of Health

TABLE 11
PERINATAL MORTALITY BY MARITAL STATUS*
VIRGINIA, 1980

Marital Status	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths		Perinatal Deaths	
	#	%	#	Rate[b]	#	Rate[b]	#	Rate
Married[c]	63,428	80.9	335	5.3	432	6.8	767	12.1
Not Married[d]	14,995	19.1	114[e]	7.5	202[f]	13.4	316	20.9
Total	78,423	100.0	453[e]	-	643[f]	-	1,096	

*Chi Square Test significant at .05 level
[a]28 weeks and more
[b]Per 1,000 live births + natural fetal deaths
[c]The mother of the infant is married to the father of the infant
[d]The mother of the infant is not married to the father of the infant
[e]Includes 4 unknowns
[f]Includes 9 unknowns
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 12
LOW BIRTH WEIGHT BY MARITAL STATUS*
VIRGINIA, 1980

Marital Status	All Live Births		Low Weight Births		Low Weight Births per 1000 Live Births
	#	%	#	%	
Married[a]	63,428	80.9	3,884	65.7	61.2
Not Married[b]	14,995	19.1	2,032	34.3	135.5
Total	78,423	100.0	5,916	100.0	-

*Chi Square Test significant at .05 level
[a]The mother of the infant is married to the father of the infant
[b]The mother of the infant is not married to the father of the infant
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 13
PERINATAL MORTALITY BY PRENATAL CARE*
VIRGINIA, 1980

Mother Received Prenatal Care	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths		Perinatal Deaths	
	#	%	#	Rate[b]	#	Rate[b]	#	Rate
Yes	77,090	99.2	367	4.7	584	7.5	951	12.3
No	621	0.8	14	22.0	38	60.0	52	81.9
Total	78,423[c]	100.0	453[d]	-	643[e]	-	1,096	-

*Chi Square Test significant at .05 level
[a]28 weeks and more
[b]Per 1000 live births + natural fetal deaths
[c]Includes 712 unknowns
[d]Includes 72 unknowns
[e]Includes 21 unknowns, excludes 32 deaths
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 14
LOW BIRTH WEIGHT BY PRENATAL CARE* VIRGINIA, 1980

Mother received prenatal Care	All Live Births #	%	Low Weight Births #	%	Low Weight Births per 1000 Live Births
Yes	77,090	99.2	5,683	97.2	73.7
No	621	0.8	163	2.8	262.5
Total	78,423[a]	100.0	5,916[b]	100.0	-

*Chi Square Test significant at .05 level
[a]Includes 712 unknowns
[b]Includes 70 unknowns
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 15
PERINATAL MORTALITY BY PARITY OF MOTHER* VIRGINIA, 1980

Parity of Mother	All Live Births #	%	Natural Fetal Deaths[a] #	Rate[b]	Hebdomadal Deaths[b] #	Rate	Perinatal Deaths #	Rate
0	36,233	46.2	206	5.7	585	16.1	791	21.7
1-2	36,505	46.6	182	5.0	47	1.3	229	6.2
3+	5,665	7.2	56	9.8	1	0.2	57	10.0
Total	78,423[c]	100.0	453[d]	-	643[e]	-	1,096	-

*Chi Square Test significant at .05 level
[a]28 weeks and more
[b]per 1000 live births + natural fetal deaths
[c]Includes 20 unknowns
[d]Includes 2 unknowns
[e]Includes 10 unknowns, excludes 32 deaths
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 16
LOW BIRTH WEIGHT BY PARITY OF MOTHER VIRGINIA, 1980

Parity of Mother	All Live Births #	%	Low Weight Births #	%	Low Weight Births per 1000 Live Births
0	36,233	46.2	2,843	48.1	78.5
1-2	36,505	46.6	2,568	43.4	70.3
3+	5,665	7.2	503	8.5	88.8
Total	78,423[a]	100.0	5,916[b]	100.0	-

*Chi Square Test significant at .05 level
[a]Includes 20 unknowns
[b]Includes 2 unknowns
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 17
PERINATAL MORTALITY BY PREVIOUS FETAL DEATHS*
VIRGINIA, 1980

Previous Fetal Death	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths		Perinatal Deaths	
	#	%	#	Rate[b]	#	Rate[b]	#	Rate
0	61,345	78.3	339	5.5	429	7.0	768	12.5
1+	17,050	21.7	107	6.2	204	11.9	311	18.1
Total	78,423[c]	100.0	453[d]	-	643[e]	-	1,096	-

*Chi Square Test significant at .05 level
[a]28 weeks and more
[b]Per 1000 live births + natural fetal deaths
[c]Includes 28 unknowns
[d]Includes 7 unknowns
[e]Includes 10 unknowns, excludes 32 deaths
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 18
LOW BIRTH WEIGHT BY PREVIOUS FETAL DEATHS*
VIRGINIA, 1980

Previous Fetal Deaths	All Live Births		Low Weight Births		Low Weight Births per 1000 Live Births
	#	%	#	%	
0	61,345	78.3	4,381	74.1	71.4
1+	17,050	21.7	1,532	25.9	89.9
Total	78,423[e]	100.0	5,916[b]	100.0	-

*Chi Square Test significant at .05 level
[a]Includes 28 unknowns
[b]Includes 3 unknowns
[c]Includes 9 unknowns, excludes 32 deaths
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 19
PERINATAL MORTALITY BY NUMBER OF PREGNANCIES
VIRGINIA, 1980

Pregnancies	All Live Births		Natural Fetal Deaths[a]		Hebdomadal Deaths		Perinatal Deaths	
	#	%	#	Rate[b]	#	Rate[b]	#	Rate
Single	76,922	98.1	411	5.3	550	7.1	961	12.4
Multiple	1,501	1.9	42	27.2	84	54.4	126	81.7
Total	78,423	-	453	-	643[c]	-	1,096	-

[a]28 weeks and more
[b]Per 1000 live births + natural fetal deaths
[c]Includes 9 unknowns, excludes 32 deaths
SOURCE: Data from Center for Health Statistics, State Department of Health

TABLE 20
LOW BIRTH WEIGHT BY NUMBER OF PREGNANCIES
VIRGINIA, 1980

Pregnancies	All Live Births #	All Live Births %	Low Weight Births #	Low Weight Births %	Low Weight Births per 1000 Live Births
Single	76,922	98.1	5,115	86.5	66.5
Multiple	1,501	1.9	801	13.5	533.6
Total	78,423	-	5,916	-	-

SOURCE: Data from Center for Health Statistics, State Department of Health

APPENDIX E

RELATIVE RISK OF LOW BIRTH WEIGHT FOR SELECTED CHARACTERISTICS OF INFANTS BORN IN VIRGINIA, 1980

DATA

The information used in this analysis is from the 1980 Virginia resident birth records. Of the 78,423 records, only 75,957 were single births with complete information; only these were considered. For a record to be complete, it must have had no missing values within the following fields: WEIGHT, RACE of MOTHER, MOTHER'S AGE, MOTHER'S EDUCATION, MARITAL STATUS, BIRTH ORDER, FETAL DEATHS (two fields), MONTH PREGNANCY CARE BEGAN. To facilitate the analysis, these types of information were broken up into the following categories:

WEIGHT - low birth weight (5 lbs., 8 oz. or less), normal birth weight (more than 5 lbs., 8 oz.)
RACE - white, nonwhite
MOTHER'S AGE - below 18, 18-25, 26-35, 36 and above
MOTHER'S EDUCATION - less than 12 years, 12 years or more
MARITAL STATUS - married (married to father of infant)
unmarried (not married to father of infant)
PARITY - 0 previous births, 1 or 2 previous births, 3 or more previous births
FETAL DEATHS - 0 previous fetal deaths, at least one previous fetal death
PRENATAL CARE - no care, care

After extensive descriptive analysis, it was determined that these categories represent fairly homogeneous, meaningful groups that capture the major effects of the characteristics upon the likelihood of a low birth weight infant.

It should be noted that some of these factors could be masks for other items. For example, RACE might not be indicative of any substantive differences among races, but could well show the effect of socioeconomic differences.

ANALYSIS

1. Single Characteristics

An analysis was performed on each single characteristic. Relative risk is calculated by the formula:

$$R.R. = \frac{\text{Incidence of Low Birth Weight Among Infants with the Characteristic}}{\text{Incidence of Low Birth Weight Among Live Births}}$$

The following example illustrates the method for calculating the relative risk of delivering a low birth weight infant:

$$\frac{\text{Incidence of low birth weight among unmarried mothers}}{\text{Incidence of low birth weight among live births}}$$

$$\frac{(1{,}791 \div 14{,}463)}{(5{,}030 \div 75{,}953)} = \frac{.1238}{.0662} = 1.9$$

A relative risk of 1 indicates the chance of delivering a low birth weight nt is not different with or without the characteristic; more than 1 indicates eater chance with the characteristic; less than 1 indicates a smaller chance the characteristic. Thus, unmarried mothers are 1.9 times more likely than population as a whole to deliver a low birth weight infant.

The relative risk values were then adjusted so that the lowest risks assumed ues of one, and other values were increased proportionally.

To compute the adjusted relative risk, the relative risk for unmarried hers was divided by the relative risk for married mothers (1.9 ÷ 0.8 = 2.4).

The adjusted relative risk for unmarried mothers states that unmarried hers are 2.4 times more likely than married mothers to deliver a low birth ight infant. Thus, adjusted relative risk provides perspective on the relative sk of a characteristic in relation to its lowest risk value.

Combination of Characteristics

In many other applications, to estimate the risk combining more than one ctor, relative risks for each of the factors are simply multiplied together. owever, because of a large interaction effect, this method seemed inappropriate n this case and, in fact, produced very inflated relative risks. Instead, elative risk was calculated as the incidence rate (of low birth weight) among hose with a combination of factors divided by the incidence rate among all live irths. Adjusted relative risk was calculated in the same manner described above or individual characteristics.

For some of the groupings, there were only a small number of observations, making it impossible to consider all seven variables at once. So, two factor-groups were considered: (1) PRENATAL CARE, MARITAL STATUS, RACE, MOTHER'S EDUCATION; and (2) FETAL DEATHS, MOTHER'S AGE, PARITY.

To obtain an estimate of a seven-factor effect, multiplying the two corresponding relative risks will produce a relative risk that, although slightly inflated (due to uncontrolled interactions between elements of different groups), gives an idea of the size of the true relative risk. For example, to approximate the adjusted relative risk of low birth weight for Care-Unmarried-Nonwhite-High School Education-18 to 25-0 Fetal Deaths-0 Previous Births, one could multiply 1.9 x 1.0 = 1.9. For those cases checked, this estimated adjusted relative risk was usually within .5 of the actual value. Caution should be used in estimating risks in this manner, however.

MAJOR FINDINGS

In the single-factor analysis, Table 1, four factors produced adjusted relative risks over 2, meaning that a birth with one of these factors is more than twice as likely to be of low weight. These factors are: no prenatal care (relative risk of 3.8), unmarried (2.4), nonwhite (2.1), and under 18 (2.0). Note that for the factors with more than two categories (AGE, PARITY), only one category has an unadjusted relative risk below 1 (reduces the risk), while the rest of the categories are above 1 (increases the risk).

Within the CARE-MARITAL STATUS-RACE-EDUCATION grouping, two combinations, No Care-Unmarried-Nonwhite, with less than a high school education or with at least a high school education, produced adjusted relative risks of 7.5 or above. Fully 14 of the 16 combinations were more than twice as likely to produce a low birth weight infant. Only one combination, Care-Married-White-High Education, produced an unadjusted relative risk below 1.

Within the AGE-FETAL DEATHS-PARITY grouping, the results were not quite as striking. The three combinations that produced the highest adjusted relative risks were 18-25 Years-1+ Previous Fetal Deaths-Parity of 3+(4.0), Less than 18-1+ Previous Fetal Deaths-Parity of 0(3.8), Age 36+-1+ Previous Fetal Deaths-Parity of 0(3.8). The combination of 26-35 years-0 Previous Fetal Deaths-Parity of 1-2 had the lowest unadjusted relative risk (0.6).

TABLE 1
STATEWIDE
CHARACTERISTICS OF LIVE BIRTHS BY BIRTH WEIGHT IN VIRGINIA, 1980

	Low Birth Weight	Total	Percent Low Birth Weight	Relative Risk	Adjusted Relative Risk
PRENATAL CARE					
Received Care	4,878	75,354	6.5	1.0	1.0
No Care	152	599	25.4	3.8	3.8
MOTHER'S MARITAL STATUS					
Married	3,239	61,490	5.3	0.8	1.0
Unmarried	1,791	14,463	12.4	1.9	2.4
RACE					
White	2,844	56,195	5.1	0.8	1.0
Nonwhite	2,186	19,658	11.1	1.7	2.1
MOTHER'S EDUCATION					
Less than 12 years	1,831	19,006	9.6	1.5	1.9
12 years or More	3,199	56,947	5.6	0.8	1.0
MOTHER'S AGE					
Under 18	486	4,470	10.9	1.6	2.0
18-25	2,687	37,023	7.3	1.1	1.4
26-35	1,666	31,908	5.2	0.8	1.0
Over 35	191	2,552	7.5	1.1	1.4
FETAL DEATHS					
None	3,697	59,373	6.2	0.9	1.0
1 or More	1,333	16,580	8.0	1.2	1.3
PARITY					
None	2,610	35,456	7.4	1.1	1.2
1 or 2	2,038	35,186	5.8	0.9	1.0
3 or More	382	5,311	7.2	1.1	1.2
TOTALS	5,030	75,953	6.6		

SOURCE: Data from Center for Health Statistics, State Department of Health

APPENDIX F

MULTIPLE RISK FACTOR ANALYSIS

The factors used in the relative risk analysis thus far have only been examined singly. It is important to note that these factors often relate to one another. For example, age of mother interacts with education of mother, in that a sixteen year old mother almost certainly has less than a high school education. An analysis of the relative risk of different sets of high risk factors has been performed. Because of concerns for statistical validity, it was necessary to conduct two analyses of the interaction of factors.[1]

One analysis of relative risk of low birth weight was conducted to include the interaction of prenatal care, marital status, race, and education. The four combinations of these factors most likely to result in low birth weight,[2] as well as the combination least likely, are as follows:

	Characteristics of Mother	Adjusted Relative Risk	Cases LBW/Total
a)	No prenatal care, unmarried,[3] nonwhite and a high school education	8.3	25/75
b)	No prenatal care, unmarried,[3] nonwhite and less than a high school education	7.7	42/137
c)	No prenatal care, unmarried,[3] white and less than high school education	7.3	23/79
d)	No prenatal care, married,[4] white and less than high school education	5.2	18/89
e)	Prenatal care, married,[4] white and with a high school education or more	1.0	1,755/42,254

The types of mothers described in categories a-d above are five to eight times as likely to deliver a low birth weight infant as mothers in category e. Category e formed the group of mothers with the lowest likelihood of delivering a low birth weight infant, as well as the largest group of mothers (about two-thirds of all live births).

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[1] For a method of combining these two analyses, See Appendix E.

[2] The highest adjusted relative risk was for no prenatal care, married, nonwhite, and a high school education (9.0). The small number of observations (28 total) for this grouping was assumed not to be sufficient for a valid adjusted relative risk.

[3] unmarried - not married to the father of the infant

[4] married - married to the father of the infant

Another analysis was conducted on the relative risk of the v combinations of age, previous fetal deaths, and parity. According to analysis, the combinations of these factors most likely to produce a low weight* infant and the combination least likely are as follows:

	Characteristic of Mother	Adjusted Relative Risk	Cases LBW/
a)	Age 18-25, one or more previous fetal deaths, and 3 or more previous births	4.0	40/2
b)	Age less than 18, 1 or more previous fetal deaths, and no previous births	3.8	46/2
c)	Age 36+, 1 or more previous fetal deaths, and no previous births	3.8	13/84
d)	Age 26-35, no previous fetal deaths, and 1-2 previous births	1.0	575/13,6

The types of mothers described in categories a-c are approximately four ti as likely to deliver a low birth weight infant as mothers in category d. Categ d formed the group with the lowest likelihood of delivering a low birth wei infant.

This analysis of relative risk shows that the likelihood of delivering a l birth weight infant increases with the presence of certain easily identifiab characteristics. The identification of these characteristics allows for t targeting of educational efforts and/or services to women who would benefit fr such efforts.

*The highest relative risk was for age less than 18, no previous fetal deaths, a 3 or more previous births (12.7). The small number of observations (2 total) f this grouping was assumed not to be sufficient for a valid adjusted relative risk

TABLE 1

PERINATAL INDICATORS BY PERINATAL REGION
VIRGINIA, 1980

	Low Birth Weight Rate	Resident Births	Resident Births Per 1000 Pop.[a]	Total Teenage Pregnancy Episodes[b]	Total Teenage Pregnancy Episodes Per 1000 Pop.[c]	Perinatal Mortality Rate	Infant Mortality Rate
STATE	75.4	78,423[d]	14.7	22,700[e]	80.5	14.3	13.7
Perinatal Region 1 (Southwest)	72.1	4,982	14.0	1,265	69.9	16.0	19.5
Perinatal Region 2 (Western)	63.2	6,124	11.9	1,882	71.4	14.9	11.1
Perinatal Region 3 (Southside)	75.6	5,859	13.1	1,680	66.6	15.4	12.3
Perinatal Region 4 (Piedmont)	70.3	8,211	13.9	2,190	65.1	12.7	10.0
Perinatal Region 5 (Northern)	60.7	16,364	14.8	3,626	66.0	9.8	10.2
Perinatal Region 6 (Central)	83.3	15,939	14.4	5,344	90.8	17.7	16.8
Perinatal Region 7 (Eastern)	87.3	20,943	17.0	6,710	103.5	15.0	15.4

[a] 1980 Census, 0-85+ population
[b] Includes teenage (women under 20 years of age) live births, teenage induced abortions, and teenage natural fetal deaths
[c] Department of Planning and Budget 1980 Populations, 14-19 female population
[d] Includes 1 unknown
[e] Includes 3 unknowns

SOURCE: Bureau of the Census. 1980 Census of Population and Housing, Virginia. U.S. Department of Commerce, 1981.

1980 Population Projections, Department of Planning and Budget, 1979 Series

Data from Center for Health Statistics, Virginia Department of Health. (Detailed Data from Vital Records Relating to Maternal and Infant Health, 1980.)

TABLE 2

PERINATAL INDICATORS BY PLANNING DISTRICT
VIRGINIA, 1980

	Weighted Low Birth Weight Rate[a]	Rank of Weighted Low Birth Weight Rate	Resident Births	Resident Births Per 1000 Pop.[b]	Total Teenage Pregnancy Episodes[c]	Teenage Pregnancy Episodes Per 1000 Pop.[d]	Perinatal Mortality Rate	
STATE	74.7	-	78,423[e]	14.7	22,700[f]	80.5	14.3	
PD 8	59.1	1	16,364	14.8	3,626	66.0	9.8	
PD 16	65.3	2	1,789	15.1	515	74.8	20.0	
PD 6	66.1	3	2,771	13.3	702	51.1	12.6	
PD 4	68.0	4	1,539	10.9	516	60.8	17.4	
PD 7	68.2	5	1,894	14.3	467	69.9	12.1	
PD 9	68.6	6	1,361	14.7	372	80.8	11.7	
PD 3	69.9	7	2,131	11.8	584	64.4	14.0	
PD 5	70.4	8	3,224	12.7	964	78.7	13.0	
PD 18	71.2	9	794	13.2	243	85.4	17.6	
PD 10	71.4	10	2,014	14.0	598	75.7	15.3	
PD 1	72.6	11	1,546	15.5	369	76.4	16.8	
PD 11	73.3	12	2,560	13.2	681	64.5	12.4	
PD 21	75.5	13	5,534	16.1	1,802	88.3	18.9	
PD 15	79.3	14	9,168	14.5	3,079	94.7	16.9	
PD 2	80.8	15	2,057	14.7	546	76.9	16.9	
PD 17	83.2	16	518	12.6	183	94.4	30.6	
PD 12	84.8	17	3,005	12.5	864	66.7	17.8	
PD 20	86.8	18	14,750	17.5	4,691	108.4	13.7	
PD 19	87.6	19	2,479	15.3	945	109.5	15.6	
PD 14	88.0	20	1,140	13.6	372	67.0	20.0	
PD 22	90.1	21	679	14.8	256	107.9	14.5	
PD 13	92.9	22	1,105	13.4	322	72.7	12.6	

[a] $\frac{\text{Live Births Under 2,501 Grams, 1976-1980}}{\text{Live Births, 1976-1980}} \times 1000$

[b] 1980 Census, 0-85 population

[c] Includes teenage (women under 20 years of age) live births, teenage induced abortions, and teenage natural fetal deaths

[d] Department of Planning and Budget, 1980 Population Projections, 14-19 female population

[e] Includes 1 unknown

[f] Includes 3 unknowns

SOURCE: Bureau of the Census. 1980 Census of Population and Housing, Virginia. U. S. Department of Commerce, 1981

1980 Population Projections. Department of Planning and Budget, 1979 Series

Data from Center for Health Statistics, Virginia Department of Health (Detailed Data from Vital Records Relating to Maternal and Infant Health, 1976, 1977, 1978, 1979, 1980).

APPENDIX H

GUIDELINES FOR THE DELIVERY OF PRENATAL CARE
IN AMBULATORY SETTINGS

Basic Services[1]

1. Appropriate prenatal care for all patients according to their risk status.

2. Identification of the patient risk status at the earliest possible date in her pregnancy and development of an intervention plan for the appropriate prenatal care according to the "Prenatal Risk Assessment and Patient Care Guidelines".

3. Complete physical examination including height, weight, blood pressure, palpitation of the thyroid, auscultation of the heart, lungs, breasts, abdomen, and pelvis, including rectum.

4. Laboratory examination to include the following laboratory tests:

   -Dipstick and microscopic urine analysis
   -Urine culture and sensitivity if indicated on dipstick or micro exam
   -Blood specimen for hematocrit, CBC, VDRL, HI titer (rubella antibody) and blood group and type
   -Coombs test and anti Rh antibodies for mother with Rh negative blood
   -Immediate blood sugar

5. In-house or readily accessible ultrasound visualization of fetus.

6. In-house or readily accessible social services and nutritional guidance.

7. Mechanism for obtaining nursing services in patients' homes.

8. Educational program providing the opportunity:

   1) for the physician and/or nurse midwife/practitioner and the patient to become better acquainted,

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[1]Adapted from: Manual-Regionalized Perinatal Health Care Program (N.C. Department of Human Resources)

Criteria and Standards: Conceptualization and Process, A Monograph (Winifred Schmeling)

Toward Improving The Outcome of Pregnancy (Committee on Perinatal Health)

2) for the physician and/or nurse midwife/practitioner to learn the patients' emotional attitudes toward pregnancy and labor,

3) for instruction of the mother and father in optimal care for and the coming baby, and

4) for optional instruction of the mother and father in prepa childbirth.

B. Physical Facilities and Equipment[2]

1. A comfortable waiting room with areas for patient reception registration and for record processing and storing.

2. A sufficient number of enclosed single examining rooms, each provi with an examining table, a chair or stool for the physician, instruments and drugs necessary for gynecologic and obstet examination and treatment, a good source of light, and a writi surface. A dressing area can be either in or adjacent to the examin room as long as it provides privacy for the patient.

3. Offices in which physicians, social service workers, dietitians, a others can interview patients privately. Medical histories can be take in examining room.

4. Adequate toilet facilities near the examining room.

5. An accurate scale and sphygmomanometer.

6. A conference room for patient and staff education.

7. Equipment for obtaining specimens for bacteriologic or cytologic studi and cervical and endometrial biopsies.

8. Facilities for performing the laboratory tests including a microscope, centrifuge, dextrometer, necessary equipment for bacteriologic and cytologic smears and materials necessary for urinalysis and bacterial cultures and for hematocrit determinations.

9. Adequate equipment for ultrasonographic studies.

10. Equipment and medications necessary for emergency resuscitation.

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[2]Adapted from: Criteria and Standards: Conceptualization and Process, A Monograph (Winifred Schmeling)

Personnel[3]

1. It is recommended that each participating ambulatory unit have the following personnel:

   a. Physician supervision as specified in "Prenatal Risk Assessment and Patient Care Guidelines": (Appendix I).

   b. A director of nursing to coordinate the activities of MCH clinics with all other ambulatory services offered by the unit.

   c. A MCH nurse supervisor to coordinate prenatal, postpartum, interconceptional, child screening, and pregnancy testing services in the unit.

   d. An obstetric-pediatric nurse practitioner or nurse specialist to assist physicians with routine screening of normal mothers and infants.

(b, c and d may be the same individual in small ambulatory units.)

2. Appropriate medical, paramedical, and nursing personnel should be available in-house or available through a contractual arrangement to care for all patients according to their status in accordance with the "Prenatal Risk Assessment and Patient Care Guidelines."

   - Class I - Nurse practitioner or physician

   - Class II - Fully qualified obstetrician or physician in consult with a fully qualified obstetrician

   - Class III - Fully qualified obstetrician

3. Personnel staffing the ambulatory unit should be knowledgeable regarding the personnel resources within the regional system of care.

   a. Each ambulatory obstetric care facility should maintain a list with names and telephone numbers of institutions and/or physicians through whom perinatal care consultation can be obtained on a 24-hour basis. A personal relationship, insofar as possible, should be developed between the physicians of each ambulatory obstetric care facility and the consulting physicians and responsible individuals at the regional centers.

   b. Regularly scheduled conferences should be developed for the personnel.

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[3]Adapted from: Manual-Regionalized Perinatal Health Care Program (N.C. Department of Human Resources)

Standards for Ambulatory Obstetric Care (American College of Obstetricians and Gynecologists)

c. Continuing education programs should be developed by the regional center. The programs should relate to the specific responsibilities and problems of the personnel of the ambulatory care centers. Time should be made available for the personnel of the ambulatory care centers to attend the programs. All personnel providing prenatal care should be involved in continuing education programs to keep abreast of the newest techniques and developments in the field.

APPENDIX I

PRENATAL RISK ASSESSMENT AND PATIENT CARE GUIDELINES

Classification	Care Guidelines
Class IV-Critical Care Pregnancy	
Eclampsia Severe Preeclampsia Chronic Hypertension with Superimposed Preeclampsia Chronic Renal Disease Uncompensated (Creatinine 1.2 or greater) Organic Heart Disease Uncompensated (early signs of failure) Hemoglobinipathies in Crisis Pyelonephritis, acute Premature Rupture of the Membranes Premature Dilation of the Cervix in the Second Half of Pregnancy Diabetes (Ketonuria) Placental Accidents (abruptio placenta, placenta previa in the second half of pregnancy)	Patient should be hospitalized immediately. See "Guidelines Concerning Maternal Transfer (Part I)" (Appendix K) for indications for referral to a regional center.
Class III-High Risk Pregnancy	
Mild Preeclampsia Diabetes without evidence of Ketonuria Chronic Hypertension Chronic Renal Disease Compensated (Creatinine less than 1.2 mg%) Organic Heart Disease Compensated (no signs of failure) Hemoglobinopathy, disease, stable (Hemoglobin greater than 8) Rhesus negative, sensitized Previous Intrauterine Fetal Demise in the Second Half of Pregnancy Proven Intrauterine Growth Retardation Maternal Weight Loss Gestational Age Documented 43 weeks Multiple Pregnancy Maternal Weight > 300 lbs.	Patient should be seen by a fully qualified obstetrician for evaluation and prenatal care.

Class II-At Risk Pregnancy

Maternal Weight > 250 lbs. Hemoglobinopathy, trait (hemoglobin 10 or greater) Deficiency Anemias (hemoglobin 10) History of Urinary Tract Infection Bacteruria Rhesus negative, unsensitized Suspected Intrauterine Growth Retardation Inadequate Maternal Weight Gain Previous Cesarean Section Previous Premature Baby Previous Baby 10 lbs. or greater Maternal Age < 16 or > 35	Patient should be seen by a fully qualified obstetrician or by a physician in consult with a fully qualified obstetrician.

Class I-Low Risk Pregnancy

Entails all other pregnancies	Patient may be seen by the primary physician or nurse practitioner.

Adapted from Medical College of Virginia Risk Identification System. Each of these classifications is not all inclusive; there may be other medical conditions.

APPENDIX J

GUIDELINES FOR INPATIENT OBSTETRICAL AND NEWBORN CARE

All hospitals delivering babies should meet basic requirements for providing routine obstetrical and newborn care. In addition, such hospitals must have the capabilities for responding to unanticipated maternal and neonatal emergencies which require immediate treatment, including adequate maternal and neonatal resuscitation and management of certain acute and life threatening problems for a finite period while preparing the baby for transfer to another facility. Accordingly, the following capabilities, personnel requirements, equipment and resources should be available in all hospitals with an obstetrical and newborn service.

A. Capabilities

1. Obstetrical

a. Perform continuous electronic maternal-fetal monitoring
b. Screen pregnant women to identify the high risk case
c. Perform emergency Cesarean section in 30 minutes time
d. Treat volume shock in the mother
e. Provide emergency resuscitation for mother
f. Obtain within 1 hour, 24 hours a day, radiology services, including Sonography
g. Cardiac arrest management

2. Newborn

a. Provide complete resuscitation (including endotracheal intubation) of the infant on a moment's notice
b. Estimate gestational age by examination of the newborn
c. Control neonatal temperature
d. Diagnose and manage acute hypoglycemia
e. Treat neonatal seizures
f. Detect and manage severe anemia and/or hypotension in the neonate
g. Evaluate for neonatal sepsis and obtain blood culture
h. Establish an intravenous line in the neonate
i. Evaluate cause and quantitate hyperbilirubinemia in the neonate
j. Control and measure environmental oxygen concentration at any value from 21-100%
k. Obtain arterial blood sample and measure blood gases sequentially for several hours

3. Laboratory

a. Abilities to perform each of the following tests on less than 1.0 ml blood within 1 hour, 24 hours a day:

-Blood Type
-Cross matching of blood
-Blood gases-should be available within 20 minutes
-Blood glucose-should be available within 20 minutes

-Complete blood count
-Total protein
-Bilirubin (total)
-Direct Coomb's test
-Electrolytes
-B.U.N.
-Clotting profile (may require more than 1.0 ml blood)

b. In an emergency, correctly matched blood should be available in 45 minutes. Type O Rh negative blood should be available at all times.

c. Availability of L/S ratio or Foam Test.

B. Personnel Requirements

1. A physician (preferably a pediatrician) in charge of the nursery and responsible for setting local policy regarding neonatal care.

2. A board certified obstetrician responsible for setting up care on the obstetrical service and available for 24 hour consultation.

3. An R.N. in charge and physically present in the nursery/obstetrical area 24 hours/day.

4. A nurse-patient ratio of at least 1:4 mother infant diads 24 hours/day ("nurse" refers to R.N., L.P.N.)

5. A licensed physician or a certified nurse midwife under the supervision of a licensed physician shall be in attendance for each delivery.

6. Full time obstetric anesthesia coverage should be provided and preferably supervised by a qualified anesthesiologist.

C. Equipment and Resources

1. Labor-Delivery Area

-Operating table and instruments for performance of Cesarean sections (in at least 1 delivery room)
-Electronic fetal monitor with internal and external attachments
-Infant examinaton and resuscitation unit with radiant heat source
-Suction equipment for mother and infant
-Oxygen source for mother and infant
-Humidifier for oxygen
-Plastic pharyngeal airways (adult and newborn sizes)
-Laryngoscope and endotracheal tubes (adult and newborn sizes)
-Positive pressure bag that can deliver 100% oxygen (adult and newborn sizes)
-Resuscitation masks (premature, infant and adult sizes)
-Sterile tray with equipment for umbilical catheterization
-Medications to include albumin or plasmanate, calcium gluconate, glucose naloxone (Narcan), epinephrine, sodium bicarbonate

-Portable unit with equipment necessary to combat cardiac or respiratory arrest
-Supply of intravenous fluids for emergency use which is monitored daily
-Equipment for assisted ventilation
-Cardiac monitor
-Infusion pump
-An appropriate device to provide a source of suction for aspiration of the baby's pharynx
-Sphygmomanometer
-Stethoscope
-Fetoscope
-Sterile pelvic tray with specula
-Sterile clamps and sponges
-Glass slides
-Culture tubes and nitrozine paper
-Necessary syringes and tubes for emergency blood work and cultures
-Delivery table that will allow variation of position for delivery
-Instruments tables and solution basin stands
-Equipment for inhalation and regional anesthesia
-Adequate lighting for vaginal or abdominal delivery
-Instruments and equipment for:
    --normal or operative delivery
    --exposure of vagina and cervix
    --repairs of lacerations and
    --management of obstetric emergencies
-Solutions and equipment for administering intravenous fluids
-Necessary equipment for examination, immediate care, and identification of the infant

2. Postpartum Area

-Equipment necessary for a complete physical examination
-A sterile pelvic tray and syringes
-Tubes and plates for blood work and cultures
-Portable unit with equipment necessary to combat cardiac or respiratory arrest
-Continuously monitored supply of emergency drugs and drugs necessary for daily use
-Immediate access to oxygen and suction
-Patients records should be organized and stored in such a manner that all pertinent information is immediately available

3. Nursery

-Servo-Controlled radiant warmer and/or incubator
-Oxygen source
-Mechanism for mixing oxygen and air to achieve a percentage of oxygen desired
-Heated humidifier for oxygen/air
-Laryngoscope and endotracheal tubes
-Positive pressure bag that can delivery 100% oxygen
-Resuscitation masks
-Sterile tray with equipment for umbilical catheterization

-Intravenous infusion pump
-Equipment to take infant's blood pressure
-Medications (as for delivery room)
-Electronic cardiac monitor
-Blood sugar screening device (e.g. dextrostix)
-Phototherapy lights
-Infant chest tube tray
-Plastic oxygen hood
-Oxygen analyzer
-Infant lumbar puncture tray
-Portable X-ray equipment
-Immediate access to O negative blood
-Appropriate device to provide source of suction for aspiraton of the pharynx

Adapted From: Toward Improving The Outcome of Pregnancy (Committee on Perinatal Health)

Standards of Care in Maryland Obstetrical Units (First Edition) (Maryland Section, American College of Obstetricians Gynecologists)

Rules and Regulations for Licensure of Hospitals in Virginia (Virginia Department of Health)

APPENDIX K

GUIDELINES CONCERNING MATERNAL TRANSFER

Maternal Conditions Requiring Consultation and/or Transfer to a Perinatal Center

These conditions are appropriate when the referring hospital has only the basic required nursery capabilities as described in "Guidelines for Inpatient Obstetrical and Newborn Care". The list may be modified for facilities with nursery capabilities beyond the basic requirements.

A. Obstetrical Complications

1. Premature rupture of membrances at < 34 weeks' gestation or with a fetus estimated at <1800 grams.

2. Premature labor at < 34 weeks' gestation or with a fetus estimated at < 1800 grams.

3. Any condition in which the probability exists for the necessity of delivery of an infant of < 34 weeks' gestation or with a fetus estimated at < 1800 grams, such as:

   a) Severe preeclampsia
   b) Multiple gestation
   c) Poorly controlled diabetes mellitus
   d) Intrauterine growth retardation with evidence of chronic fetal distress (abnormal estriol trends, suspicious or positive OCT, etc.)
   e) Third trimester bleeding
   f) RH isoimmunization
   g) Premature dilation of the cervix greater than normal for gestation and activity.

B. Medical Complications

1. Infections in which the nature of maternal illness may result in premature birth (hepatitis, pyelonephritis, influenza, pneumonia, etc.)
2. Severe organic heart disease
3. Renal disease with deteriorating function
4. Miscellaneous severe illnesses

C. Surgical complications such as trauma requiring intensive care of acute abdominal or thoracic injuries at < 34 weeks' gestation requiring surgical correction.

II. Maternal Transfer Risk Assessment Criteria

A. Low Risk - Patients in which time is not an essential factor; [illegible] is stable. Patient may travel by private automobile without [illegible] physician in attendance.

B. Medium Risk - Patients in which transport time should not exc[illegible] hours; delivery not anticipated for 4 to 6 hours; condition is [illegible] (Ex: moderate preeclampsia, suspected placenta previa with stable signs and no bleeding). If ground ambulance time < 2 hours, pa[illegible] should be transported by ground ambulance. If ground transp[illegible] hours, consideration should be given to air transport. The pati[illegible] be accompanied by a physician, nurse or advanced EMT.

C. High Risk - Patients in which maternal condition is stable, delive[illegible] infant is possible, though unlikely within two hours (Ex: patient premature labor in which tocolytic agents have been used). Personn[illegible] attendance should have experience in delivery, newborn resuscit[illegible] and intensive care. Travel time should not exceed 2 hours.

D. Ultrahigh Risk - Patients where prediction of delivery time difficult or where maternal condition is so unstable that deci[illegible] about a transport could change at any time (Ex: advanced prem[illegible] labor, significant maternal hemorrhage, unstable maternal condition These patients should be transported in the most expedient route tha[illegible] will allow medical surveillance. Personnel should be sent who [illegible] assist in the management of the patient at the referring hospital [illegible] during transport (e.g. an obstetrician and, if delivery of a high-ri[illegible] infant is expected, a neonatologist or nurse with experience in newb[illegible] resuscitation and stabilization). Patient should be transported in Class D vehicle with Class B capabilities. If the necessary personn[illegible] and equipment are not available or if it is anticipated that the patient may deliver en route, the patient should not be transported. Instead she should be delivered locally and the infant should be transported later if necessary. Such an approach will require that local facilities are staffed and equipped and personnel trained to provide optimal resuscitation and stabilization of the newborn.

Adapted from "Recommendations and Guidelines for the Transport of High Risk Obstetrical Patients". Colorado Perinatal Care Council.

APPENDIX L

GUIDELINES FOR NEONATAL SPECIAL CARE

INTRODUCTION

Because each hospital with newborn services has different capabilities to provide care for sick newborns, it is difficult and not particularly useful to classify hospitals into the three categories of care (Level I, II and III) proposed in the Mid-70's by the National Committee on Perinatal Health. Instead, the State Perinatal Services Advisory Council has found that it would be more useful to both health care practitioners and planners, to classify newborn services in Virginia based on a hospital's capability to care for specific types of neonatal morbidity. The purposes of such a classification system are: to facilitate transfer of sick newborns to the facility most appropriate to treat their particular condition(s); to further educate perinatal providers about resource requirements for delivering optimal perinatal care; and, to determine as accurately as possible the current capacity of the perinatal care system in the State and the projected capacity needed in the future.

An outline of the assumptions underlying this classification system are as follows:

1. Classifying newborn services by levels as defined by the National Committee on Perinatal Health is not useful for either health care delivery or planning purposes.

2. For a given sick newborn, a nursery may or may not have the ability to care for the baby, depending on the baby's condition(s). This capability also may change from day to day depending on census, personnel available, and other factors.

3. All hospitals having a newborn service must meet basic requirements in terms of capabilities, personnel, equipment and resources for providing routine newborn care. (Such standards are described in Appendix J.)

4. In addition to routine newborn care, eight simply-defined patient categories can be used to describe a nursery's capabilities for managing complex patient situations. (These categories and resources required to handle them are described in this Appendix.)

5. Each nursery will be classified according to its ability to handle each of these eight patient categories.

6. Obstetrical classification of hospitals should be linked with nursery's capabilities.

In addition to basic requirements outlined in Appendix J, additional support is required for newborns who have complex problems beyond the need for acute resuscitation or stabilization in preparation for transport. Most of the problems can be related to one of eight clinical or treatment categories. For each of these categories, special requirements for capabilities, personnel, and equipment can be identified. Eight patient categories requiring more than basic perinatal resources are as follows:

1. Infants with a birth weight between 1250-1800 grams or 30-34 weeks
2. Infants with a birth weight of less than 1250 grams (approximately 2 lbs.)
3. Infants requiring less than 40% inspired oxygen concentration
4. Infants requiring greater than 40% inspired oxygen concentration
5. Infants requiring assisted ventilation (CPAP or IPPV)
6. Infants requiring major neonatal surgery
7. Infants requiring exchange transfusion
8. Infants requiring cardiology evaluation

The guidelines on the following pages are intended to apply to the facilities planning to electively care for babies of each categorical description over extended periods of time (i.e., beyond stabilization in preparation for transport). Items listed are in addition to the requirements for basic neonatal facilities.

The newborns with the following problems should be treated in accordance with protocols developed in consultation with a neonatologist: sepsis, seizures, asphyxia, and meningitis.

I. Infants Between 1250 and 1800 Grams Weight or 30-34 Weeks

A. Have the capabilities to:

1. Provide a controlled temperature environment for each baby in this category
2. Administer nasogastric or transpyloric tube feedings
3. Maintain peripheral intravenous fluids with accuracy of + or 2cc/hr.
4. Perform the following tests on less than 1 ml of blood within hours, 24 hours a day:

    a. Calcium
    b. B.U.N
    c. Creatinine

B. Personnel Requirements:

1. A pediatrician or physician with special interest in pediatrics in charge of the nursery and responsible for setting local policy regarding intermediate neonatal care
2. A nurse (LNP or RN):patient ratio of 1:3 babies in this category
3. A core of nurses at the R.N. level whose primary responsibilities are the care of newborns

C. Equipment and Resources for each infant in this category:

1. Cardiorespiratory monitoring
2. Incubator or radiant warmer
3. 24 hour in-house micro blood gases

II. Infants Less Than 1250 Grams Weight or Less Than 30 Weeks

A. Have the capabilities to:

1. Meet criteria for caring for babies less than 1800 grams
2. Provide parenteral nutrition
3. Diagnose and treat patent ductus arteriosus (i.e. cardiology and/or neonatology support; ultrasound capabilities)
4. Diagnose intraventricular hemorrhage (i.e. ultrasound and/or computerized tomography)
5. Provide out-patient follow-up in a developmental clinic
6. Provide intensive support for parents

B. Personnel Requirements:

1. A board eligible or certified neonatologist in charge of the intensive care unit and responsible for setting local policy regarding neonatal care
2. An R.N. (preferably at the masters level) in charge of the nursery
3. 24 hour respiratory therapy support
4. A nurse:patient ratio (at the R.N. level) of 1:2 babies in this category
5. A medical social worker as a participating member of the unit
6. 24 hour in-house physician or certified neonatal nurse clinician coverage.

C. Equipment and Resources for each infant in this category:

1. In-house 24 hour capability for microchemistries, Blood Bank and X-ray services
2. An emergency standby electrical system

III. Infants Requiring Less Than 40% Inspired Oxygen Concentration

A. Have the capabilities to:

1. Provide a controlled temperature environment for each baby
2. Maintain peripheral intravenous fluids with an accuracy of + or - 2cc/hr.
3. Maintain central arterial catheters

B. Personnel Requirements:

1. A pediatrician in charge of the nursery and responsible for setting local policy regarding intermediate neonatal care
2. A nurse (LPN or RN):patient ratio of 1:3 babies in this category
3. A core of nurses at the R.N. level whose primary responsibilities are the care of newborns
4. 24 hour in-house respiratory therapy services

C. Equipment and Resources for each infant in this category:

1. Cardiorespiratory monitoring
2. 24 hour in-house micro blood gases
3. A compressed air source
4. Incubator or radiant warmer

IV. Infants Requiring Greater Than 40% Inspired Oxygen Concentration

A. Have the capabilities to:

1. Meet criteria for care of infants in less than 40% oxygen concentrations
2. Monitor central arterial blood pressure
3. Deliver short-term continuous distending airway pressure and/or assisted ventilation
4. Deliver noninvasive distending airway pressure

B. Personnel Requirements:

1. 24 hour in-house physician or certified neonatal nurse clinician coverage.
2. A nurse (LNP or RN):patient ratio of 1:2 babies in this category

C. Equipment and Resources for each infant in this category:

1. Equipment for delivery of continuous distending airway pressure
2. Electronic monitors for measuring blood pressure
3. Emergency standby electrical system
4. Transcutaneous oxygen monitoring
5. Microvolume assay for xanthines (i.e. aminophyllin and caffeine)

V. Infants Requiring Assisted Ventilation

A. Have the capabilities to:

1. Meet criteria for care of babies in greater than 40% oxygen

B. Personnel Requirements:

1. A board eligible or certified neonatologist in charge of the intensive care unit and responsible for setting local policy regarding neonatal care
2. An R.N. (preferrably at the masters level) in charge of the nursery
3. A nurse:patient ratio (at the R.N. level) of 1:1.5 for each baby in this category

C. Equipment and Resources for each infant in this category:

1. Ventilators designed for use with neonates

VI. Infants Requiring Neonatal Surgery*

A. Have the capabilities to:

1. Meet all criteria for babies weighing less than 1800 grams
2. Meet all criteria for infants requiring assisted ventilation
3. Provide parenteral nutrition

B. Personnel Requirements:

1. A board eligible or certified neonatologist in charge of the intensive care unit and responsible for setting local policy regarding neonatal care
2. A pediatric surgeon
3. An anesthesiologist with special training in the care of infants
4. 24 hour in-house physician or certified neonatal nurse clinician coverage.
5. An R.N. (preferrably at the masters level) in charge of the nursery
6. A nurse:patient ratio of 1:2 babies in this category

C. Equipment and Resources for each infant in this category:

1. Cardiorespiratory monitoring
2. 24 hour in-house micro blood gases
3. Electronic central venous pressure monitors

VII. Infants Requiring Exchange Transfusions

A. Have the capabilities to:

1. Perform continuous monitoring

B. Personnel Requirements:

1. A nurse (LPN or RN):patient ratio of 1:1 babies during the procedure

C. Equipment and Resources for each infant in this category:

1. Cardiorespiratory monitoring
2. In-house Blood Bank services

VIII. Infants Requiring Cardiology Evaluation

A. Have the capabilities to:

1. Perform echocardiography evaluation
2. Perform cardiac catheterization
3. Perform cardiothoracic surgery

*Surgical subspecialties may have different requirements.

B. Personnel Requirements:

1. A board eligible or certified neonatologist in charge intensive care unit and responsible for setting local regarding neonatal care
2. A pediatric cardiologist
3. A cardiothoracic surgeon
4. A nurse (LPN or RN):patient ratio of 1:2 babies in this categ

C. Equipment and Resources for each infant in this category:

1. Cardiorespiratory monitoring
2. 24 hour in-house micro blood gases
3. Cardiac catheterization laboratory
4. Echocardiography facilities

Adapted from "Classification of Nurseries in the Washington Metropolitan A (Perinatal Technical Advisory Panel)

APPENDIX M

MINIMAL REQUIREMENTS OF NEONATAL TRANSPORT PERSONNEL

Attendant-in-Charge:

- --Should be a physician or registered nurse with advanced clinical skills and judgment in newborn emergency care
- --Should be proficient in assessment of clinical status, stabilization, and resuscitation of the newborn
- --Should be familiar with the transport equipment and vehicle

Attendant:

- --Should be a registered nurse, EMT or respiratory therapist with advanced training in newborn emergency care
- --Should be familiar with the transport equipment and vehicle

Vehicle Operator:

- --Should meet the minimum requirements for vehicle operator as described in the Rules and Regulations governing Emergency Medical Services (If attendant is an EMT, he may also function as the vehicle operator)

APPENDIX N

PHYSICIAN-TO-POPULATION ANALYSIS

I. Methodology

a. An excess of 85 ob/gyns was determined based on the statewide population of 54,346,818 and a supply of 571.8 ob/gyn full-time equivalents (FTEs) in 1980. A supply of 571.8 FTEs was computed from the 1980 State Health Department Health Manpower Survey, conducted in conjunction with the State Board of Medicine's physician license renewal process. This supply figure includes all licensed physicians in Virginia who reported their primary specialty as either gynecology, obstetrics, or obstetrics/gynecology. Full-time equivalency was calculated from hours worked by each physician in primary and/or secondary locations of work, with one full-time equivalent equal to one physician working forty hours a week.

b. An excess of 349 child health physicians was determined based on a statewide child population aged 0-17 years of 1,438,648 and a supply of 924.4 child health physician full-time equivalents (FTEs) in 1980. A supply of 924.4 child health physician FTEs was computed from the 1980 State Health Department Health Manpower Survey, conducted in conjunction with the State Board of Medicine's physician license renewal process. This supply figure includes all physicians who reported their primary specialty as pediatrics and one-fourth of the total physicians who reported their primary specialty as general practice or family practice. Full-time equivalency was calculated from hours worked by each physician in primary and/or secondary locations of work, with one full-time equivalent equal to one physician working forty hours a week.

c. An excess of 222 ob/gyn FTEs for 1986 was determined based on the projected statewide population of 5,716,125 for 1986 and a projected average increase of 28.3 ob/gyns per year (as based on actual ob/gyn growth rates between 1977 and 1980, as computed from the State Health Department Health Manpower Survey).

d. An excess of 600 child health physician FTEs for 1986 was determined based on a projected statewide population of 1,466,892 for children aged 0-17 years for 1986 and projected average increase of 43.8 child health physicians per year (as based on actual growth rate of child health physicians from 1977-1980, as computed from the State Health Department Health Manpower Survey).

II. Analytic Considerations

It is important to recognize that the use of these physician-to-population guidelines serves only as a general indicator of the physician availability. Apparent excesses based on these analyses may not actually represent true surpluses. For instance, in considering the concentration of physicians in the locations of the regional centers, it is important to realize that many of these physicians may be involved in research activities and/or teaching, and therefore, may actually devote little time to patient care. Also, regional center physicians tend to serve a wider population than is indicated by the population of the city in which they work. The use of physician-to-population guidelines in determining physician shortages or excesses is limited without consideration of the location of hospitals and physician practice patterns.

APPENDIX O

An Analysis of Cost-Benefit of Improved Perinatal Experience for Low Birth Weight Infants in Virginia

996 infants ≤1500 grams were born in Virginia in 1980

583 (59%) infants survived
292 (50%) infants would be handicapped without neonatal intensive care
58 (10%) infants would be handicapped with neonatal intensive care[1]

thus

234 infants spared impairment with neonatal intensive care
77 (33% of 234) would require lifetime institutionalization if intensive care not received[2]

The estimated cost of lifetime institutionalization per patient in Virginia (based on 40-year life[3] and on an average annual cost per patient in a State Mental Retardation Training Center of $30,167[4]) is $1,206,680.

Number of patients requiring institutionalization without neonatal intensive care	x	The lifetime cost of institutionalization	=	Cost per year for institutionalization without neonatal intensive care[5]
77		$1,206,680		$92,915,130

The cost of providing care to infants 1500 grams in Virginia with neonatal intensive care

996 infants ≤1500 grams x 20,262[6] = $20.2 million for neonatal intensive care

19 infants (33% of 58 handicapped survivors) x 1,206,680 = $22.9 million for lifetime institutionalization

Total cost per year of providing care = $43.1 million

Cost per year for institutionalization without neonatal intensive care	-	Cost per year with neonatal intensive care	=	Savings per year for Commonwealth of Virginia
$92.9 million		$43.1 million		$49.8 million

Stewart (1977) Virginia House Document #15 (1976)

Florida Study (1979)

House Document #15 (1976)

[4]This cost figure is based on the average cost per patient day of $82.65 [illegible] five State Mental Retardation Training Centers in Virginia for FY 81-82 [illegible] provided by the Department of Mental Health and Mental Retardation).

[5]This cost figure is anticipated on an annual basis assuming that each ye[illegible] new group of babies will be born that, without neonatal intensive care, wo[illegible] require a lifetime of institutionalization. This cost does not take into [illegible] the costs for other support systems for the impaired individual such as sp[illegible] education needs.

[6]The average cost per infant ≤ 1500 grams is projected to be $20,262 based o[illegible]

an average total length of hospitalization of 69.3 days for infants weighing 1500 grams or less (as reported by one perinatal center in Virginia for a 6-month period in 1982)

an average length of stay in a neonatal intensive care unit of 34.5 day[illegible] for infants weighing 1500 grams or less (as reported by one neonatal intensive care unit in Virginia for 1980 and 1981) and a per diem cost of $436 (average costs for all infants receiving care in the six neonat[illegible] intensive care units in the State, as reported by the units for the fi[illegible] six months of 1981)

an average of 34.8 days (69.3 days minus 34.5 days) of continuing care received in an intermediate center (following discharge from a neonatal intensive care unit) and an estimated per diem cost of $150 (as estimate[illegible] by two intermediate care centers in Virginia)

This cost does not include physician costs, which some studies have documente[illegible] to be as high as 16% of the total costs.

APPENDIX P
TABLES ON COSTS OF NEONATAL CARE

TABLE 1
COST TO CHARGE COMPARISON

	Total Patients	Total Patient Days	Total Charges	Total Cost
Blue Cross	671	11,924	$ 7,346,598	$ 5,172,375
Medicaid	344	8,334	5,337,592	3,584,306
MCH and SLH	232	4,696	2,579,175	2,213,667
Commercial Insurance	515	8,626	5,306,400	3,662,894
Self Pay	279	6,225	3,073,173	2,704,534
TOTAL	2,041	39,805	$23,642,938	$17,337,776
Revenue per Patient Day			$ 594	
Cost per Patient Day			436	
Cost per Admission			8,495	

Because allocation methods differ from hospital to hospital and some hospitals provide higher levels of care, costs per day may vary dramatically. In this study, the average cost per day ranged from $221 to $493. Three of the hospitals exceeded $471 per day and the average cost at these institutions ($482) closely reflected prior studies.

In a study completed by the Massachusetts Rate Setting Commission in 1976 costs were reported at $287 for NICUs with Level III beds and $133 for NICUs with multiple levels. If updated to 1981 for inflation, these figures would be approximately $490 and $227 respectively.

Prior studies have compared cost to charges and the conclusions drawn indicate that costs represented about 68% of the charges. In our study shown above, the costs closely resemble prior studies. This indicates that charges for neonatal patients may fall below other states.

TABLE 2
LENGTH OF STAY

	Total Patients	Total Patients Days	Length of Stay
Blue Cross	671	11,924	17.8
Medicaid	344	8,334	24.2
MCH and SLH	232	4,696	20.2
Commercial Insurance	515	8,626	16.7
Self Pay	279	6,225	22.3
TOTAL	2,041	39,805	19.5

Based upon the data from 5 of the 6 NICUs, it was interesting to note that patients who had no insurance or were supported by state or local funds had longer lengths of stay. Patients in this category averaged 22.5 days while Blue Cross and commercially insured patients averaged only 17.3 days.

By taking the length of stay and multiplying it by the cost per day, costs per admission may be studied by payor. The average cost of a patient covered by commercial insurance is approximately $7,300 while costs for Medicaid patients is approximately $10,600.

TABLE 3
UNCOMPENSATED CARE

	Total Charges	Total Reimbursement	Write Off/Bad Debt & Contractuals
Blue Cross	$ 7,346,598	$ 5,854,912	$ 1,491,686
Medicaid	5,337,592	2,179,857	3,157,735
MCH and SLH	2,579,175	669,780	1,909,395
Commercial Insurance	5,306,400	4,184,261	1,122,139
Self Pay	3,073,173	430,834	2,642,339
Subtotal	$23,642,938	$13,319,644	$10,323,294
6th Hospital	3,785,562	2,134,955	1,650,607
TOTAL	$27,448,500	$15,455,599	$11,973,901
Charges/Patient Day		$ 594	
Reimbursement/Patient Day		335	
Write Off or Contractuals/Patient Day		259	

The table indicates that $259 per day is uncompensated care. Based on this information, the total amounts written off for all NICUs in Virginia approximate nearly $12 million.

Because the Blue Cross, Medicaid, MCH and SLH reimbursement is a function of costs, raising rates merely adds more to the already high bad debts and contractuals.

APPENDIX Q

ESTIMATED BIRTHS AND EXPECTED SOURCES OF PAYMENT,
LOW INCOME FAMILIES, 1981

Primary Third Party Coverage	Estimated Number of Births	Hospital Charges Before Allowances		
		Total (1)	Third Party	Patient
Total	23,200 (2)	$29,432,912	$21,293,302	$8,139,610
No 3rd Party	4,942 (3)	6,269,718	-0-	6,269,718
SLH	492 (4)	624,181	305,705 (4)	318,476
MCH	528 (5)	669,852	598,074 (5)	71,778
VMAP	5,575 (6)	7,072,779	7,072,779	-0-
Private	11,663 (7)	14,796,382	13,316,744	1,479,638

(1) The average cost per delivery is estimated to be $1,268.66 based upon the following 1981 data on Virginia hospitals provided by the Virginia Health Services Cost Review Commission. The ratio of cost to charges (83%) was calculated based on data on Virginia hospitals published within the American Hospital Association's 1981 edition of Statistics:

Labor and Delivery Charges	$ 286.50
Room Charges (4 days)	432.00
Ancillary Charges	648.00
Nursery Charges (3 days)	162.00
Subtotal: Hospital Charges	$1,528.50
Ratio of Costs to Charges	x .83
AVERAGE COST PER DELIVERY	$1,268.66

(2) Based upon 1970 census data for Virginia according to age, race, and income level, and corresponding Virginia data on birth rates, it is estimated that in 1981 there were 8,800 births among near poverty families (income above poverty level, but less than 1.5 times poverty level income) and 14,400 among families with income below poverty level, for a total of 23,200 low income births (out of 80,000 total births for Virginia residents).

(3) A report by DHEW on the 1976 Health Interview Survey (Advancedata, No. 44, 9/20/79) indicates that 21.3% of persons with family income below $7,000 have no public or private third party coverage.

(4) Per FY 1981 annual report of patients and reimbursement (not charges).

(5) Per FY 1981 annual report of patients and reimbursement (not charges).

(6) Per VMAP data on physician claims paid, FY 1981 (the average physician claim paid was $237).

(7) Assume remaining projected births are covered by private insurance, with 90% of charges billed to third party and 10% to patient.

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