

**Development of a Methodology for Assessing the  
Effect of a Lay Home Visitation Program for  
Rural High-Risk Women and Infants**



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Effect of a Lay Home Visitation Program for  
Rural High-Risk Women and Infants**

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- The pilot study successfully demonstrated that a retrospective, population-based, comparative design is a feasible method for evaluating the effect of a maternal-infant home visitation program on adequacy of preventive services and health outcomes.
- Subjects in our sample, comprised of pregnant Medicaid women and their resulting infants from rural, African American communities, shared many characteristics that increased the risk of poor pregnancy and birth outcomes, including age (below 18 or over 34 years, 18%), less than a high school education (30%), and first pregnancy (46%).
- Approximately half of mothers obtained adequate prenatal and post partum care. Adequacy of maternal preventive services was similar among the three comparison groups.
- Adequate well child care was obtained by 37% of infants. However, infants in the Study Group (47%) were nearly 3 times as likely as those in the Same Counties Comparison Group (18%) to obtain adequate preventive care ( $p < .0001$ ).
- Fewer infants (8%) in the Study Group than in Similar (25%) or Same Counties (22%) Comparison Groups recorded any visits for preventable conditions, a finding that approached statistical significance ( $p=.0589$ ). On the other hand, Study Group infants averaged more medical encounters for nonpreventable conditions ( $M = 19$ ) than Comparison Group infants (Similar,  $M = 14$ ; Same,  $M = 12$ ).

### *Key Findings*

Readers are advised to interpret the statistical results with caution. Given that (a) the purpose of the pilot study was to test feasibility of the design and procedures, (b) generation of data occurred during first year of operation of the home visitation program, and (c) the small Study Group sample size (39 mother-infant pairs), results may be biased.

Healthy Start.

identified data elements from Vital Records Birth Certificates, Medicaid, and Low County counties 2 years prior to program implementation ( $n = 283$ ). Analysis was performed using de-identified data elements from Vital Records Birth Certificates, Medicaid, and Low County in which the program was not offered ( $n = 243$ ), and (c) a comparison group from the same Program during its first year of operation ( $n = 39$ ), (b) a comparison group from similar counties compared across three groups of mother-infant pairs: (a) participants in the Resource Mothers and their infants receiving Medicaid. Adequacy of preventive services and health outcomes were applied the method to a home visitation program that uses lay health workers to provide health education, referral, and social support to rural, low-income pregnant African American women community health worker program for women at risk for poor pregnancy and birth outcomes. We applied the method to a home visitation program that uses lay health workers to provide health education, referral, and social support to rural, low-income pregnant African American women and their infants receiving Medicaid. Adequacy of preventive services and health outcomes were compared across three groups of mother-infant pairs: (a) participants in the Resource Mothers Program during its first year of operation ( $n = 39$ ), (b) a comparison group from similar counties in which the program was not offered ( $n = 243$ ), and (c) a comparison group from the same counties 2 years prior to program implementation ( $n = 283$ ). Analysis was performed using de-identified data elements from Vital Records Birth Certificates, Medicaid, and Low County identified data elements from Vital Records Birth Certificates, Medicaid, and Low County.

This small pilot study tested a linked data set approach for evaluating the effectiveness of a community health worker program for women at risk for poor pregnancy and birth outcomes. We applied the method to a home visitation program that uses lay health workers to provide health education, referral, and social support to rural, low-income pregnant African American women and their infants receiving Medicaid. Adequacy of preventive services and health outcomes were compared across three groups of mother-infant pairs: (a) participants in the Resource Mothers Program during its first year of operation ( $n = 39$ ), (b) a comparison group from similar counties in which the program was not offered ( $n = 243$ ), and (c) a comparison group from the same counties 2 years prior to program implementation ( $n = 283$ ). Analysis was performed using de-identified data elements from Vital Records Birth Certificates, Medicaid, and Low County identified data elements from Vital Records Birth Certificates, Medicaid, and Low County.

Case management is a community-focused approach to augmenting prenatal and well child care which incorporates health education and social support. Lay health care workers from the clients' community are thought to be influential in modifying behavioral and environmental determinants because of their common social, cultural, and environmental milieu. The positive impact of paraprofessional support programs on use of services was consistently documented in the literature. However, their effects on pregnancy and birth outcomes among low-income, rural women were less clear.

## EXECUTIVE SUMMARY

was higher than that of metropolitan counties, while the reverse occurred in the Northeast and geographic region. In the South and West, the 1996-98 average IMR in nonmetropolitan counties

*Rural-urban disparities in infant health.* Rural-urban differences in IMRs vary by

black as among white infants (14% versus 7%).<sup>3, p. 8</sup>

birth weight. In 2000 the prevalence of low birth weight in South Carolina was twice as high in

Low birth weight babies (<2,500 g) were much more likely to die than those who were not low

smoke during pregnancy, obtain inadequate prenatal care, and be hospitalized during pregnancy.

than 18 years old, have less than a high school education, obtain Medicaid during pregnancy,

delivery, compared to those whose infants lived, were more likely to be black, unmarried, less

Whitehead and Connelly<sup>4</sup> found that women who experienced an infant death within 6 months of

In a study of 10,221 new mothers in South Carolina from 1992 to 1997, Helms, Dillard,

increased from 2.1 to 2.5.<sup>3, p. 4</sup>

increased 14%.<sup>3, p. 5</sup> Between 1990 and 2000, the black to white IMR ratio in South Carolina

96 to 1998-00: While deaths among white infants decreased 3%, those among black infants

term decline ended in 1996. The 3-year average IMR in South Carolina increased 5% from 1994-

continuous long-term decline in the IMR since 1915.<sup>2, p. 849</sup> However, in South Carolina the long-

that among white infants (14.1 vs. 5.7).<sup>1, p. 105</sup> For the nation as a whole, there has been a

4.6 and highest in Mississippi at 10.7. However, the death rate among black infants was 2½ times

6.9 deaths of infants <1 year of age per 1,000 live births. The IMR was lowest in Massachusetts at

*Racial disparities in infant health.* Nationwide the infant mortality rate (IMR) in 2000 was

**1. The Problem: Severe Disparities in Infant Health**

**BACKGROUND AND SIGNIFICANCE**

**CHAPTER ONE**

increased total tooth loss<sup>5, p. 64</sup> in comparison to urban residents. Availability of care in rural communities is limited by distance and health professional shortages. Barriers to use of existing services that are more characteristic of rural than urban populations include poverty (13% vs. 11%),<sup>12, p. 2</sup> lack of health insurance (23% vs. 18%),<sup>11, p. 28</sup> and unpaid sick leave for doctor visits (57% vs. 50%).<sup>11, pp. 35-36</sup> While a smaller proportion of rural than urban residents have no motor vehicle (4% vs. 11%),<sup>13, p. 57</sup> those without a vehicle are very unlikely to have access to public transportation: 88% of small communities (<2,500 population) lack a public transportation system.<sup>11, p. 26</sup> Rural sociocultural characteristics, such as reduced anonymity, pride in self-reliance, distrust of outsiders, also contribute to underuse of services.<sup>14, p. 131</sup> The need to address rural health issues is substantiated by the recent initiation of the Rural Healthy People 2010 project at the Southwest Rural Health Research Center at Texas A & M University. The Center recognized “that rural areas frequently pose different and, in some instances, greater challenges than urban areas in addressing a number of Healthy People 2010 objectives.”<sup>15</sup>

Problems in health care accessibility and availability are exacerbated for rural African Americans. According to Probst et al.,<sup>16, pp. 24-26</sup> who analyzed data from USA Counties 1998 and the February 2000 Area Resource File, in rural communities, African Americans are more likely than white Americans to experience poverty (34% vs. 14%) and live in a county: That is entirely or partly a Health Professional Shortage Area (71% vs. 64%)

- In the bottom quartile for the physician/population ratio (15% vs. 12%)
- Without a hospital (12% vs. 10%)

Availability of maternal-infant preventive services is compromised in rural communities. Availability of prenatal care has declined: Rural obstetricians decreased by 20% between 1984 and 1989,<sup>17</sup> and rural family physicians providing obstetric care decreased from 43% to 37% between 1988 and 1992.<sup>18</sup> According to Colwill and Cullice,<sup>19, p. 32</sup> the maldistribution of

This report presents the results of a small pilot study evaluating the effectiveness of a home visitation program using lay health workers. This program, unlike most of those represented in the

## 5. Focus of This Report

- Insufficient inclusion of rural populations
- Short-term measurement of outcomes
- Inconsistent pregnancy and birth outcomes
- Narrowly defined infant outcomes
- Scant study of cost effectiveness

However, this body of research suffers these limitations:

American women suggest that such programs increase use of prenatal care and pregnancy-related services and may decrease poor pregnancy and birth outcomes and cost of infant medical care.<sup>24-34</sup> management programs using lay health workers among low-income, largely urban African

*Previous studies of effectiveness.* A review of studies evaluating the effectiveness of case

rationale for use of lay health workers.<sup>22, p. 362, 23</sup>

respect. Potential cost savings and a shortage of health professionals in rural areas provide further (e.g., teen parenting) foster a provider-client relationship characterized by mutual trust, caring, and

patterns, health beliefs and values, understanding of barriers to care, and personal experiences

because of their common social, cultural, and environmental milieu. Shared communication community are thought to be influential in modifying behavioral and environmental determinants

Administration, which currently funds 96 sites. Lay health care workers from the clients?

an integral part of the Healthy Start Program within the Health Resources and Services

and well child care which incorporates health education and social support. Case management is

*The concept.* Case management is a community-focused approach to augmenting prenatal

## 4. Home Visitation Using Lay Health Workers

The Resource Mothers Program was initiated September 1, 1999, by Low Country Healthy Start under the auspices of the South Carolina Office of Rural Health. At the end of its first year of operation, the Resource Mothers Program included a staff of four lay health workers, also known

support and practical assistance with the nonmedical aspects of pregnancy and child care. prenatal care through home visits by lay health workers, who provided culturally-congruent social than 24 months ago; or history of high risk pregnancy.<sup>35</sup> Program services augmented customary previous low-weight birth, still birth, or fetal death; gave birth, or had a pregnancy that ended, less with one or more of the following characteristics were eligible: age less than 20 or more than 35; assess social service needs, and enroll the client, if eligible. Pregnant women receiving Medicaid master's prepared social worker visited the potential client in her home to determine eligibility, nurses, social workers, and school personnel in the service area. When a referral was received, a Clients were referred to the Resource Mothers Program by physicians, nurse-midwives, health in two rural, medically underserved counties in southwestern South Carolina. Program aimed to reduce racial disparities in pregnancy and birth outcomes and improve infant program primarily for low-income, African American pregnant women and their infants. The Resource Mothers Program, which used lay health workers, was designed as a care coordination of community based health workers varies from project to project. The Low Country Healthy Start which is one of seven core interventions of the federally funded Healthy Start Initiative. The use Healthy Start projects across the nation take different approaches to case management

#### **1. Description of the Resource Mothers Program**

### **CHARACTERISTICS AND EVALUATION**

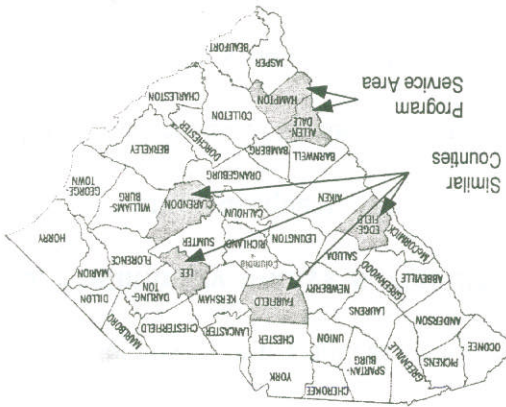
## **THE RESOURCE MOTHERS PROGRAM: PROGRAM**

### **CHAPTER TWO**

The Similar Counties Comparison Group was 384 pregnant Medicaid women and their infants, excluding multiple births, from Clarendon, Edgefield, Fairfield, Fairfield, and Lee Counties, whose delivery/birth occurred November 1999–May 2000. The Same Counties Comparison Group was

During its first year, the Resource Mothers Program served 123 pregnant women. Of these, only 78 were Medicaid recipients who had participated in the Program for at least 3 months before delivery (A home visitation intervention of less than 3 months would lack the strength to make an impact on its recipient). Medicaid recipient numbers could not be matched for 12 mother-infant pairs, limiting the Study Group to 66 mother-infant pairs.

Figure 2. Resource Mothers Program Area & Similar Counties



Criteria. Figure 2 displays the location of study and comparison counties. *Participants.* All participants in the study were pregnant Medicaid women and their infants, excluding multiple births. Initially, the Study Group included 78 mother-infant pairs; the Similar Counties Comparison Group, 384; and the Same Counties Comparison Group, 455.

The Similar Counties were not contiguous to the program service area because they were selected using social, perinatal status, and health resource indicators rather than location as

Data compiled by the South Carolina Office of Research and Statistics in March 2001. <sup>a</sup>Allendale and Hampton Counties. <sup>b</sup>Clarendon, Edgefield, Fairfield, Fairfield, and Lee Counties.

Indicator	Study/Same Counties <sup>a</sup>	Similar Counties <sup>b</sup>
% Deliveries paid by Medicaid, 1998	78	66
% Low-weight births, 1998	10	12
% Less than adequate prenatal care, 1998	49	34
% Population living in urban areas, 1990	25	19
% Population nonwhite, 1998	60	57
Per capita income in dollars, 1998	17,597	16,986

Location of Comparison Group

Table 2  
Selected Social, Perinatal Status, & Health Resource Indicators, by Location



(American)

- Availability of care limited by distance and health professional shortages
- Use of existing services limited by poverty and Medicaid coverage
- No public transportation system for those without a personal vehicle
- Knowledge deficits related to maternal and infant health promotion and illness prevention
- Culture-specific health beliefs and patterns of care patterns (i.e., rural, Southern, African American)

include:

existing services in rural minority communities discussed earlier (see pages 10 - 12). These sociocultural characteristics and encountered the disparities in resources and barriers to use of Thus, for the purposes of this research, the investigators assumed that the sample shared the Health and Human Services (Medicaid data), and (c) Low Country Healthy Start (participant list). Statistics and Information Services (birth certificate data), (b) South Carolina Department of by the (a) South Carolina Department of Health and Environmental Control Public Health rural, African American mother-infant pairs who were Medicaid recipients. Data were collected *Secondary analysis design and assumptions about the sample.* This study analyzed data on observed and lag times before data were available.

limitation to the study, but was imposed by the time frame during which the program was Same Counties Comparison Group. The low number of program mother-infant pairs constitutes a mother-infant pairs in the Similar Counties Comparison Group, and 283 mother-infant pairs in the mother and infant data could be matched included 39 mother-infant pairs in the Study Group, 243 This reduced the total number of mother-infant pairs from 905 to 565. The final sample for which controls to be effective, the studied sample was restricted to single black mothers and their infants.

and black women, and that there were too few observations in other categories for statistical Given that participants in the Study Group were disproportionately high risk unmarried

A favorable outcome of pregnancy and birth was defined as the uncomplicated labor and delivery of a healthy, full-term baby weighing at least 5½ pounds (2,500 grams). Pregnancy and birth outcomes were similar among the Study and Comparison Groups: Nearly two thirds of mothers and one third of infants experienced an unfavorable outcome. No infants in the sample died during their first year of life. See Figure 6. (Table B-3, p. 40)

*A. Pregnancy and Birth Outcomes*

**3. Health Outcomes**

were nearly 3 times as likely as those in the Same Counties Comparison Group (18%) to obtain adequate preventive care ( $p < .0001$ ). Adequacy of infant preventive services in the Study and Similar Counties Groups (55%) were equivalent. See Figure 5. (Table B-2, p. 39)

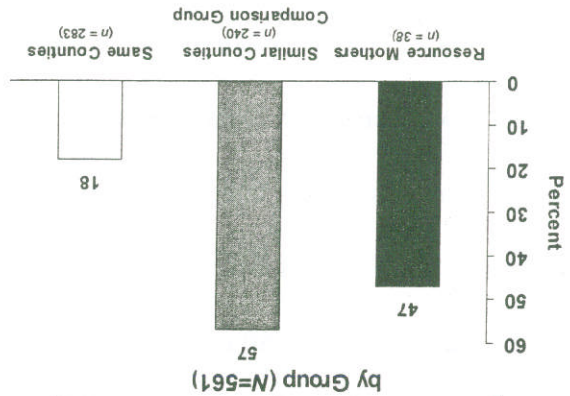


Figure 5. Percent Adequate Well Child Care, by Group (N=561)

Among all infants in the sample, just over one third (37%) obtained adequate preventive services, defined as at least four well child visits by age 1 year. Infants in the Study Group (47%) were nearly 3 times as likely as those in the Same Counties Comparison Group (18%) to obtain adequate preventive care ( $p < .0001$ ).

*C. Well Child Care*

Half (51%) of all mothers obtained a postpartum check-up between 4 to 8 weeks following delivery, with no difference among the three groups. (Figure 4 and Table B-2, p. 39)

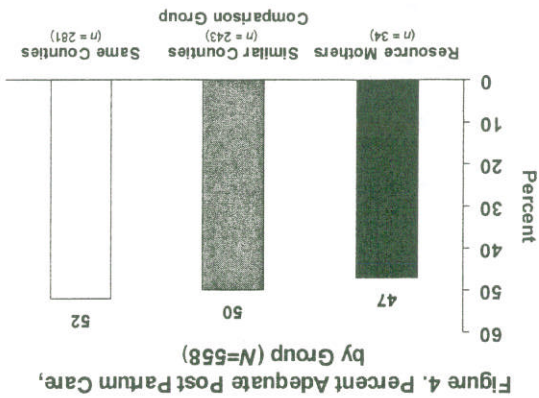


Figure 4. Percent Adequate Post Partum Care, by Group (N=558)

*B. Postpartum Check-Up*

*B. Prevention of Short Pregnancy Interval*

Infants born to women who space their pregnancies 2 years apart are more likely to be full-term and of normal birth weight compared to those born to women with shorter or longer pregnancy intervals.<sup>44, 45</sup> More than half of the mothers in the sample (56%) became pregnant within 12 months of delivery. Mothers in the Similar Counties Comparison Group were least likely to experience a short pregnancy interval following this birth ( $p < .0001$ ). See Figure 8. (Table B-5, p. 42)

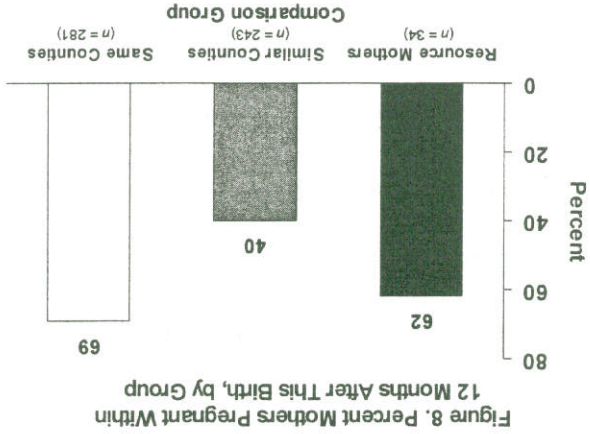


Figure 8. Percent Mothers Pregnant Within 12 Months After This Birth, by Group

*C. Preventable Illnesses and Injuries Among Infants*

Health education for mothers related to parenting, breast feeding, infant sleeping position, infant safety, and hygiene can reduce the frequency of diarrhea, respiratory infections, ear infections, child abuse and neglect, and unintended injuries.<sup>46, pp. 9-14, 15-3-5, 16-8-9</sup> Most (78%) infants in the sample were not treated for a preventable medical condition during their first 60 days of life, and only 9 infants were hospitalized for a preventable condition (Similar Counties, 2; Same Counties, 7). Infants in the Study Group were one third as likely as those in the Similar and Same Counties Comparison Groups to experience medical treatment for preventable illness and injury ( $p = .0589$ ). See Figure 9. Given the small size of the Study Group and the relatively large effect

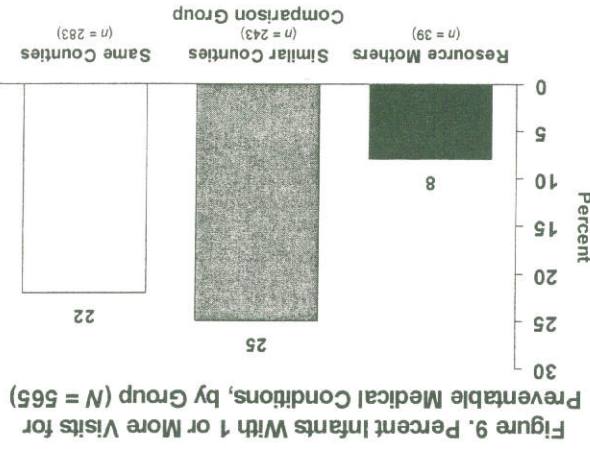


Figure 9. Percent Infants With 1 or More Visits for Preventable Medical Conditions, by Group (N = 565)

## CHAPTER FOUR

### CONCLUSIONS AND POLICY IMPLICATIONS

Given the purpose of the pilot study (to test feasibility of the design and procedures), the

small Study Group sample size (39 mother-infant pairs), and generation of data during first year of operation of the home visitation program, statistical results must be interpreted with caution. Our findings may also be biased by the poorer health of infants in the Study Group versus those in either Comparison Group. However, we believe that we have demonstrated that a retrospective, population-based, comparative design is a feasible method for evaluating the effect of a maternal-infant home visitation program on adequacy of preventive services and health outcomes.

Preliminary findings indicate that lay health workers may contribute to improved rates of well

child care and preventable conditions, warranting further study.

#### 1. Discussion of Results

##### A. The Evaluation Process

One purpose of the project was to ascertain that it was feasible to conduct an evaluation of

a maternal-infant intervention, linking programmatic Healthy Start data to other data bases,

including Vital Records and Statistics (birth certificate) and payer (Medicaid). We found that this

process was feasible, but more time consuming and challenging than originally anticipated.

Changes that we would suggest for future researchers include:

- Sample from a period when the program is fully operational. Our project used data

from the first year of operation of Low County Healthy Start Resource Mothers

Program. Delays in staffing, and therefore outreach activities, reduced the number of

mother-infant pairs available for study, thus reducing study power. Differences

between study infants and others—study infants appear to have been, by chance, in

post partum care between participants and nonparticipants. In the 1995-96 survey, nearly 65% of mothers obtained a postpartum check-up. However, in the 1995-96 survey, post partum care was measured at 6 months following delivery rather than 8 weeks, as in our study.<sup>26, p. 56</sup>

#### *Well child care.* Studies of home visitation programs have reported mixed results in

increasing adequacy of well child clinic visits among low-income infants, whether the case

manager was a public health nurse<sup>50-52</sup> or a lay health worker.<sup>25, 53, 54</sup> We found that infants in the

Study Group were 3 times more likely to obtain adequate well child visits than infants in the Same Counties Comparison Group. Given the small size of our Study Group ( $n = 39$ ), this is an

important finding that warrants further investigation.

It is noteworthy that our rural sample had a substantially lower rate of adequate well child

visits (55%) than a similar, but urban population. Schuster et al.<sup>54, p. 1001</sup> used a population-based,

randomized control design ( $N = 365$ ) to study the impact of case management on adequacy of well

child care among low-income African American infants in South Central Los Angeles. Eighty-one

percent of infants who had received at least four home visits during their first year of life obtained

adequate (4 or more) well child clinic visits by age 1 year, as opposed to 70% of infants in the

control group ( $p = .012$ ). The adequacy of well child visits in the South Central Los Angeles

sample was comparable to the national rate among children aged 3 to 17 years (77%)<sup>55</sup>, while our

sample was not. No national surveillance data for adequacy of well child care for infants was

available for comparisons.

#### *C. Health Outcomes and Care Patterns*

*Birth weight.* Rates of premature and low-weight births were similar among our three

groups ( $p > .05$ ) and comparable to those across the nation in 2001.<sup>49, p. 56</sup> Seventeen percent of

infants in our sample were born early,<sup>1</sup> comparable to 18% of black infants but higher than 11% of

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<sup>1</sup>Less than 37 weeks from conception to birth.

considerably lower than the 10% reported for unmarried black mothers in South Carolina in 2001.<sup>60</sup> Both smoking and alcohol use are underreported on the birth certificate.<sup>49</sup>, pp. 13-14

However, our pilot data are consistent with the national data.

*Prevention of short pregnancy interval.* Over half (55%) of mothers in the pilot study became pregnant within 12 months of delivery. Mothers in the Study Group (62%) and Same Counties Comparison Group (69%) were more likely than those in the Similar Counties Comparison Group (40%) to experience a short pregnancy interval following this birth ( $p < .0001$ ). These rates are considerably higher than national baseline data: In 1995, 14% of black mothers aged 15 to 44 years gave birth within 24 months of a previous birth.<sup>46</sup>, p. 9-13

*Illness and injury among infants.* Our finding that infants in the Study Group were one third as likely as those in the Similar and Same Counties Comparison Groups to experience

treatment for preventable illnesses and injuries fell short of statistical significance ( $p = .0589$ ). Given the small size of the Study Group ( $n = 39$ ) and relatively large size of the Same ( $n = 283$ )

and Similar ( $n = 243$ ) Counties Comparison Groups, this result suggests one potential area in which community health worker programs may contribute to improved health outcomes.

It is unlikely that Study Group infants were less likely to seek medical care for preventable conditions since they were more likely to obtain medical care for nonpreventable conditions than infants in both Comparison Groups ( $p < .0001$ ). Furthermore, they were 3 times more likely to obtain adequate well child visits than infants in the Same Counties Comparison Group ( $p < .0001$ ). Both patterns of care are indicative of preventive care behaviors which might be attributed to

culturally appropriate health promotion activities of lay community health workers.<sup>61</sup>, pp. 199-202, 62,

p. 123

decreasing encounters for preventable illness and injury among infants.

- Research efforts extend the monitoring of effects of care coordination on children past the perinatal period, as the greatest effects of the intervention is likely to be on infant care and health. We recommend evaluation through the first 2 years of life.
- Process evaluation should be incorporated into the research design to monitor the quality of program implementation and data reporting.
- Data included in formal program evaluation should be drawn from the period when the program is at full strength, with all staff and systems operational.

**3. Programmatic Recommendations**

As a preliminary evaluation effort primarily designed to assess the feasibility of rigorous study of the Resource Moms program, our research does not yield broad programmatic recommendations regarding provision of services. However, as evaluators, we note that an effective community-focused maternal-infant health promotion program will produce changes in client knowledge, beliefs, behavior, and/or environmental conditions, which in turn facilitate achievement of improved infant health and decreased medical costs. Such changes will fail to be detected unless effective data capture procedures are in effect. We recommend that all Healthy Start programs apply continuous quality improvement techniques to primary data collection. Without consistent, reliable and timely data collection, program evaluation results are jeopardized and the ability to make future policy recommendations threatened.

medically underserved area through enhanced coordination of care across settings and providers. While other women who met eligibility criteria were not excluded,<sup>35</sup> the target population was rural, low-income, pregnant African American women and their infants.

The Resource Mothers Program was initiated September 1, 1999, in Allendale and Hampton Counties by Low Country Healthy Start under the auspices of the South Carolina State Office of Rural Health, funded through the Healthy Start Initiative of the Maternal and Child Health Bureau. The program was administered by the director of Low Country Healthy Start. By the end of the first year of operation, the core staff included four indigenous paraprofessionals, known as "resource mothers," and two master's prepared social workers. Space and secretarial support for the Resource Mothers Program staff was provided in the Low Country Healthy Start office in Denmark, SC.

Pregnant women with one or more of the following characteristics were eligible for services: age > 20 or < 35; previous birth was low-weight (< 2,500 grams), still birth, or fetal death; interpregnancy interval < 2 years; and history of high risk pregnancy or psychosocial risk factors.<sup>35</sup> Potential clients were referred to the program for case management services by physicians, nurse-midwives, nurses, social workers, and school personnel in the service area. The Resource Mothers Program augmented customary prenatal care by providing culturally-congruent social support and practical assistance with the nonmedical aspects of pregnancy and child care. Case management services provided during home visits, hospital visits, and telephone calls included:

- a. Facilitation – making it easy for mothers to access community services to support their needs;
- b. Education – instructing mothers about pregnancy, childbirth, child development, parenting, and decision making for future education and employment;



county. See Table A-1.

similar to the Low Country Healthy Start Resource Mothers Program were operating in that nurse supervisor in potential comparison counties was called to verify that no ongoing programs service area counties by the South Carolina Office of Research and Statistics. The public health status, and health resource characteristics were most similar to the Low Country Healthy Start other case management program using indigenous paraprofessionals but whose social, perinatal selected from South Carolina counties in which there was neither Healthy Start Program nor *Comparison counties*. Counties for the Similar Counties Comparison Group were 56% in Allendale County to 99.5% in Hampton County.<sup>68</sup>

were African American,<sup>60</sup> and approximately 84% of births occurred out of county (ranging from (25.0)).<sup>3, pp. 69-71, 67, p. 47</sup> Sixty-eight percent (322/476) of live births in the two counties in 2000 County black population (95.2) was 381% higher than the rate among the white population (87.5) was 359% higher than that of the nation (24.4), while the rate among the Allendale the teen pregnancy rate (pregnancies per 1,000 women 15-17 years old) in Allendale County more than twice as high among black than white infants (12% vs. 5%).<sup>3, pp. 49-51, 67, p. 16</sup> In 2000, low birth weight infants were born in the service area (10%) than the nation (6%), with the rate infants (12.1) over 5 times that of white infants (2.3).<sup>3, p. 8, 7, p. 33</sup> In 2000, a higher proportion of area (11.2 per 1000 births) is higher than the national rate (7.0), with the death rate among black nation as a whole (12% poor; 12% African American). The 1998-2000 mean IMR in the service high proportion of residents were poor (26%) and African American (61%) compared to the totaled 32,456. The area is very rural, with only 4,018 residents in the largest town. A relatively

*Sample size.* Study Group = 39 mother-infant pairs. Same Counties Comparison Group = 283 mother-infant pairs. Similar Counties Comparison Group = 243 mother-infant pairs. The small number of observations in the Study Group is recognized as a principal limitation of this study.

*Sampling method.* This study used a nonprobability, population-based sample of convenience with nonrandom assignment to groups. All (100%) mother-infant pairs meeting selection criteria during the time frame for inclusion were included in the sample. This sampling method is appropriate in evaluation research where interventions can only be implemented in intact service areas.

### 3. Variables and Their Measurement

Measures of dependent/outcome variables and demographic characteristics of subjects were obtained by linking three state electronic data sets: Low Country Healthy Start Data File, Vital Records Birth File, and Medicaid Data File. Selected data elements from the three data sets were obtained through the South Carolina Office of Research and Statistics. Applications for release of data stored by the Office of Research and Statistics were made and approved following approval of the study by the Medical University of South Carolina Institutional Review Board. Table A-3 displays the independent and dependent/outcome variables and their measurement by hypothesis/research question

Table A-3  
Variables, Their Measurement, and Data Source, by Hypothesis / Research Question

H <sub>1</sub> Rural, low-income pregnant women who had prenatal care augmented by a home visitation program using indigenous paraprofessionals, relative to those who obtain customary prenatal care, are more likely to obtain adequate prenatal care	Independent variable: Prenatal care augmented by a home visitation program using indigenous paraprofessionals <i>versus</i> customary prenatal care
How determined: Participation <i>versus</i> nonparticipation in the Resource Mothers Program	How determined: Adequate prenatal care
Dependent variable: Adequate prenatal care	How determined: An adequate <i>versus</i> less than adequate Kessner Index, where 1 = Adequate; 2 = Intermediate; 3 = Inadequate <sup>36</sup>
Data source: Vital Records Birth File	Note: The Kessner Index defines adequate prenatal care as care initiated in the first trimester of pregnancy and the number of medical visits for gestation at birth recommended by the Institute of Medicine (e.g., a minimum of nine visits for a birth of 36 weeks gestation or longer) <sup>36, p. 1008</sup>

dichotomized (black/white) for use as a control variable because of its association with adequacy of vaccination coverage<sup>46, p. 14-36</sup> and preventable health outcomes.<sup>78-80</sup>

#### **4. Procedure**

- a. The South Carolina Office of Research and Statistics identified Study Group mother-infant pairs by selecting first-year participants in the Resource Mothers Program from the Low Country Healthy Start Data File. The Office of Research and Statistics used a personal identifier to link Study Group mother-infant pairs and their Low Country Healthy Start data elements to requested data elements from the Vital Records Birth and Medicaid Data Files.
- b. The Office of Research and Statistics used a personal identifier to link the requested data elements from the Vital Records Birth and Medicaid Data Files for mother-infant pairs in the Similar Counties and Same Counties Comparison Groups.

- c. The Office of Research and Statistics created a master electronic data file which contained linked data elements for mother-infant pairs in the Study and Comparison Groups. The Office of Research and Statistics de-identified all subjects in the master file by substituting codes for personal identifiers. All personal identifiers that could link subjects to data were destroyed by the Office of Research and Statistics prior to release to the principal investigator in a Microsoft Excel electronic file. See Figure A-2.

## 6. Limitations of Methods

One limitation of the proposed study is the scope of the cost analysis. Ideally, we would conduct a comprehensive cost-effectiveness study that assesses the full array of costs (both direct and indirect) and converts outcomes to standard measures of effectiveness (e.g., Quality Adjusted Life Years or Disability Adjusted Life Years). Such a cost effectiveness analysis is beyond the scope of this study.

The most serious threat to the internal validity of the proposed study is that groups of subjects are compared that may differ on confounding variables due to nonrandom assignment. Internal validity was strengthened by use of multiple comparison groups and statistical methods to control variables known to be associated with dependent variables during data analysis. A second threat, present in the comparison of the Study Group to the Same Counties Comparison Group, is that unidentified, differing events in the subjects' environment may influence the dependent variables. The inclusion of the Similar Counties Comparison Group addresses this limitation.

A third threat to internal validity is that the quality of the data is dependent on the

accuracy of records. This study performs secondary analysis of relevant data elements from live birth certificate and Medicaid claims data sets. Research<sup>81-83</sup> conducted to validate birth

certificate data has matched birth certificates to data abstracted from medical records. Findings from these studies suggest a high degree of agreement for gravidity, parity, birth weight, Apgar score, and method of delivery. Other items were underreported, such as alcohol and tobacco use, medical history, complications of labor and delivery, and obstetrical procedures. Medicaid

claims for billed visits showed a very high degree of correspondence with medical records.<sup>84</sup> These studies suggest that if data elements are selected with care from birth certificate and

Medicaid data files, aggregate analyses will be valid for maternal-child research and evaluation.

## APPENDIX B

### DETAILED TABLES

<i>Table</i>	
38	B-1. Number and Percent Subjects, by Demographic Characteristics and Group ( $N = 565$ )
39	B-2. Number and Percent Subjects, by Adequacy of Preventive Services and Group ( $N = 565$ )
40	B-3. Number and Percent Subjects, by Perinatal Outcomes and Group ( $N = 565$ )
41	B-4. Number and Percent Mothers, by Modifiable Risk Factors for Poor Birth Outcomes and Group ( $N = 565$ )
42	B-5. Number and Percent Mothers, by Pregnancy Status Within 12 Months of Delivery and Group ( $N = 558$ )
42	B-6. Number and Percent Infants, by Number Encounters for Illness and Injury and Group ( $N = 561$ )
42	B-7. Descriptive Statistics for Number Encounters for Nonpreventable Conditions in First 60 Days of Life, by Group ( $N = 561$ )
42	B-8. Wilcoxon Scores (Rank Sums) for Number Encounters for Nonpreventable Conditions in First 60 Days of Life, By Group ( $N = 561$ )
43	B-9. Descriptive Statistics for Length of Stay for Nonpreventable Conditions in First 60 Days of Life, by Group ( $N = 561$ )
43	B-10. Wilcoxon Scores (Rank Sums) for Length of Stay for Nonpreventable Conditions in First 60 Days of Life, by Group ( $N = 561$ )

Table B-2  
 Number and Percent Subjects, By Adequacy of Preventive Services and Group (N = 565)

	Comparison Group				p <sup>a</sup>
	Same Co.		Similar Co.		
	No.	%	No.	%	
Kessner Index of prenatal care	Preventive Service				0.25
	Adequate	247	46	15	
Post partum check-up within 4-8 weeks post delivery	Preventive Service				0.87
	Less than adequate	292	54	21	
# encounters for routine infant health check by 1 year	Preventive Service				0.0001
	Yes	283	51	16	
0 to 3	Preventive Service				0.0001
	4 or more	206	37	18	
Missing	Preventive Service				0.87
	Missing	7	1	5	
4-8 weeks post delivery	Preventive Service				0.87
	Yes	283	51	16	
Adequate	Preventive Service				0.25
	Less than adequate	292	54	21	
Post partum check-up within 4-8 weeks post delivery	Preventive Service				0.87
	Yes	283	51	16	
# encounters for routine infant health check by 1 year	Preventive Service				0.0001
	4 or more	206	37	18	
0 to 3	Preventive Service				0.0001
	4 or more	206	37	18	
Missing	Preventive Service				0.87
	Missing	7	1	5	

The actual number of observations used in specific computations varied due to missing values.

<sup>a</sup>Fisher exact probability test.

Table B-4  
 Number and Percent Mothers, by Modifiable Risk Factors for Poor Birth Outcomes and Group (N = 565)

Modifiable Risk Factor	Total (N = 565)		Study (n = 39)		Similar Co. (n = 243)		Same Co. (n = 283)		p <sup>a</sup>
	No.	%	No.	%	No.	%	No.	%	
Tobacco use during pregnancy	27	5	3	8	14	6	10	4	0.2595
Yes	27	5	3	8	14	6	10	4	
No	536	95	35	92	228	94	272	96	
Missing	2		1		1		0		
Average # cigarettes/day among smokers	17	68	2	67	7	58	8	80	0.7071
< 10	17	68	2	67	7	58	8	80	
10 or more	8	32	1	33	5	42	2	20	
Missing	2								
Alcohol use during pregnancy	5	1	2	5	0	0	3	1	0.0118
Yes	5	1	2	5	0	0	3	1	
No	558	99	36	95	242	100	280	99	
Missing	2		1		1				
Maternal anemia in pregnancy	95	17	3	9	62	26	30	11	<0.0001
Yes	95	17	3	9	62	26	30	11	
No	463	83	31	91	181	74	251	89	
Missing	7		5		0		2		
Weight gain during pregnancy	254	47	22	61	102	44	130	47	0.056
< 25 pounds	254	47	22	61	102	44	130	47	
25 to 34 pounds	168	31	10	28	65	28	93	34	
> 34 pounds	119	22	4	11	63	27	52	19	
Missing	24		3		13		8		
Kessner Index for prenatal care	253	46	21	41	112	50	120	43	2.81
Adequate	253	46	21	41	112	50	120	43	
Less than adequate	300	54	30	59	112	50	158	57	

The actual number of observations used in specific computations varied due to missing values.  
<sup>a</sup>Fisher exact probability test.

Table B-9  
Descriptive Statistics for Length of Stay for Encounters for Nonpreventable  
Conditions in First 60 Days of Life (N = 561)

Group	N obs	Mean	SD	Median	Minimum	Maximum
Study	39	4.71	7.98	2	0	44
Similar Co.	243	4.51	11.53	2	0	107
Same Co.	283	4.08	9.59	2	0	96
Total	565					561

Table B-10  
Wilcoxon Scores (Rank Sums) for Length of Stay for Encounters for Nonpreventable  
Conditions in First 60 Days of Life, by Group (N = 561)

Group	N	Sum of Scores <sup>a</sup>	Expected Sum H <sub>0</sub>	SD under H <sub>0</sub>	Mean Score
Study	38	11,396.00	10,678.00	963.74	299.89
Similar Co.	240	65,977.50	67,440.00	1,739.95	274.91
Same Co.	283	80,262.50	79,523.00	1,758.31	283.63

<sup>a</sup>Average Scores were used for ties.  
Kruskal-Wallis,  $\chi^2(2, N = 561) = 1.11, p > .05$ .



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