WIC General Analysis Project

Profile of WIC Children

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Executive Summary

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) provides supplemental foods, nutrition education and access to health care to pregnant, breastfeeding and postpartum women, infants, and children up to age five. Since its inception in the early 1970's, the program has received fairly widespread support and it has grown in size to serve 7.4 million participants in FY98 at an annual cost of around $4 billion.[1] Just over half of the participants (51.4 percent) are children between the ages of 1 and 5.[2]

While considerable research has been done on the WIC program, most of it focuses on pregnant women and infants rather than on children. This report uses existing data on children and their families to describe the children who participate in WIC. In order to address a wide range of issues, three main data sources were analyzed:

- the Third National Health and Nutrition Examination Survey (NHANES-III), which provides information on a nationally representative sample of children between 1988 and 1994;

- the 1993 Panel of the Survey of Income and Program Participation (SIPP), which provides information on a nationally representative sample of children between 1993 and 1995; and

- the second wave of the Comprehensive Child Development Programs (CCDP2), which provides information on a *nonrepresentative* sample of children between 1994 and 1997. The children in the CCDP2 sample are two-year-olds from ten sites across the country, and do not span the full range of WIC income eligibility. Although WIC in general serves children up to 185 percent of the federal poverty level, this sample was limited to children whose households were under 100 percent of the federal poverty level during their prenatal period or infancy. While the results from this sample are not generalizable to the child WIC population as a whole, they help us to understand the poorest of WIC participants more fully.

Much of the analysis reported here consists of comparisons between child WIC recipients and other low-income children (under 185 percent of poverty). In interpreting these comparisons,

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[1] Source: National Data Bank.

[2] Source: Bonnie Randall, Susan Bartlett, and Sheela Kennedy, *Study of WIC Participant and Program Characteristics 1996*, Abt Associates Inc., August 1998.

it is important to recall that WIC children differ from other low-income children in two regards:

- They are economically needier. About a quarter of WIC children are extremely poor (under 50 percent of poverty), compared with a sixth of nonparticipating low-income children.

- They were more likely to have received WIC as infants. It is estimated that 72 percent of WIC children, compared with 35 percent of other low-income children, were also WIC infants.

Higher income children are used as an additional comparison group for measures using NHANES-III or SIPP data. The analyses reported here also include a description of dynamic (age-related) patterns of child WIC participation.

The purpose of this project is descriptive. Although the data may suggest some hypotheses about possible impacts of WIC, testing these hypotheses is a task for future research. This is particularly important to bear in mind when considering comparisons between WIC children and other low-income children. When we see a difference, we cannot conclude that WIC caused the difference; and conversely, when we see no difference, we cannot conclude that WIC had no effect.

This summary briefly describes the WIC program for children, and then reviews what has been learned with regard to the following issues:

- how WIC children differ from and resemble other low-income children with regard to

    - characteristics of the pregnancy and infancy
    - their households, families, and communities
    - nutrition and health status; and

- children's patterns of entering and leaving the WIC program.

The profile of WIC children that emerges from these data sources includes the following features:

- The average age of their mothers at the time of the children's birth was 25, but 7.5 percent had mothers who were young teenagers (under 18) at the time.

- Nearly a third of their mothers smoked cigarettes during the pregnancy.

- Around 12 percent of the children were low birthweight.

- Two-fifths were breastfed, in most cases for less than six months.

- Most (54 percent) live in poverty, and 25 percent are extremely poor (income under 50 percent of the federal poverty level).

- Many receive AFDC/TANF (43 percent) or food stamps (60 percent), and nearly a tenth live in subsidized housing.

- Half live in a household headed by a married couple.

- Nearly all have medical insurance, primarily Medicaid.

WIC Eligibility and Benefits for Children

To be eligible for WIC, a child must be under the age of five, in a household with income under 185 percent of the federal poverty level, and at nutritional risk. WIC is not an entitlement program. A system of priorities has therefore been developed by the Food and Nutrition Service (FNS) to assist State and local WIC providers in allocating limited benefits. Children have lower priority for WIC services than pregnant women and infants.

The program benefits for children participating in WIC are threefold. First, participants receive vouchers for *supplementary food*. The package includes milk, cheese, eggs, cereal, 100 percent fruit juice, and dried beans or peanut butter. Second, *nutritional education* is provided to the child's caregiver, and in some cases directly to the child. Finally, *access to health care* is facilitated.

Prenatal Period and Infancy

WIC children differ from other low-income children in several dimensions of their earliest experiences. Their mothers tend to be less healthy overall. The pregnancy was more likely to have been attended with certain obstetrical risks (older mother, first pregnancy), to have had medical complications, and to have been compromised by the mother's use of alcohol and illegal drugs. Available data do not indicate whether the mother participated in WIC during pregnancy. WIC children at birth were less healthy than other low-income children.

A few illustrative measures of pregnancy status and birth outcomes are displayed for WIC participants, other low-income children, and higher income children in Exhibit ES.1. (Items that are based on the CCDP2 data are available for low-income children only.) For some of these measures, WIC children and other low-income children look quite similar–e.g., likelihood that the mother was a young teenager, and use of cigarettes during pregnancy[3]. For both of these risk factors, higher income

Exhibit ES.1
Characteristics of Pregnancy and Infancy

children have substantially lower values. Alcohol use during pregnancy, in contrast, was substantially more prevalent among mothers of WIC children in the nonrepresentative CCDP2 sample than among mothers of other low-income children during pregnancy (15.5 *versus* 10.3 percent); and low birthweight was significantly more common among WIC children than among other low-income children (11.6 percent *versus* 8.3 percent). Low birthweight was even less common among higher-income children (5.3 percent).

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[3] Exact definitions of the items displayed appear at the end of this summary.

Nonetheless, WIC children's feeding patterns during infancy were generally better than that of other low-income children: for example, they were significantly less likely to be given cow's milk before 12 months of age, or put down with a bottle containing anything other than water (Exhibit ES.2). It is possible that this pattern reflects effects of WIC participation during infancy, because WIC children were more likely to have been WIC infants than other low-income children.

Exhibit ES.2
Infant Feeding Patterns

■ WIC participants □ Other low-income children □ Higher-income children
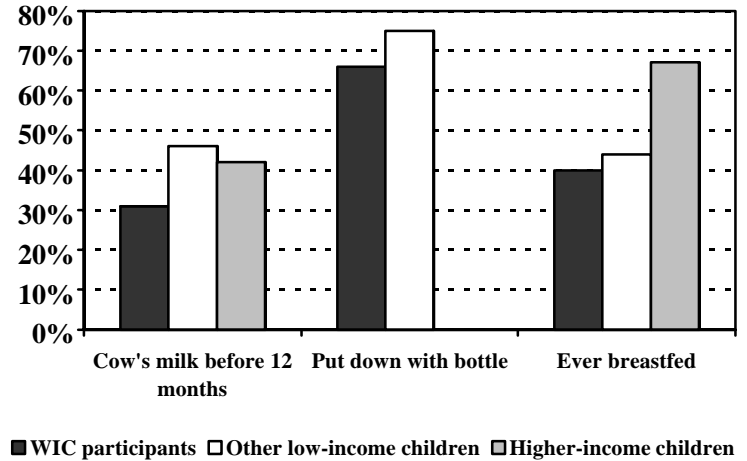
WIC children were, however, no more likely than other low-income children to have been breastfed; and substantially less likely than higher-income children (40.0 percent *versus* 66.7 percent).

Households and Environments

WIC children are worse off than other low-income children in many aspects of household wellbeing and environment. A striking exception is that they are more likely to have health insurance, because of Medicaid (Exhibit ES.3). Also, despite greater poverty, they are no more likely to experience food insecurity. It is plausible that WIC contributes to this situation (as well as the Food Stamp Program, in which 60 percent of WIC children's households participate).

Exhibit ES.3
Health Insurance, Poverty, AFDC/TANF

■ WIC participants □ Other low-income children □ Higher-income children
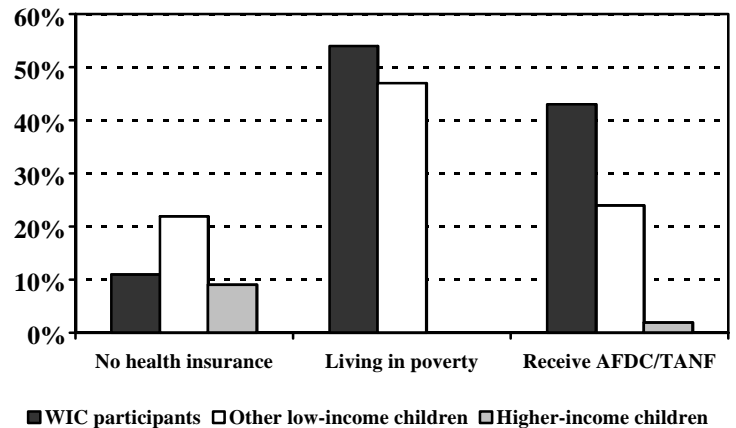
As mentioned previously, WIC children are drawn primarily from the low end of the income distribution, even among households with income under 185 percent of the federal poverty level. Among WIC children, 54 percent are living in poverty and 25 percent in extreme poverty (under 50 percent of the federal poverty level). The corresponding percentages for other low-income children are 47 percent and 18 percent. WIC children are more likely to be

receiving other means-tested benefits such as AFDC/TANF or food stamps, to live in subsidized housing, and to be in a female-headed household.

The CCDP2 sample showed a striking pattern of differences in maternal effectiveness: mothers of WIC children scored significantly lower in locus of control and financial skills, and significantly higher in use of maladaptive coping mechanisms (mental or behavioral disengagement), than mothers of other low-income children.

The home and neighborhood environments of WIC children are less conducive to their development than those of other low-income children (Exhibit ES.4). Mothers of WIC children in CCDP2 sample were found to be significantly more likely to harbor inappropriate expectations for their children, to lack empathy, and to engage in role reversal than mothers of other low-income children. In teaching their children a new task, they were less encouraging of children's cognitive growth. The neighborhoods in which WIC children live are less safe and are lower ranked as "a place to live" or "a good place to raise your children" than the neighborhoods of other low-income children.

Exhibit ES.4
Home and Neighborhood
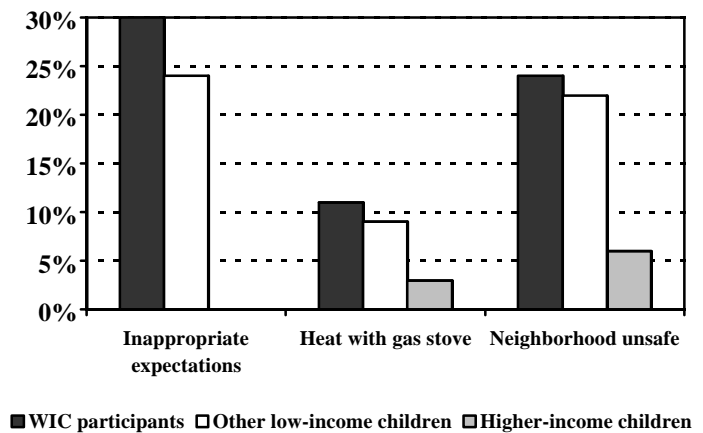
On some other measures, WIC children are not significantly worse off than other low-income children. As mentioned previously, they are more likely to have health insurance coverage (primarily Medicaid), and no more likely to experience economic or food insecurity, as measured by standard batteries of items on these topics. Home environmental factors that are similar for WIC children and other low-income children include parenting practices such as reading to the child, home safety, and smoking in the home. These measures, when available, were all substantially more favorable for higher income children: e.g. parents of higher income children read to them more, their homes are much less likely to be heated by gas stoves or ovens, their homes are safer from crime, and adults are much less likely to smoke cigarettes in the home.

Nutrition and Health

Despite their greater poverty, WIC children are as well off as other low-income children with regard to several (but not all) aspects of nutrition and health that the program attempts to improve (Exhibit ES.5). Their dietary intake is similar to that of other low-income children with regard to most nutrients, and significantly higher with respect to calcium and folate. As expected, they consume more WIC foods, such as milk (CCDP2 sample). Negative

Exhibit ES.5
Nutritional Status

■ WIC participants   □ Other low-income children   ▨ Higher-income children

aspects of WIC children's nutrition relative to that of other low-income children include higher consumption of high-fat foods (CCDP2 sample), and greater prevalence of underweight. Higher income children are significantly less likely to be overweight.
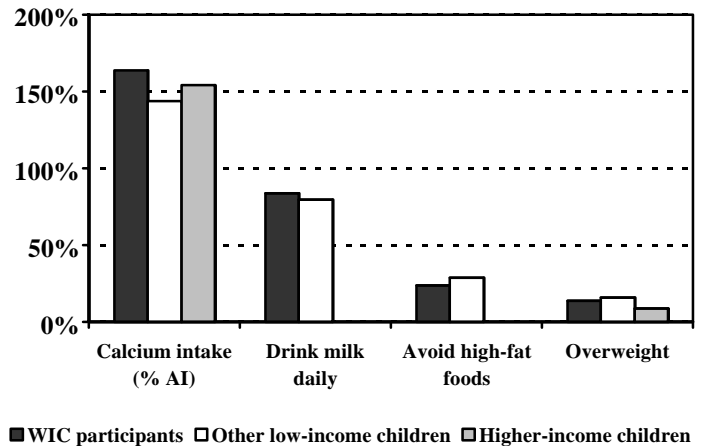
Although WIC children have better access to health care than other low-income children, the CCDP2 data suggest that they are more likely to suffer developmental delays. In addition, WIC children in the CCDP2 sample score significantly lower than their counterparts on five scales of cognitive development, language development, and socioemotional development.

Dynamic Patterns of Receipt

For analyzing age-related patterns of WIC receipt, we considered WIC infants and children jointly. The primary dynamic feature of WIC participation in this group is that participation declines sharply with age: infants comprise 32 percent of infant and child recipients, while four-year-olds comprise only 12 percent. Most infant recipients go on to participate as children (81 percent).

Children may participate at a lower rate than infants for several reasons. The prioritization system has historically restricted children's access to WIC; children must be recertified every six months, while infants may be certified for up to a year; and the food package for children has a lesser monetary value than the package for infants that receive formula. In addition, older children may participate at a lower rate than younger children because food is more

often available outside the home, in Head Start and day care programs; and because the child may develop food preferences that do not coincide with the WIC food package.

Of all infants and children who ever enter the WIC program, the great majority (70 percent) do so in infancy. Final exits from the WIC program are much more diffusely distributed: about two-fifths of recipients exit in infancy or at age one, and nearly a quarter receive benefits through their fifth birthday. Few children exit WIC and then subsequently reenter.

For children not turning five, WIC exits can often be related to trigger events, i.e. changes in household circumstances. Those that are most closely associated with WIC exits are:

- increase in family member's earnings
- exit from other welfare
- new family member with earnings.

More than a quarter of WIC exits occur without any measured change in household circumstances, however. Possible reasons include loss of eligibility due to removal of nutritional risk, administrative closure due to insufficient funding to serve all eligible children, or decisions by parents that WIC benefits are not worth meeting the participation requirements.

NOTES ON EXHIBITS

Exhibit ES.1
Young teenage mother: Mother less than 18 at time of birth of focus child, NHANES-III.
Smoked cigarettes: Mother smoked cigarettes during pregnancy with focus child, NHANES-III.
Used alcohol: Mother used alcohol during pregnancy with focus child, CCDP2.
Low birthweight: Child weighed less than 5 1/2 pounds at birth, NHANES-III.

Exhibit ES.2
Cow's milk before 12 months: Child first drank cow's milk on a daily basis before aged 12 months, NHANES-III.
Put down with bottle: Child was ever put down to sleep with a bottle (containing a fluid other than water) at bedtime or naptime, CCDP2.
Ever breastfed: NHANES-III.

Exhibit ES.3

No health insurance: Child is not covered by Medicaid or private insurance, SIPP.

Living in poverty: Child's household income in previous month under 100 percent of poverty, SIPP.

Receive AFDC/TANF: In previous month, SIPP.

Exhibit ES.4

Inappropriate expectations: Child's caregiver scored low (4 or lower on a scale of 1 to 10) on Inappropriate Expectations scale of Adult-Adolescent Parenting Inventory, CCDP.

Heat with gas stove: Child in household that uses gas stoves or oven to heat the home, NHANES-III.

Neighborhood unsafe: Household head reported neighborhood "very unsafe" or "fairly unsafe", SIPP.

Exhibit ES.5

Calcium intake (% AI): Mean calcium intake expressed as percent of Adequate Intake standards defined by Food and Nutrition Board, Institute of Medicine, from 24-hour recall, NHANES-III.

Drink milk daily: CCDP2.

Avoid high-fat foods: Child "rarely or never" eats fried foods or foods prepared with gravy or sauces, CCDP2.

Overweight: Above 90th percentile of weight for height, NHANES-III.

Chapter One
Introduction

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) has provided supplemental foods, nutrition education and access to health care to pregnant, breastfeeding and postpartum women, to infants up to 12 months of age, and to children up to age five since its inception in the early 1970's. The program has received widespread support and it has grown in size to serve 7.4 million participants in FY 1998 at an annual cost of around $4 billion.[1] Just over half of the participants (51.4 percent) are children.[2]

While considerable research has been done on the WIC program, most of it focuses on pregnant women and infants rather than on children. This report uses existing data on children and their families to provide information about children's participation in WIC.

This project has four research objectives:

- to describe the child WIC population in terms of demographic and income factors, nutritional and health status, dietary intake, health care utilization, participation in other means-tested programs, and other characteristics;

- to compare the child WIC population on these measures with other low-income children who are potentially eligible for WIC;

- to compare WIC children with children who are financially ineligible for WIC; and

- to describe dynamic (age-related) patterns of WIC receipt by children.

The purpose of this research is description and hypothesis-generation, not hypothesis testing. There is a great deal that one would like to know about why some children receive WIC and others do not, whether WIC benefits are targeted to those deemed most in need, and whether WIC affects those who do participate in desirable ways. The information presented here may help policymakers think about those questions and plan research to address them, but this analysis is not designed to provide scientifically sound answers to the questions. This is particularly important to bear in mind when considering comparisons between WIC children and other low-income children. When we see a difference, we cannot conclude that WIC caused the difference; and conversely, when we see no difference, we cannot conclude that WIC had no effect.

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[1] Source: National Data Bank.

[2] Bonnie Randall, Susan Bartlett, and Sheela Kennedy, *Study of WIC Participant and Program Characteristics 1996*, Abt Associates Inc., August 1998.

In this introductory chapter, we first provide a context for this project by describing how the WIC program operates and how it serves children. Next, we characterize the three databases used in the study. We then present a conceptual framework for understanding the relationship between children's WIC participation on the one hand, and a host of antecedents and outcomes on the other. We conclude the chapter by describing our general approach to comparisons of three groups of children.

The chapters that follow present findings from the three databases on the following topics:

- Characteristics of the pregnancy
- Characteristics of the child during infancy
- Characteristics of the child, the household, and the mother
- Characteristics of the environment: home, community, child care
- Child's nutritional status
- Child's health, growth, and development
- Age-related patterns of child WIC participation.

Details of data and methodology may be found in appendices referenced throughout the report.

WIC Benefits for Children

WIC services are delivered throughout the United States, including Guam, Puerto Rico, and the American Virgin Islands. At the federal level, the Food and Nutrition Service (FNS) and its seven regional offices provide cash grants to state WIC agencies for program administration and operations, and also issue regulations and provide technical assistance to the States. At the State level, WIC agencies allocate funds to local WIC sponsoring agencies and provide technical assistance to local WIC agency staff. Through April of 1999 State agencies also set nutritional risk eligibility standards.[3] WIC sponsors are typically State and county health departments, municipal and community health agencies, and hospitals. Local WIC agencies use the funds received to provide supplemental foods to WIC participants and to cover their administrative costs, including certification of participants and nutrition education.

Eligibility for WIC has three components. First, an individual must be *categorically eligible*: a pregnant woman, a breastfeeding woman (through 12 months postpartum), a nonbreastfeeding woman (through six months postpartum), an infant (up to one year of age), or a child (up to five years of age). Second, the individual must be *financially eligible*—in a household with income under 185 percent of the federal poverty level, or receiving Medicaid.[4] Finally, the individual must be at *nutritional risk*, as certified by a competent professional authority. Nutritional risks

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[3] After that date, all State agencies were required to adopt the nutritional risk criteria established by FNS and the National Association of WIC Directors (NAWD).

[4] Receipt of AFDC/TANF and Food Stamps also confers eligibility automatically, but these programs have income cutoffs lower than the WIC cutoff. The income cutoff for Medicaid varies by State, sometimes higher and sometimes lower than 185 percent of poverty. Also, medically needy individuals may qualify for Medicaid (and thus for WIC), at any income level.

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may be medical (e.g., anemia), dietary (e.g., inadequate nutrient intake), or predisposing (e.g., homelessness).

WIC is not an entitlement program. The number of participants served each year depends on annual funding levels established by Congress and the allocation of the funds by FNS to the individual States. A system of priorities is used by State and local WIC providers to ration benefits to eligible individuals when necessary. For a given type of nutritional risk, pregnant and breastfeeding women and infants are given higher priority than nonbreastfeeding postpartum women and children. Within each participant category, individuals with medical risks are given higher priority than those with only dietary risks. Thus, in the absence of sufficient funding, children who meet the general eligibility criteria may not be served.

The food package for children up to age five includes milk, cheese, eggs, cereal, 100 percent fruit juice, and dried beans or peanut butter. Other benefits include health referrals and nutrition education for the child's caregiver (and sometimes for the child). Children must be recertified at six-month intervals.

Data Sources

Three data sources are used in this report. The first of these is the third *National Health and Nutrition Examination Survey* (NHANES-III), which collected data on a nationally representative sample of individuals two months of age and over between 1988 and 1994. Selected individuals (or proxy respondents for infants and children) were asked to participate in extensive interviews. Clinical examinations of sample members were performed in a large mobile examination center. Information was obtained on sample members' demographic and income characteristics, nutritional and health status, dietary intake, health care utilization, and participation in government programs. The final sample consists of 31,311 individuals, of whom 4,745 are children aged 12 to 59 months and 1,010 are child WIC recipients.

The second data source, the *Survey of Income and Program Participation* (SIPP), consists of large panels of households chosen every year or two. Respondents in each panel are interviewed at four-month intervals over a period of approximately three years, so that the time periods of the panels overlap.[5] In contrast to NHANES, the SIPP collects complete information on all members of included households, rather than only selected sample members. Like NHANES, the SIPP is nationally representative.

The 1993 panel of the SIPP consisted of nine waves of data collected on approximately 20,000 households at four-month intervals, from 1993 through 1995. Detailed information about children was obtained in a variety of topical modules administered during the interviews, including their health status and health care use, home environment, child care arrangements, and financial and food security. The sample of WIC children varies from one wave to the next, because children who are receiving WIC during one interview period may not be receiving WIC

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[5] While the 1988, 1990, 1991, 1992, and 1993 panels followed this pattern, the Bureau of the Census then switched to a strategy of larger, abutting panels. Thus, the 1996 panel does not overlap with its predecessors, and includes nearly twice as many households as the 1993 panel.

during the next. In Wave 6, for example, the sample includes 2,919 children up to age five, of whom 357 received WIC in the last month covered by the interview. In addition to the SIPP topical modules used in Chapters Two through Seven, the longitudinal files of the 1992 and 1993 SIPP panels are used in Chapter Eight to explore the dynamic (age-related) patterns of child WIC receipt.

The final data source used is the survey of two-year-olds from the second wave of the *Comprehensive Child Development Programs* (CCDP2). The sample of children differs in several important ways from the NHANES and SIPP samples. First, the children do not comprise a probability sample. They are a convenience sample of children from low-income families that participated in the CCDP2 demonstration in ten sites. Second, the children do not cover the full age range of WIC children. At the time of the interviews, which occurred in 1994 through 1997, they were all at or near their second birthdays.[6] Third, the children do not cover the full range of household incomes. A criterion for participation was household income less than 100 percent of the federal poverty level at time of recruitment. Families were recruited into the CCDP2 sample between April 1993 and September 1994, when the mother was pregnant with the focus child or when the child was less than one year old. The CCDP2 data are of special interest because they provide an extensive array of information on family characteristics and developmental outcomes that are typically too resource-intensive for national surveys to collect, including standardized cognitive and socioemotional measures, and observations of mother-child interactions.

Conceptual Framework[7]

The three aforementioned databases include a vast wealth of information on children of both low and high income, and the low-income children include some who do and some who do not receive WIC. To organize this information it is helpful to group the measures by topic area, and to arrange the topic areas by whether they logically precede, follow, or are concurrent with children's participation in WIC.

Exhibit 1.1 provides such an organization. On the left side of the diagram are the factors that might cause or increase the likelihood of child WIC participation (such as poverty and low birthweight) as well as those that covary with WIC in affecting child outcomes (the child's environment). On the right side of the diagram are outcomes that could potentially be affected by child WIC participation. For completeness, the diagram includes family wellbeing,

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[6] Two measures are taken from an interview conducted around the children's third birthdays.

[7] For a thorough discussion of this topic, we refer the reader to Institute of Medicine: *WIC Nutrition Risk Criteria, A Scientific Assessment* (1996). This report reviews the literature and breaks new ground on the relationship between poverty and nutritional risk, the WIC program's nutrition risk criteria and priority system, the significance of each anthropometric, biochemical, medical, and dietary risk that can confer WIC eligibility, and the importance of predisposing nutrition risk criteria such as homelessness, passive smoking, and maternal depression. The authors' conceptual model of WIC participation shows a nutrition risk assessment leading to WIC participation with its attendant benefits, ultimately leading to nutrition and health outcomes which for children comprise healthy growth and development (preventing or curing anemia, promoting normal growth patterns, preventing growth deficits), good health status, and normal cognitive, social, and emotional development.

Exhibit 1.1
CAUSES AND OUTCOMES OF CHILD WIC PARTICIPATION

Potential Causes of Child WIC Participation		Outcomes Potentially Affected by Child WIC Participation

Characteristics of Pregnancy

Characteristics of Child at Birth and During Infancy

Characteristics of the Child, the Mother, and the Household

WIC Participation as a Child

Child's Nutritional Status

Child's Health, Growth, Development

Covariates of Child Outcomes

Characteristics of Child's Environment

Family Wellbeing

although these outcomes are beyond the scope of this report. Some of the variables discussed below have been excluded from the analysis as well, due to lack of data.

An important feature of this framework (and the research described in this report) is that it considers the variables as they relate to child WIC participation, and not how they relate to each other. In particular, many of the variables shown here as antecedents of child WIC are potential outcomes of earlier WIC participation, either prenatally or during infancy. For example, birth outcomes such as low birthweight are thought of as antecedents in this framework, because they have already occurred by the time an individual could start to receive child WIC. In a broader framework that took only the characteristics of the family at the time of conception as fixed, birth outcomes would be potential consequences of WIC participation. The same is true for the mother's behaviors during pregnancy (smoking, drinking, nutrition) and infant development in the first year. These variables can be affected not only by prenatal and infant WIC participation, but also by family characteristics in these earlier periods, such as poverty and family supportiveness. Exploring the causal relationships among all these variables is, however, beyond the scope of this report.

Below we discuss each of the groups of variables in the framework. Variables included in the groups—including those for which data are not available to us—are listed in Exhibit 1.2.

Potential Causes of WIC Participation
The left side of Exhibit 1.1 shows factors that link to WIC participation and also, potentially, directly to child outcomes. As noted above, these factors may link with one another as well as to WIC participation and outcomes. In order to keep the framework focused on the relationship between child WIC participation and child outcomes, no attempt was made to depict the relationships among the causal and covariate influences.

Characteristics of the pregnancy. This topic area comprises three groups of variables: the mother's health status at the time of conception, risk factors for the pregnancy, and events occurring during the pregnancy (such as complications and the mother's use of cigarettes).

Characteristics of child at birth and during infancy. This area includes birth characteristics, such as birthweight and gestational age; factors relating to infant health and development, such as breastfeeding and other infant feeding practices; and services received during infancy, including WIC.

Characteristics of the child, the mother, and the household. This group of variables includes demographic characteristics of the child and of the mother, the mother's psychological wellbeing, household composition, income sources and amounts, and household food security.

Covariates: Child's Environment
The factors included in this part of the framework are seen as covariates to WIC participation during childhood. Although they may not directly affect the likelihood of WIC participation, they can be linked to child outcomes. Factors associated with the *home environment* include parenting practices and home safety. Relevant aspects of the environment created by the *neighborhood and community* include overall neighborhood quality and safety. The *child care* environment is characterized by the age at which child entered nonparental care, mode of care, and quality of care.

Exhibit 1.2

MEASURES OF ANTECEDENTS AND OUTCOMES OF CHILD WIC PARTICIPATION

Topic Area	Measures

Characteristics of the Pregnancy (Chapter Two)	Mother's health at conception
	Risk factors
	  Young teenager
	  Older mother
	  Primagravida
	  Multiple fetuses
	  Obstetric history: premature deliveries, miscarriages*
	Course of the pregnancy
	  Prenatal care
	  Complications
	  Behaviors: use of alcohol, cigarettes, illegal drugs
	  Nutritional intake*
	  WIC participation*

Characteristics of the Child During Infancy (Chapter Three)	Birth characteristics
	  Gestational age
	  Birthweight
	  Health status at birth
	  Birth defects
	  Temperament*
	Health and development
	  Health and developmental problems during infancy
	  Breastfeeding
	  Other infant feeding practices
	Services received during infancy
	  Well-baby care*
	  Immunizations*
	  Services for health and developmental problems*
	  Infant WIC participation*

Characteristics of the Child, Household, and Mother (Chapter Four)	Child characteristics
	  Age
	  Sex
	  Race/ethnicity
	  Health insurance coverage
	Household characteristics
	  Household composition
	  Supportiveness of family climate*
	  Social connectedness to community
	  Income relative to poverty
	  Employment of household members
	  Receipt of government benefits
	  Economic security
	  Food security
	Maternal characteristics
	  Age at birth of first child
	  Education
	  Employment status
	  Locus of control
	  Coping and life skills

Exhibit 1.2
(continued)

Topic Area	Measures

Characteristics of the Child's Environment (Chapter Five)	Home
	  Parenting characteristics
	  Parenting practices
	  Level of stimulation available*
	  Home safety
	  Smoking in the home
	  Mobility
	Neighborhood/community
	  Overall quality
	  Resource availability
	  Level of support for families
	  Neighborhood safety
	Child care
	  Age at which child entered nonparental care
	  Mode of care
	  Quality of care
	  Consistency of care
	  Fraction of time spent in care

Children's Nutritional Status (Chapter Six)	Nutritional intake Biochemical abnormalities Physical growth Child's and caregiver's nutritional knowledge*
Children's Health, Growth, and Development (Chapter Seven)	Regular source of health care Immunizations Physical health status Hospitalizations Injuries and accidents Vision, hearing, dental status Physical development Cognitive development Socioemotional development School readiness* School achievement* Retention in grade* Special education placement*
Family Wellbeing	(Characteristics of the household, measured subsequently)*

* Items marked by an asterisk are not included in this report.

Child and Family Outcomes

WIC can be anticipated to have effects on children and their families in several domains through provision of supplemental foods, nutrition education, and health care referrals.

Child's nutritional status. The outcomes affected most directly by the WIC program are those related to child nutrition. These include, for example, the child's nutritional intake, and the child's and caregiver's nutritional knowledge.

Child's health and development. Other child outcomes that could be affected by WIC, either through strengthened links with the health care system or through improved nutrition and nutrition education, include health status, cognitive development, and socioemotional development. Beyond the scope of this study are long-term outcomes that occur after a child "graduates" from WIC, such as school achievement.

Family wellbeing. WIC could ultimately affect the functioning of the child's family in the same dimensions listed above among characteristics of the mother and the household. Exploring these future outcomes is likewise beyond the scope of this study.

Analytic Approach and Interpretations

We conclude this chapter by describing our approach to comparing WIC children with other low income children and with higher income children.

Three characteristics of the WIC program should be borne in mind in interpreting the comparisons. First, while the focus of this report is child WIC participation, a child may be affected by earlier WIC participation. Mothers' participation in WIC prenatally can influence child development, as can children's participation during infancy. Apart from a child's own WIC participation, the participation of a sibling or the participation of a mother during a subsequent pregnancy could influence the child's health and development, because of the increased availability of food to the household, improved nutritional knowledge of the mother, or facilitated linkages to other social services. Our comparisons do not take account of these other categories of WIC participation, and in fact no data are available to us on children's participation in WIC prenatally or as infants.[8]

Not only the child's outcomes, but even the child's likelihood of participation in WIC may be influenced by earlier participation. Infants who received WIC are more likely than other low-income individuals to receive WIC as children; and women who participated in WIC when pregnant are more likely to enroll their infants in WIC than other low-income mothers. Thus earlier WIC participation may both modify a child's need for WIC and increase the likelihood that the child will receive WIC.

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[8] In Chapter Eight we present information on age-related patterns of WIC participation based on the SIPP longitudinal files. In most cases, however, we cannot determine WIC participation as an infant by individual children in the SIPP, and no information on this subject is available in the other two data bases.

A second characteristic of the WIC program is that it offers several distinct benefits to participants. Positive outcomes may be due to any one of the three main program components—supplemental foods, nutrition education, and access to health care—or to some combination. Provision of information on other social services has recently become an additional thrust of the program. It would be valuable to determine which of the elements of WIC have the most influence on child development, and whether the elements have a synergistic effect. To address this question, however, would require data from an experimental setting in which only some of the components were offered in various combinations. In our comparative analyses, we cannot attribute causation even to the WIC program as a whole.

Finally, WIC may have both direct and indirect effects on children and their families. Most directly, by supplying supplemental foods that are nutritionally appropriate, WIC may improve a child's dietary intake. This improved intake may then be related to a host of more distal outcomes, ranging from improved childhood health to increased school readiness (e.g., improved ability to attend, appropriate level of motor coordination). Less directly, WIC staff may provide assistance to link families to other social services, which may, in turn, improve family income and thus provide more opportunities for children.

Description of the child WIC population. A profile of children receiving WIC is a necessary foundation for any other analysis. Our description of WIC children is based on the two nationally representative databases, NHANES-III and the SIPP. Child WIC recipients are identified as **individuals up to age five who are reportedly receiving WIC at the time of the interview**[9].

Comparison between WIC children and other low-income children. Comparing WIC children with other low-income children will help us think about two central policy questions:

- Are WIC services targeted to those low-income children with the greatest health and nutrition needs?

- Do WIC children do as well as other low-income children with respect to outcomes that WIC might be expected to improve?

While this research will provide helpful information, it cannot provide clear answers to these questions. To address the first question would require a full model of the determinants of child WIC participation, including measures of prenatal and infant participation and administrative constraints. With regard to the second question, lacking an experimental design or even repeated measures of nutritional risks, we cannot attempt to measure impacts of WIC. To the extent that outcomes differ between WIC participants and other low-income children, we would expect WIC children to be better off, other things equal, because of the benefits of WIC. But in fact, most of these outcomes are primarily determined by child status at age 12 months, and WIC children may be worse off than other low-income children at that point. Furthermore, other

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[9] In NHANES, respondents are questioned about the child's current WIC receipt. In the SIPP, respondents are questioned about WIC receipt in the past four months. We define "current" recipients in the SIPP as children who received WIC in the calendar month preceding the interview.

things are not equal: WIC children as a group are substantially poorer than other low-income children.

We identify low-income children based on the WIC income cutoff of 185 percent of poverty. **Children up to age five not receiving WIC, in households with reported income under 185 percent of the federal poverty level**, are therefore identified as income-eligible nonparticipants in NHANES-III and the SIPP.

Within this low-income group, however, it should be noted that WIC children are concentrated at the lower end of the distribution. In the SIPP, for example, 25 percent of WIC children but only 18 percent of other low-income children are in households with income under 50 percent of poverty.

In the CCDP2 analyses, the comparison between WIC children and other low-income children is limited in two regards. First, the children in both groups are exclusively two-year-olds (except for two measures of cognitive development, which are taken from a subsample at age three). Second, neither the WIC children nor the non-WIC children span the full range of income-eligibility. As previously noted, all members of the CCDP2 sample were below the federal poverty level at the time of CCDP recruitment; and as will be shown in Chapter Four, even several years later sample members are substantially poorer than the low-income population as a whole. "Other low-income children" in the CCDP2 sample is therefore taken to comprise all non-WIC children in the sample.

The analysis samples for WIC children and income-eligible nonparticipants in the three databases are shown in Exhibit 1.3, along with the WIC participation rate among income-eligibles. This participation rate is defined here as the weighted proportion of children under 185

Exhibit 1.3
SAMPLE SIZES AND WIC PARTICIPATION RATES
IN NHANES-III, THE SIPP, AND CCDP2

| | Sample Sizes | | WIC participation rate among low-income children[a] |
	WIC children	Other low-income children[a]	
NHANES-III	1010	1969	27.3%
SIPP (1993, Wave 6)	357	945	26.4%
CCDP2	1120	947	54.2%

[a]Low income is defined as under 185 percent of the federal poverty level in NHANES-III and the SIPP. All children in CCDP2 are deemed to be low-income.

percent of poverty who were receiving WIC at the time of the interview.[10] The participation rate is substantially higher in CCDP2 than in the other two databases, for two reasons that will be documented in Chapter Four. First, the sample is restricted to two-year-olds, who are more likely to participate in WIC than older children. Second, the CCDP2 sample is poorer than low-income children in general, another factor increasing their participation rate.

In the two nationally-representative databases, we would have expected a somewhat higher participation rate in the SIPP (end of 1994) than in NHANES (1988-1994), given that the child WIC caseload more than doubled over this period (1.6 million in 1988 versus 3.5 million in 1994). The observed pattern is assumed to result from the numerous differences in measurement

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[10] Both NHANES and the SIPP contain a small number of children reportedly receiving WIC although their household income is reportedly above 185 percent of the federal poverty level. This could happen for a variety of reasons:

- In some States, the income cutoff for Medicaid, receipt of which confers adjunctive eligibility for WIC, is above 185 percent of poverty. In 1994, around the middle of the period analyzed in this report, Vermont used an income cutoff of 225 percent of poverty for children, and Minnesota used a cutoff of 275 percent.
- Some higher-income children may qualify for WIC because they are eligible for "medically needy" Medicaid due to large medical expenses.
- Income eligibility is established at the time of certification, and household income may exceed the cutoff in subsequent months before the next certification.
- WIC eligibility workers measure income contemporaneously while surveys measure it retrospectively (e.g. income over the past 12 months.)
- Survey staff may ascertain household income using different probes and other techniques than WIC eligibility workers.
- The time period over which income is measured may be different—e.g., a year versus a month.
- NHANES measures income as a range rather than as an exact value. The midpoint of the range is used to compare household income to the poverty line.

Consequently, a child in a household with reported income of, say, 250 percent of poverty in a survey might have been found financially eligible by WIC staff (e.g., because the family's situation improved after the most recent certification). These higher-income children are included in the tabulations of WIC participants.

of household income in the two surveys, as well as differences in how child WIC participation is ascertained.[11]

Comparison between WIC children and higher income children. Children who are not eligible for WIC because of higher family income comprise another useful comparison group. Comparing these two groups of children, we may ask:

- How far do WIC children have to go in various areas to reach the levels of children who are not constrained by low income?

- Are the health and nutrition risks that are indicators for WIC intervention substantially more prevalent among WIC children than among higher-income children?

- Do WIC children do as well as higher income children with respect to outcomes that WIC might be expected to improve?

Higher-income children in NHANES and the SIPP are defined as **children up to age five with household income over 185 percent of the federal poverty level**.

A few measures that we examine are strongly related to a child's age—e.g. nonparental child care. WIC children are younger on average than other children. To make the comparisons more meaningful, these measures have been *age-adjusted*, i.e. calculated as if the age distribution was the same for all three groups of children.

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[11] Child WIC participation in NHANES is ascertained by inquiring of the proxy respondent:

> Did ___ receive benefits from WIC, that is, the Women, Infants, and Children Program, in the past 12 months?

> [If yes,] Is ___ now receiving benefits from the WIC program?

The SIPP, on the other hand, first ascertains if an adult respondent received WIC during the last four months for herself or any of her children; then in which months WIC was received; and then who was covered during these months.

The Centers for Disease Control (CDC) calculates income as a percent of poverty in NHANES based on the midpoint of the reported range of household income for the preceding 12 months. In the SIPP, household income relative to the federal poverty level is calculated on a monthly basis.

Chapter Two
Characteristics of the Pregnancy

WIC children differ from other low-income and higher income children from the moment of conception. Some of these differences may have long-term implications for their health, development, and nutritional status.

In this chapter, we characterize the mothers of WIC children at the time of their pregnancy and compare them with other pregnant women. We focus on three areas: women's health status, obstetrical risks, and the course of pregnancy. All of these characteristics may affect the outcome of the pregnancy, and thus both the child's subsequent well being and the child's subsequent WIC participation. We find that where differences exist, the pregnancies of mothers of WIC children were more problematic than the pregnancies of mothers of other low-income children, and (not surprisingly) substantially more problematic than the pregnancies of mothers of higher income children.

Not included in this analysis is prenatal WIC participation. This key maternal behavior strongly affects the likelihood of subsequent WIC participation by the infant and child, and has been indicated in some research to affect birth outcomes. Unfortunately, none of the available data sources include information on children's prenatal WIC participation.

Mother's Health Status

A woman's health status is likely to affect the course of pregnancy. Women who have current or prior health conditions such as hypertension or respiratory problems generally require closer monitoring than women without such conditions, and may experience more complications during pregnancy. While none of the three databases recorded mother's health conditions at the time of the pregnancy *per se*, both the SIPP and CCDP2 include current measures from which we can infer the mother's health at the earlier time.[1]

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[1] It will be recalled that NHANES sampled individuals, rather than entire households. The mothers of the sampled children were typically not interviewed, so that information on the pregnancy is not available from this database.

Self-Reported Overall Health

The SIPP and CCDP2 include comparable survey items on health status. Respondents were asked to rate their *current* health as poor, fair, good, very good or excellent. This may be a reasonable proxy for health at the time of the pregnancy. While it is true that the mother's health may have improved or deteriorated in the interim, it seems likely that the intertemporal correlation will be high.

Roughly one in ten of the low-income women in the SIPP sample rated their health as either poor or fair (Exhibit 2.1). There was no significant difference between mothers of WIC children and mothers of other low-income children in this regard. Compared to mothers of higher income children, however, mothers of WIC children were more than three times as likely to report that their health was poor or only fair (13 percent *versus* 4 percent). Note that asterisks in this exhibit and in all other exhibits in this report represent statistical significance of differences between the indicated groups and WIC participants.

In the poorer CCDP2 sample, the prevalence of self-reported poor or fair health status was substantially greater: around 18 percent overall. Moreover, mothers of WIC children were significantly more likely than mothers of other low-income children to rate their overall health negatively.

Prior or Current Health Conditions

The CCDP2 data set also included an inventory of past and current health conditions. Mothers of WIC children were significantly more likely than mothers of non-participating low-income children to report a significant health condition (38 percent *versus* 30 percent). Conditions assessed include arthritis, diabetes, heart problems, hypertension, lung and respiratory problems (including asthma), thyroid disease, AIDS and AIDS-related complex, cancer, kidney stones or other kidney problems, and stroke. The most frequently reported health conditions were asthma and hypertension.

Both the SIPP and CCDP2 included indicators of limitations on activities due to health conditions. The SIPP determined whether individuals' health or condition limited the kind or amount of work they could do. No significant difference appeared between mothers of WIC children and other low-income mothers, but higher income mothers were significantly less likely to be limited by their health: a likelihood of 5 percent, *versus* 10 percent for mothers of WIC children.

The CCDP2 interview collected information on whether health conditions limited mother's abilities to engage in general activities like lifting heavy objects or climbing stairs; to work at

Exhibit 2.1
MOTHER'S HEALTH STATUS

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Self-rated health fair or poor (percent)					
SIPP	13.1	10.4	11.2	3.8**	7.3
CCDP2	19.9	15.8*	18.2		
Prior or current health condition (percent)[1]					
CCDP2	38.4	30.3**	35.1		
Health condition limits kind or amount of work (percent)					
SIPP	9.9	8.2	8.7	4.6**	6.6
Health condition limits activities (percent)					
CCDP2					
General	28.3	20.5**	25.1		
Work	15.2	10.8**	13.4		
Social	23.9	19.7*	22.1		

1   Includes arthritis, heart problems, hypertension, lung or respiratory problems, thyroid disease, diabetes, AIDS or AIDS-related condition, cancer, kidney stones/problems, and stroke.

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
            *   Statistically significant difference from WIC participants at the 5 percent level.

a job, work around the house, or go to school; or to participate in social activities like visiting friends and relatives. In all three of these areas, a significantly greater fraction of mothers of WIC children than other mothers reported some health-related limitations.

Obstetrical Risks

Obstetrical risk factors include mother's age, first pregnancy, multiple fetuses, and closely spaced pregnancies.

Mother's Age

Higher income mothers tend to be older than low-income mothers. This may reduce one obstetric risk (being a young teenage mother) while increasing another (being an older mother).

Mothers of WIC children in all three samples were about 25 years old on average at the time the focus child was born (Exhibit 2.2). In the NHANES-III and SIPP samples, mothers of other low-income children were about the same age, but mothers of higher income children were significantly older (28 and 29 years, respectively). In the CCDP2 sample, mothers of other low-income children were a year younger on average than mothers of WIC children.

Young Teenage Mothers

Young teenage mothers, defined here as women who were under age 18 when the focus child was born, are at increased risk for adverse outcomes.[2] Among mothers of WIC children in NHANES and the SIPP, 7 percent were young teenagers. In all three data sets, the prevalence of young teen mothers was similar among mothers of WIC children and mothers of other low-income children. Mothers of higher income children, however, were substantially less likely to be young teenagers (only 2 percent).

Older Mothers

Women aged 35 or more when their children are born are also at increased obstetrical risk. This risk was found among 6 to 9 percent of mothers of WIC children in the SIPP and NHANES samples. Rates in both data sets were similar for other low-income mothers, but higher (12 to 13 percent) for higher income mothers.

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[2] This age cut-off was selected for consistency with the WIC Program and Participant Characteristics Studies. See, for example, Bonnie Randall, Susan Bartlett, and Sheela Kennedy, *Study of WIC Participant and Program Characteristics 1996*, Abt Associates, Inc., August 1998.

Exhibit 2.2
OBSTETRICAL RISKS: MOTHER'S AGE AND PARITY

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Mean age at birth of focus child (years)					
NHANES-III	24.7	24.8	24.8	28.2**	26.4
SIPP	25.3	26.0	25.9	29.0**	27.4
CCDP2	25.0	23.8**	24.5		
Young teenage mother (age < 18) at birth of focus child (percent)					
NHANES-III	7.4	7.3	7.3	1.7**	4.6
SIPP	6.9	6.5	6.6	1.7**	4.3
CCDP2	10.2	9.4	9.9	1.5	4.1
Older mother (age 35+) at birth of focus child (percent)					
NHANES-III	6.3	5.6	5.8	12.3**	9.0
SIPP	9.0	8.2	8.4	12.9	10.6
CCDP2	5.4	3.5**	4.6		
Focus child is first live birth (percent)					
SIPP	19.7	16.2	17.1	29.6**	23.3
CCDP2	40.7	47.3**	49.5		
Multiple fetus (percent)					
CCDP2	1.6	1.0	1.3		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
  * Statistically significant difference from WIC participants at the 5 percent level.

In the CCDP2 sample, mothers of WIC children were significantly more likely to be 35 or over than other low-income mothers, although the rates for both groups were quite low.

Parity

First pregnancies are more likely to result in low birthweight babies. Information was available from the SIPP and CCDP2 on number of *previous live births*, which was taken as a proxy for number of previous pregnancies.

About 20 percent of WIC children in the SIPP sample were firstborn. The proportion was similar for other low-income children, but much higher for higher income children (30 percent).

In the poorer CCDP2 sample, children were much more likely to be firstborn than in the nationally representative SIPP sample. Two-fifths of the WIC children and nearly half of the other poor children in this survey were their mother's first children.

Multiple Fetuses

WIC children in the CCDP2 sample were not significantly more likely to have been twins or triplets than other low-income children in the sample.

Course of the Pregnancy

The mother's health behaviors and experiences during the pregnancy could also have important effects on birth outcomes. Measures examined include timing of prenatal care, prevalence of problems during pregnancy, and use of cigarettes, alcohol, and illegal drugs during pregnancy.

Prenatal Care

The CCDP2 questionnaire asked women about how far along they were in the focus pregnancy before they enrolled in prenatal care. Roughly 12 percent of this sample of women enrolled in prenatal care late, that is, after the first trimester (Exhibit 2.3). Mothers of WIC children were no less likely than mothers of other children in poverty to initiate prenatal care after the first trimester.

Complications During Pregnancy

CCDP2 also included a question about the occurrence of significant health problems during pregnancy (serious complications with pregnancy, blood pressure or circulatory problems, rapid weight gain, and gestational diabetes). Mothers of WIC children were about as likely as other low-income mothers to report one or more of these problems (28 percent *versus* 25 percent).

Exhibit 2.3
COURSE OF THE PREGNANCY

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	**Non-Participants**	**All**		
Enrolled in prenatal care after first trimester (percent)					
CCDP2	11.8	11.5	11.7		
Significant health problem during pregnancy (percent)					
CCDP2	28.4	25.2	27.1		
Smoked cigarettes (percent)					
NHANES-III	29.0	27.5	28.0	18.4**	23.3
CCDP2	28.3	27.5	28.0		
Used alcohol (percent)					
CCDP2	15.5	10.3**	13.3		
Used illegal drugs (percent)					
CCDP2	7.7	4.7**	6.4		
Used crack or cocaine (percent)					
CCDP2	4.9	2.7*	4.0		

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
    *   Statistically significant difference from WIC participants at the 5 percent level.

Use of Cigarettes, Alcohol, and Illegal Drugs

Cigarette smoking bears a strong inverse relationship to income. This behavior may be addressed in WIC nutrition education for pregnant women because of its well-known deleterious effects on birth outcomes. In the NHANES-III sample, 28 percent of low-income mothers smoked during their pregnancy with the focus child. Mothers of WIC children were about equally likely as mothers of other low-income children to exhibit this behavior, but were substantially more likely to do so than mothers of higher income children. The prevalence of smoking during pregnancy among mothers of WIC children was 29 percent compared to 18 percent for higher income mothers.

Patterns observed in the CCDP2 data mirrored those seen in NHANES-III. The prevalence of smoking during pregnancy was similar among mothers of WIC children and mothers of other low-income children.

With regard to alcohol or drug use during pregnancy, which was measured only in CCDP2, mothers of WIC children were significantly more likely than mothers of other low-income children to use alcohol (16 percent *versus* 10 percent) or illegal drugs (8 percent *versus* 5 percent) during pregnancy. Both of these differences were significant at the 1 percent level. The two most frequently reported drugs were crack and cocaine. Among WIC children, about five percent of mothers reported use of one or both of these drugs during pregnancy. The comparable percentage for mothers of other low-income children was three percent.

Conclusions

Not surprisingly, WIC children are handicapped relative to higher income children before they are born with regard to their mother's health status, certain obstetrical risks, and behaviors and health conditions during pregnancy. WIC children's mothers are significantly more likely than mothers of higher income children to have been in only fair or poor health,[3] to have been a young teenager at the time of the birth, and to have smoked cigarettes during the course of the pregnancy. They are less likely than higher income women, however, to be subject to two other risks while pregnant with the focus child: higher maternal age and first pregnancy.

No significant differences in characteristics of the pregnancy were found between mothers of WIC children and mothers of other low-income children in the two nationally-representative data bases. In the poorer CCDP2 sample, however, WIC children appeared to face greater obstacles to healthy growth and development than their non-WIC counterparts. At the time of the pregnancy, the WIC children's mothers were significantly more likely than other low-income mothers in this sample to have been in only fair or poor health, to have been suffering from a health condition such as asthma or hypertension, to be aged 35 or older, and to have used alcohol and illegal drugs, including crack or cocaine. On the positive side, they were less likely than the other low-income mothers to be pregnant for the first time. Overall, however, the disadvantaged condition of WIC children begins very early indeed.

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[3] Recall that we use mother's current self-reported health status as a proxy for her health status at conception.

Chapter Three
Characteristics of the Child During Infancy

Characteristics of the child at birth and during the first year of life may influence both the child's WIC participation and subsequent child outcomes. Some of these characteristics, such as low birthweight, prematurity, and the presence of birth defects, are explicitly identified by the WIC program as nutritional risks. They thus qualify the child for subsequent receipt of WIC, while at the same time being associated with negative health outcomes. Others, like breastfeeding and other infant feeding practices, are specific topics of WIC nutrition education. Because WIC children are likely to have been WIC infants, good infant nutrition may be associated with child WIC participation.

Although the relationship between infant and child WIC receipt is of great importance, we cannot compare WIC children and other low-income children explicitly with respect to their infant WIC participation. None of the datasets allow us to determine directly the proportions of WIC children and other low-income children that received WIC as infants. From the longitudinal analyses of WIC participants reported in Chapter Eight, we can estimate that of children receiving WIC at a point in time, about 72 percent received WIC in infancy; and that of low-income children *not* receiving WIC at a point in time, about 35 percent received WIC in infancy. This estimate should, however, be viewed as a rough approximation rather than exact.[1]

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[1] The estimate was calculated as follows. While low-income children outnumber low-income infants in the 1992 and 1993 longitudinal panels of the SIPP by about 4 to 1, WIC children outnumber WIC infants by 2.37 to 1. (This ratio is calculated based on the numbers of WIC infants aged 4 to 11 months in the SIPP, inflated by the ratio of infants aged 0 to 11 months to infants aged 4 to 11 months in the PC94 Analytic File, described in Appendix D.) Given the 26.4 percent participation rate for low-income children (see Chapter One), we infer a 44.6 percent participation rate for infants ($0.264 \times 4 / 2.37$). We also report in Chapter Eight that 71.5 percent of WIC children received WIC as infants. Putting these numbers together suggests that among low-income children, 18.9 percent are WIC children who received WIC as infants; 7.5 percent are WIC children who did *not* receive WIC as infants; 25.7 percent are non-WIC children who were WIC infants; and 47.9 are non-WIC children who were not WIC infants.

This calculation has at least two weak points. First, the population of low-income children is not identical to the population of children that was low-income in infancy. Second, the WIC program is not in a "steady state", as this calculation assumes; child participation has been growing rapidly relative to infant participation in recent years. (It is probably not a major problem that WIC infants in the SIPP aged 0 to 3 months are included in the calculation only indirectly. Although most infant certifications occur in this time period, few enrolled infants are likely to leave the program before age 4 months.) These considerations may impart unknown biases to the estimate.

In this chapter we present information on WIC children and compare them to other children in two areas of infant well being: health status at birth and infant feeding patterns. We find that WIC children were less healthy than other low-income children and higher income children at birth. Their infant feeding patterns, however, tended to be better than those of other low-income children, and in some areas, even better than those of higher income children. An important exception is breastfeeding, which was substantially more common among higher income children.

Health Status at Birth

The measures examined in this domain included the proportions of children who:

- were born seven or more weeks prematurely (gestation of less than 34 weeks);
- were low birthweight (less than 5.5 pounds or 2500 gm);
- required a stay of one or more nights in the neonatal intensive care unit; and
- were born with a birth defect.

Where differences exist, they tend to be unfavorable for WIC children relative both to other low-income children and to higher income children.

Gestational Age

Information on gestational age was available only in the nonrepresentative CCDP2 sample. Very few children in this sample (3 percent overall) were born seven or more weeks prematurely. The prevalence of premature birth was similar for WIC children and other low-income children (Exhibit 3.1).

Birthweight

WIC children were significantly more likely than other children to have been low birthweight. The prevalence of low birthweight among WIC children was 12 and 13 percent in the NHANES-III and CCDP2 samples, respectively, compared to 8 to 9 percent for other low-income children. In comparison to higher income children, WIC children in the NHANES-III sample were more than twice as likely to have been low birthweight (12 percent *versus* 5 percent).

Exhibit 3.1
HEALTH STATUS AT BIRTH

Characteristic	Low-Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Born seven or more weeks early (percent)					
CCDP2	3.8	2.6	3.3		
Low birthweight (percent)					
NHANES-III	11.6	8.3*	9.4	5.3**	7.4
CCDP2	13.1	8.6**	11.2		
Required time in intensive care nursery (percent)					
NHANES-III	14.8	9.4**	11.1	10.9	11.0
CCDP2	17.7	15.0	16.6		
Birth defect (percent)					
CCDP2	0.6	0.4	0.5		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
  * Statistically significant difference from WIC participants at the 5 percent level.

Use of Neonatal Intensive Care Services

WIC children in the NHANES sample were half again as likely to have required a stay in the newborn intensive care unit as other low-income children or higher income children (15 percent *versus* 9 to 11 percent). The difference between WIC children and other low-income children in the CCDP2 sample, although in the same direction, was not statistically significant. These findings are consistent with the higher prevalence of low birthweight among WIC children, because low birthweight often precipitates the need for specialized neonatal care.

Birth Defects

Birth defects were very rare among children in the CCDP2 sample (less than one percent) and the prevalence among WIC children was not significantly different than among other low-income children.

Infant Feeding Patterns

Variables examined in this analysis include initiation and duration of breastfeeding, use of cow's milk, inappropriate use of baby bottles, and introduction of solid foods. Because WIC children were likely to have received WIC as infants, we might expect relatively favorable infant feeding patterns, and indeed we find them on several measures.

Breastfeeding

Breastfeeding is a beneficial practice that is positively correlated with household income. In the NHANES-III sample, 40 percent of WIC children were breastfed at some time (Exhibit 3.2). The prevalence of breastfeeding among other low-income children (44 percent) was not significantly different. The prevalence of breastfeeding among higher income children, however, was 67 percent, two-thirds again as high as the rate among WIC children.

A similar pattern is noted for breastfeeding over an extended period. Only 16 percent of WIC children and 18 percent of non-WIC low-income children were breastfed for at least six months. In contrast, 30 percent of the higher income children were breastfed this long.

Use of Cow's Milk

Both WIC and the American Academy of Pediatrics recommend that cow's milk be avoided until after an infant has reached 12 months of age. WIC children in the NHANES sample were significantly less likely than either non-participating low-income children or higher income children to have received cow's milk on a daily basis before 12 months of age. The

Exhibit 3.2
INFANT FEEDING PATTERNS

Characteristic	Low-Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Ever breastfed (percent)					
NHANES-III	40.0	44.3	42.9	66.7**	54.5
Breastfed six months or more (percent)					
NHANES-III	15.7	17.5	16.8	29.5**	23.1
Fed cow's milk before 12 months of age (percent)					
NHANES-III	31.3	45.6**	41.1	41.6**	41.3
Put down to sleep with bottle containing anything other than water (percent)					
CCDP2	69.5	75.3**	71.9		
Fed by bottle after 12 months of age (percent)					
NHANES-III	86.2	84.4	84.9	83.5	84.3
CCDP2	79.9	79.5	79.7		
Fed solid foods before 4 months of age (percent)					
NHANES-III	19.1	23.2	21.9	22.3	22.1

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
  * Statistically significant difference from WIC participants at the 5 percent level.

prevalence of this behavior among WIC children was 31 percent, compared to 46 percent and 42 percent for other low-income children and higher income children, respectively.

A plausible explanation for this pattern is the influence of WIC participation during infancy. Use of cow's milk during infancy is specifically discouraged in WIC nutrition education. This message, coupled with the direct provision of infant formula through 12 months of age, may act as serious deterrent to the use of cow's milk before the recommended age among WIC infants.

Inappropriate Use of a Baby Bottle

Inappropriate use of a baby bottle may promote a systematic form of tooth decay referred to as "nursing bottle syndrome." This results when infants hold carbohydrate-containing fluids in their mouths for long periods of time because they are put to sleep with a bottle or are allowed to suck on a bottle for extended periods of time while awake.

The CCDP2 questionnaire asked respondents whether the child had ever been "put down to sleep with a bottle (containing a fluid other than water) at bedtime or naptime." While the prevalence of this behavior is much higher than desired (72 percent overall), it is significantly less common among WIC children (70 percent) than among other low-income children (75 percent). Because the issue of nursing bottle caries is commonly addressed in WIC nutrition education, participation in WIC during infancy may also play a role in this finding.

Infant feeding guidelines issued by WIC and the American Academy of Pediatrics recommend weaning infants from the bottle by 12 months of age in order to decrease reliance on formula and milk and promote a well-balanced diet. Data from both NHANES-III and CCDP2 indicate that the majority of caregivers, across all participation and income categories, do not follow this advice. Eighty percent or more of all children were still using a bottle at 12 months of age. There were no significant differences between WIC children and either low-income children or higher income children in the prevalence of this behavior.

Introduction of Solid Foods

Infant feeding guidelines issued by WIC and the American Academy of Pediatrics also recommend that infants not be fed solid foods until at least four months of age. Data from NHANES-III indicate that WIC children were about as likely to have been fed in accordance with this recommendation as non-participating low-income children and higher income children. Nineteen percent of WIC children received solid foods before four months of age. The comparable figures for non-participating low-income children and higher income children were 22 to 23 percent.

Conclusions

WIC children were significantly more likely than other low-income children and than higher income children to have been low birthweight and to have required time in an intensive care nursery. The proportions of WIC children with these two disadvantages at birth were 12 percent and 15 percent, respectively.

On the other hand, WIC children were–with one exception–not disadvantaged with regard to infant nutrition. They were significantly less likely than both other low-income children and higher income children to have been fed cow's milk as infants. Furthermore, in the poorer CCDP2 sample, they were significantly less likely to be put down to sleep with a bottle (although the prevalence of this practice was still disturbingly high, at 70 percent). While nearly all WIC children were inappropriately bottle fed after the age of 12 months, that did not distinguish them from other low-income children or higher income children.

Where WIC children lose out in infant nutrition is in the mother's fundamental decision whether to breastfeed. WIC children were no more likely than other low-income children to have been breastfed, and substantially less likely than higher income children.

These generally favorable results with regard to infant feeding practices are consistent with the hypothesis that many WIC children benefited from WIC participation during infancy.

Chapter Four
Characteristics of the Child, Household, and Mother

This chapter compares WIC children, other low income children, and higher income children with respect to characteristics of the children themselves, their households, and their mothers. Measures examined include the focus children's age, race, and sex, household income relative to poverty, presence of earnings, receipt of public assistance, household composition, health insurance coverage of children, and mothers' education, employment status, and age at birth of first child. We also examine more subjective measures of perceived financial security, food security, and mothers' ability to cope with the stresses in their lives.

By providing supplementary foods, nutrition education, and linkages to health care providers WIC may improve households' food security and economic welfare. Yet deficiencies in these same factors are also antecedents or causes of WIC participation. Since differences in these measures across the three groups of families could reflect a combination of causes and consequences of WIC participation, these comparisons cannot reveal the effects of WIC, and they provide less than perfect information on what determines WIC participation. Nevertheless, these comparisons can provide some general insights about how WIC benefits are targeted among children in low income families, and information on the extent to which the financial circumstances of WIC children's households lag behind those of higher income children's households.

An important finding of this chapter, in accordance with prior research, is that the income distribution of child WIC recipients, compared with that of all income-eligible children, is heavily concentrated toward the low end. Hence, although "other low-income children" could in principle have received WIC based on their household income, the households of the participant and low-income nonparticipants are not well-matched comparison groups. This consideration needs to be borne in mind in all the comparisons of WIC and other low-income children.

Demographic Characteristics of the Child

Despite possible correlations of gender with some nutritional risks, all three surveys show that children who receive WIC services are about equally likely to be boys as girls (Exhibit 4.1).

It is well known that child WIC participation drops off with age, and this is confirmed in the age distributions from both NHANES and SIPP.[1] The mean ages of WIC children in these two

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[1] See Chapter Eight for a discussion of the temporal patterns of child WIC participation.

Exhibit 4.1

DEMOGRAPHIC CHARACTERISTICS OF THE CHILD

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Sex of child: percent male					
NHANES-III	52.9	50.4	51.2	51.2	51.4
SIPP	49.3	48.4	48.7	51.9	50.5
CCDP2	53.0	54.2	53.5		
Age of child					
NHANES-III					
Mean age in years	2.5	3.6**	2.9	3.0**	2.9
Distribution (percent)[a]					
1 year	41.3	18.4	25.6	23.7	24.7
2 years	23.3	26.7	25.7	26.1	25.9
3 years	22.0	27.8	26.0	25.3	25.6
4 years	13.4	27.1	22.8	25.0	23.9
SIPP					
Mean age in years	2.3	2.7**	2.6	2.5**	2.5
Distribution (percent)[a]					
1 year	31.8	17.1	22.2	24.3	23.4
2 years	25.3	25.7	25.6	24.6	25.0
3 years	25.5	24.6	24.9	26.0	25.5
4 years	17.4	32.7	27.3	25.1	26.1
Race/ethnicity of child					
NHANES-III					
Percent nonwhite	58.3	51.3	53.5	18.5**	36.4
Distribution (percent)[a]					
Black (non-Hispanic)	30.9	22.1	24.8	7.3	16.3
White (non-Hispanic)	41.7	48.7	46.5	81.5	63.6
Hispanic	23.0	24.7	24.2	7.8	16.2
Other	4.4	4.5	4.5	3.4	4.0
SIPP					
Percent nonwhite	53.2	47.3	49.4	20.0**	32.9
Distribution (percent)[a]					
Black (non-Hispanic)	26.2	20.3	22.4	8.1	14.4
White (non-Hispanic)	46.8	52.7	50.6	80.0	67.1
Hispanic	23.9	22.6	23.0	7.3	14.2
Other	3.4	5.5	4.8	4.7	4.7

Exhibit 4.1
(continued)

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
CCDP2					
Percent nonwhite	80.5	68.4**	75.0		
Distribution (percent)[a]					
Black (non-Hispanic)	59.6	58.2	58.9		
White (non-Hispanic)	19.5	31.6	25.6		
Hispanic	16.4	6.3	11.4		
Other	4.5	3.9	4.2		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
         * Statistically significant difference from WIC participants at the 5 percent level.

[a]Significance tests not shown.

databases are 2.3 and 2.5 years old, respectively. Other low income children are significantly older on average: 2.7 years in the SIPP, 3.6 years in the less recent NHANES. Looking at the age distribution, one-year-olds comprise 41 percent of WIC children in NHANES and 32 percent of WIC children in the SIPP.[2] The difference between the two data sets reflects the timing of the surveys: 1988-1994 for NHANES, 1995 for Wave 9 of the 1993 panel of the SIPP, from which these numbers were calculated. According to administrative records, one-year-olds comprised 44 percent of WIC children in 1992 and 36 percent of WIC children in 1996.[3]

The racial/ethnic composition of the three groups of children varies markedly by WIC status. In both the NHANES and CCDP2 samples, WIC children are significantly more likely to be nonwhite than other low-income children. Furthermore, in NHANES and the SIPP, over half of WIC children are nonwhite, compared with only 20 percent of higher income children. Nonwhite WIC children are about equally split between black and Hispanic.[4]

Household Income, Poverty Rates, and Employment

To qualify for WIC, children must generally have household incomes below 185 percent of the federal poverty level, although families with incomes above 185 percent of the federal poverty level may qualify for Medicaid and WIC if they have large medical expenses and are thus considered medically needy. WIC participation depends in part on the extent to which low income families know about the program and seek assistance and the extent to which needy families are referred to the program by doctors, welfare case workers, or other informed service providers.

The surveys indicate that most WIC children are, in fact, in households with incomes below the federal poverty level (Exhibit 4.2). Average household income relative to poverty was 90 percent for WIC children in the NHANES sample and 112 percent for WIC children in the SIPP sample. Furthermore, the percentage of WIC children living in poverty was 68 percent in NHANES and 54 percent in the SIPP. WIC also serves a large number of households with very low incomes: the percentage of WIC households with incomes below 50 percent of the federal poverty level was 27 percent in NHANES and 25 percent in the SIPP.

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[2] Significance tests are not shown for each category of the age distribution, as these are hard to interpret individually.

[3] Bonnie Randall, Susan Bartlett, and Sheila Kennedy, *Study of WIC Participant and Program Characteristics 1996*, August 1998, p. 36.

[4] Significance tests are not shown for each category of the racial/ethnic distribution.

Exhibit 4.2
HOUSEHOLD INCOME AND PRESENCE OF AN EMPLOYED ADULT

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Income as percentage of federal poverty level					
NHANES-III					
Mean	90.0	98.7	96.2	333.8**	214.4
Distribution (percent)[a]					
less than 50 percent	26.9	17.6	20.3	0.0	10.2
51 to 100 percent	41.3	34.4	36.4	0.0	18.4
101 to 185 percent	24.0	48.0	41.0	0.0	20.7
over 185 percent	7.9	0.0	2.3	100.0	50.7
SIPP					
Mean	112.4	103.4	106.6	377.9**	259.7
Distribution (percent)[a]					
less than 50 percent	25.0	17.5	20.1	0.0	8.8
51-100 percent	28.5	29.2	28.9	0.0	12.7
101-185 percent	32.5	53.3	46.0	0.0	20.2
over 185 percent	14.0	0.0	4.9	100.0	58.2
CCDP2					
Mean	67.1	79.5**	72.3		
Distribution (percent)[a]					
less than 50 percent	50.2	43.8	47.6		
51-100 percent	31.8	32.8	32.2		
101-185 percent	12.1	13.2	12.6		
over 185 percent	4.2	9.0	6.4		
Percent of households with employed adult					
SIPP	66.6	76.6**	72.9	99.5**	87.8

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
  *   Statistically significant difference from WIC participants at the 5 percent level.

[a]Significance tests not shown.

In the CCDP2 survey sample, more than four of every five WIC households have incomes below the federal poverty level; this survey was administered to a sample of very low income families and does not provide a representative sample of WIC households.[5] For purposes of comparison, administrative data indicate that two-thirds of WIC children in 1996 were living in poverty, and 35 percent were in households with income under 50 percent of the federal poverty level.[6] The survey results may understate the extent to which WIC serves households with very low incomes because incomes may have risen after they became certified for WIC.

The SIPP survey also indicates that about two-thirds of WIC households have at least one adult with some earned income. These findings imply that the WIC program serves a large number of families who remain poor despite having a working adult.

We found that the proportion of households with WIC children that had incomes greater than 185 percent of the federal poverty level was only about 8 percent in the NHANES-III survey sample and 14 percent in the SIPP survey sample. This finding suggests that our rule for forming the comparison group of "other low income households" eliminates a relatively small number of children whose reported family incomes exceeded 185 percent of the poverty line and who might have qualified for WIC. Furthermore, as noted in Chapter One, there are many reasons why income reported in these surveys might be higher than income determined by WIC staff at certification. These reasons include time elapsed between certification and interview, contemporaneous measurement of income by WIC eligibility workers *versus* retrospective measurement in the surveys, inclusion in the surveys of income sources that are not counted by WIC, and use of different probes and techniques to collect income information.

Gordon *et al*. (1997) found similar proportions of WIC participants with income over 185 percent of poverty in the 1990 and 1991 panels of the SIPP.[7] Their sample was not WIC children, but rather women in families participating in WIC prior to a pregnancy, during a pregnancy, and in the 12 months following the birth of a child. Their analysis also differed from this one in that both WIC participation and income were measured on a quarterly basis.

The proportion of the households that were income-eligible ranged from 81.1 percent (third trimester of pregnancy) to 86.4 percent (0 to 2 months postpartum). This compares with the reported value from the SIPP in Exhibit 4.2 of this report of 86.0 percent. The authors determined that many of the income-ineligible households in their sample were in fact on Medicaid, and therefore adjunctively eligible. The remainder, apparently ineligible at the time of the survey, comprised as little as 6.2 percent of households containing women who were 0 to 2

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[5] In 1996, the federal poverty level was $12,273 in annual income for a three-person family.

[6] Randall *et al., op. cit.,* p. 54.

[7] Anne Gordon, Kimball Lewis, and Larry Radbill, *Income Variability Among Families with Pregnant Women, Infants, and Young Children*, Mathematica Policy Research, Princeton, NJ, January 1997.

months postpartum, and as many as 11.7 percent of households containing an infant aged 9 to 11 months.[8]

The distribution of income of households with WIC children differs from the distribution of income of low income households and, of course, higher income households. All three surveys show that, relative to WIC children, low income nonparticipants are less likely to be living in poverty, and are more likely to have an employed adult in their household.[9] As one would expect, the remaining group of higher-income households in the NHANES-III and SIPP surveys have far higher average incomes and virtually all contain at least one working adult.

Receipt of Public Assistance

For several reasons, we expect to find that a substantial proportion of households with WIC children will also receive support from AFDC/TANF, the Food Stamp Program, and other programs. Many of these households will be eligible and in need of other assistance. Case managers enrolling families in one of these programs will probably enroll them or refer them in other programs for which they qualify. And receipt of AFDC/TANF, Food Stamps, or Medicaid automatically qualifies a family as income-eligible for WIC.

Exhibit 4.3 confirms that households with WIC children often receive benefits from other government programs. In the nationally representative NHANES-III and SIPP samples, 35 to 43 percent of WIC children are in households that reportedly receive AFDC/TANF, and 60 percent are in households that reportedly receive food stamps. The SIPP also reveals that about 9 percent of WIC children are in households that receive SSI, 9 percent reside in subsidized housing, and 42 percent have older siblings that qualify for free or reduced priced school breakfast or lunch. In the very low-income CCDP2 sample, about 71 percent of WIC children are in households receiving AFDC/TANF, 78 percent are in households that receive food stamps, and about 25 percent reside in subsidized housing.

The rate of receipt of benefits from these programs is higher among households of WIC children than among other households of other low income children. This finding is consistent with the

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[8] *Op. cit.*, p. 77.

[9] Mean household income as a percent of poverty was no higher among low-income nonparticipants than among WIC children in the SIPP. Recall that the nonparticipant category is definitionally restricted to households under 185 percent of poverty, while the WIC child category is not.

Exhibit 4.3
RECEIPT OF GOVERNMENT BENEFITS

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Percent in households receiving AFDC/TANF					
NHANES-III	34.9	27.4	30.2	0.9**	16.1
SIPP	43.1	24.2**	30.9	1.7**	14.5
CCDP2	71.0	60.8**	66.8		
Percent in households receiving Food Stamps					
NHANES-III	59.7	39.3**	45.6	1.2**	23.9
SIPP	59.5	35.4**	43.9	2.6**	20.7
CCDP2	77.7	64.7**	72.3		
Percent in households receiving SSI					
SIPP	8.6	7.7	8.0	1.0**	4.1
CCDP2	9.0	5.6**	7.6		
Percent in subsidized housing					
SIPP	9.3	5.6	6.9	0.5**	3.3
CCDP2	25.1	15.4**	21.0		
Percent in households receiving free or reduced price SBP/NSLP					
SIPP	42.1	42.4	42.3	4.9**	21.3

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
         *   Statistically significant difference from WIC participants at the 5 percent level.

fact that WIC children are poorer on average than other low-income children. Not surprisingly, participation in the programs among higher income families is negligible.[10]

Household Composition

About half of WIC children live in households headed by a married couple (55 percent in the NHANES-III sample, 51 percent in the SIPP sample; Exhibit 4.4). The remaining WIC children live in households headed by a single adult, or some other arrangement.[11] The substantial number of WIC children in single-adult households is not surprising because single-adult households tend to have low incomes and may face more nutritional risks. The poorer CCDP2 sample contains fewer children in households headed by married couples–only 31 percent.

WIC children in the SIPP and CCDP2 samples have an average of 2.6 to 2.7 children in their families, and an average of 1.6 to1.9 children young enough to qualify for WIC. Many households receiving WIC benefits have more than three children.

Household composition varies substantially by children's WIC status, in the expected direction. Both low-income nonparticipant children and higher-income children in NHANES and the SIPP are significantly more likely than WIC children to be in households headed by a married couple. (There is no difference in the CCDP2 sample.) In the two nationally representative data bases, the proportion of higher income children living with a married couple is around 90 percent, compared with 51 to 55 percent for WIC children , and 59 to 65 percent for other low-income children.

Higher income children have fewer other children in their households on average than WIC children. Comparisons of WIC children with other low-income children with regard to total number children in the household do not show a clear pattern, but the differences in any event are small.

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[10] The biennial Study of WIC Participant and Program Characteristics does not include tabulations of receipt of benefits from other programs broken out by participant category. Of *all* WIC participants in 1996, 25 percent were receiving AFDC/TANF at time of certification, and 36 percent were receiving food stamps.

[11] The NHANES public use files only allow us to determine household size and whether the sample person's household includes the spouse of the household reference person–not the total numbers of adults and children in the household or their relationships.

Exhibit 4.4
HOUSEHOLD COMPOSITION

	Low Income Children			Higher income children	All children
Characteristic	**WIC participants**	**Non-participants**	**All**		
Adults in household (percent)					
NHANES-III					
No married couple	44.8	35.2	38.2	7.3	23.1
Married couple	55.2	64.8**	61.8	92.7**	76.9
SIPP					
One adult	34.0	24.7*	28.0	4.4**	14.8
Married couple	50.7	58.9*	56.0	89.1**	74.6
Other arrangement[a]	15.3	16.4	16.0	6.5**	10.7
CCDP2					
One adult	40.4	33.2**	37.4		
Married couple	30.7	30.8	30.7		
Other arrangement[a]	21.9	28.5	24.6		
Children in household					
SIPP					
Mean number under 18	2.6	2.8	2.7	2.1**	2.4
Mean number under 5	1.6	1.5	1.6	1.4**	1.5
CCDP2					
Mean number under 18	2.7	2.5**	2.6		
Mean number under 5	1.9	1.7**	1.8		

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
      *   Statistically significant difference from WIC participants at the 5 percent level.

[a]Child lives with multiple adults, but household is not headed by a married couple.

Health Insurance Coverage

We also expect to find most WIC children participating in Medicaid, although in some States the Medicaid income cutoff at the time of the survey was lower than 185 percent of poverty. About three out of four WIC children in the nationally representative SIPP sample and an even larger percentage of WIC children in the low-income CCDP2 sample are covered by Medicaid (Exhibit 4.5).[12] Only 21 percent of WIC children in the SIPP sample and only 6 percent of WIC children in the CCDP2 sample are covered by private insurance. Largely because of this extensive reliance on Medicaid, only 11 percent of WIC children in the SIPP sample and 4 percent in the CCDP2 sample have no health insurance at all.

WIC children are more likely to have health insurance than other low income children. Medicaid coverage clearly accounts for this finding. In the SIPP sample, the rate of private health insurance coverage is 21 percent for WIC children and 40 percent for other low income children; the rate of Medicaid coverage is 75 percent for WIC children and only 44 percent for other low income children. As a result, the proportion of children without insurance is 11 percent among WIC children but 22 percent among other low income children.

Relative to WIC children, children from higher income households are far less likely to rely on Medicaid and far more likely to have private coverage. Balancing these out, the proportion of WIC children and higher income children with no coverage is quite similar (11 *versus* 9 percent).

Economic Security and Food Security

Another measure of household resources is the extent to which survey respondents report feeling they have enough food and enough money to pay for necessities. The link between these perceptions and WIC participation may go in either direction. Anxiety about these issues may lead to WIC participation, but participation in WIC may alleviate these pressures.

According to responses to the SIPP survey, WIC children's households continue to face significant financial stress. About 29 percent of WIC children were in households whose head reportedly could not meet essential expenses (Exhibit 4.6). Of these same respondents, 16 percent were not able to pay their full rent or mortgage, 27 percent could not pay all of their utility bills, 11 percent had a phone disconnected because the bill was not paid, and 13 percent did not have enough money to see a doctor.

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[12] The income cutoffs for Medicaid are generally stricter than for WIC, so it is possible to be eligible for WIC but not Medicaid. Some higher-income households may be eligible for Medicaid if they have unusually high medical costs ("medically needy"). In some States, however (such as Tennessee), Medicaid income eligibility cutoffs are higher than WIC's. Some WIC participants are adjunctively eligible although their income exceeds 185 percent of the federal poverty level.

Exhibit 4.5
HEALTH INSURANCE OF FOCUS CHILD

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Percent covered by Medicaid/other public insurance					
SIPP	75.0	43.9**	54.8	6.4**	27.7
CCDP2	89.0	78.5**	84.7		
Percent covered by private insurance					
SIPP	21.1	39.5**	33.0	86.8**	63.1
CCDP2	6.3	11.8**	8.6		
Percent with no health insurance					
SIPP	11.4	21.6**	18.0	9.2	13.9
CCDP2	3.9	8.3**	5.7		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
   * Statistically significant difference from WIC participants at the 5 percent level.

Exhibit 4.6
PERCEIVED ECONOMIC SECURITY OF THE HOUSEHOLD

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Percent of households that in past 12 months...					
SIPP					
Couldn't meet essential expenses	28.8	31.6	30.6	9.3**	18.6
Didn't pay full rent or mortgage	16.4	17.7	17.3	5.6**	10.7
Didn't pay full gas, oil, or electric bills	26.5	22.5	24.0	7.7**	14.7
Had phone disconnected because bill was not paid	10.6	12.3	11.7	2.4**	6.4
Didn't have money to see a doctor	12.8	9.3	10.5	3.9**	6.8

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
  * Statistically significant difference from WIC participants at the 5 percent level.

The percentage of respondents reporting these problems was similar for WIC children's household heads and other low income children's household heads. This is a striking result, given the substantially greater poverty of WIC children's households. As expected, respondents from higher income households with children report experiencing these types of financial hardships much less frequently.

An expert working group of the American Institute of Nutrition has developed and published a conceptual definition of food insecurity as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways."[13] Accordingly, the survey items intended to measure food insecurity in the three surveys that were used in the current analysis focus on the recent experiences of the children or their families with regard to the availability of food. The questions are worded specifically to identify limited food availability due to financial constraints. These items have been used in numerous surveys (e.g. the Food Security Supplement to the April 1995 Current Population Survey), and have been found to have a clear relationship with poverty.[14]

The three surveys indicate that most households with WIC children feel reasonably secure about access to food, but a significant minority also express some concerns (Exhibit 4.7). In the NHANES-III and SIPP survey samples of WIC children's households, about 12 to14 percent of respondents feel that their households "sometimes" or "often" do not have enough food to eat, and 8 to 9 percent report at least one day in the previous month in which there was no food and not enough money to buy food. In these samples of respondents, the average number of days in the last month without enough money to buy food was less than one. The NHANES-III survey responses indicate that about 3 percent of WIC children skipped a meal in at least one day in the previous month, but none of the WIC children skipped eating entirely for at least one day in the previous month. The CCDP2 sample confirms that the WIC children themselves nearly always get enough to eat.

WIC children's households and other low income children's households provided very similar responses to these questions. Given the greater poverty of WIC children's households documented above, it is possible that WIC families felt more concerned about these problems before receiving WIC, and that the program alleviated their concerns to levels similar to those felt by other low income families. As expected, respondents from higher income families rarely report these insecurities.

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[13] S.A. Anderson, (ed.). (1990). Core Indicators of Nutritional State for Difficult-to-Sample Populations. *Journal of Nutrition* 120 (11S): 1557-1600.

[14] See, for example, William Hamilton *et al.* (1997). *Household Food Security in the United States in 1995. Summary Report of the Food Security Measurement Project.* Alexandria VA: U.S. Department of Agriculture, Food and Consumer Service.

Exhibit 4.7
PERCEPTIONS OF FOOD SECURITY

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Does household have enough food to eat? Percent of children in households responding ...					
NHANES-III					
Yes, enough to eat	87.8	87.2	87.4	99.5	93.3
Sometimes not enough	11.0	12.0	11.7	0.5	6.2
Often not enough	1.2	0.8	0.9	0.0	0.5
SIPP					
Yes, enough to eat	86.3	87.7	87.2	97.4**	93.0
Sometimes not enough	12.5	11.4	11.8	2.0**	6.2
Often not enough	1.1	1.0	1.0	0.6	0.8
Does child have enough food to eat? Percent of children with caregivers responding ...					
CCDP2					
Yes, enough to eat	94.3	95.6	94.9		
Sometimes not enough	5.7	4.4	5.1		
Often not enough	0.8	0.4	0.6		
Number of days in which no food and not enough money to buy food					
NHANES-III					
Percent with zero days	91.1	91.7	91.5	99.7**	95.5
Mean days	0.5	0.5	0.0	0.5	0.3
SIPP					
Percent with zero days	91.7	93.5	92.9	98.6**	96.1
Mean days	0.8	0.5	0.6	0.1**	0.3
CCDP2					
Percent with zero days	95.7	96.6	96.1		
Mean days	0.2	0.2	0.2		

Exhibit 4.7
(continued)

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Percent of children who skipped a meal for some days in the past month					
NHANES-III	3.2	2.5	2.7	0.0**	1.4
CCDP2	3.6	3.4	3.5		
Percent of children who did not eat at all in at least some days in the past month					
NHANES-III	0.0	0.1	0.0	0.0	0.0
CCDP2	1.3	0.6	1.0		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
   * Statistically significant difference from WIC participants at the 5 percent level.

Mother's Age at First Birth, Education, and Employment

We previously showed that 7 to 10 percent of WIC children in the SIPP and CCDP2 samples were born to young teenage mothers (Exhibit 2.2). A considerably larger fraction of WIC children, however, have mothers who **began** childbearing as a young teenager: 18 percent in the SIPP sample, and 31 percent in the CCDP2 sample (Exhibit 4.8). Furthermore, a third of WIC children have mothers who lack high school diplomas, and two thirds have mothers who are not currently employed. The mothers of WIC children do not differ significantly from mothers of other low income children in these areas, except with regard to employment status in the CCDP2 sample, where mothers of WIC children are less likely to be currently employed.

Mothers of higher income children were much less likely to have been young teen mothers, and much more likely to be high school graduates and to be employed.

Mother's Sense of Mastery, Social Connectedness, and Coping Skills

The CCDP2 interview included a host of measures on the mother's ability to cope. We now review these measures, noting that the findings apply to a nonrepresentative sample of the child WIC population.[15]

The mother's sense of mastery, or locus of control, was assessed in the CCDP2 sample using the Pearlin and Schooler Mastery Scale (Pearlin and Schooler, 1978). This scale measures the extent to which an individual regards his/her life as being under one's own control rather than determined by fate. It consists of seven items such as: "There is really no way I can solve some of the problems I have" and "I can do anything I really set my mind to." The respondent is asked to rate each item on a 4-point scale from "strongly agree" to "strongly disagree." Possible scores range from a low of 7 to a high of 28. The mean for mothers of WIC children was 20.6 (Exhibit 4.9).

Indices of social connectedness were created from a series of questions from the CCDP2 parent survey instrument. The *instrumental support* scale is a measure of the extent to which the mother had someone she could count on for help with shopping, cleaning, paying bills, managing money, and taking care of and disciplining children. The scale ranges from 0 (no support) to 20 (support in all areas). The *emotional support* scale is a similar measure of the extent to which the mother had someone she could count on for emotional support ("tell you that you're OK the way you are", "comfort you when you are sad"), and is also on a 0 to 20 point scale. The *harmonious*

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[15] As noted in Chapter One, the CCDP2 sample comprises a convenience sample of children from low-income families that participated in the CCDP2 demonstration in ten sites. They were all at or near their second birthdays at the time of the interview, and their household income at the time of recruitment (during their prenatal period or infancy) was less than 100 percent of the federal poverty level.

Exhibit 4.8
MOTHER'S CHARACTERISTICS

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Percent under age 18 at the birth of first child					
SIPP	17.5	20.3	19.7	4.3**	12.0
CCDP2	30.8	30.1	30.5		
Percent that are not high school graduates					
SIPP	34.1	39.1	37.8	7.7**	22.8
CCDP2	31.6	35.1	33.0		
Percent employed					
SIPP	34.0	37.2	36.0	67.5**	53.5
CCDP2	30.8	40.7**	34.9		

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
         *   Statistically significant difference from WIC participants at the 5 percent level.

Exhibit 4.9
MOTHER'S ABILITY TO COPE

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Mother's locus of control *CCDP2*	20.6	21.0*	20.8		
Mother's social connectedness indices *CCDP2*					
Instrumental support	11.9	12.5	12.2		
Emotional support	15.8	15.9	15.8		
Harmonious relationships	8.8	8.9	8.8		
Mother can get all/most help when needed from ... (percent) *SIPP*					
Family	65.4	69.8	68.2	76.8**	73.1
Friends	48.8	53.9	52.1	59.6*	56.3
Social agencies/church	37.7	29.7	32.5	29.6	30.9
Mother's life skill indices *CCDP2*					
Ability to survive financially	2.0	2.2*	2.1		
Ability to live efficiently	8.0	8.0	8.0		
Mother's ways of coping inventories *CCDP2*					
Active coping	11.3	11.2	11.3		
Planning	12.5	12.4	12.5		
Seek social support/emotional					
Seek social support/instrumental	11.0	10.9	11.0		
Religion	10.9	10.8	10.8		
Mental disengagement	11.6	11.0**	11.3		
Behavioral disengagement	9.6	9.2**	9.4		
	7.5	7.0**	7.3		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
   * Statistically significant difference from WIC participants at the 5 percent level.

Ranges for scales are as follows:
Locus of control:	7 to 28	Ability to survive financially:	0 to 5
Instrumental support:	0 to 20	Ability to live efficiently:	0 to 10
Emotional support:	0 to 20	Ways of coping subscales:	4 to 16
Harmonious relationships:	0 to 10		

relationships scale is a measure of the extent to which the mother had problems with her neighbors, landlord, current partner, spouse, household members, or bill collectors. A score of zero indicates problems with all of these persons, and a score of ten indicates no problems. Among mothers with WIC children, the average instrumental support score was 11.9, the average emotional support score was 15.8, and the average harmonious relationships score was 8.8.

A simpler measure of social connectedness comes from the SIPP. This survey asks whether the mother can get all or most of the help she needs from family and friends. Among mothers of WIC children, 65 percent can get this help from family, and 49 percent can get help from friends. The CCDP2 survey included two measures of life skills. The scale measuring *ability to survive financially* was created from five survey items: whether the mother had a bank account, had a credit card, had money at the end of the month for food, had money at the end of the month for other things, and was not bothered by bill collectors. A score of zero corresponds to negative responses to all questions; a score of five corresponds to positive responses to all questions. A score of 4 or 5 would be a good score. Among mothers with WIC children, the average score was 2.0. The scale measuring *ability to live efficiently* was created from questions about whether the mother had transportation, had alternative transportation if the primary means was unavailable, had a driver's license, had access to a car, knew where the bus stop was, could plan shopping for sales, had a telephone, had meals at the same time every day, could keep track of appointments, and knew where to get prescriptions. A score of ten means the respondent answered positively to all questions. Among mothers with WIC children, the average score was 8.0.

Ways of coping were assessed based on the Carver and Scheier Ways of Coping Inventory.[16] This measure consists of 27 survey questions in which the respondent has to complete sentences such as "When I am under a lot of stress, I make a plan of action" or "When I am under a lot of stress, I use drugs or alcohol to make myself feel better." The respondent could answer 1) I usually don't do this at all, 2) I usually do this a little bit, 3) I usually do this a medium amount, or 4) I usually do this a lot. According to the authors, the following two subscales measure tendencies that presumably should be adaptive in circumstances in which active coping efforts yield good outcomes: *active coping* (taking action, exerting efforts to remove or circumvent the stressor) and *planning* (thinking about how to confront the stressor, planning one's active coping efforts). The following three scales measure tendencies that are less explicitly associated with active coping, but there is evidence to suggest that they should also be adaptive: *seeking instrumental social support* (seeking assistance, information, or advice about what to do); *seeking emotional social support* (getting sympathy or emotional support from someone); and *religion* (increased engagement in religious activities). The remaining two scales measure tendencies that should be maladaptive in circumstances in which active coping efforts are necessary to yield good outcomes: *mental disengagement* (psychological disengagement from the goal with which the stressor is interfering, through daydreaming, sleep, or self-distraction), and *behavioral disengagement*

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[16] Carver, C.S., Scheier, M.F., & Weintraub, J.K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*,**56**, 267-283.

(giving up, or withdrawing effort from the attempt to attain the goal with which the stressor is interfering).   The range for each of these seven scales is 4 to 16. WIC mothers had average scores around 11, 12, or 13 for each of these, except mental disengagement (10) and behavioral disengagement (8).

There is no clinical cut-off level above which maladaptive behavior would be implied, but based on the items comprising the scales one can form an interpretive judgement. For example, the four items that make up the behavioral disengagement scale complete the sentence that begins "When I am under a lot of stress…" with the following phrases:

- "I admit to myself that I can't deal with it, and quit trying".
- "I just give up trying to reach my goal".
- "I give up the attempt to get what I want".
- "I reduce the amount of effort I'm putting in to solving the problem".

A scale score of four corresponds to a response of "I don't usually do this at all" for all items in the subscale. If the respondent answered, "I usually do this a little bit" to all items in the subscales, she would receive a scale score of 8. If she answered "I usually do this a medium amount" on all items, her scale score would be 12. If she always answered "I usually do this a lot", her scale score would be 16. The actual scale score is computed as the sum of responses coded 1 to 4 so that two responses of "I usually do this a little bit" and two responses of "I usually do this a medium amount" would result in a score of 10.

For the behavioral disengagement scale, none of the items appear, at face value, to be an adaptive way of dealing with stress. So, anything above a score of four could be thought of as being at least somewhat maladaptive. A score of six or more would imply that a respondent did at least two of those behaviors, at least a little bit of the time. Higher scores indicate more maladaptive response to stress.

The mental disengagement scale is made up of three items (to be consistent with other subscales, the score is converted to a range of 4 to 16). The items are:

- I turn to work or other substitute activities to take my mind off things,
- I daydream about things other than this,
- I go to movies or watch TV, to think about it less.

Responding to stress with these behaviors more than a little bit of the time (score of 8) or medium amount of the time (score of 12) might be considered maladaptive.

The religion scale does not indicate adaptive or maladaptive response to stress, but rather serves as a descriptive measure of the way people respond.

Although differences between WIC children and mothers of other low-income children in all these measures were small, they were generally in the direction of less ability to cope for the mothers of the WIC children. Statistically significant differences in this nonrepresentative sample were seen with regard to mother's locus of control, instrumental support, harmonious relationships, ability to survive financially, and reliance on two maladaptive coping strategies: mental disengagement and behavioral disengagement.

On the related measures contained in the SIPP, mothers of WIC children were significantly less likely to get all the help they needed from either family members or friends than mothers of higher-income children.

Conclusions

This chapter has presented a range of measures describing the characteristics of WIC children, their households, and their mothers. We have also compared these characteristics to those of other low income children and higher income children.

The three surveys provide a detailed statistical portrait of WIC children and their households. In the nationally representative NHANES-III and SIPP survey samples, about a third of WIC children are one-year-olds and only a sixth are four years of age. Close to half are non-Hispanic white, and the remainder are about equally split between Hispanic, and non-Hispanic black. Most WIC children live in households with incomes below the federal poverty level, and one-quarter have incomes below 50 percent of the federal poverty level. Nearly all WIC children have health insurance coverage, generally Medicaid. Two-thirds of WIC children's mothers were high school graduates and a third are employed. Despite their low incomes and financial problems, the great majority of WIC children's households–86 to 88 percent–reported that they had enough food to eat.

The children receiving WIC benefits differed in several ways from other low-income children who did not receive WIC benefits. Relative to other low income children, WIC children were younger, more likely to be black and less likely to be white, poorer, more likely to receive AFDC/TANF and food stamps, more likely to be in households headed by a single adult, and more likely to be covered by Medicaid. Their mothers also tended to score lower on measures of life skills and coping abilities. Household heads for the two groups of low income children were about equally likely to report financial stress and food insecurity.

These comparisons reflect an unknown combination of both the causes of WIC eligibility and the effects of WIC participation. It does seem clear, however, that WIC targets very low income families within the general strata of low income households.

As expected, WIC children and children from higher income children differ markedly on most of these measures. Clearly, households with WIC children have relatively lower incomes and are

more likely to receive public assistance. Relative to children up to age five from higher income families, WIC children are younger, less likely to be white, less likely to be in a household headed by a married couple, more likely to experience financial problems or food insecurity, and less likely to have an employed adult in the household. WIC children and higher income children are about equally likely to be covered by insurance because Medicaid covers the vast majority of WIC children.

Chapter Five
Characteristics of the Child's Environment

Characteristics of children's environments are of interest in studying the WIC program because of their independent influence on child outcomes. Disadvantages that child WIC recipients face in their home, neighborhood, and child care settings should be considered in interpreting any differences found in their nutritional status, health, growth, and development.

In the sections that follow, we present comparisons pertaining to:

- children's home environment, including parenting practices, safety, mobility, and smoking by family members;
- children's neighborhoods and communities, including resource availability and safety; and
- children's child care settings, including quality and consistency of care.

We find that WIC children's home and neighborhood environments are significantly worse in a number of ways not only than the environments of higher-income children, but also than the environments of other low-income children.

Home Environment: Parenting Practices

Both CCDP2 and the SIPP contain measures of parenting practices, key components of children's home environment. These include a parental attitude measure in CCDP2, a direct measure of parent-child interactions in CCDP2, and a set of parenting practices questions addressed to parents in the SIPP. The CCDP2 measures indicate significantly poorer parenting attitudes and parent-child interactions in families of WIC children than in families of other low-income children. The SIPP data find similar parenting practices among WIC and other low-income families, but significantly better practices among higher-income families. We remind the reader that the CCDP2 findings apply to a nonrepresentative sample of the child WIC population.[1]

Parent's *attitudes toward child rearing and beliefs about parenting* were measured in CCDP2 by the Adult-Adolescent Parenting Inventory (AAPI). The AAPI is a 32-item self-report inventory designed to be used with adults and adolescents. It is based upon four parenting patterns that are considered to be maladaptive and associated with abusive parental behavior.[2] Scores from the

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[1] As noted in Chapter One, the CCDP2 sample comprises a convenience sample of children from low-income families that participated in the CCDP2 demonstration in ten sites. They were all at or near their second birthdays at the time of the interview, and their household income at the time of recruitment (during their prenatal period or infancy) was less than 100 percent of the federal policy level.

[2] S. Bavolek (1989). *Research and Validation Report of the Adult-Adolescent Parenting Inventory (AAPI)*. Eau Claire, WI: Family Development Resources, Inc.

AAPI show the degree of agreement or disagreement with statements about parent beliefs about four constructs: (1) inappropriate expectations of the child, (2) parents' inability to be empathetically aware of the child's needs, (3) belief in the value of physical punishment, and (4) role reversal.

Analyses of the raw total scores indicate that, relative to the mothers of non-WIC children, the mothers of WIC children had significantly worse mean attitude scores on three of the four subscales (Exhibit 5.1). The AAPI is scored such that higher total scores indicate less abusive attitudes.

Conversion of raw scores to standardized scores, known as sten scores, helps in the interpretation of AAPI results. As noted in the handbook for the AAPI:

> Sten scores of 1 and 2 are extremely low and indicate significant deficiency in appropriate parenting behavior. Individuals with sten scores of 1 and 2 in any construct should be considered high risk for abusive parent-child interactions… Sten scores of 5 and 6 are average scores and reflect the norm for that population.

We have therefore grouped scores of 7 to 10 as "high", 1 to 4 as "low", and 1 to 2 as "very low."

Overall, around a quarter to a third of caregivers had high sten scores on the four scales, while between a tenth and a quarter of caregivers had very low sten scores on the four scales. Corroborating the evidence of the comparisons of the raw mean scores, mothers of WIC children were:

- significantly less likely to have high sten scores on the *inappropriate expectations*, *lack of empathy,* and *role reversal* scales,
- significantly more likely to have low scores for the *inappropriate expectations*, *lack of empathy,* and *role reversal* scales, and
- significantly more likely to have very low sten scores for *role reversal* scales.

There were no marked differences on the *corporal punishment* scale.

Interactions between the mother and the focus child were assessed directly in CCDP2 through a brief structured observation in the home.[3] For this purpose, a standardized rating system, the Nursing Child Assessment Teaching Scale (NCATS) was used.[4] The scale is designed to describe the repertoire of behaviors demonstrated in a teaching interaction by both members of the parent-child dyad, and the contingency of their responses to one another. Mothers are asked to choose a task appropriate to the child's development—for example, zipping a zipper or building a tower of blocks — and teach it to the child. The observer rates the interaction on 73

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[3] There were substantial missing data for the observation-based items: 12.4 percent for WIC children, 8.4 percent for other low-income children.

[4] K. Barnard (1989). *NCATS Scale*. Seattle, WA: University of Washington, School of Nursing.

Exhibit 5.1
CHILDREN'S HOME ENVIRONMENT: PARENTING PRACTICES AND CHARACTERISTICS

	Low Income Children			Higher income children	All children
	WIC Participants	**Non-participants**	All		
Parental Attitudes					
CCDP2					
Inappropriate parental expectations					
Mean score	23.8	24.2 **	23.9		
Percent high score	28.8	33.6*	30.7		
Percent low score	29.8	24.1*	27.2		
Percent very low score	7.0	7.0	7.0		
Lack of empathy					
Mean score	29.5	30.6**	29.9		
Percent high score	14.6	20.2**	16.9		
Percent low score	55.6	46.7**	51.9		
Percent very low score	21.8	16.9	19.8		
Role reversal					
Mean score	28.6	29.7**	29.1		
Percent high score	23.4	28.8**	25.6		
Percent low score	32.8	28.3*	31.0		
Percent very low score	13.0	10.0*	11.8		
Corporal punishment					
Mean score	33.0	33.4	33.2		
Percent high score	22.5	23.3	22.8		
Percent low score	43.8	43.8	43.8		
Percent very low score	11.2	9.7	10.6		
Parent-Child Interaction					
CCDP2					
Mother's total score	36.4	36.7	36.5		
Sensitivity to cues	8.5	8.6	8.6		
Response to child's distress	8.0	7.8	7.9		
Fosters child's socio-emotional growth	8.1	8.1	8.1		
Fosters child's cognitive growth	11.9	12.2*	12.0		
Child's total score	14.1	14.6*	14.3		
Clarity of cues	7.3	7.6**	7.4		
Response to caregiver	6.8	7.0	6.9		

Exhibit 5.1
(continued)

	Low Income Children			Higher income children	All children
	WIC Participants	**Non-participants**	**All**		
Parenting Practices					
SIPP					
Family members read to child (times last week)	5.1	5.7	5.5	8.1**	7.1
Family members take child on outings (times last month)	13.7	14.7	14.4	16.2*	15.4
Percent child's television watching is unrestricted (percent)[a]	20.1	20.3	20.2	13.6	16.4

[a] Children aged 3 and 4.

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
         *   Statistically significant difference from WIC participants at the 5 percent level.

Ranges for scales are as follows:

Inappropriate parental expectations:	6 to 30
Lack of empathy:	8 to 40
Role reversal:	8 to 40
Corporal punishment:	14 to 50
Mother's total parent-child interaction:	0 to 50
Sensitivity to cues:	0 to 11
Response to child's distress:	0 to 11
Fosters child's socio-emotional growth:	0 to 11
Fosters child's cognitive growth:	0 to 17
Child's total parent-child interaction:	0 to 23
Clarity of cues:	0 to 10
Response to caregiver:	0 to 13

For parental attitudes, standardized sten scores have been calculated with a range of 1 to 10.

High score:	standardized score of 7-10
Low score:	standardized score of 1-4
Very low score:	standardized score of 1-2

binary items grouped into six subscales. Based on research that links caregiver-infant interaction to child competence, the scale has been used widely in clinical and research practice. The measure has been shown to be related to children's performance on language and IQ tests and is moderately correlated with the Home Observation Measurement of the Environment Inventory.[5]

Analyses of raw scores for the four adult subscales, the combined score for the parent, and the combined raw score for the two child subscales are summarized in Exhibit 5.1. There were small but statistically significant differences on one of the adult subscales, one child subscale and the child combined total score. Caregivers of WIC children scored slightly worse on the *Cognitive Growth Fostering* scale, indicating slightly lower average competency in grasping the child's present level of understanding and providing stimulation which is just above that level. In addition, WIC children had worse scores on the *Clarity of Cues* scale indicating that, on average, they were less adept at sending clear clues to their caregivers. The WIC children were also, on average, slightly less responsive to their caregiver's cues, resulting in significantly poorer average scores on the combined total score.

The SIPP topical module on children's wellbeing asks the designated parent or guardian of each child under age six:

- how many times in the past week a family member read stories to the child;
- how many times in the past month a family member took the child on an outing "to the park, grocery store, zoo, playground, etc."; and
- (for children over age three) whether television watching is restricted with regard to types of programs, how early or late the child may watch, or total number of hours per week.

WIC children did not differ significantly from other low-income children on any of the three measures. On two of the three measures (reading and family outings), WIC children were significantly worse off than higher income children. Family members read to WIC children 5 times per week on average, *versus* 8 times per week for higher income children. Similarly, WIC children go on 14 outings per month with family members, compared with 16 outings per month for higher income children. Television watching is restricted for most three- and four-year-olds, without significant differences among the groups.

Home Environment: Safety, Mobility, Smoking

Other significant aspects of the home environment include safety, mobility, and cigarette smoking. Important differences are found between higher- and lower-income households, particularly with regard to use of gas ovens or stoves for heating, and cigarette smoking in the home.

All three databases provide at least some information on the physical safety of the home (Exhibit 5.2). Space heaters are used roughly equally in the homes of WIC participants, income-eligible nonparticipants, and higher income children, at rates of 18 to 19 percent. Striking differences are seen, however, with regard to the dangerous practice of using gas stoves or ovens to heat the

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[5] B.M. Caldwell and R.H Bradley (1984). *Home Observation for Measurement of the Environment.* Little Rock, AK: University of Arkansas at Little Rock.

Exhibit 5.2
CHILDREN'S HOME ENVIRONMENT: SAFETY

	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Percent that use space heaters to heat home *NHANES*	19.2	17.8	18.3	18.6	18.4
Percent that use gas stoves or ovens to heat home *NHANES*	11.4	8.8	10.3	2.8**	6.6
Rate home as a place to live, 0 to 10 *SIPP*					
Mean	7.5	7.4	7.4	8.3**	7.9
Percent low (0 to 3)	7.9	6.5	6.9	1.5**	4.0
Percent high (7 to 10)	72.1	68.9	69.9	87.7**	79.3
Home safe from crime, 1 (very safe) to 4 *SIPP*					
Mean	1.9	1.8	1.9	1.6**	1.7
Percent very/fairly unsafe	13.3	12.1	12.4	3.9**	7.9
Percent that always use car seat[a] *CCDP2*	81.6	78.8	80.4		
Percent that have ipecac in house *CCDP2*	17.4	16.9	17.2		
Percent that cover all electrical outlets *CCDP2*	32.8	33.4	33.1		
Percent that have working smoke detectors *CCDP2*	81.5	79.5	80.7		
Percent that have window guards *CCDP2*	52.4	51.2	51.9		

Exhibit 5.2
(continued)

	Low Income Children			Higher income children	All children
	WIC participants	**Non-participants**	**All**		
Percent that keep chemicals locked in cabinets *CCDP2*	50.9	43.4**	47.7		
Percent with telephone number of poison control center readily available *CCDP2*	54.2	51.0	52.9		

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
          *   Statistically significant difference from WIC participants at the 5 percent level.

[a]Children who do not ride in a car, and are thus not at risk, are grouped together with those that always use a car seat.

home: 11 percent of WIC children and 9 percent of other low-income children, but only 3 percent of higher income children, are exposed to this hazard.

Parents responding to the SIPP rated their home as a place to live on a scale of 0 to 10, and with regard to safety from crime on a scale of 1 to 4. These measures were quite similar for WIC children and other low-income children. As expected, higher income children's homes were rated as significantly better as a place to live and significantly safer from crime than those of WIC children.

A battery of questions in CCDP2 on safety within the home showed only one significant difference between WIC and non-WIC children: parents of WIC children were reportedly *more* likely to keep chemicals locked up in cabinets. A striking feature of these tabulations is the high proportion of low-income two-year-olds, WIC and non-WIC alike, that are exposed to serious hazards. Less than a fifth of the respondents had ipecac, a treatment for poisoning, in the house, and only half had the telephone number of the poison control center readily available. A fifth of the homes lacked working smoke detectors, and two-thirds had uncovered electrical outlets.

The three databases give inconsistent information on relative mobility. While the SIPP indicates that WIC children were significantly *more* likely to have moved in the past 12 months than other low income children, CCDP2 indicated that WIC children of poorer, newer mothers were significantly *less* likely to have moved (Exhibit 5.3). NHANES shows mobility rates that are about the same for these two groups. SIPP and NHANES agree, however, that WIC children were about twice as likely to have moved in the past year than higher income children.

WIC children in the CCDP2 sample were about equally likely as other low-income children to have spent some time in the last 12 months living in a non-home setting (foster home, institution, battered women's shelter, on the street, or in a car). Fewer than 3 percent of these two-year-olds had this experience.

Finally, NHANES and CCDP2 suggest that WIC children are about equally likely to be exposed to cigarette smoke in the home as other low-income children (Exhibit 5.4). NHANES indicates strongly that children's exposure to cigarette smoke in the home is a function of income: 45 percent of WIC children, but only 29 percent of higher-income children, face this health hazard.

Neighborhoods and Communities

SIPP and CCDP2 collected information on a variety of items describing the neighborhood or community in which the child lives.[6] These include overall neighborhood quality, safety from crime, quality of schools, and supportiveness. In general, neighborhoods of WIC children are reportedly the same or somewhat worse than neighborhoods of other low-income or poor children, while neighborhoods of higher income children are reportedly significantly better.

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[6] The SIPP refers to "communities" when interviewing respondents in rural areas, "neighborhoods" otherwise.

Exhibit 5.3
CHILDREN'S HOME ENVIRONMENT: MOBILITY

	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Child has moved in the past 12 months (percent) *NHANES*	35.3	34.8	35.0	18.7*	27.0
Child's mother has moved in past 12 months (percent) *SIPP*	34.5	26.9	29.6	17.3*	22.7
Child has moved in past 12 months (percent) *CCDP2*	39.2	44.1*	41.3		
Child has been in foster home, institution, hospital, battered women's shelter, slept on the street, slept in a car in past 12 months (percent) *CCDP2*	2.3	3.5	2.8		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
  * Statistically significant difference from WIC participants at the 5 percent level.

Exhibit 5.4
CHILDREN'S HOME ENVIRONMENT: SMOKING

	Low Income Children			Higher income children	All children
	WIC participants	**Non-participants**	**All**		
Family member smokes in the home (percent) *NHANES*	45.1	47.7	46.9	29.0**	38.1
Family member smokes in the home (percent) *CCDP2*	52.3	51.3	51.9		

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
          *   Statistically significant difference from WIC participants at the 5 percent level.

Overall neighborhood quality was measured by an item in the SIPP in which children's parents or guardians rated their neighborhood "as a place to live" on a scale of 0 to 10. A low quality rating (0 to 3) was given by 16 percent of parents and guardians of WIC children, but by only 10 percent of parents and guardians of other low-income children (Exhibit 5.5). Similarly, in the CCDP2 sample, the percentage of respondents that consider their neighborhood "a good place to raise [their] children" was 48 percent among mothers of WIC children, but 52 percent among mothers of other poor children. The SIPP also provides strong evidence of the higher perceived quality of neighborhoods of higher-income children: the parents and guardians of 85 percent of higher-income children rated their neighborhood highly as a place to live, while the corresponding percentage for low income children was 61 percent.

Neighborhood safety is also reportedly more of an issue for WIC children than for other poor and low-income children, and less of a problem for higher-income children. Three items in the SIPP and four in CCDP2 addressed this neighborhood characteristic. In the SIPP, parents and guardians indicated on a scale of 0 to 10 their agreement with these statements:

- I keep my children inside my home as much as possible because of dangers in the neighborhood/community.
- There are safe places in the neighborhood/community for children to play.

They also indicated whether they considered their neighborhood "very safe from crime, fairly safe, fairly unsafe, or very unsafe". On the second of these measures (safe places for children to play), neighborhoods of WIC children were reportedly significantly less safe than those of other low-income children. All of the safety measures were much more favorable for higher income children.

Exhibit 5.5
Exhibit 5.5
CHILDREN'S NEIGHBORHOODS AND COMMUNITIES

	Low Income Children			Higher income children	All children
	WIC participants	**Non-participants**	**All**		
Overall Neighborhood Quality					
Neighborhood as a place to live (0 to 10)					
SIPP					
Mean	6.5	6.9	6.8	8.0**	7.4
Percent low score (0 to3)	15.6	10.2*	11.7	3.1**	7.2
Percent high score (7 to 10)	56.7	61.6	61.0	84.9**	73.7
Percent neighborhood "is a good place to raise your children"					
CCDP2	47.6	51.9	49.4		
Safety					
Keep children inside home because of dangers (0 to 10)					
SIPP	4.7	4.3	4.5	2.7**	3.4
There are safe places for children to play outside (0 to 10)					
SIPP	6.0	6.6	6.4	7.3**	7.0
Neighborhood safe from crime, 1(very safe) to 4					
SIPP					
Mean	2.2	2.1	2.1	1.7**	1.9
Percent very/fairly unsafe	23.7	22.3	22.7	6.4**	14.0
Most people in neighborhood use drugs (percent)					
CCDP2					
Yes	22.6	18.2*	20.7		
No	45.0	50.8*	47.4		
Don't know/refused	28.4	27.4	28.0		
Mother feels safe when out alone at night (percent)					
CCDP2	55.8	58.8	57.1		
Mother feels safe when out alone during the day (percent)					
CCDP2	87.0	86.0	86.6		
Mother a victim of crime in past year (percent)					
CCDP2	9.8	10.4	10.0		

Exhibit 5.5
(continued)

	Low Income Children			Higher income children	All children
	WIC participants	**Non-participants**	**All**		
Quality of Education in Local Schools (0 to 10) *SIPP*					
Mean	7.1	7.1	7.1	7.5	7.3
Percent low score (0 to 3)	6.4	7.7	7.3	4.5	6.1
Percent high score (7 to 10)	64.7	66.2	65.7	74.9*	70.6
Neighborhood Supportiveness (0-10) *SIPP*					
People help each other out	5.4	5.9*	5.7	6.6**	6.3
People watch out for each other's children	6.2	6.3	6.3	7.0**	6.7
Can count on people in neighborhood	5.7	6.3*	6.1	7.4**	6.8
There are people who might be a bad influence	4.9	4.6	4.7	3.7**	4.1
If child were outside playing, would trust nearby adults to help child	6.5	6.7	6.6	7.5**	7.1

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
* Statistically significant difference from WIC participants at the 5 percent level.

Mothers of WIC children in CCDP2 were significantly more likely than other poor mothers to report that "almost all" or "most" people in their neighborhood used illegal drugs. No significant differences were found between the two groups of low-income mothers in perceived safety when out alone during the day or at night, or reported crime victimization in the past year.

Quality of education in the local public schools was rated in the SIPP on a scale of 0 to 10. Perceived quality was about the same in WIC children's neighborhoods as in neighborhoods of other low-income children, but significantly higher in neighborhoods of higher-income children.

Finally, the SIPP included several measures of neighborhood supportiveness. On a scale of 0 to 10, children's parents or guardians indicated to what extent they agreed with the following statements:

- People in this neighborhood help each other out
- We watch out for each other's children in this neighborhood
- There are people I can count on in this neighborhood
- There are people in this neighborhood who might be a bad influence on my children
- If my child were outside playing and got hurt or scared, there are adults nearby who I trust to help my child.

For two of these items, WIC children's neighborhoods were perceived as significantly less supportive than neighborhoods of other low-income children. Neighborhoods of higher-income children scored significantly higher on all these measures.

Child Care Settings

Researchers have developed a host of approaches to classification of child care arrangements.[7] Dimensions that may be considered are:

- identity of provider: relative, friend, other;
- location of care: child's home, other home, center;
- activities of primary caregiver while child is in care: working, in school, neither; and
- paid *versus* unpaid.

Two types of care that are sometimes excluded from consideration are care by the child's own father (assuming the mother is the primary caregiver), and care while the mother is neither working nor in school.

For this study, focusing on the child's environment rather than on how the mother obtains child care coverage, we exclude any care provided by the father while the mother is working or in school. Children in parental care, regardless of whether it is provided by the father or the mother, are still in their home environment. We do include nonparental care used by families

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[7] See Nancy R. Burstein and Jordan Hiller, *National Study of Child Care for Low Income Families: Review of the Literature on Determinants of Child Care Choices*, Abt Associates, Inc., January 1999.

even when the mother is not working or in school—e.g. nursery schools used by parents for their developmental advantages.

The three data bases measure child care in very different ways, and give somewhat contradictory information. Higher income children certainly spend more time in nonparental care than WIC children, especially in institutional arrangements. The SIPP indicates that WIC children are in care significantly more than other low-income children; but significant differences in the opposite direction are found for work-related care in the CCDP2 sample, and for institutional care in general in the NHANES sample.

Age of Child When Entering Care

About one in eight WIC children in the SIPP sample were put in nonparental care during infancy, similar to the proportion for other low-income children (Exhibit 5.6). Nearly three times as many higher-income children entered care as infants. The limited data in NHANES, which only refers to institutional care before age four, indicates that WIC children were significantly *less* likely to be in care when young than other low-income children (24 *versus* 31 percent), and much less likely than higher income children (24 *versus* 51 percent).

Current Receipt of Any Nonparental Care

At the time of the SIPP interview, 34 percent of WIC children, age-adjusted, were still exclusively in their parents' care, compared with 41 percent of other low-income children, and only 21 percent of higher-income children.[8] The age-adjusted proportions in *work-related* child care showed a similar pattern: 42 percent of WIC children are work-related in care, 35 percent of other low-income children, and 60 percent of higher income children. The CCDP2 survey, which only collected information on work-related child care, found a significant difference for the sampled two-year olds that went in the opposite direction: only 41 percent of the WIC children, compared with 51 percent of the non-WIC children, were currently in nonparental work-related care.

Intensity of Care

The SIPP showed no difference in the proportions of WIC children and other low-income children in full-time care: about a quarter of both groups, age adjusted. Higher income children in the SIPP were half again as likely to be in full-time care, however (37 percent). CCDP2, which found substantially fewer WIC children to be in nonparental work-related care than other low-income children, also found significantly fewer to be in full-time care (20 *versus* 25 percent).

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[8] Because WIC children are younger on average than other low-income children and higher-income children, it is not meaningful to compare the proportions of children that have ever had some experience across the three groups. The age adjusted proportions reweight the samples so that children of each age (one, two, three, and four) comprise 25 percent of the total within each stratum—WIC children, other low-income children, and higher income children.

Exhibit 5.6
CHILDREN'S CHILD CARE SETTINGS

	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Entered nonparental care in infancy (percent) *SIPP*	12.5	13.6	13.3	35.7**	25.2
Attended day care center or nursery school before age four (percent) *NHANES*	24.4	30.6*	28.7	50.9**	40.5
Currently in any nonparental child care, (percent, age-adjusted) *SIPP*	66.3	58.9*	61.5	79.2**	71.4
Currently in work-related nonparental child care (percent) *SIPP* (age-adjusted) *CCDP2*	41.7 41.4	35.2 51.0**	37.5 45.3	60.0**	50.1
Child in nonparental care fulltime (percent) *SIPP* (age-adjusted) *CCDP2*	23.7 19.9	22.4 24.6*	22.9 21.9	37.4**	31.0
Child's current care arrangement(s), (percent, age-adjusted) *SIPP*					
Nursery/preschool	10.0	10.5	10.4	21.2**	16.4
Day care center	13.6	9.3	10.8	20.0**	16.0
Family day care	9.3	8.4	8.7	15.4**	12.5
Head Start	7.6	5.2	6.0	1.3**	3.3
Sibling 15+ years old	1.5	1.6	1.6	1.1	1.3
Sibling under age 15	0.2	0.8	0.6	1.2**	0.9
Grandparent	30.1	27.9	28.7	29.3	29.1
Other relative	15.3	15.2	15.3	14.5	14.8
Other nonrelated person	11.1	13.2	12.4	21.7**	17.7
No nonparental care	33.7	41.1*	38.5	20.8**	28.6

Exhibit 5.6
(continued)

	Low Income Children			Higher income children	All children
	WIC participants	**Non-participants**	**All**		
Child's primary care arrangement (percent) *CCDP2*					
Nursery or preschool	2.1	3.3	2.6		
Day care center or family childcare	14.4	15.8	15.0		
Head Start	0.7	0.5	0.6		
Sibling 15+ years old	0.2	0.3	0.2		
Sibling under age 15	0.2	0.1	0.1		
Grandparent or other relative	13.8	16.8	15.1		
Other nonrelated person	4.4	7.7**	5.7		
No work-related nonparental care	62.0	52.3**	57.1		
Child in other arrangements in past 12 months (percent) *SIPP*	6.9	4.7	5.5	5.2	5.3
More than one child care arrangement in past six months (percent) *CCDP2*	3.2	4.3	3.6		
Mother's satisfaction with child care (children in care only, percent) *CCDP2*	72.0	73.8	72.8		

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
       * Statistically significant difference from WIC participants at the 5 percent level.

Mode of Care

The SIPP collected information on all modes of care used by families. The totals therefore do not sum to 100 percent. The patterns were quite similar for WIC participants and other low-income children: about 10 percent each in nursery school, day care centers, and family day care; about 7 percent in Head Start; nearly 30 percent cared for by grandparents; and about 15 percent each by other relatives and nonrelatives (babysitters). Higher income children were significantly more likely than WIC children to be enrolled in nursery schools, day care centers and family day care centers, and to be cared for by nonrelatives. Higher-income children were, however, significantly less likely to be enrolled in Head Start.

CCDP2 only determined the primary care arrangement while the mother was working or in school. The difference in nonparental child care between the WIC and non-WIC groups previously mentioned was accounted for almost entirely by heavier use of informal care for the non-WIC children, i.e. care by a grandparent or other relative, or by a babysitter ("other nonrelated person").

Stability of Child Care Arrangements

This dimension of care was about the same for all three groups of children, as measured by other arrangements having been used in the last 12 months (SIPP) or six months (NHANES). According to the SIPP, 7 percent of WIC children experienced a change in their child care arrangements in the past year. In the CCDP2 sample, 3 percent of WIC children had changed their primary care arrangements in the past six months.

Satisfaction With Care

Among those in the CCDP2 sample who used regular nonparental work related childcare, satisfaction was high and there was no difference between the groups. More than 70 percent of caregivers in each group was "satisfied" or "very satisfied" on seven dimensions of childcare including how easy it was to get child there, how dependable the arrangement was, how much attention the child got there, how much the child was learning, how safe the child was there, how good the baby-sitter or teacher was with children, and the training or experience of the baby-sitter or teacher.

Conclusions

The home, neighborhood, and child care environments of WIC children differ in a number of ways from the environments of other low-income children and of higher income children. The home and neighborhood differences are virtually always in the direction of poorer environments for WIC children than for other low-income children, and much worse environments for WIC children than for higher-income children. Another difference is that WIC children are much less likely than higher-income children to be in any nonparental care.

It might seem so obvious as not to need saying that poorer children live in lower quality home and neighborhood environments than better-off children; and WIC children, as shown in Chapter Four, are not only substantially poorer than WIC ineligibles, but also poorer than income-eligible

nonparticipants. This is certainly a sufficient explanation of differences in characteristics of the neighborhoods in which children live. But differences are also seen in the home environments on points not necessarily related to income: parental attitudes, parent-child interactions, reading to children, taking them on outings, and smoking in the home.

WIC children were found to be significantly worse off than eligible nonparticipants with regard to the following environmental features:

- three out of four dimensions of parental attitudes: inappropriate expectations, lack of empathy, and role reversal (CCDP2);
- mothers' fostering their cognitive growth (CCDP2);
- giving their mothers clear cues (CCDP2);
- overall neighborhood quality (SIPP and CCDP2);
- availability of safe places to play outside (SIPP);
- neighborhood drug use (CCDP); and
- several dimensions of neighborhood supportiveness (SIPP)

The findings for the poorer families in the CCDP2 sample on parental attitudes and parent-child interactions should be taken in context with lack of statistically significant differences in parenting *practices* between WIC families and other low-income families seen in the nationally representative SIPP sample.

Differences between the environments of WIC children and higher-income children were in accord with expectations. Compared to higher income children, WIC children

- were read to less often (SIPP);
- were taken on fewer family outings (SIPP);
- were substantially more likely to be exposed to such hazards in the home as gas stoves used for heating, risks of crime, and cigarette smoke (NHANES);
- lived in neighborhoods that were less highly rated by their parents overall, with regard to safety, with regard to school quality, and with regard to neighbors' supportiveness (SIPP); and
- were substantially less likely to attend nursery schools and preschools, day care centers, and family day care, and to be cared for by a babysitter (SIPP).

Chapter Six
Children's Nutritional Status

Nutritional status is the main outcome that WIC participation is intended to affect directly. Aspects of nutritional status include dietary intake, nutritional biochemistries, and anthropometric status. Dietary intake may be directly affected by WIC supplemental foods and/or nutrition education. Improved dietary intake may in turn lead to improvement in more objective measures of nutritional status such as levels of iron in the blood (hemoglobin and hematocrit) and height and weight.

WIC children's diets are, on average, as good or better than those of both higher-income and other lower-income children with respect to intake of calories, protein, vitamin A, vitamin C, iron, calcium, and folate. Diets consumed by all groups of children exceeded the *Dietary Guidelines for Americans* recommendations for intake of fat and saturated fat. Although children are not expected to meet these recommendations until the age of five, there was no evidence of a gradual decline in fat intake with increasing age. In addition, WIC children were more likely than higher-income children to consume more cholesterol (although means for both groups met the recommendation) and more sodium (mean for WIC children exceeded the recommendation.)

In the restricted CCDP2 sample, information on usual eating habits showed that WIC children eat WIC foods more often than other lower-income children, but are more likely to eat foods that are fried or prepared with sauces and gravies.

The NHANES-III data show that in comparison to other low-income children and, especially, to higher-income children, a greater percentage of WIC children have high serum lead levels. In addition, WIC children are significantly more likely than other lower-income children to be underweight, and are significantly more likely than higher-income children to have low hemoglobin levels and to be overweight.

In interpreting these comparisons, it is important to bear in mind that a child's nutritional status may both determine WIC participation and result from it. Inadequate dietary intake, low levels of blood iron, and inadequate or excessive weight, for example, are all recognized nutritional risks in the WIC program.

The format for exhibits in this chapter differs from that used in previous chapters. All of the data presented in this chapter come from NHANES-III or CCDP2, and there are no items common to both sources. Consequently, each exhibit presents data from only one source, which is identified in the exhibit title rather than in exhibit rows.

24-Hour Dietary Intake

A 24-hour dietary recall was used to determine intake of calories and nutrients as part of NHANES-III. Caregivers of young children completed the recalls, which were implemented by trained interviewers. Food models and household measuring utensils were used to assist respondents in describing portions of food consumed.

Analysis of the 24-hour recall data focuses primarily on food energy (calories) and the nutrients that are specifically targeted in the WIC program (protein, vitamin A, vitamin C, calcium, and iron). WIC food packages are designed to ensure that participants' needs for these nutrients, which previous research has shown to be problematic among low-income populations, are met. Children's food packages include milk, cheese, eggs, 100 percent fruit juices, selected low-sugar breakfast cereals, peanut butter, and legumes. In addition, data are presented for folate, an additional nutrient of special interest for the WIC population.

The analysis compared group means, generally expressed as percentages of age-specific Recommended Dietary Allowances (RDAs). 1989 RDAs were used for calories, protein, vitamin A, vitamin C, and iron.[1] The new (forthcoming in 1999) RDA was used for folate[2]. Updated RDAs are not yet available for calories or the other nutrients examined.

For calcium, recently updated reference standards defined an Adequate Intake (AI) rather than an RDA, because data were deemed insufficient to support estimation of an RDA.[3] The RDAs specify a level of intake that is estimated to meet the needs of nearly all (97 to 98 percent) of healthy individuals in group (defined by age, gender, and pregnancy and lactation status). The AI, on the other hand, is based on observed or experimentally determined approximations of the average nutrient intake, by a defined population or subgroup, that appears to sustain a defined nutritional state, such as normal circulating nutrient values or growth.[3] That is, the AI defined for calcium for each life-stage group is an experimentally-derived approximate group mean intake value that appears to support maximal calcium retention. As such, it is a *lower* standard than the previous RDA. For example, the previous RDA for calcium for 1-3 year olds was 800 mg; the new AI is 500 mg.

Cut-offs were not used in assessing nutrient intake. Because the RDAs are defined to meet the nutrient needs of nearly all healthy individuals, looking at the percentage of individuals failing to

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[1] National Research Council (1989). *Recommended Dietary Allowances* (Tenth Edition). Washington, DC: National Academy Press.

[2] Food and Nutrition Board, Institute of Medicine (1998). *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12},, Pantothenic Acid, Biotin, and Choline.* (Prepublication copy: Uncorrected proofs). Washington, DC: National Academy Press.

[3] Food and Nutrition Board, Institute of Medicine (1997). *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride.* (Prepublication copy: Uncorrected proofs). Washington, DC: National Academy Press.

meet 100 percent of the RDA would greatly overestimate the prevalence of inadequate intakes. Although some authors have used cutoffs of 75 - 77 percent of the RDA[4], this approach is not recommended by the Food and Nutrition Board.[5] Moreover, the dietary intake data available in the NHANES-III data base is based on a single 24-hour recall. Such data provide reliable estimates of mean intakes for population groups but do not provide reliable estimates of intake at the individual level.[6]

In addition to comparing mean intake of calories, protein, vitamin and minerals to recommended levels of intake, we examined the percentage contribution of fat, saturated fat, carbohydrate, and protein to total calorie intake, and compared group means to recommendations included in the *Dietary Guidelines for Americans*[7] and the National Research Council's *Diet and Health* Report.[8] Intakes of cholesterol and sodium were also examined. Reference standards used in these comparisons are summarized below:

- no more than 30 percent of calories from fat
- less than 10 percent of calories from saturated fat
- no more than 300 mg cholesterol per day
- no more than 2,400 mg sodium per day.

Only children two years of age and older were included in analyses focusing on fat, cholesterol, and sodium intake because recommendations used to define reference standards do not apply to younger children.[9] Analyses were limited to comparisons of group means because, as noted above, a single 24-hour recall does not provide reliable estimates of intake at the individual level.

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[4] Rush, D. *et al., Evaluation of the Special Supplemental Food Program for Women, Infants and Children (WIC)* (four volumes). Report prepared by Research Triangle Institute for the U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation and Edozien, J.C., Switzer, B.R., and Bryan, R.B. (1979). Medical Evaluation of the Special Supplemental Food Program for Women, Infants, and Children. American Journal of Clinical Nutrition 32: 677-692.

[5] Personal communication from Suzanne Murphy, Ph.D., Chair, Food and Nutrition Board's subcommittee on Evaluation and Use of the DRIs.

[6] The Center for Nutritional Policy and Promotion has made public a report using NHANES-III showing median nutrient intake as a percent of RDA of WIC children, broken out into two age groups. The report, entitled "Review of WIC Supplemental Food Packages in Light of Current Nutritional Guidance and Food Consumption Patterns," was submitted to Under Secretary Watkins in March 1999.

[7] U.S. Department of Agriculture and U.S. Department of Health and Human Service (1995). *Dietary Guidelines for Americans* (4th edition). Washington DC: U.S. Government Printing Office.

[8] National Research Council (1989). *Diet and Health: Implications for Reducing Chronic Disease.* Washington DC: National Academy Press.

[9] The *Dietary Guidelines* recommend that children between the age of two and four begin to adopt a low-fat diet, with the goal of adhering to the recommended levels of fat and saturated fat intake by the age of five. Thus, children included in this analysis are not expected to be meeting the *Dietary Guidelines* recommendations. The analysis was included to provide some insight into how closely children's diets approximate these standards.

Nutrient Intake Relative to RDAs

Mean calorie intake for WIC children did not differ significantly from means for other low-income children or for higher-income children (Exhibit 6.1). Means for all three groups approximated 100 percent of the RDA.

Mean intakes of all nutrients met or exceeded 100 percent of the RDA for all groups of children. Mean calcium intake exceeded 100 percent of the AI. These findings indicates that, on average, children were consuming diets that were nutritionally adequate with respect to the nutrients targeted by the WIC program. In comparison to other lower-income children, WIC children consumed significantly more calcium and folate. In comparison to higher-income children, WIC children consumed significantly more protein and folate and less vitamin A. Although mean intakes for all groups met or exceeded 100 percent of the RDA, any increase in the group mean increases the likelihood that all individuals within the group are consuming diets that meet their individual nutrient needs.

Nutrient Intake Relative to *Dietary Guidelines* and NRC Recommendations

The percentage of calories from fat and saturated fat in the diets consumed by all groups of children exceeded the *Dietary Guidelines* recommendations of no more than 30 percent and less than 10 percent, respectively (Exhibit 6.2). The guidelines recommend a gradual decline in the amount of fat and saturated fat in children's diets starting at age two, in order to meet these goals by age five.

There were no significant differences between WIC children and lower-income children in these measures. Diets consumed by higher-income children, however, derived significantly fewer calories from fat than diets consumed by WIC children (31.7 percent *versus* 33.7 percent). Results stratified by age (not shown) revealed very little difference across age groups, i.e., no evidence of a gradual decline in fat intake toward meeting the *Dietary Guidelines* goal at age five. Hence the overall measures shown were not age-adjusted. Sample sizes were too small to test statistical significance of age-group differences.

With regard to cholesterol and sodium intake, higher-income children again seem to be consuming a diet that is more in keeping with current public health recommendations. Mean intakes for all groups of children satisfied the recommendation of no more than 300 mg of cholesterol per day. Higher-income children consumed significantly less cholesterol, on average, than WIC children (166 mg *versus* 229 mg). Likewise, higher-income children consumed less sodium. Mean intakes for WIC children and other low-income children exceeded the recommended maximum of 2,400 mg per day (no significant difference between the two groups). In contrast, the mean for higher-income children satisfied the recommendation (2,277 mg). The difference between WIC children and higher-income children was statistically significant at the five percent level.

Exhibit 6.1
24-HOUR DIETARY INTAKE (NHANES-III):
MEAN CALORIE AND NUTRIENT INTAKE RELATIVE TO RDAS AND AIS

| Characteristic | Low Income Children | | | Higher income children | All children |
	WIC participants	Non-participants	All		
Calories					
Mean percent RDA [1]	104	103	103	100	102
Protein					
Mean percent RDA [1]	314	305	308	286**	297
Vitamin A					
Mean percent RDA [1]	166	162	163	188**	175
Vitamin C					
Mean percent RDA [1]	249	226	233	227	230
Iron					
Mean percent RDA[1]	113	106	108	110	109
Calcium					
Mean percent AI [2]	164	144**	150	154	152
Folate					
Mean percent RDA [3]	137	125*	129	126*	128

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
   * Statistically significant difference from WIC participants at the 5 percent level.

[1] Based on 1989 RDAs (revised DRIs not yet available).
[2] Based on Adequate Intake defined by DRIs. An RDA was not set for calcium because of inadequate data on requirements.
[3] Based on revised RDA specified in DRIs, which is substantially higher than 1989 RDA.

Exhibit 6.2
24-HOUR DIETARY INTAKE (NHANES-III): MEAN PERCENTAGE OF
CALORIES FROM FAT AND SATURATED FAT AND
MEAN INTAKE OF CHOLESTEROL AND SODIUM

| Characteristic | Low Income Children | | | Higher income children | All children |
	WIC participants	Non-participants	All		
Percent of calories from fat	33.7	33.8	33.8	31.7*	32.7
Percent of calories from saturated fat	12.8	12.8	12.8	12.0*	12.4
Cholesterol (mg)	229	208	213	166**	190
Sodium (mg)	2504	2455	2467	2277*	2374

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
　　　　 * Statistically significant difference from WIC participants at the 5 percent level.

Analysis limited to two- to four-year-olds.

Usual Food Habits

CCDP2 included a set of questions about children's usual eating habits.[10] Caregivers were asked whether the child consumed a number of different types of food and, if so, how often the food was consumed. In addition, respondents were asked whether the child ate breakfast, how often sweeteners or salt were added to the child's foods, and how often the child's foods were fried or prepared with added gravy or sauces. In analyzing questions about intake of specific foods, WIC foods (milk, cheese, and 100 percent fruit juice) were considered separately from non-WIC foods (fruits and vegetables).

WIC children were significantly more likely than other low-income children to consume WIC foods at least once a day (Exhibit 6.3). This pattern is consistent with greater mean intake of calcium observed in the NHANES-III dietary intake data.

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[10] As noted in Chapter One, the CCDP2 sample comprises a convenience sample of children from low-income families that participated in the CCDP2 demonstration in ten sites. They were all at or near their second birthdays at the time of the interview, and their household income at the time of recruitment (during their prenatal period or infancy) was less than 100 percent of the federal poverty level.

There were no differences between WIC children and non-WIC children in usual consumption of the two non-WIC foods (fruits and vegetables) included in the inventory.[11] Nor were any differences detected in daily consumption of breakfast or in the use of sweeteners and salt in children's foods. WIC children were, however, significantly more likely than other low-income children to consume fried foods or foods prepared with gravies and sauces (24.4 percent of WIC children reportedly consume such foods rarely or never compared to 29.4 percent of other low-income children). The NHANES-III data summarized in Exhibit 6.2 suggest that the nutritional consequences of this difference are negligible: there were no significant differences between WIC children and other low-income children in mean calorie intake or in the percentage of calories provided by fat or saturated fat in the nationally representative NHANES-III sample. We note, however, that difference in characteristics of NHANES-III and CCDP2 samples require that comparison of findings from the two data sources be interpreted with caution: the CCDP2 sample is nonrepresentative, and is limited to poorer WIC and non-WIC children.

Nutritional Biochemistries

NHANES-III included a battery of biochemical measures. Levels of hemoglobin, hematocrit, and lead were assessed in all children. Six additional measures were taken for children four years of age and older.[12] Sample sizes for the measures that included only four year olds were too small to estimate standard errors properly, so significance tests were not performed for these variables. Cut-offs used in assessing the prevalence of abnormal results were defined for each measure based on current WIC policy[13] or medically acceptable levels defined for analysis of the NHANES-III data.

The prevalence of blood levels that were considered abnormal (above or below cut-off) was relatively low for all groups of children (Exhibit 6.4). Among WIC children, the indicator with the greatest number of abnormal values was serum lead; more than 14 percent of WIC children had abnormally high levels of lead in their blood. Corresponding percentages were significantly lower for both other low-income children and higher-income children, eight percent and three percent, respectively. Given that WIC participation is unlikely to lead to high lead levels and that excessive lead is a risk factor for child WIC participants in most WIC programs, the most logical explanation for the higher prevalence of this problem among WIC participants is that children with high lead levels are enrolled in WIC at a higher rate than children who do not have this problem.

A similarly problematic indicator for WIC children was red blood cell (RBC) folate. Fourteen percent of WIC children had low levels of folate in their blood, compared to 11 percent of

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[11] Legumes are available through WIC but are not often included in children's food packages.

[12] Triglyceride data were not analyzed because the number of unacceptable values (quite high) suggested that many subjects were not in a fasting state when their blood was drawn. Triglyceride levels are substantially affected by recent food consumption and an accurate test requires that subjects be fasting.

[13] U.S. Department of Agriculture, "WIC Policy Memorandum 98-9: Nutritional Risk Criteria," June 29, 1998.

Exhibit 6.3
USUAL FOOD CONSUMPTION (CCDP2)

Characteristic	WIC participants	Other low-income children	All low-income children
Percentage eating WIC foods at least daily			
Milk	84.4	80.3*	82.7
Cheese	37.3	32.9*	35.5
100 percent fruit juice	80.1	74.1**	77.6
Percentage eating non-WIC foods at least daily			
Fruit	57.4	58.0	57.7
Vegetables	59.6	60.4	59.9
Percentage exhibiting positive eating behaviors			
Eats breakfast every day	89.3	91.4	90.1
Sweeteners rarely or never added to foods	53.6	57.0	55.1
Salt rarely or never added to foods	60.8	61.4	61.1
Fried foods or foods prepared with gravy or sauces rarely or never eaten	24.4	29.4*	26.5

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
  * Statistically significant difference from WIC participants at the 5 percent level.

Exhibit 6.4
NUTRITIONAL BIOCHEMISTRIES (NHANES-III)

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Percentage above or below cut-off					
Hemoglobin (Age 1 : < 11; Age 2-4: <11.1)	10.3	9.9	10.1	5.8**	8.1
Hematocrit (< 33 g/dL)	9.0	9.0	9.0	5.9	7.5
Lead (≥ 10 mcg/dL)	14.4	8.4**	10.2	3.0**	6.9
RBC folate (4-year-olds only; < 140 ng/mL)	14.0	11.2	11.7	6.6	9.2
Serum folate (4-year-olds only; < 4 ng/mL)	1.6	2.1	2.0	1.1	1.6
Serum cholesterol (4-year-olds only; ≥ 240 mg/dL)	0.0	0.6	0.5	1.8	1.1
HDL cholesterol (4-year-olds only; < 35 mg/dL)	4.9	7.6	8.2	8.1	7.6
Serum vitamin A (4-year-olds only; < 25 mcg/dL	6.8	7.9	7.7	3.3	5.6
Serum vitamin B12 (4-year-olds only; < 100 pg/mL)	0.00	0.02	0.02	0.00	0.11

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
        *   Statistically significant difference from WIC participants at the 5 percent level.

Due to small sample sizes, tests of statistical significance were not completed for measures that were collected only for four-year-olds.

nonparticipating low-income children and seven percent of higher-income children. Small sample sizes precluded testing the statistical significance of this difference.

Abnormal levels of blood iron, assessed by both hemoglobin and hematocrit measures, was the next most common nutrition-related problem. The prevalence of low hemoglobin and low hematocrit levels was very similar for WIC children and other low-income children and was notably greater than that observed for higher-income children. The difference between WIC children and higher-income children in the prevalence of abnormal hemoglobin levels (10.3 percent *versus* 5.8 percent) was statistically significant.

All of the other measures were completed only for four-year-olds. Although sample sizes were too small to support significance testing, the prevalence of abnormal values was very low for most measures, and differences between groups do not appear to be large.

Height and Weight

Data on children's heights and weights were transformed into percentiles of accepted weight-for-height growth standards developed by the National Center for Health Statistics (NCHS).[14] Transformations were completed using the ANTHRO software program developed by the Centers for Disease Control and the World Health Organization.[15] Cut-offs for both *low* weight-for-height (underweight) and *high* weight-for-height (overweight) were defined based on current WIC policy for definition of nutritional risk.[16]

The prevalence of low weight-for-height, defined as weight-for-height below the 10th percentile, was relatively low for all groups of children (Exhibit 6.5). WIC children, however, were significantly more likely than other low-income children to be low weight-for-height (5.5 percent *versus* 3.0 percent). Because it is unlikely that WIC participation leads to low weight-for-height, this pattern probably reflects an increased rate of WIC enrollment among low weight-for-height, low-income children.

High weight-for-height, or overweight, was much more common than low weight-for-height among all groups of children. Using a cutoff of more than the 90th percentile for weight-for-height, 14 percent of WIC children are considered overweight. This compares to 16 percent of other low-income children and nine percent of higher-income children. The difference between WIC children and higher-income children is statistically significant at the five percent level.

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[14] P.V. Hamill *et al.*(1979). Physical Growth: National Center for Health Statistics Percentiles. *American Journal of Clinical Nutrition.* 32: 607-629.

[15] M. Sullivan and J. Gorstein (1990). *ANTHRO: Software for Calculating Pediatric Anthropometry*, Version 1.01.

[16] U.S. Department of Agriculture, *op. cit*.

Exhibit 6.5
HEIGHT AND WEIGHT (NHANES-III)

| Characteristic | Low Income Children | | | Higher income children | All children |
	WIC participants	Non-participants	All		
Low weight-for-					
< 10th percentile	5.5	3.0**	3.8	3.9	3.8
High weight-for-height					
> 90th percentile	13.6	16.2	15.4	8.8*	12.2

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
* Statistically significant difference from WIC participants at the 5 percent level.

Conclusions

The evidence suggests that, with regard to nutritional adequacy, diets consumed by WIC children are roughly equivalent to those consumed by other low-income children and higher-income children, although somewhat higher in calcium, folate, and protein content. However, diets consumed by WIC children, as well as other low-income children, tend to be higher in sodium, cholesterol, fat, and saturated fat, than diets consumed by higher-income children.

WIC children in the nonrepresentative CCDP2 sample consume more of the WIC foods examined in this analysis (milk, cheese, and 100 fruit juice) than other low-income children. They also tend to consume fried foods and foods prepared with gravies and sauces more often than other low-income children. However, available data on nutrient intake (from another data source) found no differences between WIC children and other low income children in intake of either total calories or fat. WIC children did, however, consume more fat (total fat and saturated fat) than higher-income children.

With regard to nutritional status, WIC children are significantly more likely than higher-income children (but not than other low-income children) to have low hemoglobin levels, as defined by WIC policy; and more likely than both groups to have abnormal levels of serum lead. They are also more likely than other low-income children to be underweight and more likely than higher-income children to be overweight. All of these measures of nutritional status are deemed nutritional risks that qualify a child to participate in WIC, and thus reflect, in part, the selection process that draws children into WIC or retains them on WIC. Although it is reasonable to infer that children's increased consumption of WIC foods is attributable to WIC participation, it is not

possible to tell from these data to what extent WIC participation improves any of the other measures of nutritional status from what they otherwise would have been.

Chapter Seven
Child's Health, Growth, and Development

In this chapter, we examine the remaining outcomes defined in our conceptual model that could potentially be affected by WIC participation, either directly or indirectly. Outcomes that could be affected directly include health care and immunization status. More distal outcomes include general health status; hospitalizations, injuries, and accidents; dental health; and physical, emotional, and cognitive development.

WIC children are found to have at least as good access to health care as other low income children, but they lag behind on a host of developmental measures. While it is plausible that WIC leads to better access to health care, other explanations for that result are also possible–e.g., health care providers refer families to WIC. With regard to the developmental measures, these data do not allow us to draw any inferences about the relative contributions of selection and causation.

Access to Health Care

Questions considered in this analysis include whether children had a regular source of health care and whether they received standard preventive health care services including dental care, vision screening, and hearing screening. WIC children were more likely than other low-income children, though less likely than higher income children, to have a regular source of health care and to have visited a dentist. They were much more likely than higher income children to get their care from a free or low-cost neighborhood clinic.

Regular Source of Health Care

All three data sources included a question about whether the child had a regular source of health care. The NHANES-III and SIPP questions encompassed all sorts of health care services including health care advice, routine health care, and care for specific illnesses or injuries. The CCDP2 survey included two separate items for routine health care and health care for specific illnesses and injuries.

All three data sources found that about 95 percent of WIC children had a regular source of health care (Exhibit 7.1). Although WIC participants were less likely than higher income

Exhibit 7.1
CHILD'S ACCESS TO HEALTH CARE

Characteristic	Low-Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Regular source of health care (percent)					
NHANES	95.2	90.9**	92.2	97.7*	94.9
SIPP	95.5	91.2**	92.5	98.2*	95.5
CCDP2 (routine care)	94.8	90.0**	93.2		
CCDP2 (illness/injuries)	95.9	92.9**	94.7		
Uses a free or low-cost neighborhood clinic (percent)					
SIPP	15.1	12.5	13.2	1.8**	
Visited a dentist (percent)					
NHANES-III	37.7	30.3	32.1	43.3	37.7
CCDP2	13.8	13.5	13.7		
Had vision screening (percent)					
NHANES-III	31.7	35.7	34.8	36.0	35.4
CCDP2	19.4	17.0	18.4		
Had hearing screening (percent)					
NHANES-III	27.4	28.1	27.9	25.8	26.9
CCDP2	28.2	27.0	27.7		

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
           *   Statistically significant difference from WIC participants at the 5 percent level.

children to have a regular source of health care, they were significantly more likely to have one than other low-income children (95 to 96 percent *versus* 90 to 91 percent). In addition, in the CCDP2 sample, WIC participants were more likely than other low-income children to have a regular source of care for illnesses and injuries (96 percent *versus* 93 percent). This finding is consistent with expectations for program outcomes. Referral to health care services is one of three major program benefits. On the other hand, health care providers refer families to WIC, so the causation could also go in the other direction.

The SIPP also included a question about where families received their health care. One of the options was a low-cost health clinic in their neighborhood. Approximately 15 percent of WIC participants reported receiving their health care at such a facility. A similar proportion of non-participating low-income children also received their health care through low-cost neighborhood clinics (12 percent). Not surprisingly, higher-income children were significantly less likely (2 percent) than current WIC participants to use low-cost neighborhood clinics.

Preventive Health Services

Both NHANES-III and CCDP2 included questions about whether the child had visited a dentist and whether they had received vision and hearing screenings.

The NHANES-III data showed that WIC participants, other low income children, and higher income children were about equally likely to have visited a dentist, with rates of 38 percent, 30 percent, and 43 percent, respectively. In the younger CCDP2 sample (all two-year-olds), dental visits were much less common (about 14 percent of all children) and there was no difference between WIC children and other low-income children.

Analysis of data on vision and hearing screenings in NHANES-III was limited to children three years of age and older, because this is the age at which most children can be expected to complete these screenings reliably. There were no statistically significant differences among the groups. About a third of the WIC children in the NHANES sample had had a vision screening and about a quarter had had a hearing screening. The corresponding proportions for WIC children in the CCDP2 sample were 20 percent for vision screenings, and 28 percent for hearing screenings.

Childhood Immunizations

WIC children were found to be significantly more likely than other low-income children to be up-to-date in their immunizations. The CCDP2 study gathered detailed information on the number and type of immunizations children received. Data were gathered in face-to-face interviews and, where available, "shot records" were reviewed to verify responses. Several measures of immunization status were created to indicate whether children had received the recommended

number of doses of specific vaccines (based on recommendations of the American Academy of Pediatrics). The vaccines assessed include DTP (diphtheria and tetanus toxoids and pertusis), four or more doses; polio, three or more doses; MMR (measles, mump, rubella), one or more doses; HiB (Haemophilus influenzae), three or more doses; and HEP (hepatitis B), three or more doses. In addition to the individual measures, two composite measures were created to indicate successful completion of full immunization series. One composite measure included the HiB vaccine and the other did not.

For every measure except MMR, which is a single dose immunization, WIC children were significantly more likely than other low-income children to have received recommended immunizations (Exhibit 7.2). For each individual immunization series (excluding the single dose MMR), 64 to 78 percent of WIC children received the recommended number of doses, compared to 57 to 69 percent of other low-income children. Moreover, for the two comprehensive measures examined, the percentage of WIC children who received the complete battery of recommended immunizations was five to seven percentage points higher than non-WIC children. This pattern is entirely consistent with the fact that WIC children were more likely than non-WIC children to have a regular source of health care.

While the data suggest a positive impact of WIC participation or selection, it is important to recognize that about half of the WIC children in the CCDP2 sample had not received all of their recommended immunizations. In recent years, WIC has identified childhood immunizations as a high-priority area for participant education and referrals. These data (collected in 1994-1997) substantiate the need for such an initiative.

General Health Status

Compared with higher income children, WIC children were significantly less likely to be in good or excellent health, according to their caregiver's report; more likely to have a chronic health condition; but *less* likely to have had three or more ear-infections, age-adjusted.

Both NHANES-III and SIPP asked parents or caregivers to rate the child's overall health as excellent, very good, good, fair, or poor. Nearly all respondents in both samples rated children's health as good, very good, or excellent (Exhibit 7.3). There were no significant differences between WIC children and other low-income children. Higher income children in NHANES were significantly more likely than current WIC children to receive good to excellent ratings.

NHANES-III also included a physician-reported measure of children's health which used the same response scale. Physicians reported that virtually 100 percent of all children were in good, very good, or excellent health.

Exhibit 7.2
IMMUNIZATION STATUS

Characteristic	WIC participants	Other low-income children	All low-income children
Received all recommended DTP (percent) *CCDP2*	64.2	57.7**	61.5
Received all recommended polio (percent) *CCDP2*	78.4	68.6**	74.4
Received all recommended MMR (percent) *CCDP2*	84.4	83.0	83.8
Received all recommended HiB (percent) *CCDP2*	65.3	58.3**	62.4
Received all recommended HEP (percent) *CCDP2*	63.9	56.6**	60.9
Received all recommended DTP, Polio, and MMR (percent) *CCDP2*	58.2	51.3**	55.3
Received all recommended DTP, Polio, MMR, and HiB (percent) *CCDP2*	49.3	44.1*	47.1

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
         *   Statistically significant difference from WIC participants at the 5 percent level.

Exhibit 7.3
CHILD'S HEALTH STATUS

Characteristic	Low Income Children			Higher income children	All children
	WIC Participants	Non-participants	All		
Good or excellent health (caregiver report; percent)					
NHANES-III	92.4	93.7	93.3	98.2**	95.7
SIPP	96.0	96.3	96.2	98.9	97.7
Good or excellent health (physician report; percent)					
NHANES-III	99.5	99.6	99.6	99.7	99.6
Has chronic health condition (percent)					
NHANES-III[1]	8.8	9.4	9.2	6.4	7.8
CCDP2[2]	29.1	22.3**	26.2		
Had infection during past four weeks (percent)					
NHANES-III	49.6	46.5	47.5	48.2	47.8
Saw health professional for illness during past six months (including emergency room visits; percent)					
CCDP2	22.7	21.3	22.1		
Has had three or more ear infections[a] (percent)					
NHANES-III	36.8	34.6	35.3	49.4**	42.1

[1]Includes rheumatic fever/heart disease; epilepsy/fit/convulsions; cerebral palsy; mental retardation; muscle weakness/paralysis; asthma; chronic bronchitis; and hayfever.

[2]Question asked whether child had condition that lasts a long time or comes back again and again.

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
  *   Statistically significant difference from WIC participants at the 5 percent level.
[a] Age adjusted.

Chronic Health Conditions

NHANES-III and CCDP2 assessed prevalence of chronic health conditions, but used different methods. NHANES-III asked specifically about the following health conditions: rheumatic fever/heart disease, epilepsy/fit/convulsions, cerebral palsy, mental retardation, muscle weakness/paralysis, asthma, chronic bronchitis, and hayfever. The prevalence of these conditions was equivalent among WIC and non-WIC children. Higher-income children were not significantly less likely than current WIC participants to have one or more of these conditions.

CCDP2 asked whether the child had any health problems that "last a long time or come back again and again." The data indicate that caregivers of WIC children were significantly more likely than caregivers of other low-income children to report such a condition. The most commonly reported chronic conditions were repeated ear infections, asthma, and other chronic respiratory problems.

Other Measures of Health

The two surveys included a number of other measures of specific aspects of children's health status with little overlap. No consistent pattern of differences between WIC children and others is visible in these measures.

NHANES-III assessed whether the child had had an infection during the past four weeks. There were no significant differences between WIC participants and either low- or higher income non-participants in this regard.

CCDP2 included a different measure of recent health: whether the child had seen a health professional for an illness during the past six months. Emergency room visits were included in the measure. Findings for both WIC and non-WIC children were comparable: just over 20 percent of the children in each group had seen a health professional.

NHANES-III gathered information on the frequency of ear infections. In analyzing these data, age adjustment was used because WIC children are younger on average than non-WIC children, and the number of ear infections a child experiences can only increase as a child grows older. There were no differences between WIC children and other low-income children. In comparison to higher-income children, however, WIC participants were less likely to have had three or more ear infections. A possible explanation of this anomalous result is that higher income parents may take their children to their doctors more often and get ear infections diagnosed, while poorer parents might wait them out. New guidelines from the American Academy of Pediatrics advise against treating fluid in the ears as an infection, as doctors had previously been doing.

Hospitalizations, Accidents, and Injuries

The three groups of children did not differ significantly with respect to hospitalizations, accidents, and injuries.

In the NHANES-III sample, one in five children had been hospitalized at least once since birth, excluding neonatal intensive care (Exhibit 7.4). Data were age-adjusted to account for the influence of age on this cumulative measure.

Data from the SIPP and CCDP2 suggest that hospitalizations occurred fairly early in children s lives. Only about four percent of children were hospitalized within the past year (SIPP) or the past six months (CCDP2).

Injuries and accidents were reported for 11 to 14 percent of the children in NHANES-III. The prevalence of serious injury was lower for the CCDP2 sample (about 5 percent). This difference may be attributable to a shorter reference period (six months rather than one year) and the younger age of the children.

Dental Health

WIC children's dental health was significantly worse than that of higher income children, but similar to that of other low-income children.

CCDP2 assessed whether children's teeth are brushed regularly. Caregivers of 71 percent of the children responded affirmatively (Exhibit 7.5).

NHANES-III included a complete dental assessment for all children two years of age and older. Dentists assessed children's overall dental health, reported the number of decayed, missing, and filled teeth, and indicated whether there was any evidence of nursing bottle caries. Eighty-six percent of WIC children were rated as having good, very good, or excellent dental health. Results were comparable for other low-income children. Higher-income children, on the other hand, were significantly more likely than current WIC participants to receive a positive rating (97 percent).

A quarter of all low-income children had at least one cavity. In keeping with the finding reported above, higher-income children were significantly less likely than WIC participants to have had one or more cavities (11 percent *versus* 22 percent). Overall, WIC children averaged less than one cavity, while other low-income children averaged slightly more than one cavity. Higher-income children had an average of 0.35 cavities.

Exhibit 7.4
HOSPITALIZATIONS, INJURIES, AND ACCIDENTS

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Hospitalized one or more nights since birth[a] (exclusive of neonatal intensive care; percent)					
NHANES-III	21.8	19.7	20.4	17.7	19.1
Hospitalized within past year (percent)					
SIPP	3.9	3.3	3.5	2.3	2.8
Hospitalized within past six months (percent)					
CCDP2	4.3	3.6	4.0		
Serious injury or accident in past year (percent)					
NHANES-III	13.7	10.9	11.8	13.7	12.7
Serious injury in past six months (percent)					
CCDP2	5.4	4.2	4.9		

NOTES:　**　Statistically significant difference from WIC participants at the 1 percent level.
　　　　　*　Statistically significant difference from WIC participants at the 5 percent level.
[a] Age adjusted.

Exhibit 7.5
DENTAL CARE

	Low Income Children			Higher income children	All children
Characteristic	**WIC participants**	**Non-participants**	**All**		
Brushes teeth regularly (percent)					
CCDP2	73.6	68.4*	71.4		
Good or excellent dental health (dentist report; 2+ years; percent)[a]					
NHANES-III	86.3	84.3	84.8	96.5**	90.6
Has had one or more cavities[a] (2+ years; percent)					
NHANES-III (dentist)	21.7	26.0	25.0	10.9**	18.0
CCDP2 (caregiver report)	5.4	4.8	5.1		
Mean number of decayed, filled, or missing teeth[a] (dentist report; 2+ years)					
NHANES-III	0.79	1.09	1.02	0.35**	0.69
Evidence of nursing bottle caries (dentist report, one-year-olds only; percent)					
NHANES-III	1.8	1.9	1.9	0.0	1.0

NOTES: ** Statistically significant difference from WIC participants at the 1 percent level.
   * Statistically significant difference from WIC participants at the 5 percent level.

[a]Age-adjusted

Finally, the data indicate that nursing bottle caries were rare in all groups of children. They were completely absent among the higher-income children and apparent in only one to two percent of WIC and non-WIC children. This is consistent with the CCDP2 data on behaviors associated with nursing bottle caries (see Chapter Three).

Physical, Emotional, and Cognitive Development

WIC children in the nonrepresentative CCDP2 sample are significantly disadvantaged relative to other low-income children on a variety of measures pertaining to language and cognitive development and social behavior, but (based on nationally representative samples) not much different with regard to physical development. The few measures that are available for all income groups indicate greater likelihood of health-related limitations and developmental delays for WIC children relative to higher-income children.

Developmental and Learning Delays

Developmental delays and learning disorders are quite infrequent among children of this age. NHANES-III asked caregivers whether the focus child was limited in taking part in age-appropriate activities because of an illness or impairment. Limitations in age-appropriate activities were reported for less than one percent of all children (Exhibit 7.6). There were no differences between WIC children and other low-income children. Limitations were particularly rare among higher-income children, where the prevalence was 0.1 percent compared to 1.1 percent for WIC participants.

NHANES-III also included a physician assessment of children's ability to complete age-appropriate play activities. Physician assessments were consistent with caregiver reports. Fewer than one percent of all children were unable to complete age-appropriate activities. There were no differences between WIC and non-WIC children or between WIC children and higher-income children.

Physicians also assessed children's communication skills. Below-age communication skills were relatively rare. Although the estimated prevalence of this problem was somewhat higher among WIC children than other groups of children (3 to 4 percent *versus* 1 percent), these differences were not statistically significant. Finally, NHANES-III assessed whether children had seen a health professional for emotional, mental, or behavioral problems. Again, these problems were relatively rare and differences among groups did not reach statistical significance. The survey also asked about the receipt of medication for behavioral, emotional, or mental problems, but the number of children who received medication was too small for analysis.

Exhibit 7.6
PHYSICAL LIMITATIONS AND DEVELOPMENTAL DELAYS

Characteristic	Low Income Children			Higher income children	All children
	WIC participants	Non-participants	All		
Limitations because of health or impairment (caregiver report; percent)					
NHANES-III	1.1	1.5	1.4	0.1	0.7
Limitations in ability to complete play activities (physician report; percent)					
NHANES-III	1.3	0.9	1.1	0.6	0.8
Below age-level communication skills (physician report; percent)					
NHANES-III	3.5	1.0	1.6	1.0	1.3
Has seen psychiatrist for emotional, mental, or behavioral problem (3+ years; percent)					
NHANES-III	2.5	6.7	5.9	1.9	3.9
Developmental delay (caregiver report; percent)					
SIPP	5.9	3.4	4.3	2.7*	3.5
Developmental delay or learning disorder (caregiver report; percent)					
CCDP2	4.9	3.1*	4.1		

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
          *   Statistically significant difference from WIC participants at the 5 percent level.

The CCDP2 survey included a more comprehensive self-report measure that encompassed both developmental delays and learning orders. Respondents were asked whether they had ever been told the child had any of the following conditions:

- learning disability
- behavioral disorder/emotional disturbance
- mental retardation
- physical handicap
- speech impairment
- language impairment
- hearing impairment
- visual impairment
- handicaps
- hyperactivity
- sensory motor disorder
- attention deficit disorder (ADD).

Even with this comprehensive inventory, the prevalence of developmental/learning disorders was relatively infrequent: fewer than five percent of all children. Although disorders were uncommon in both groups, WIC children were significantly more likely than other low-income children to have developmental/learning delays (5 percent *versus* 3 percent). This may reflect the fact that developmental problems are considered risk factors for WIC participation during infancy and childhood. Alternatively, WIC children may be more likely to have existing problems diagnosed than other low-income children if they have better access to health care. According to a similar item in the SIPP, WIC children were significantly more likely than higher-income children to have experienced developmental delays (6 percent *versus* 3 percent) but not significantly more likely than the low income children.

Language and Cognitive Development

The CCDP2 study included three instruments to measure cognitive development: (1) the Bayley Scales of Infant Development; (2) the Peabody Picture Vocabulary Test (PPVT); and (3) Kaufman Assessment Battery for Children.[1] Detailed information about these instruments appears in Appendix C. All of these measures were administered individually to children by independent testers trained to an established standard of reliability. Two of these measures (the PPVT and the Kaufman) were taken after the point at which information on WIC participation was obtained (two years of age). Thus, in analyses of measures administered at three-years-of age, the data for WIC children   includes *recent* WIC participants, i.e., children who were in WIC when they were two years old. Children may or may not have been WIC participants at the time the

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[1] As noted in Chapter One, the CCDP2 sample comprises a convenience sample of children from low-income families that participated in the CCDP2 demonstration in ten sites. They were all at or near their second birthdays at the time of the interview, and their household income at the time of recruitment (during their prenatal period or infancy) was less than 100 percent of the federal poverty level.

developmental measure was actually taken. These measures show WIC children to be somewhat more disadvantaged than other low-income children in several cognitive areas.

The **Bayley Scales of Infant Development (BSID)** showed no difference between groups for motor skills, but WIC children scored significantly lower than non-WIC children on the mental scale (Exhibit 7.7). The BSID is a full-scale assessment measure used to assess childrens' cognitive development at 2 years of age. Separate scores are calculated for the motor and mental scales. It should be noted that there were substantial missing data: 8 percent of WIC children and 7 percent of non-WIC children were not tested.

The **Peabody Picture Vocabulary Test (PPVT)** was used to assess children's receptive vocabulary at 3 years of age. Children who completed the English version of the instrument had scores of approximately 82. There were no differences between WIC children and non-WIC children for this measure.

This measure was tabulated only for the English-speaking part of the subsample of children who were followed through age 3. The net effect of these restrictions is a response rate of 55 percent for WIC children, and 57 percent for non-WIC children. We do not believe that the three-year-olds who were excluded from followup were systematically different from the rest of the sample.

Finally, the **Kaufman Achievement Battery for Children** is a full-scale standardized measure of cognitive development consisting of a mental processing and an achievement scale. Tests were administered when children were approximately three years old. Because of the reduced sample size for three-year-old followup, scores were missing for 38 percent of WIC children and 42 percent of non-WIC children.

For both scales, scores for WIC children were significantly lower than scores for other low-income children. On the achievement scale, WIC children scored an average of 88, compared to 90 for non-WIC children. The disparity between groups was even larger for the mental processing scale where WIC children averaged 97 and non-WIC children averaged 101. This finding is consistent with the increased prevalence of developmental delays and learning disorders reported for WIC children.

Measures of Social and Emotional Development

The measures of social and emotional development used in the CCDP2 evaluation reflect a conceptual distinction between adaptive behavior and socioemotional problems. Adaptive behavior focuses on relationships with others. Children can be expected to exhibit enhanced adaptive behavior with age because of the gradual development of cognitive structures underlying feelings such as empathy.

Exhibit 7.7
LANGUAGE AND COGNITIVE DEVELOPMENT

Characteristic	WIC participants	Other low-income children	All low-income children
Mean Bayley motor score *CCDP2*	92.7	93.3	93.0
Mean Bayley mental score *CCDP2*	86.8	88.1*	87.3
Mean PPVT Score – English (3 year olds) *CCDP2*	81.9	82.5	82.2
Mean Kaufman achievement score (3 year olds) *CCDP2*	88.0	89.6**	88.6
Mean Kaufman mental processing score (3 year olds) *CCDP2*	97.2	100.9**	98.7

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
          *   Statistically significant difference from WIC participants at the 5 percent level.

All scores have been nationally normed to a mean of 100 and a standard deviation of 15.

Social and emotional problems are less clearly linked to cognitive development and are traditionally theorized to reflect more enduring aspects of the individual. For the CCDP2 evaluation, two instruments were used to measure social and emotional development of two year olds. These included the Achenbach Child Behavior Checklist and the Adaptive Social Behavior Inventory (ASBI), described in Appendix C. All of the instruments relied on parent report to describe children's behavior.

Measures from both of these instruments show a strikingly consistent pattern of lags in socioemotional development for WIC children relative to other low income children.

The **Achenbach Checklist** for ages 2 to 3 provide a report of the frequency of 99 behavioral and emotional problems. In addition to a total score, two "wide-band" syndromes can be derived: "Externalizing" includes aggressive, destructive, and delinquent behavior, and "Internalizing" includes somatic complaints, and anxious/depressed and withdrawn behaviors. The "total" scale includes these two subscales in addition to items that measure sleep problems, somatic problems, and a variety of other maladaptive behavior.

On all three measures, WIC children scored significantly higher than non-WIC children, indicating that WIC children tended to have more social and emotional behavior problems than non-WIC children (Exhibit 7.8)

Developed as part of the Infant Health and Development Program, an early intervention program implemented in the early 1990s, the **Adaptive Social Behavior Inventory (ASBI)** measures adaptive or prosocial behaviors among high-risk children. WIC children in the CCDP2 sample scored significantly lower than non-WIC children on two of the three subscales as well as overall. Lower scores indicate that WIC children had fewer adaptive skills than non-WIC children.

The ASBI consists of three subscales: Express, Comply and Disrupt. Sample items from the Express scale are "understands others' feelings" and "Is open and direct about what he/she wants." Sample items from the Comply scale are "Is helpful to other children" and "Shares toys or possessions." Sample items from the Disrupt scale are "gets upset when you don't pay enough attention" and "Is bossy, needs to have his/her way." In addition, a measure of Prosocial behavior is computed by combining the Express and Comply subscales. For the purposes of the CCDP2 evaluation, a total score was computed by adding all three subscales (with the Disrupt items recoded so that a higher score indicates more positive behavior).

In the CCDP evaluation, the ASBI was administered to children at ages 2, 3 and 4 years of age. Data reported here include only 2-year-old measures.

WIC children scored significantly lower than other low-income children at both the "express" and "prosocial" scales, as well as on the combined scale.

Conclusions

This chapter has presented findings on a broad array of measures of the health and development of children. While WIC children do relatively well with regard to preventative care, their health and developmental outcomes are not as good as those of other low-income children. For example, relative to other low-income children, WIC children are more likely to have a regular source of health care, to have seen a dentist recently, and to have their teeth brushed regularly. They are also more likely to be up-to-date on their immunizations. Nonetheless, they are less likely than other low-income children to be in good or excellent health (caregiver report), and more likely to have a developmental delay or learning disorder (caregiver report). In the non-representative CCDP2 sample, they score significantly lower than other low-income children in the Bayley mental score, the Kaufman achievement score, and the Kaufman mental processing score–indicators of cognitive development. The socioemotional development of WIC children

Exhibit 7.8
SOCIAL AND EMOTIONAL BEHAVIOR

Characteristic	WIC participants	Other low-income children	All low-income children
Mean Achenbach externalizing score [a]			
CCDP2	15.6	14.4**	15.1
Mean Achenbach internalizing score [a]			
CCDP2	10.3	9.0**	9.7
Mean Achenbach total score [a]			
CCDP2	39.8	35.8**	38.2
Mean ASBI comply score [b]			
CCDP2	8.0	8.2	8.1
Mean ASBI express score [b]			
CCDP2	12.9	13.3**	13.0
Mean ASBI prosocial score [b]			
CCDP2	20.9	21.5**	21.1
Mean ASBI disrupt score [a]			
CCDP2	3.6	3.6	3.6
Mean ASBI total score [b]			
CCDP2	25.3	25.8*	25.5

NOTES: **   Statistically significant difference from WIC participants at the 1 percent level.
          *   Statistically significant difference from WIC participants at the 5 percent level.

[a] Higher value corresponds to *less* desirable outcome.
[b] Higher value corresponds to *more* desirable outcome.

Ranges for scales are as follows:
  Achenbach externalizing: 0 to 52
  Achenbach internalizing: 0 to 50
  Achenbach total: 0 to 198

Total scale includes items on externalizing and internalizing subscales, plus 96 additional items.

ASBI comply: 0 to 14
ASBI express: 0 to 16
ASBI prosocial: 0 to 30
ASBI disrupt: 0 to 8
ASBI total: 0 to 38
Prosocial =   Express + Comply
Total =   Express + Comply + Reverse-Coded Disrupt

in this sample also lags, as evidenced by significant differences on the Achenbach and ASBI scales.

The children served by the WIC program thus have a host of developmental issues relative to other low-income children. It is likely that these developmental lags are related to other factors that increase the likelihood of WIC participation, such as poverty and its correlates of poor birth outcomes and less beneficial parenting practices. It is not possible to determine from these comparisons whether WIC improves these outcomes.

Chapter Eight
The Dynamics of Child WIC Receipt

Previous chapters have provided a profile of the WIC child caseload relative to other children. We now turn to dynamic patterns of child WIC participation. In this chapter, we address the following questions:

- Looking at a snapshot of the child WIC caseload, what is the age distribution of participants? What proportion of recipients first entered the program as infants, one-year-olds, etc.? What proportion will continue to receive benefits until they are five-year-olds, four-year-olds, etc.?

- How many WIC infants continue to receive WIC as children? Has this proportion increased as the program has expanded?

- What is the age distribution of a *cohort* of children entering WIC? Of a *cohort* of children leaving WIC?

- How often do children who leave the WIC program return?

- What events appear to trigger children's program exits?

Methodological issues are addressed in Appendices D and E.

A Snapshot of the Infant and Child WIC Caseload

The most striking dynamic feature of the infant and child WIC caseload is that participation declines with age—precipitously between infancy and childhood, and then gradually from age one through four. In April of 1994, for example, around the midpoint of the interval covered by the two SIPP panels, the age distribution of the infant and child caseload was as follows:

Infants (0 to 11 months):	32.2 percent
One-year-olds:	23.6 percent
Two-year-olds:	18.1 percent
Three-year-olds:	14.2 percent
Four-year-olds:	11.9 percent.

There are several reasons for this pattern. First, on the *supply* side, as noted in Chapter One, when funds were insufficient to serve all eligible applicants, children were enrolled in WIC only after all infants, pregnant women, and breastfeeding women with equivalent nutritional risks have been served. In addition, anecdotal evidence suggests that local agencies tended to give preference to younger children. Consequently, the availability of WIC declined with age.

Several factors on the *demand* side may also cause lower participation by children than by infants, and lower participation by older children than by younger children. First, although infants may be certified for benefits for as much as a year—through their first birthday—children must be recertified at six month intervals. Hence their parents must take an active step to ensure the continuation of their benefits. Second, the dollar value of the WIC food package is roughly only half as great for a child as for an infant. In 1996, for example, the average dollar value of the food package for infants was $78, compared with $34 for children. Third, older preschoolers may be in day care or Head Start, and receiving food through those programs; and finally, older preschoolers may refuse to eat the specific foods covered by WIC vouchers. These considerations suggest that WIC tends to become less attractive to families as their children grow older.

A second striking dynamic feature of the infant and child WIC caseload is that over 70 percent of all participants at a point in time began receiving benefits in infancy, and the bulk of the remainder as one-year-olds (Exhibit 8.1). Just under 30 percent of participants at a point in time will continue to receive WIC for the maximum time allowed, i.e. through their fifth birthday (Exhibit 8.2).

The Infant-Child Transition

WIC funding and enrollment has expanded greatly in the 1990s, and children have become a larger share of the caseload relative to infants (Exhibit 8.3). Although total WIC enrollment grew by 125 percent over the period shown, enrollment of children grew by 144 percent and enrollment of infants by only 85 percent. The implication is that the fraction of WIC infants that are recertified for WIC benefits as children has been increasing, and/or that greater numbers of children who did not receive WIC as infants are enrolling in the program. In fact, the latter explanation is the correct one.

About four-fifths (80.7 percent) of infants receiving WIC just before their first birthday continued to receive WIC immediately after their first birthday.[1]

The WIC exit rate at the end of infancy actually *increased* somewhat from the earlier to the later part of the time interval examined. For example, for infants born in 1991 or 1992 (*n*=507) the exit rate was 18.5 percent whereas for infants born in 1993 or 1994 (*n*=452) the exit rate was 20.1 percent. These data therefore do not support the hypothesis that a greater proportion of WIC infants were being recertified as children in the later years. Instead, it appears that more one-year-olds entered WIC in the later than in the earlier years.

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[1] This statistic is based on reported WIC receipt by children aged 12, 13, 14, or 15 months in the last reference month of a SIPP wave, compared to receipt by those children in the last month of the previous wave. We assumed, in accordance with WIC regulations, that benefits received in Month 12 were received as a one-year-old child. To check the effect of this assumption, we also examined receipt of WIC by individuals aged 13, 14, 15, or 16 months in the last reference month of a wave relative to their receipt at the end of the previous wave. Doing so yielded a virtually identical exit rate of 20.0 percent.

Exhibit 8.1
AGE OF WIC RECIPIENTS AND LENGTH OF PAST RECEIPT

Y-axis: Percent of all WIC infants and children

X-axis: Age of children (in years)

Legend:
- □ Began WIC receipt in infancy
- □ Began WIC receipt at age 1
- ▨ Began WIC receipt at age 2
- ▨ Began WIC receipt at age 3
- ■ Began WIC receipt at age 4

Data labels: 32.2, 23.6, 18.1, 14.2, 11.9
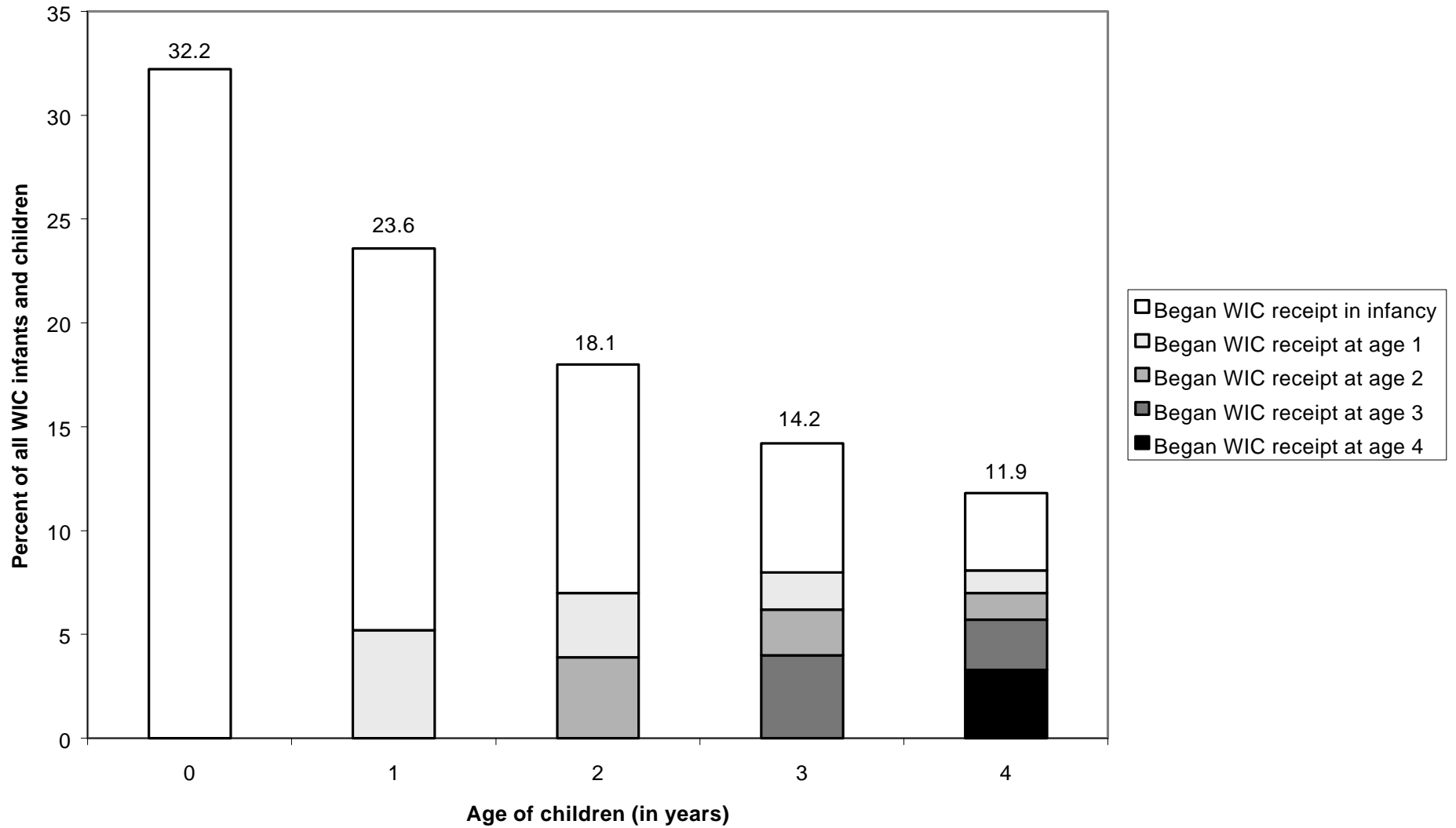
Exhibit 8.2
AGE OF WIC RECIPIENTS AND LENGTH OF FUTURE RECEIPT
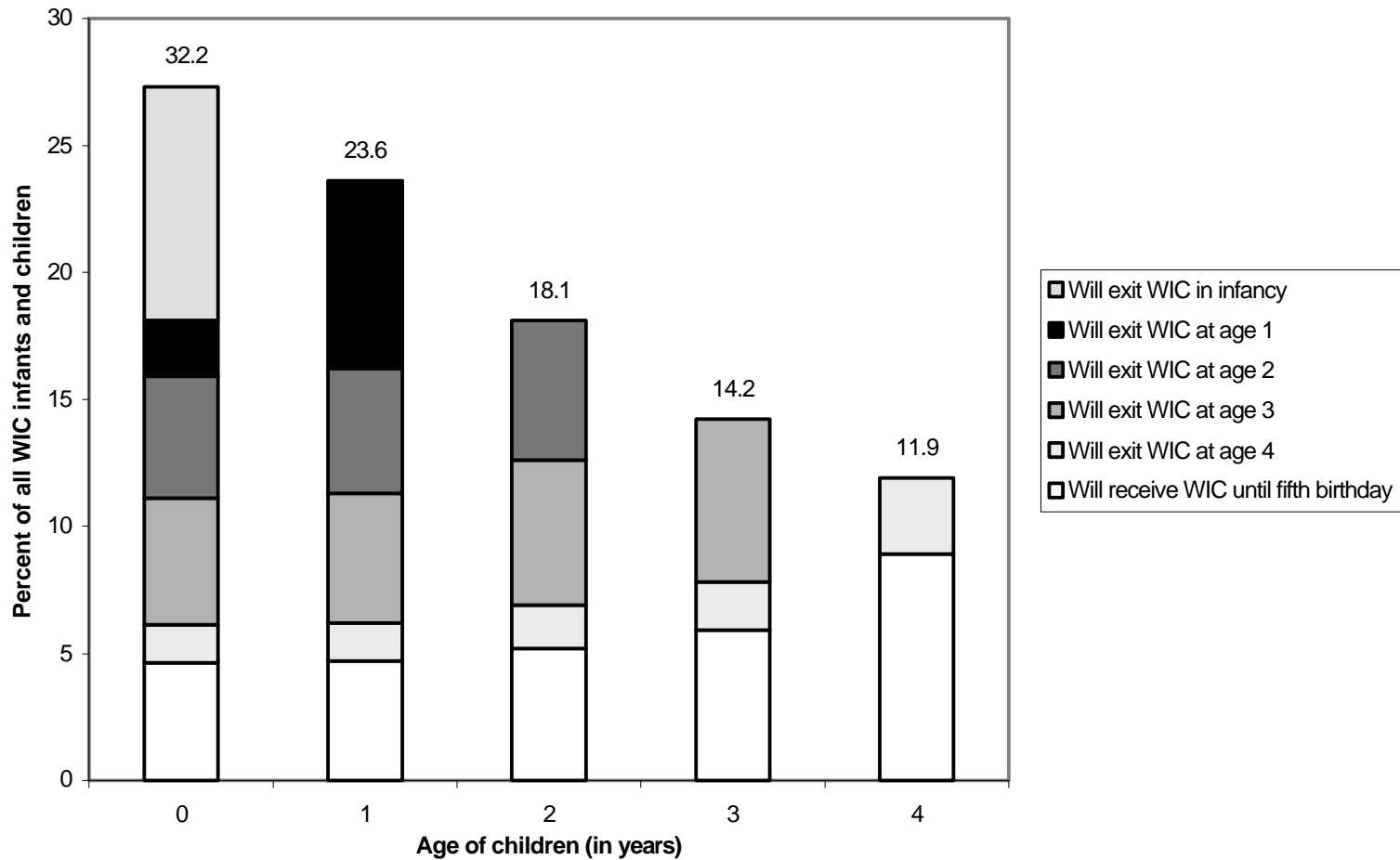
Exhibit 8.3
ENROLLMENT IN WIC IN A TYPICAL MONTH, 1988-1996

	1988	1990	1992	1994	1996
Total WIC enrollment (000)	3,440	4,538	5,754	6,908	7,747
Infants enrolled in WIC (000)	1,075	1,353	1,732	1,852	1,989
Children enrolled in WIC (000)	1,631	2,103	2,733	3,465	3,983
Children as percent of total infant and child enrollment	60.3%	60.9%	61.2%	65.2%	66.7%

Source: Study of WIC Participation and Program Characteristics

The WIC exit rate around children's first birthday is comparable to the exit rate over the next year. Thus, of children receiving WIC at age 12 to 15 months (n=921), 18.2 percent exit at age 16 to 19 months; and of children receiving WIC at age 16 to 19 months (n=850), 17.4 percent exit WIC at age 20 to 23 months. Exit rates before age one are lower. For example, only 14.1 percent of infants receiving WIC when they were aged 4 to 7 months exited at age 8 to 11 months. The uniformly higher WIC exit rate for one-year-olds is consistent with the hypothesis that parents perceive WIC food benefits for children as less valuable than those for infants relative to the costs of participation.

Age at First Entry

About 70 percent of individuals who ever receive WIC as infants and children first enter the program as infants. Between 5 and 10 percent of WIC infants and children first enter at each succeeding year of age (Exhibit 8.4). These proportions may be slightly biased "to the right"— that is, it is possible that even more WIC infants and children enter at early ages and even fewer at later ages. But these estimates still show clearly that the great majority of WIC infants and children enter the program in the first year or two of life.

Exhibit 8.1 earlier showed estimates of the percentage of WIC recipients who had first started to receive WIC at ages 0, 1, 2, 3, and 4. Although these estimates are a useful tool for understanding the composition of the WIC infant and child **caseload at a point in time**, they do not correspond to the age distribution of WIC infant and child **entries**. Suppose, for example, that every year 5,000 individuals entered WIC who were evenly distributed from ages 0 to 4, and that they all stayed on WIC until their fifth birthday. Then on the one hand, 20 percent of all WIC entries would be by infants; on the other hand, one-third of the WIC caseload would consist

Exhibit 8.4
AGE OF INFANTS AND CHILDREN AT FIRST ENTRY TO WIC (ADJUSTED)
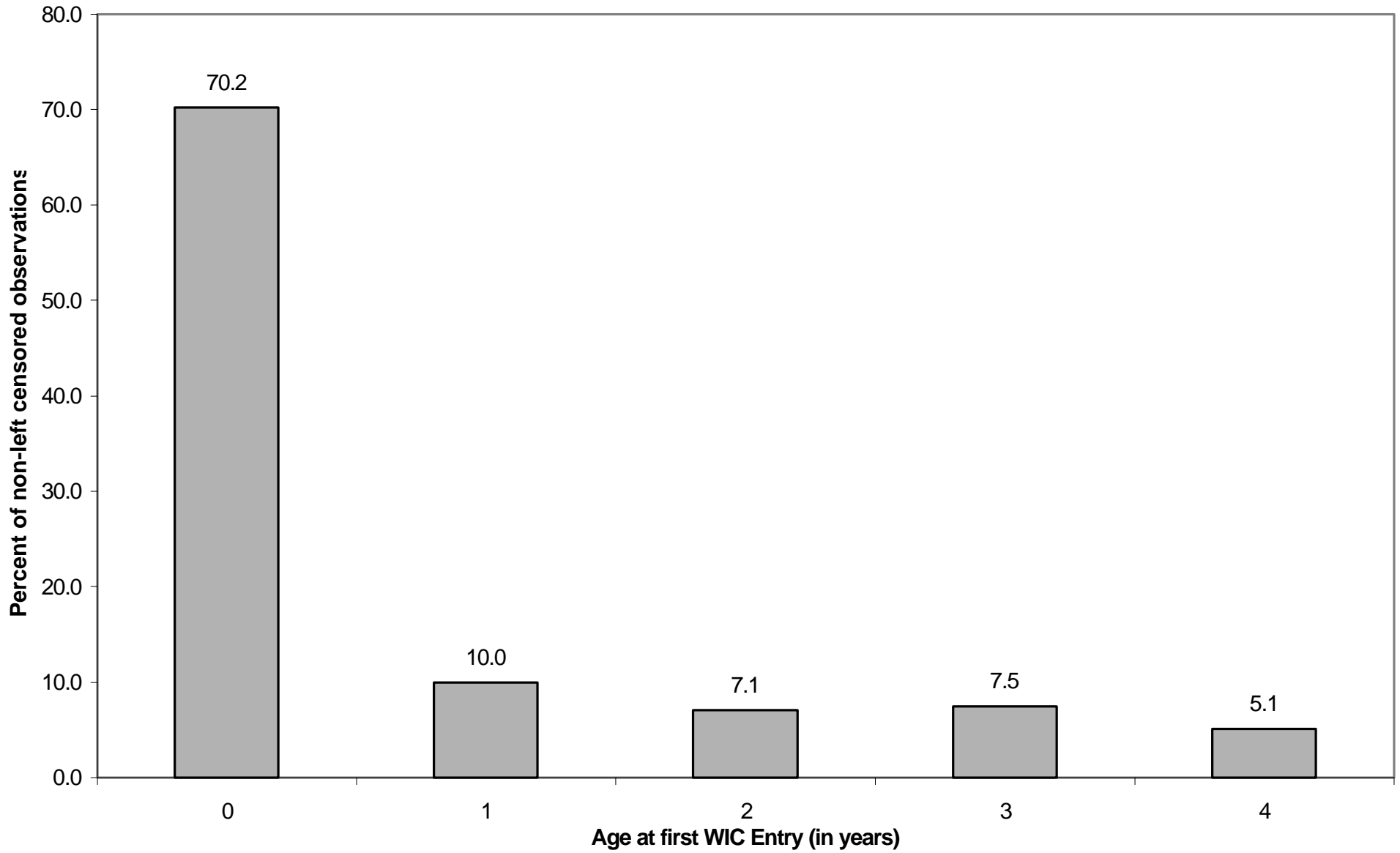
of individuals who had entered as infants.[2] In general, because we expect individuals who enter as infants to stay on WIC longer than individuals who enter as older children, we would also expect to find a higher proportion of infant entrants in a snapshot of the caseload (such as Exhibit 8.1) than in a tabulation of entries *per se*.

Age at Last Exit

The pattern of last exits is bimodal, with peaks at age one and five. About a quarter (24 percent) of infants and children who ever receive WIC stay on, possibly with interruptions of receipt, until their fifth birthday, and another quarter (24 percent) exit as one-year-olds (Exhibit 8.5). About one-sixth of recipients exit as infants and do not receive WIC again.

We can speculate that this pattern represents the net effect of several forces. Most infant and child recipients start receiving WIC in infancy. In some cases slots are available and the family wishes to keep the child on WIC. In this case the child stays on through age five. Where slots for children are not available, exits occur at age one. Exits in intermediate years may occur at varying rates as agencies ration slots to younger children, as families' situations change, or as families find child WIC benefits less attractive.

Continuity of Receipt

In the two previous sections, we have estimated that 70 percent of WIC infants and children first entered WIC as infants and many of the rest as one-year-olds; and that about a quarter of WIC infants and children last exit WIC as one-year-olds and another quarter stay on until age five. Our caveats about the ages at which children enter and exit WIC reflect in part our uncertainty about the extent to which individuals exit WIC and then return a long time later. We can, at least, determine the extent to which individuals exit WIC and then return a *moderate* time later. This is not very often. Only two to three percent of children who receive WIC at all during a two year period exit and reenter during that period. Depending on age, a quarter to a third of children who receive WIC during a two-year period receive it for the entire two years. The remainder enter at some point during the period and stay on, or exit at some point during the period and stay off, or both.

To examine exits from and re-entries into WIC, we focused on three time intervals: between a child's first and third birthdays, between a child's second and fourth birthdays, and between a child's third and fifth birthdays. For each of these intervals, we selected an analysis sample of children who were observed continuously for that span and were ever on WIC during the time in question.

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[2] At each point in time there would be 5,000 individuals active who had entered as infants (i.e., the last five cohorts, now aged 0, 1, 2, 3, and 4); 4,000 individuals who had entered as one-year-olds; 3,000 who had entered as two-year-olds; 2,000 who had entered as three-year olds; and 1,000 who had entered as four-year-olds. Hence, the infant entrants would comprise one-third of total active cases of infants and children.

Exhibit 8.5
AGE OF INFANTS AND CHILDREN AT LAST EXIT FROM WIC (ADJUSTED)
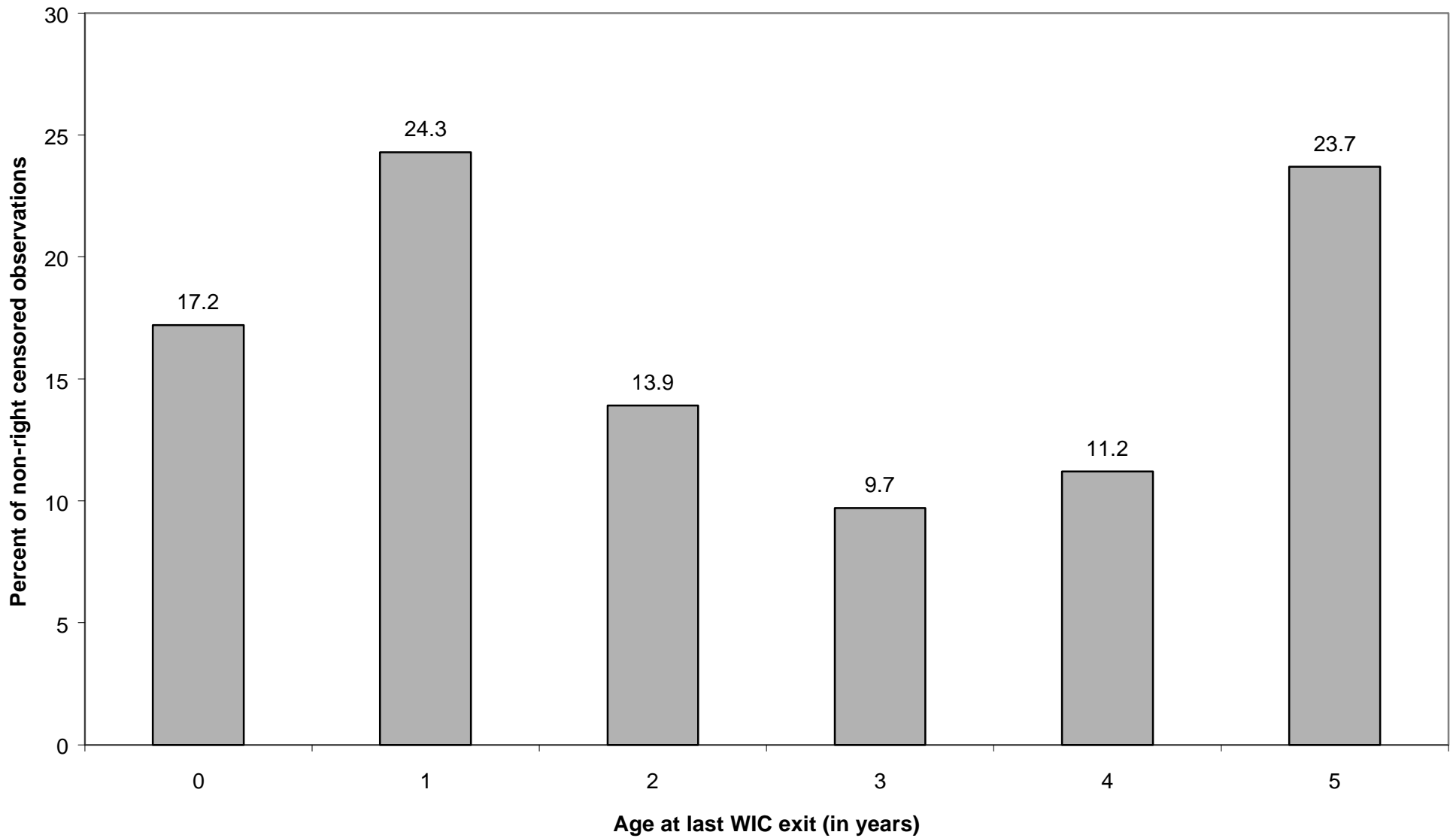
For all three samples of children, roughly two-thirds of WIC recipients in that age group either received WIC for the entire two years, or else were on WIC at the start of the observation period and exited sometime in the next two years (Exhibit 8.6). Continuous receipt was less likely for the oldest sample (aged three to five). Another 14 to 15 percent of children who ever received WIC in a given age range first started getting WIC after the beginning of the span and continued through to the end, whereas another 18 to 20 percent entered partway through the span but exited before it was over.

Exhibit 8.6
CONTINUITY OF WIC RECEIPT

	Sample 1	Sample 2	Sample 3
Age range	First through third birthdays	Second through fourth birthdays	Third through fifth birthdays
Sample size	472	349	333
Fraction of children that:			
Were on WIC continuously	31.8%	28.7%	25.8%
Exited (and stayed off WIC)	34.1	34.1	36.9
Entered (and stayed on WIC)	13.6	15.2	15.0
Entered and exited WIC	17.6	18.6	20.1
Exited and re-entered WIC	3.0	3.4	2.1

Only 2 to 3 percent showed a pattern of exiting and re-entering WIC within a two-year span. This lends support to the notion that we do not lose very much information on long-run WIC dynamics in the SIPP due to the limited observation period, because children who exit the program are unlikely to return.

Household Circumstances Surrounding WIC Closures

The final research question pertains to the circumstances surrounding children's exits from WIC. Certain events occurring in the child's household can be expected to trigger an exit from WIC. For each such event we would like to know:

- How likely is it that the child will exit WIC, given that the event has occurred?

- Conversely, what proportion of WIC exits can be associated with that event occurring?

Turning five years old will obviously cause a child to exit WIC. In addition, we find that children are especially likely to exit WIC if (a) a household member experiences a marked increase in earnings; (b) an individual with substantial earnings joins the household; or (c) the household exits a cash assistance program. The first and third of these events are also associated with substantial numbers of child WIC exits. The advent of a new earner, however, is quite rare, and therefore

accounts for only a few WIC exits. About a quarter of all child WIC exits are not associated with any identified trigger events.

Identifying Trigger Events of Interest

An exit from WIC could occur either because a child loses eligibility, or because (while still eligible) the child is displaced by an infant or mother of higher WIC priority, or because the child's parent or guardian decides that the benefits are less than the costs of participation.

Not all of these types of occurrences can be measured in the SIPP. The SIPP does not collect information on nutritional risk, so that a child's loss of eligibility due to nutritional risks being cured cannot be observed. Furthermore, displacement of a WIC child by an infant or mother of higher priority cannot be observed or inferred. Also, respondents are not asked why they left the program. These considerations suggest examining the following potential trigger events for WIC exits, associated with the child's loss of eligibility:

- the child turns five;
- the child's household income increases, due to an increase in earnings by a household member; or
- the child's household income increases due to the addition of a new household member with earnings.

Examples of these events are that the child's mother gets a new job, or that the child's mother marries a man with earnings who was not previously part of the household. These three trigger events for all practical purposes exhaust the possibilities of *changes in eligibility* that can be measured in the SIPP.[3]

Because the size of the child WIC benefit is so small relative to benefits from other programs, some changes in the household situation that do not render the child ineligible might also lead to an exit. These might be events that require the household to take a positive action in order to continue receiving child WIC, or the loss of eligibility for another benefit which the family considers linked to child WIC. Examples of these other types of events are:

- the household moves, interrupting the connection with the local WIC agency;
- another household member who was receiving WIC becomes ineligible, or a WIC infant in the household turns one, reducing the total benefits that the household can receive from WIC participation;

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[3] For example, although a household's income could increase due to receipt of unearned income, this is unlikely to cause an exit from WIC. Income from means-tested programs such as AFDC, food stamps, and SSI would not cause a household to exceed the income threshold, and in fact, may be used to help establish WIC eligibility. Other types of unearned income such as SSDI, alimony, and child support would cause an otherwise WIC-eligible household to lose eligibility only very rarely. Similarly, departure of a household member with little earnings could (by reducing the household size) render the remaining members financially ineligible. This is also deemed to be a sufficiently rare source of exits from WIC to be disregarded.

- the household loses eligibility for AFDC/TANF or other means-tested benefits, reducing the total benefits that a household can get from assistance programs in general.

The final change in circumstances that reduces the value of child WIC that can be measured in the SIPP is simply that:

- the child grows older.

WIC children growing older may be correlated with several of the other events that lead to WIC exits: increased household income from the mother returning to work, older siblings aging out of WIC, younger siblings no longer WIC infants. Also, this is not a trigger event *per se*. We therefore consider the relationship between child WIC exits and age independent of the trigger events.

It should be emphasized that even when a change in circumstances, such as an increase in earnings, does precede a WIC exit, it is not necessarily the "explanation" of the exit. As will be seen below, many children reportedly continue to participate in WIC despite substantial reported increases in household earnings—in part because WIC households are so poor.

Children Turning Five

Of all observed WIC closures for children past their first birthday (*n*=1,574), 19.7 percent of them can be attributed to children turning five.[4]

Children Growing Older

While particular WIC exits cannot be attributed to children under age five growing older, there is clearly a greater tendency for older children to exit. The WIC exit rate, defined as the proportion of person-waves of WIC receipt that are followed by a person-wave of nonreceipt, generally increases with children's age (Exhibits 8.7, 8.8).

Another striking feature of the exit rate that can be seen in Exhibit 8.8 is that it tends to peak in the four-month periods which include children's birthdays. This may reflect the confluence of two factors: the requirement for a recertification (which also occurs in children's half-birthdays) and age-prioritization by local WIC offices. The expiration of a child's certification period when the child turns two, three, or four may be an occasion for the WIC agency to stop offering benefits.

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[4] This fraction differs in several regards from the rate shown in Exhibit 8.5 (23.7 percent). The denominator here is all observed WIC exits for WIC children past their first birthday. In Exhibit 5, the denominator is final WIC exits (observed or not) for WIC infants **and** children.

Exhibit 8.7
WIC EXIT RATE BY CHILD'S AGE

Age of child	Exit rate
1 year	18.5%
2 years	16.9
3 years	20.0
4 years	23.1
Turning 5	100.0

Other things equal, children's likelihood of exiting WIC in a four-month period—which is 19 percent on average—grows at a rate of about 1.5 percentage points per year, and is 2 percentage points higher than normal in periods containing a birthday.

Increases in Household Members' Earnings

We now look at WIC exits occurring *between* a child's first and fifth birthdays, when children have reportedly received WIC for at least the two previous periods (*n*=894). Of these closures,
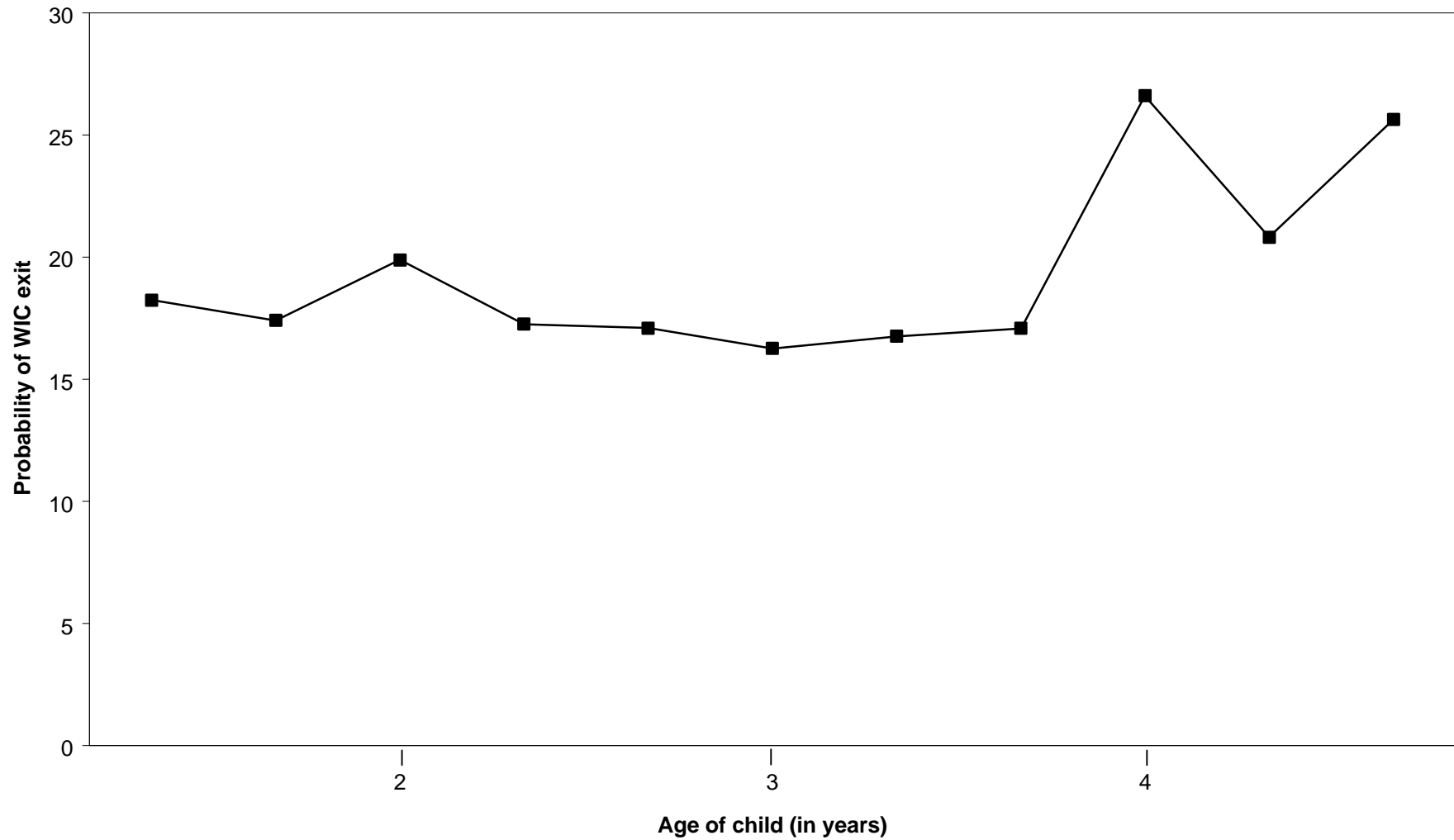
- In 12.9 percent of cases, household members had increased their earnings by at least $1500 per month over the last two waves.

- In 28.2 percent of cases, household members had increased their earnings by at least $500 per month over the last two waves.

To put these increases in context, an increase in income of $1500 per month, or $18,000 per year, would bring a household of four with annual income of $8,200—the median income for WIC households containing children in 1994—to a level that was just below the income cut-off for WIC (185 percent of the poverty level). Hence, though representing a sizeable change in a household's financial situation, such an event would not necessarily render the household ineligible. We have focused on absolute changes in earnings rather than changes that brought the household above a cutoff for several reasons: WIC participation tends to decline with increasing income even before the cutoff is reached; changes in income are not reflected in eligibility assessments until the child is due for recertification; and, most importantly, because income as measured in the SIPP does not correspond exactly to income as ascertained by WIC eligibility workers.

Can we therefore attribute 28.2 percent, or at least 12.9 percent, of WIC exits by children between their first and fifth birthdays to their parents or other adults in their households increasing their earnings? Not necessarily. Let us define a *potential closure* as a situation in

Exhibit 8.8
PROBABILITY OF WIC EXIT BETWEEN FIRST AND FIFTH BIRTHDAYS

which a child has received WIC for at least two consecutive interview waves and is observed in the current wave (after the first but before the fifth birthday). Among ongoing WIC cases that were *potential but not actual closures* (*n*=4,333),

- In 7.4 percent of cases, household members had increased their earnings by at least $1500 per month

- In 23.9 percent of cases, household members had increased their earnings by at least $500 per month.

These household events thus also occur among children who remain on WIC.

Turning these numbers around, we find that WIC children in households that did increase their earnings by $500 per month exited WIC with a likelihood of 19.6 percent, compared with WIC children in other households, who had an exit rate of 16.3 percent. Thus, most children who experience this household event do *not* exit WIC. The $500 per month increase in earnings is associated with an increase in the exit rate of 3.3 percentage points, or 19.9 percent.[5] Similarly, the exit rate for children in households that increased earnings by $1500 per month was 26.4 percent, compared with 16.3 percent for other children—a difference of 10.1 percentage points, or 62.6 percent. We conclude that, although these events by no means render a WIC exit certain, they do make it substantially more likely.

New Household Members with Earnings

We may also ask what fraction of exits between the ages of one and five can be associated with the arrival of a new household member who has substantial earnings. Because the household is defined as the set of people living with the child, this includes situations in which the mother and child move in with a person with earnings, as well as the converse.

This is a much rarer event than an increase in earnings to current household members. Among the 894 closures, only 4.5 percent were associated with new members with at least $500 in earnings. Half of these closures (2.2 percent) were associated with increases of over $1500 per month in earnings.

Among WIC children who did not exit, only 3.3 percent gained new household members with at least $500 in earnings, and only 1.5 percent gained new household members with at least $1500 in earnings.

This event is a relatively strong predictor of WIC closures. Children in households that gain a new member with at least $1500 in earnings have a 23.5 percent chance of exiting WIC, compared with other children who have a 17.0 percent chance—38.5 percent greater. If we broaden the definition of the trigger event to include households that gain new members earning $500 to $1500 per month, the WIC closure rate for children who experienced the event is 21.6

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[5] That is, $((0.1955 - 0.1630) / 0.1630) = 0.199$.

percent, compared with 16.9 percent for the remainder of WIC children—a difference of 4.7 percentage points, or 27.6 percent.

Households Moving

Moving is not strongly related to children's exits from WIC. A move was defined as a change of address in the current or previous period. Moves were associated with 26.3 percent of actual closures, and with 25.0 percent of potential closures—nearly identical rates.

Household's WIC Entitlement Decreasing

A household with a WIC child may also include other individuals eligible for WIC. When these individuals lose their eligibility, the household may no longer be interested in obtaining the relatively small amount of benefits for which the child is still eligible.

Loss of eligibility by *women* in the household would not be trigger events for children exiting WIC. When a pregnant women loses her WIC eligibility there is virtually always an infant who can get benefits; and likewise, when a breastfeeding or other postpartum woman loses eligibility, there is nearly always a one-year-old child or six-month-old infant who is still eligible. (Exceptions would occur if the infant or child died, went into foster care, etc.) We therefore focus on other children in the household turning five, and infants in the household turning one. Either of these events would reduce the total amount of WIC benefits for which the household was potentially eligible.

The data indicate that neither younger siblings turning one nor older siblings turning five predict WIC exits by children. The child WIC exit rate was 17.1 percent in situations in which another child had turned five during the last two waves, and also 17.1 percent in situations in which another child had *not* turned five during the last two waves. The WIC exit rate was actually somewhat *lower* for children whose younger sibling turned one in the last two waves (16.0 percent) than for children who did not experience this event (19.3 percent). It may be that the presence of multiple children *per se* increases the attractiveness of WIC to a family, even if they receive less benefits at some times than at others.

Loss of Means-Tested Benefits

The final trigger event that we consider is an exit from another means-tested program. A family that loses eligibility or otherwise decides to exit AFDC (now TANF), the Food Stamp Program, General Assistance, or other welfare is likely to leave WIC at the same time. In fact, this is a powerful explanatory factor. Of children whose families exited one of these programs in the current or previous wave, 34.3 percent also exited WIC, compared with only 23.6 percent of children whose families did *not* exit one of these programs. Of course, this begs the question of why the family exited the other programs. It could well have been due to one of the other trigger events mentioned above—an increase in earnings to an ongoing family member, or a new family members with earnings. We therefore need to look at combinations of trigger events.

Closures Associated with All Measured Trigger Events

Information on all measured trigger events is summarized in Exhibit 8.9. The first set of columns repeats information discussed above on the effect of each event, considered in isolation, on the likelihood of a WIC exit. For example, 100 percent of all children turning five experience a WIC exit, while 19 percent of all children *not* turning five experience a WIC exit. The odds ratio, defined as the ratio of these two proportions, is 5.3. This statistic is a measure of the discriminatory power of the event in predicting WIC exits—how much greater the likelihood is of an exit when the event occurs than when it doesn't occur. The other potential trigger events are listed below in decreasing order of their odds ratios, for children who did not turn five.

A high odds ratio does not necessarily correspond to overall ability to predict WIC exits. An event might invariably be associated with WIC exits, and thus have a high odds ratio, yet explain only a small fraction of closures because it happens rarely. We have therefore defined the events hierarchically in order of their odds ratios and calculated the proportion of closures associated with each one, if none of the higher-ranked events occurred. For example, the proportion of WIC exits hierarchically associated with welfare exits only counts those welfare exits by families in which the focus child did not turn five, and in which earnings of current members did not increase by $1500. We have put "none of the above" at the bottom of the hierarchy, although its odd ratio is higher than that of one of the hypothesized triggers.

We find that of *all* observed child WIC closures, 19 percent are attributable to a child turning 5; 10 percent are associated with an earnings increase of a household member of at least $1500 when the child did not turn 5; and 22 percent are associated with an exit from welfare when earnings did not increase by $1500 and the child did not turn 5. The addition of a new household member with over $1500 in earnings, or with over $500 in earnings, account for only 1 percent each of child WIC exits after the aforementioned events have been accounted for. Despite the high odds ratios for the occurrence of these events, they are so rare that they only account for a few child WIC exits.

Other exits can be attributed to moderate increases in earnings of current household members (7 percent), the household moving (8 percent), and a sibling turning five (4 percent). The 2 percent of exits associated with a sibling turning one should probably be ignored, given that the odds ratio for this event is less than 1.

What is happening in the remaining instances—the 27 percent of child WIC exits that are not associated with any of the potential trigger events? We can only speculate. Other WIC exits may be due to:

- Loss of eligibility, because children are no longer at nutritional risk.

- Administrative closures due to insufficient funding to serve all eligible children.

Exhibit 8.9
TRIGGER EVENTS FOR CHILDREN'S WIC EXITS

	Individual events			Hierarchically defined events[a]	
	p(C|E)	p(C|E*)	Odds ratio	p(C|E)	p(E|C)
Child turned five	100.0%	18.9%	5.3	100.0%	19.7%
For children not turning five:					
Increase in family member's earnings of $1500/month or more	26.4	16.3	1.6	26.4	10.3
Exit from welfare	23.1	15.1	1.5	21.6	22.9
New family member with earnings of $1500/month or more	23.5	17.0	1.4	42.9	0.5
New family member with earnings of $500/month or more	21.6	16.9	1.3	16.7	0.7
Increase in family member's earnings or $500/month or more	19.6	16.3	1.2	15.5	6.8
Family moved	16.8	16.9	1.1	13.2	7.8
Sibling turned five	17.1	17.1	1.0	17.8	4.4
Sibling turned one	11.2	17.8	0.6	9.5	1.6
None of the above	14.5	18.6	0.8	14.5	25.2

NOTES: p(C|E) = probability of closure given that event occurred.
p(C|E*) = probability of closure given that event did not occur.
p(E|C) = probability of event given that closure occurred.
Odds ratio = p(C|E) ÷ p(C|E*)

[a] Hierarchically defined events are deemed to occur only if the events listed above have not occurred.

Conclusions

This chapter presents analyses of the dynamics of WIC receipt by children. They are based on the 1992 and 1993 panels of the Survey of Income and Program Participation. This rich data source is undoubtedly the best nationally-representative source of information available on this topic. Still, it lacks information on nutritional risks, reasons for program exits, and local administrative policies, and it ends in the early months of 1996. Child WIC participation was growing during this period, and is at a considerably higher level now than during most of the study period.

These limitations could be overcome by use of appropriate administrative records. Should the biennial Studies of WIC Participation and Program Characteristics ever be expanded to include historical data on WIC receipt by current participants, they would be the basis *par excellence* for analyzing WIC dynamics.

Our analyses indicate that:

- Of WIC infants and children active *at a point in time*, at least 71 percent first received WIC as infants, and 29 percent will receive WIC through their fifth birthday.

- Twenty percent of WIC infants exit the program upon reaching their first birthday.

- At least 70 percent of individuals who ever receive WIC between the ages of zero and five first do so as infants, and another 10 percent as one-year-olds.

- Just under one-third of individuals who receive WIC between the ages of zero and five stay on the program until after their fourth birthday, and one-quarter do so until their fifth birthday. About one-sixth receive WIC only as infants.[6]

- Over a two-year period, only 2 or 3 percent of WIC child recipients exit the program and then re-enter. The great majority tend to receive WIC continuously, or start off on WIC and then exit and stay off.

- Children are more likely to exit WIC if they are older rather than younger; if a family member has experienced a marked increase in earnings; if a new earner has joined the household; or if the family has exited welfare.

- Of all WIC exits by children, 19 percent are due to the child turning five. Another 10 percent are associated with an increase in earnings of at least $1500 per month by a household member, while 23 percent are associated with an exit from AFDC/TANF or other cash assistance, absent a marked increase in earnings by current household members. An additional 8 percent of closures are associated with moderate earnings increases to household members (i.e. $500 to $1500), and to earners joining the household. Other changes in circumstances that are associated with child WIC exits may be related to costs of participation relative to the benefits: the household moving (8 percent), or a sibling turning five (4 percent). About a quarter (27 percent) of WIC exits by children are not associated with any of these events.

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[6] These numbers differ from those in the first bullet above because they refer to a cohort of children rather than to a snapshot.

Appendix A
NHANES-III

The third National Health and Nutrition Examination Survey (NHANES-III), the seventh in a series of national examination studies, collected data on individuals and households between 1988 and 1994. The survey, administered by the Centers for Disease Control (CDC), was designed to obtain information for assessing the health status of the entire U.S. civilian, noninstitutionalized population. NHANES-III data allow the estimation of the national prevalence of selected diseases, the investigation of the natural history of selected diseases, and determination of nutritional status. The nutritional components of the survey contain questions for families and individuals about having enough food or money to buy food, use of food stamps, and participation in WIC and school breakfast and lunch programs. Information collected during the medical exam permits the clinical measurement of individual health status. Information collected during the nutrition interview permits assessment of usual dietary intake at the group level.

The first stage of the sample design for NHANES-III was selection of 81 primary sampling units (PSUs), which were principally individual counties. Using lists of addresses, households in each county were screened. Individuals were then selected from sampled households based on gender, age, and race or ethnicity. The procedure was designed to draw large numbers of young children, older persons, blacks, and Mexican-Americans into the sample, to ensure reliable estimates for these subgroups.

About 40,000 persons two months of age and over were selected and asked to participate in extensive interviews and examinations in a large mobile examination center. After the household screening and the selection of individuals to be included in the sample, the interviewer administered either the Household Adult Questionnaire (for persons aged 17 years and over) or the Household Youth Questionnaire (for persons two months through 16 years of age) to the sampled person or proxy. These surveys focused on incidence of common diseases and health conditions. The interview closed with the Family Questionnaire, which was administered to a responsible adult household member. This questionnaire collected family-level information on educational levels, ethnicity, occupational information, health insurance coverage, family income, and housing. Sampled persons were then asked to visit a Mobile Examination Center (MEC) for physical examinations, other tests and measurements, nutrition interviews, and blood and urine specimen collection. Approximately 77 percent of sampled persons completed the MEC portion of the survey. The NHANES-III sample consists of 31,311 individuals, of whom 4,745 are children aged 12 to 59 months.

Measurement Issues

In the great majority of cases the mothers of children in the NHANES-III sample were not sample members themselves. Consequently, the information that NHANES-III collects on women's obstetric history, current health status, and health related behaviors was not available for the particular women of interest to us. We therefore relied on the Household Youth Questionnaire, the Household Screener, and the Family Questionnaire for data on the child's mother–e.g. age at child's birth, current age, smoking during pregnancy.

Two other items of interest were collected for the head of household:

- educational level (highest grade achieved)
- marital status (married and living with spouse, married but spouse not in household, living as married, widowed, divorced, separated, never married).

Because the child's mother is the head of household in only a nonrepresentative subsample, we did not attempt to use the data on the household head to measure maternal education. We did, however, use the information on marital status, for households headed by either the child's mother or the child's father.

NHANES-III includes a "poverty index" variable constructed by CDC using information on income and family size.

Data on health insurance coverage turned out not to be usable. Four versions of the questionnaire were used over the course of the survey, with assorted versions of the health insurance items. The public use data file was missing information for a quarter to a third of the sample on these items.

Weights and Standard Errors

NHANES-III is a complex survey requiring special statistical techniques for analysis. The results presented in this report use the analytic weights developed by CDC and the procedures recommended in the *Analytic and Reporting Guidelines* included with the NHANES public use files. STATA was used to estimate the standard errors.

Appendix B
The SIPP

The Survey of Income and Program Participation (SIPP) was first administered by the Bureau of the Census to a nationally representative panel of some 20,000 households, each of which was interviewed once every four months over a period of 32 to 36 months, starting in October 1983. The sample was divided into four rotation groups which were interviewed on a staggered basis, with the last interviews occurring in July of 1986.

Since then, new panels of households have been inaugurated at varying times, with varying sample sizes and varying numbers of interview waves. Upon completion of all interviews for a given panel, the Bureau of the Census has constructed longitudinal analysis files in which all of the data are linked across time. The 1991 panel consisted of approximately 14,000 households who were interviewed 8 times (covering 32 months), starting in February 1991. The 1992 panel consisted of 20,000 households who were interviewed 10 times (covering 40 months), starting in February 1992.[1] These panels, which together contained information on a total of 2715 infant and child WIC recipients, were used in Abt's recent analysis of the dynamics of WIC participation by children.[2] Since then, additional data have become available, including the longitudinal analysis file for the 9-wave 1993 panel, and Wave 1 of the 1996 panel. The 1993 panel consisted of 20,000 households, and the 1996 panel (in progress) comprises some 37,000 households.

The SIPP instruments include a control card (one per household), a core questionnaire (one per household member aged 15 or over for each interview wave), and a variety of topical modules. The *control card* contains a household roster, which tabulates each individual's relationship to the reference person, date of birth, race, and sex. In addition, each individual's parent and spouse are identified if they live in the household. The *core questionnaire* of the SIPP includes detailed information on labor force participation, program participation, and income amounts. *Topical modules* cover a wide variety of subjects pertaining to children and their environments, including:

- household relationships
- migratory history
- children's functional limitations and disability
- children=s utilization of health care services

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[1] One of the four rotation groups was interviewed only 9 times.

[2] Nancy Burstein and Gus Baker (1998), *The Dynamics of WIC Recipients Reported in the Survey of Income and Program Participation*, Abt Associates Inc.

- child care
- children's well being
- basic needs.

Measurement Issues

A key issue in using the SIPP is linking the mother to the child. If the child's mother is in the household, in most cases she will be identified by Control Card item 25 (person number of parent) and/or item 27 (designated parent or guardian). An examination of these two items for children aged 1 to 4 in Wave 6 of the 1993 Panel indicated that the child's "parent" was female in 92 percent of cases, and the child's "designated parent or guardian" was female in 96 percent of cases. If these items show a male parent or designated parent who is the household reference person, and the household also contains the spouse of the reference person, we assume that that spouse is the child's mother. In any event, the "mother" may not always be the child's biological mother. If the child's mother is not in the household, no information about her is available in the SIPP.

The child's designated parent or guardian is asked the child's height and weight without shoes in Wave 6 Topical Module, Part I. Conversation with SIPP staff has indicated, however, that the quality of these items is too poor to use.

Weights and Standard Errors

The SIPP, like the NHANES, has a very complex sample design. The Bureau of the Census has provided a series of weights and guidance to users on how to apply them.[3] Our estimates of means, proportions, and standard errors are based on their documentation, implemented using STATA.

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[3] *Survey of Income and Program Participation (SIPP) 1993 Panel, Wave 1, 2, 3 Core Microdata Files Technical Documentation*. Prepared by the Data User Services Division, Bureau of the Census, Washington, DC: U.S. Government Printing Office (1995).

Appendix C
CCDP2

The Comprehensive Child Development Program (CCDP) was first funded by the Department of Health and Human Services' Administration on Children, Youth and Families (ACYF) in 1989. The overall goal of the program was to provide early and comprehensive services to enhance child health and development and to support families in gaining economic self-sufficiency. Decades of research and experience in trying to help economically disadvantaged children and families has shown that uncoordinated services in narrowly defined programs cannot provide the kind of support needed to help children or families. CCDP attempted to address the multiple and often interacting problems associated with poverty, including problems dealing with health, nutrition, housing, employment, child care and safety. In addition, CCDP was intended to intervene early and continue until the child reached school age.

Rather than duplicating locally-available services, CCDP projects were designed to build upon existing service delivery networks. CCDP relied heavily on an approach in which case managers provided some services directly (e.g., counseling, life skills training) while, at the same time, organizing the provision of other services through individual referrals and/or brokered arrangements with local provider agencies.

Certain core services were required to be made available to children and their families. In the case of infants, toddlers, and preschool children, mandated services included health services (immunizations, treatment and referral); developmental screening and assessment; early childhood development programs; early intervention services for children with or risk of developmental delay; and nutritional services. In the case of parents and other household family members, services included prenatal care; education in infant and child development, health care, nutrition and parenting; health care; mental health care; substance abuse identification and treatment; child care that meets State licensing requirements; employment counseling; vocational training; education; and assistance in securing adequate income support, nutritional assistance and housing. CCDP sites were encouraged, but not required, to provide for other supportive services as well.

CCDP grantees included universities, hospitals, and public and private non-profit organizations. How they provided the services differed, depending on their focus and what was available in the community. Nonetheless, they all were monitored by ACYF for their compliance with the provision of the core services.

Twenty-two CCDP projects were funded in 1989. Abt completed the evaluation of these projects and the report was released and sent to Congress in 1997. The data from these

projects are rich and were collected from families over a five-year period. We are not using this data set for the analysis of WIC and children, because of a crucial limitation: The question on WIC participation, while distinguishing between the participation of "mothers" and "others in the household", does not allow us to infer in many cases whether or not the focus child received WIC.

Ten additional projects were funded as a second CCDP cohort by ACYF in 1992. The data collected on this second cohort (CCDP2) is a rich source of information on WIC and income-eligible non-WIC children. The cohort includes over 2,000 low-income families with a preschool-aged focus child[1], in ten sites across the country. Data from this second group of CCDP projects has been analyzed in this report.

Families were recruited for CCDP2 between April 1993 and September 1994 when the mother was pregnant with the focus child, or when the child was less than one year old. Dates of birth for sample members thus ranged from early 1992 to early 1995. CCDP, like WIC, was targeted to low-income pregnant and post-partum women. A criterion for participation was household income less than 100 percent of poverty. Participating families were randomly assigned to CCDP treatment or control groups.

The analysis file consists of information collected by the sites at time of enrollment, a family interview on the one-year anniversary of enrollment, and two follow-up interviews timed to coincide with the focus child's second and third birthdays. The baseline data include demographic information such as race, income and employment. Because CCDP was hypothesized to have a wide range of effects on both children and their families, the follow-up surveys were designed to collect information on a great variety of outcome measures for children and their mothers. The presence of survey items on receipt of WIC by the focus child makes it possible to compare WIC and income-eligible non-WIC children on a broad array of service and outcome measures. Fifty-four percent of the focus children were enrolled in WIC at age two, and 43 percent at age three. The two-year-old followup survey is the main data source used in this report.

A key decision for the current analysis was how to treat the CCDP2 intervention. Although the intervention was hypothesized to have a positive impact on childrens' health and well-being, our previous analyses found no significant differences between the treatment and control groups in these dimensions.[2] CCDP was also intended to link children and their families to services, and here it did succeed.

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[1] The "focus child" is the family member who was the focus of the study.

[2] Robert G. St.Pierre, Jean I. Layzer, Barbara D. Goodson, and Lawrence S. Bernstein (1997), *National Impact Evaluation of the Comprehensive Child Development Program: Final Report*, Abt Associates Inc., Cambridge MA.

Our current analyses include both CCDP treatment group members and control group members. We note that WIC participation at age two was virtually identical in the CCDP treatment and control groups. Both WIC and non-WIC children participate in other federal, state and local programs and receive other kinds of benefits, including Food Stamps and Temporary Assistance for Needy Families. Many low income families across the country have increasingly become involved in the Early Head Start Program, which is the successor to CCDP. In fact, many of the CCDP sites have transitioned into Early Head Start Programs. Thus, low-income families in general are not likely to be any different from those in the CCDP evaluation, taking advantage of opportunities to help them and their children by whatever means are available.

Measurement Issues

The CCDP2 data set includes three measurement instruments for child's cognitive development: the Peabody Picture Vocabulary Test (PPVT), the Kaufman Assessment Battery for Children (K-ABC), and the Bayley Scales of Infant Development (BSID). The PPVT and Kaufman batteries were administered when the children were three years old. We therefore analyzed these measures for the smaller sample of three-year-olds.

The *PPVT*[3] is used to assess children's receptive vocabulary. An individually-administered measure of children's receptive language or vocabulary, the PPVT is considered to provide a quick estimate of verbal ability and literacy-related skills. The test consists of 175 vocabulary items of increasing difficulty. For Spanish-speaking children, the Spanish version of the PPVT–the Test de Vocabulario en Imagenes Peabody, or TVIP–is used[4]. Results from the TVIP are not analyzed in this report because the scores are not comparable with those from the English-language version, and the children who took the TVIP were a small subsample of the total.

The *Kaufman Assessment Battery for Children*[5] is a full-scale standardized measure of cognitive development that assesses children's ability to solve problems using simultaneous and sequential mental processes, and acquired reading and arithmetic skills. The test includes 16 subtests, each containing between 15 and 40 items. The subtests are organized into two measurement scales: mental processing and achievement.

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[3] L. Dunn and L. Dunn (1981), *PPVT-R Manual for Forms L and M*, Circle Pines, MN: American Guidance Service.

[4] L. Dunn, E. Padilla, D. Lugo, and L. Dunn (1986), *Examiner's Manual for Test de Vocabulario en Imagenes Peabody*, Circle Pines, MN: American Guidance Service.

[5] A.S. Kaufman and N.L. Kaufman (1983), *Kaufman Assessment Battery for Children*, Circle Pines, MN: American Guidance Service.

The *Bayley scales*[6] were used to assess children's cognitive development at two years of age. The BSID is a full-scale assessment measure consisting of 178 mental scale items that assess memory, habituation, problem solving, early number concepts, generalization, classification, vocalizations, language, and social skills, and 111 motor scale items that assess control of gross and fine muscle groups.

The CCDP2 data set also includes two measurement instruments for child's socioemotional development, the Adaptive Social Behavior Inventory (ASBI) and the Achenbach Child Behavior Checklist (CBCL).

Developed as part of the Infant Health and Development Program, the *Adaptive Social Behavior Inventory* (ASBI) measures adaptive or prosocial behaviors[7]. It includes 30 items that describe social behaviors. There are three subscales: Express, Comply and Disrupt. Sample items from the Express scale are "understands others' feelings" and "Is open and direct about what he/she wants." Sample items from the Comply scale are "Is helpful to other children" and "Shares toys or possessions." Sample items from the Disrupt scale are "gets upset when you don't pay enough attention" and "Is bossy, needs to have his/her way." A measure of Prosocial behavior has been computed by combining the Express and Comply subscales. Additionally, a Total score was computed by adding all three subscales (with the Disrupt items recoded so that a higher score indicates more positive behavior).

In the CCDP2 evaluation, the ASBI was administered to children at both two and three years of age. Although the ASBI was developed specifically for children three years of age, the authors expressed confidence that the scales would be sensitive to a broader developmental span. For two-year-olds, a modified version was developed by dropping 11 of the original 30 items, based on the determination that their content was not appropriate for children less than three years of age.

The *Achenbach Child Behavior Checklist* (CBCL) provides a report of the frequency of more than 100 behavioral and emotional problems.[8] Analyses are based a total score, and two "wide-band" syndromes: "externalizing", which includes aggressive, destructive, and delinquent behavior, and "internalizing", which includes somatic complaints, and anxious/depressed and withdrawn behaviors.

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[6] N. Bayley (1969), *Bayley Scales of Infant Development*, Berkely, CA: Institute of Human Development, University of California.

[7] K.G. Scott and A. Hogan (1987), *The Adaptive Social Behavior Inventory*: Jovanovich.

[8] T.M. Achenbach and C. Edelbrock (1983), *Manual for the Child Behavior Checklist and Revised Child Behavior Profile*, Burlington, VT: University of Vermont Department of Psychiatry.

Weighting and Standard Errors

The CCDP2 survey data do not comprise a probability sample. Rather, they represent a convenience sample of 10 sites which, in turn, collected information on a convenience sample of participating households at each site. There were no strata, PSUs or sampling design for selecting participants.

Statistically speaking, standard errors for an overall mean can provide a confidence interval around the sample point estimate only when the sample mean comes from a properly weighted probability sample of the target population. The confidence interval around the sample mean has a 95 percent probability of containing the population mean only if the sample is representative of the population. Making adjustments to improve the calculation of the standard errors may be essentially beside the point, if the sample mean is a biased estimate of the population mean due to a non-representative sample. Without a sample design and probability sample, it is not possible to be certain that the survey constitutes a representative sample.

Although it is safe to assume that the CCDP2 data are a good representation of the CCDP2 program participants at that time, it is a much bolder assumption that these results can be extended to the WIC population or a subset of WIC-eligible children. To the extent that CCDP2 program participants are generally income-eligible for the WIC program, we can assume that CCDP2 participants receiving WIC are very similar to some WIC participants not involved in CCDP2. But without a probability sample, we have to be cautious in our claims that the WIC/non-WIC differences measured in the CCDP2 survey data are a reliable estimate for WIC/non-WIC differences among poor children in general.

Another important statistical assumption is that the observations are independent draws from a distribution. We certainly think the observations in one site are independent of the observations from another site. However, two observations taken from the same site are more likely to be similar to one another than two random observations taken from different sites. The CCDP2 program was customized for each site, so it is reasonable to assume that observations drawn from the same site are somewhat dependent on one another. We control for site differences by including site dummies. The site dummies capture the difference between the overall average and the site average of the dependent variable. The remaining difference between WIC and non-WIC recipients is measured by the coefficient on the WIC dummy.

We considered, but ultimately rejected, a robust variance estimator which would adjust the standard errors by incorporating within-site covariance effects for each site cluster.[9] The standard variance estimates assume that there is no subgrouping that would cause the variation within a group to be different from the variation between groups. The sites in the CCDP2 survey may cause such a subgrouping or clustering effect. Therefore, we could in principle adjust the standard errors with a robust variance estimator that recognizes the possibility of site clusters. If it happened that the variance was the same within and between clusters, the robust variance estimator would give the same results as the standard variance estimator.

While the robust variance estimator adjusts the standard errors for clustering when there is a large number of sites, it does not provide reliable estimates when the number of sites is small. In fact, we applied this technique and found that it had no consistent effect on the estimated standard error. We therefore concluded that this technique did not provide a reliable adjustment for our data.

Taken to the extreme, the idea of different program implementation for each site would imply that there is not one CCDP2 effect, but really ten separate CCDP2 effects. The differences we are trying to measure, however, between WIC and non-WIC groups, are not closely connected to the CCDP2 treatment. Besides, sample sizes within each site are quite small, and the WIC difference for a single site has very limited applicability to a broader population of low-income children. By pooling the results from the ten sites, we get a better overall measure of the WIC difference that is not so site dependent.

There are a number of ways to combine the WIC difference from each site to get an overall measure. One way would be to treat each of the sites equally, calculating an overall mean by simply averaging together the site means. This approach assumes the sites with larger sample sizes do not provide either more information or more accurate estimates. If the goal were to measure the CCDP effect, rather than the WIC effect, it might be more appropriate to treat each site as providing a single data point with equal weight as any other site. Our goal is to measure the WIC effect, however, which is not so site dependent. By pooling the data at the individual level, sites with larger sample sizes are allowed to have a bigger impact than smaller sites.

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[9] See, for example:

Huber, P.J., 1967, "The Behavior of Maximum Likelihood Estimates Under Non-Standard Conditions," Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability, Berkeley, CA: University of California Press, vol. 1, 221-233.

White, H., 1980, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica*, 48:817-830.

White, H., 1982, "Maximum Likelihood Estimation of Misspecified Models," *Econometrica*, 50: 1-25.

We therefore estimated a set of fixed effects models of the form:

$$y_i = b_0 + b_1(site\ 1_i) + ... + b_9(site\ 9_i) + b_{10}(WIC_i) + e_i$$

where y represents the value of some measure for child i, site1, ... , site9 represent site dummies, and WIC_i is an indicator for the overall WIC effect. The intercept captures the average for the left out (10th) site and the β_1, ... , β_9 measure the average site difference relative to the left out site. β_{10} is the parameter of interest. It measures the overall average difference in the dependent variable between the WIC and non-WIC children.

Appendix D

Using the SIPP to Analyze the Dynamics of Child WIC Participation

The SIPP has several features that make it appropriate for analyzing dynamics of WIC receipt among children. It is nationally representative; it provides acceptable sample sizes of WIC participants when two panels are pooled; it follows individuals over time; it interviews households multiple times over the course of a year; and it collects detailed information on household composition and income sources and amounts. It is undoubtedly the best nationally-representative data source available for this analysis. Nonetheless, the SIPP does have several shortcomings, described in the sections that follow.

For much of our analysis, we are interested in analyzing children of a particular age. In the discussion which follows we have therefore employed the concept of "periods", which are the interview waves realigned so as to start with the birth of the child (Exhibit D.1). A child could be born in the first, second, third, or fourth month of a wave. Hence, the child's age at the end of the first period could be 0, 1, 2, or 3 months. (A child is deemed to be 0 months old in the calendar month in which he or she is born.) A child's first birthday must occur in Period 4. Hence, by the end of Period 4, if the individual is receiving WIC, it must presumably be as a child rather than as an infant.

Length of Observation Period

The most important limitation of the SIPP is that it spans only 36 to 40 months. Infants and children are potentially eligible for WIC for 60 months (from birth through their fifth birthday). Thus, we have no opportunity to observe particular children continuously over the full range of ages of WIC eligibility. Instead, we can observe some children from birth to age 2 (useful for studying the transition from WIC infant to WIC child); others from age 3 to 5; and still others for an intermediate range of years. It is thus not possible to determine from the SIPP whether a four-year-old child received WIC as an infant. Similarly, it is not possible to determine whether an infant who exited WIC received WIC later as a four-year-old.

Furthermore, even when the observation period is in principle long enough to determine the relationship between WIC receipt at age x and at age $x + t$, it may not be possible in practice because of sample size considerations. For example, we could in principle observe WIC receipt in the 1993 panel for an individual from birth through age 36 months, but this span could only be observed for those infants who were born in the first month of the panel—a small fraction of all the infants and children in the sample. A more reasonable goal might be to observe WIC receipt from birth through age 24 months. This span could be observed for any infant who was born in months 1 through 12 of the observation period, multiplying the analysis sample by approximately a factor of 12.

Exhibit D.1

CORRESPONDENCE BETWEEN CHILD'S AGE AND PERIOD

Period	Child's age in months, at end of period	Significance
1	0-3	Contains date of birth.
2	4-7	First period included in analyses, due to under reporting of newborns (see below).
3	8-11	Last period in which an individual is an infant at the end of the period. WIC benefits received in last month must be as an infant.
4	12-15	Contains first birthday. WIC benefits received in last month must be as a child.
7	24-27	Contains second birthday.
10	36-39	Contains third birthday.
13	48-51	Contains fourth birthday.
15	56-59	Last period in which WIC receipt, measured at the end of the wave, should occur.
16	60-63	Contains fifth birthday. Child loses eligibility during this period. WIC can issue benefits in the month that the child turns five.

"Heaping" of Transitions

Another important limitation of the SIPP is that households are interviewed retrospectively at four-month intervals. This is obviously a great improvement over annual interviews such as those administered by the Panel Survey of Income Dynamics, or one-time retrospective interviews such as those conducted by the National Health and Nutrition Examination Survey. Nonetheless, we believe it would be seriously misleading to treat the SIPP data as monthly in nature. As noted in the Technical Documentation for the 1992 SIPP,

> Sample persons tend to report the same status of a characteristic for all four months of a reference period. This tendency results in a bias toward reported spell lengths that are multiples of four months. This tendency also affects transition estimates in that, for many characteristics, the number of month-to-month transitions reported between the last month of one reference period and the

first month of the next reference period are much greater than the number of
reported transitions between any two months within a reference period (p. 8-6).

This concentration of reported transitions at the seams between waves is called "heaping".[1]

A likely explanation of the observed patterns is that respondents project their current situation at
the time of the interview back to the beginning of the target period. Although we have no reason
to doubt the accuracy of the last month of data covered by an interview, the retrospectively
collected information pertaining to income sources and amounts in earlier months are suspect.

Heaping can clearly be seen in infants' and children's exits from and entries into WIC in the 1992
SIPP panel. For example, among those infants and children who ever received WIC, the
likelihood of a WIC entry for a nonparticipant in any month that was the first month of a wave
was 8.1 percent, but in any other month was only 0.9 percent. Similarly, the likelihood of a WIC
exit by a participant in any month that was the last month of a wave was 10.0 percent, but in any
other month was only 1.2 percent.

We have therefore chosen to treat the data as "wavely" in nature. Because the information
pertaining to the last month of each wave, being most recent, is most likely to be accurate, we use
that information exclusively. For most sample members this tells us the same story as if we had
used all months of information. Although we do lose information in some cases on intrawave
transitions, we believe that it would be more misleading than helpful to combine this information
with the less precise information available for the majority of cases. In any event, we believe that
the patterns of WIC dynamics for children can readily be understood based on data collected
every four months, without using monthly detail.

Fluctuations in WIC Receipt

Another oddity of the SIPP data is that they show a substantial number of one-wave breaks in
WIC receipt. For example, a child reportedly received WIC throughout Wave 2, did not receive
WIC in Wave 3, and once again received WIC throughout Wave 4. It seems unlikely that many
children would stop receiving WIC for four months and then start again, given that children are
certified to receive WIC for six months at a time. A possible explanation of this pattern in the
data is that the proxy respondent who reported on the child's WIC receipt was a different
individual in the intervening wave (e.g., the child's father rather than the child's mother), who did
not know that the child was receiving WIC or did not choose to report WIC receipt. Even if the
respondent was the same individual, it seems more likely than not that the child received WIC
continuously. We have therefore filled in all one-wave gaps of WIC receipt, and deemed an
individual to have exited WIC only if no receipt is reported for two consecutive waves. This
approach is consistent in spirit with the Census Bureau imputations, which fill in missing waves of

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[1] For further discussion of seam effects, see Glen G. Cain, "The Future of SIPP for Analyzing Labor Force
Behavior," *Journal of Economic and Social Measurement*, 18:1-4, 1992.

data based on information from the waves on either side. We believe that on net our approach leads to a more accurate picture of dynamic patterns of WIC receipt.[2]

Analysis Weights

The Bureau of the Census has constructed several longitudinal weights for each panel, corresponding to particular calendar years and to the panel as a whole. Only those individuals who are present in the sampled households in the first interview ("original" sample members) are assigned longitudinal weights. Individuals who move in with original sample members later are properly given zero personal weights (although their needs and resources are included in the household counts); they had a positive probability of selection into the SIPP, and are thus already represented by the original sample members.

This logic does not apply to infants who are born to original sample members during the course of the panel. They are in fact deemed to be original sample members, yet have zero longitudinal weights. This anomaly could be resolved by assigning them their parents' weights.

Adopted children of original sample members present a different situation. Depending on their age and on whether they were previously living in an institution or a household, they might or might not have had a positive probability of selection into the SIPP. Like newborn infants, they are deemed to be original sample members, but have zero longitudinal weights.

The SIPP's "following rules" add another complication to the longitudinal weights. SIPP interviewers attempt to collect information on all original sample members regardless of where they move—but only if they are age 15 or older. Original children and newborn infants of original members who no longer live with an adult original sample member are not followed. As a consequence, sample attrition will be greater for WIC children than for, say, WIC mothers. A sample child who moves in with other relatives will no longer be in the SIPP sample. The attrition correction made by the Census to adults' longitudinal weights may therefore be inaccurate for infants and children who were assigned a zero longitudinal weight by the Census and who also have a higher likelihood of sample attrition than their parents.

Although each of these issues might conceivably be resolved, the dynamic structure of our analysis is such that it ultimately seems impossible to use or adapt the longitudinal weights. Nearly all of the analyses reported here use samples of infants and children of a particular age rather than at a given calendar period—the basis for the Census weights. For example, our analysis of WIC infants' transition to WIC children uses four samples of children: those who are observed in Periods 2 and 3, those who are observed in Periods 3 and 4, those who are observed in Periods 4 and 5, and those who are observed in Periods 5 and 6. The first sample thus includes infants who were born from four months before the start of Wave 1 through the end of Wave 7 (1992 Panel, first rotation group and 1993 Panel), or through the end of Wave 8 (1992 Panel, other rotation groups). The other four analysis samples correspond to different cohorts of births.

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[2] See also Jacob Alex Klerman, "Pitfalls of Panel Data: The Case of SIPP Health Insurance Data," *Proceedings of the 1991 Public Health Conference on Records and Statistics*, Washington, DC: July 15, 1991.

Many other analysis samples are used for addressing the other four research questions. To develop correct longitudinal weights for each of these would be a Herculean task. Furthermore, the advantage of using weights seems limited, because the 1992 and 1993 panels used essentially self-weighting designs.[3] As noted by Gordon *et al.*, weighted and unweighted distributions of persons in SIPP with respect to such variables as race and family type are generally quite similar, because the SIPP sample is not stratified along these dimensions.[4]

We therefore decided not to use the longitudinal weights, but to count each sample member equally. We also decided to include in our analyses information on non-original sample members who receive WIC. These are children who move into households containing original sample members in Wave 2 or later, for example from their mother's to their grandmother's home. Given our inability to develop appropriate weights, we do not think this inclusion does any harm, and it may help the estimates of transition rates both by increasing the sample sizes and by providing some representation for children who switch households. These children's counterparts among the original sample (i.e., those who moved out of their mother's homes) are not followed, and hence have been lost to the SIPP analysis sample.

Underreporting of Infants

Information is requested on household composition in each wave of the SIPP. The presence of newborn infants is apparently not always captured. This can be seen by the entry into the sample of a substantial number of infants who are already several months old. For example, the 1992 and 1993 panels included information on 1303 WIC recipients[5] who were not present in the first wave of SIPP and who were infants at the time they entered the sample. Based on their reported date of birth, only 71 percent of these infants were included in the sample in the four-month reference period that included their date of birth. Although some infants may spend prolonged time in the hospital, it does not seem plausible that such a large proportion of infants joined a household after the month of their birth.

Because this report focuses on WIC receipt of children, we have avoided the potential inconsistencies associated with data on newborns by excluding data on infants under the age of 4 months. We thus define "receipt of WIC as an infant" as meaning receipt from age 4 to 11 months. We believe this exclusion is harmless, because it is very unlikely that an infant would receive WIC during the first three months of life but not thereafter.

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[3] Communication from Karen King, Bureau of the Census.

[4] Anne Gordon, Kimball Lewis, and Larry Radbill, *Income Variability Among Families with Pregnant Women, Infants, or Young Children*, Mathematica Policy Research, Inc., Princeton, NJ, January 1997, 118-119. Prepared for the U.S. Department of Agriculture, Food and Consumer Service, Office of Analysis and Evaluation, Alexandria, VA.

[5] That is, individuals who reportedly received WIC in one or more months of the panel.

Underreporting of WIC Receipt by Infants

The SIPP, like other surveys, tends to underreport receipt of means-tested benefits such as WIC. In addition, the underreporting is skewed by age: the SIPP shows a smaller ratio of infant to child WIC recipients than appears in PC94.

This extent of infant under reporting cannot be seen directly from the PC94 reports, because the published tabulations show age at time of certification. For purposes of comparison, we wish to examine the age distribution in a typical month—e.g., in April 1994, the month of the PC94 census. This differs from the published distribution because most infants who were certified at age 0 to 3 months, say, will be out of that age category by the following April. We have therefore used the PC94 Analytic File (a representative subsample of the entire database) to calculate the age, as of April 1994, of recipients certified as infants and children, based on their recorded birthdates. Infants aged 0 to 3 months in April 1994 were deleted, as were the handful of cases with missing or out-of-range birthdates. Comparing PC94 and the 1992 and 1993 SIPP panels (Exhibit D.2), we find that the SIPP WIC recipients are disproportionately children, especially three-year-olds, rather than infants. For this reason, we based our profile of WIC recipients shown earlier in Exhibits 8.1 and 8.2 on the PC94 age distribution, while using transition probabilities from the SIPP.[6] Furthermore, for those research questions that depend on the age distribution of WIC recipients, we have, where possible, noted the direction of the bias associated with this discrepancy.

Exhibit D.2

COMPARISON OF AGE DISTRIBUTION OF WIC INFANTS AND CHILDREN, PC94 ANALYTIC FILE AND 1992 AND 1993 SIPP PANELS

Age of WIC recipients in typical month	Percent	
	PC94	**1992 and 1993 SIPP Panels**
4-11 months	30.5%	22.2%
1 year	26.6	27.5
2 years	17.8	20.3
3 years	13.6	17.1
4 years	11.4	12.9
Total	100.0%	100.0%

NOTE: Excludes infants aged 0 to 3 months, children aged 61 or more months. Children aged 60 months included with 4-year-olds.

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[6] Adding back in the infants aged 0 to 3 months, who comprised 26.2 percent of all WIC infants in the PC92 analytic file, entailed inflating the proportion of infants shown in Exhibit D-2 by $(1/(1 + 0.262))$ and renormalizing the total to add up to 100 percent.

Appendix E
Technical Notes on Dynamics of Child WIC Participation

This appendix provides additional detail about two aspects of Chapter Eight. First, the calculations used to generate Exhibits 8.1 and 8.2 are presented. Second, the adjustments to the Exhibits 8.4 and 8.5 for right- and left-censoring are explained.

Calculation of Age Distribution of WIC Recipients and Length of Past and Future Receipt

Exhibits 8.1 and 8.2 show the estimated percentages of WIC recipients aged 0, 1, 2, 3, and 4 who entered WIC and will exit WIC at each year of age. To develop these estimates requires making several assumptions. First, we assume that the likelihood of an infant or child continuing to receive WIC for one more year is independent of how long the infant or child has already received WIC (although it varies with the child's age).[1] This assumption is necessary because we cannot observe individuals' receipt of WIC in the SIPP continuously from birth to age five. It might be thought that children of a given age who have been on WIC longer are more likely to have been cured of their nutritional risk, and may therefore lose eligibility. On the other hand, those who have been on WIC longer may value the benefits more and may therefore be more likely to continue on the program. Lacking any empirical evidence, and with no *a priori* reason to believe one effect is stronger than the other, it seems most reasonable to assume that there is on average no relationship between participation duration and exit rate.

Using similar reasoning, we make the analogous assumption with regard to how long a child has already been receiving WIC: among children of a given age, the likelihood of having started to receive WIC within the last year is independent of how much longer the child will be observed to receive WIC in the future. Finally, we take at face value transition rates derived from the SIPP, although there is reason to believe some entries by infants appear in the SIPP as entries by one-year-olds.

As discussed in Appendix D, the age distribution of infant and child WIC recipients in the 1992 and 1993 SIPP panels does not match the actual distribution reported in PC94. Note that the age distribution shown in Exhibits 8.1 and 8.2 includes infants aged 0 to 3 months, who were omitted

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[1] For example, let r_1 be the likelihood that a one-year-old WIC recipient continues to receive WIC for another year, and let r_2 be the likelihood that a two-year-old WIC recipient continues to receive WIC for another year. Then we calculate the probability that a one-year-old WIC recipient will continue to receive WIC for **two** more years as simply the product of r_1 and r_2.

from Exhibit D.2 because of their systematic under representation in the SIPP. It was assumed for purposes of Exhibit 8.2 that the exit rate of these infants is the same as that of older infants.

Using the PC94 analytic file, we determined the distribution of infant and child WIC recipients by age at last birthday as of the census month (April 1994). These proportions were:

0 years:	32.2 percent
1 year:	23.6 percent
2 years:	18.1 percent
3 years:	14.2 percent
4 years:[2]	11.9 percent

Then, using the 1992 and 1993 SIPP Longitudinal Files, transition rates were calculated for each year of age, representing the fraction of children who, receiving WIC at that age, had received WIC continuously for a year or more (Exhibit E.1, second line). Each wave of observation for each child contributed to these ratios, provided that the child had been observed for all of the preceding three waves as either a WIC recipient or a nonrecipient (or at least back to the second period of life).[3] Multiplying these rates together cumulatively yielded the proportion of children at each age who had received WIC at each earlier age (Exhibit E.1, lines 3 through 7). For example, the proportion of two-year-olds who received WIC since infancy was estimated to be 0.782×0.779, or 60.9 percent. The proportion of two-year-olds that had started to receive WIC at age one was calculated as the fraction that had received WIC for at least a year (78.2 percent) minus the fraction that had received it since infancy (60.9 percent), or 17.3 percent. The remaining 21.8 percent of two-year-old recipients entered the program as two-year-olds. Finally, these proportions were applied to the percentages of WIC recipients by age (Exhibit E.1, lines 8 through 12). The results are displayed graphically in Exhibit 8.1.

An analogous method was used to calculate the length of future WIC receipt by age, based on children's observed receipt of WIC for the three subsequent waves (or until the child turned five). The results are shown in Exhibit E.2 and displayed in Exhibit 8.2.

Adjustment of Distribution of Age at First WIC Entry, Age at Last WIC Exit

To understand the timing of children's entries into WIC, we would ideally like to tabulate the ages of all WIC children at the time that they first received WIC. This cannot be done exactly using the SIPP data, for two reasons. First, children are only observed for 40 months at the most. When we observe a WIC entry by a child who was born before the observation period began, that is, receipt of WIC after at least one observed wave of non-receipt, we cannot be certain that the child did not receive WIC previously. An additional source of bias is that the SIPP sample

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[2] Including a handful of children past their fifth birthday.

[3] It will be recalled that the second period refers to the wave succeeding the infant's birth.

Exhibit E.1
AGE OF WIC RECIPIENTS AND LENGTH OF PAST RECEIPT

	Age of recipient				
	0	**1**	**2**	**3**	**4**
Proportion of all infant and child recipients	32.2%	23.6%	18.1%	14.2%	11.9%
Likelihood of having received WIC for a year (or since Period 2)	100.0	77.9	78.2	71.7	71.9
Conditional likelihood of having received WIC since age:					
0	100.0	77.9	60.9	43.7	31.4
1		22.1	17.3	12.4	8.9
2			21.8	15.6	11.2
3				28.3	20.4
4					28.1
Unconditional likelihood of having received WIC since age:					
0	32.2	18.4	11.0	6.2	3.7
1		5.2	3.1	1.8	1.1
2			3.9	2.2	1.3
3				4.0	2.4
4					3.3

Exhibit E.2
AGE OF WIC RECIPIENTS AND LENGTH OF FUTURE RECEIPT

	Age of recipient				
	0	**1**	**2**	**3**	**4**
Proportion of all infant and child recipients	32.2%	23.6%	18.1%	14.2%	11.9%
Likelihood of receiving WIC for the next year (or until age 5)	71.6	68.7	69.6	55.1	75.1
Conditional likelihood of receiving WIC until age:					
0	28.4				
1	22.4	31.3			
2	15.0	20.9	30.4		
3	15.4	21.5	31.2	44.9	
4	4.7	6.6	9.5	13.7	24.9
5	14.2	19.8	28.8	41.4	75.1
Unconditional likelihood of receiving WIC until age:					
0	9.2				
1	7.2	7.4			
2	4.8	4.9	5.5		
3	5.0	5.1	5.7	6.4	
4	1.5	1.5	1.7	1.9	3.0
5	4.6	4.7	5.2	5.9	8.9

contains substantially fewer infants on WIC than expected (see Appendix D). If WIC participation had been accurately reported, we would have seen more individuals receiving WIC as infants, and therefore entering WIC as infants. As it turns out, however, we can get a reasonably accurate answer because we know the direction of the bias and can make a statistical adjustment to correct at least a part of it.

We began the analysis by tabulating age at entry to WIC based on all first non-left-censored spells (n=1,912).[4] Conceptually, we were looking at all entries to WIC in each wave of the observation period, ignoring any second (or subsequent) observed entries for a given child. Because of the problem of underreporting of newborn infants, we ignored all observations of Period 1, and counted all individuals observed receiving WIC in Period 2 as starting a non-left-censored spell. If an infant was first observed in Period 3 and was receiving WIC then, however, the spell was judged to be left-censored and was excluded. Although such an individual obviously did begin WIC receipt as an infant, we did not wish to use this information. Our reason was that the analysis sample contained other, older children who were already receiving WIC when they were first observed who had also just started receipt in the current or previous wave. To include the spells of the older infants but not of the other children would bias the distribution. Any children receiving WIC in the first wave in which they were observed were likewise excluded, as left-censored observations.

The unadjusted tabulation showed a fairly heavy concentration of WIC entries among infants: two-thirds of the children ever receiving WIC did so before their first birthday (Exhibit E.3). In fact, the proportion of WIC children first receiving benefits as infants could be even higher, because some of the included spells could be second or subsequent spells of receipt. To adjust for the distribution to the extent possible, we first determined for all children observed to enter WIC at a given age, for whom data were available, the proportion that had also received WIC three and four waves previously. For example, there were 90 observed WIC entries by four-year-olds who had been in the sample for the three waves preceding their observed entry. Of these children, 17, or 18.9 percent, had received WIC in one of those three preceding waves.[5]

These 17 children were not included in the unadjusted distribution shown in Exhibit E.3. We can infer from their existence, however, that, of the observed entries by four-year-olds who were not in the sample for the three preceding waves, about 18.9 percent represented re-entries rather than first entries, and should therefore be deleted from the distribution. Similarly, of four-year-olds with WIC entries who were observed for at least four waves prior and who did not receive WIC three waves before the entry, 15.0 percent did receive WIC in the fourth prior wave. Hence, of

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[4] A left-censored spell of benefit receipt is one that was already in progress when the individual was first observed, so that it is not known when the spell began. Similarly, a right-censored spell of benefit receipt is one that is still in progress when the individual is last observed, so that it is not known when the spell ended. By restricting our analysis sample to non-left-censored spells, we examine in effect a series of cohorts of infants and children entering WIC.

[5] In fact, it was necessarily the first of those waves in which they received WIC, because had they reportedly received WIC in the second wave, the gap in the third wave would have been filled in and the observed entry would not have occurred.

Exhibit E.3
AGE AT FIRST WIC ENTRY

	Percent of non-left-censored observations	
Age at first WIC entry	Unadjusted	Adjusted
0 years	65.7%	70.2%
1 year	11.8	10.0
2 years	8.3	7.1
3 years	8.4	7.5
4 years	5.8	5.1

the supposed non-left-censored entries at age four who were observed three but not four waves prior, we deducted 15.0 percent as being reentries; and of the supposed non-left-censored entries at age four who were observed only one or two waves prior, we included $(1 - 0.189) \times (1 - 0.150)$, or 68.9 percent, as the likely proportion of these children who had not received WIC in the unobserved time periods three or four waves previously. Small sample sizes precluded making adjustments for greater lags. The size of the adjustment factors and the sample sizes on which they are based are shown in Exhibit E.4.

Exhibit E.4
FRACTION OF WIC OPENINGS WITH EARLIER WIC RECEIPT, BY AGE AT OPENING

Age at opening	Fraction of individuals with WIC receipt within previous three waves	Fraction of individuals with WIC receipt within previous four waves
1	0.1385 (*n*=65)	0.1053 (*n*=19)
2	0.1639 (*n*=122)	0.1975 (*n*=81)
3	0.1643 (*n*=140)	0.1319 (*n*=91)
4	0.1889 (*n*=90)	0.1500 (*n*=60)

A similar approach was used to modify the distribution of age at last exit, except that the sample sizes allowed for consideration of reentry within the next five waves, as well as within the next four and three waves. We began by tabulating children's age when exiting WIC for all last non-right-censored spells (n=1,801). The sample excluded children who were still receiving WIC when last observed (unless they were already in Period 15), and exits that were followed by re-entries. The unadjusted distribution suggests that about a fifth of children who ever receive WIC stay on until their fifth birthday, whereas about a sixth receive WIC only as infants (Exhibit

E.5). This distribution is biased by being shifted to the left, however, because, for example, some infants shown as exiting WIC may in fact have reentered the program at a later age. This bias is likely to be smaller than the corresponding bias for entries, because WIC receipt declines with increasing age. Thus, a child who exits WIC at age 2 is less likely to receive WIC again later than a child who enters at age 2 is to have received WIC earlier. The underrepresentation of WIC infants in the SIPP has an unknown effect, depending on whether the unidentified WIC infants are more or less likely than other WIC infants to receive WIC as children.

Exhibit E.5
AGE AT LAST WIC EXIT

	Percent of non-right-censored observations	
Age at last WIC exit	**Unadjusted**	**Adjusted**
0 years	16.3%	17.2%
1 year	23.0	24.3
2 years	15.0	13.9
3 years	15.9	9.7
4 years	9.6	11.2
5 years	20.3	23.7

To adjust the estimates, we calculated, for example, that of infants exiting WIC who were observed for at least three subsequent waves, 5.6 percent reentered in that third wave; of those exiting WIC infants observed for at least four subsequent waves who did not reenter in the third wave, 4.6 percent reentered in the fourth wave; and of those exiting WIC infants observed for at least five subsequent waves who did not reenter by the fourth wave, 5.6 percent reentered in the fifth wave. The adjustment factors are shown in Exhibit E.6.

Exhibit E.6
FRACTION OF WIC OPENINGS WITH LATER WIC RECEIPT,
BY AGE AT CLOSING

Age at closing	Fraction of individuals with WIC receipt within next three waves	Fraction of individuals with WIC receipt within next four waves	Fraction of individuals with WIC receipt within next five waves
0	0.0563 (*n*=160)	0.0462 (*n*=130)	0.0556 (*n*=90)
1	0.0780 (*n*=295)	0.0708 (*n*=226)	0.0533 (*n*=169)
2	0.1550 (*n*=200)	0.1241 (*n*=145)	0.1188 (*n*=101)
3	0.1034 (*n*=203)	0.1237 (*n*=97)	0.0930 (*n*=43)