Appendix A

Summary of Impact Studies Identified in the Literature Review

Note: As discussed in the text, all identified research that described differences between participants and nonparticipants is included in these tables. Although some of these studies had weak designs or used rudimentary or, in some cases, no statistical analysis, they are included in the interest of completeness. The tables include information about both design and analysis methods. In interpreting findings from the complete body of research for a given program, greater weight was given to findings from studies that had the strongest design and analysis methods and that used the most recent data.

Food Stamp Program

Appendix table 1—Studies that examined the impact of the Food Stamp Program on household food expenditures

Study	Data source[1]	Measure of expenditures[2]	Population (sample size)	Design	Measure of participation	Analysis method
Group IA: Participant vs. nonparticipant comparisons—Secondary analysis of national surveys						
Hama and Chern (1988)	1977-78 NFCS elderly supplement	At-home Nonpurchased food included Per person per week	FSP-eligible households with elderly members (n=1,454)	Participant vs. nonparticipant	Participation dummy	Simultaneous food expenditure/nutrient availability equation[3]
Kisker and Devaney (1988)	1979-80 NFCS-LI	At-home Nonpurchased food included Per ENU per week	FSP-eligible households (n~2,900)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Basiotis et al. (1983)	1977-78 NFCS-LI	At-home Nonpurchased food included Per household per week	FSP-eligible households (n=3,562)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Price (1983)	1973-74 BLS-CES	At-home Purchased food only Per equivalent adult per week	All households (n=10,359)	Participant vs. nonparticipant; also dose-response	Participation dummy; benefit amount	Multivariate regression
Salathe (1980)	1973-74 BLS-CES	At-home, away, total Purchased food only Per person per week	FSP-eligible households (n=2,254)	Participant vs. nonparticipant; also dose-response	Participation dummy; benefit amount	Multivariate regression
Group IB: Participant vs. nonparticipant comparisons—State and local studies						
Lane (1978)	Kern County, CA (1972-73)	At-home Nonpurchased food included Per person per month	FSP-eligible households (n=329)	Participant vs. nonparticipant	Participation dummy	Bivariate comparisons based on proportion of income spent on food
West et al. (1978)	Washington State (1972-73)	At-home Nonpurchased food included Per equivalent adult per month	FSP-eligible households with child age 8-12 (n=332)	Participant vs. nonparticipant; also dose-response[4]	Participation dummy; bonus amount	Weighted multivariate regression

See notes at end of table.

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Appendix table 1—Studies that examined the impact of the Food Stamp Program on household food expenditures—Continued

Study	Data source[1]	Measure of expenditures[2]	Population (sample size)	Design	Measure of participation	Analysis method
Group II A: Dose-response estimates—Secondary analysis of national surveys						
Kramer-LeBlanc et al. (1997)	1989-91 CSFII	At-home, total Purchased food only Per household per week	FSP participant households (n=790)	Dose-response	Benefit amount	Multivariate regression
Levedahl (1991)	1979-80 NFCS-LI	At-home, total Purchased food only	FSP participants who used all their food stamps (n=1,210)	Dose-response	Bonus value	Multivariate regression
Fraker et al. (1990)	1985 CSFII	Expenditures on food during previous 2 months	FSP- and WIC-eligible households (n=515)	Dose-response	Participation dummy; benefit amount	Multivariate regression
Devaney and Fraker (1989)	1977-78 NFCS-LI	Aided recall of food used in last 7 days	FSP-eligible households (n=4,473)	Dose-response	Participation dummy; bonus value	Multivariate regression
Basiotis et al. (1987)	1977-78 NFCS-LI	At-home Nonpurchased food included Per household per week	FSP-eligible households (n~3,000)	Dose-response	Participation dummy; bonus value	Simultaneous equations for food cost/nutrient availability/nutrient intake relationship
Senauer and Young (1986)	1978 PSID	At-home Purchased food only Per household per month	FSP participant households (n=573)	Dose-response	Bonus value	Multivariate regression
Smallwood and Blaylock (1985)	1977-78 NFSC-LI	At-home Purchased food only Per person per week	FSP-eligible households (n=3,582)	Dose-response	Participation dummy; expected weekly bonus value	2-equation selection-bias model
West (1984)	1973-74 BLS-CES	At-home, away, total Purchased food only Per equivalent adult per week	FSP-eligible households (n=2,407)	Dose-response	Participation dummy; bonus value	Multivariate regression
Allen and Gadson (1983)	1977-78 NFCS-LI	At home, away, total Purchased food only Per household per week	FSP-eligible households (n=3,850)	Dose-response	Bonus value	Multivariate regression
Chen (1983)	1977-78 NFCS-LI	Aided recall of food used in last 7 days	FSP participant households (n=1,809)	Dose-response	Participation dummy; bonus value	Multivariate regression

See notes at end of table.

Continued—

Appendix table 1—Studies that examined the impact of the Food Stamp Program on household food expenditures—Continued

Study	Data source[1]	Measure of expenditures[2]	Population (sample size)	Design	Measure of participation	Analysis method
Brown et al. (1982)	1977-78 NFCS-LI	Aided recall of food used in last 7 days	FSP participant households (n=911)	Dose-response	Bonus value	Multivariate regression
Chavas and Yeung (1982)	1972-73 BLS-CES	At-home Purchased food only Per household per week	FSP-eligible households, southern region (n=659)	Dose-response	Bonus value	Seemingly unrelated regression model, interactions between bonus value and demographic variables[5]
Johnson et al. (1981)	1977-78 NFCS-LI	At-home Nonpurchased food included Per household per week	Low-income households (n=4,535)	Dose-response	Participation dummy; bonus value	Multivariate regression
Benus et al. (1976)	1968-72 PSID	Annual expenditures for food used at home	All households (n~3,300)	Dose-response	Participation dummy; bonus value	Dynamic adjustment model
Hymans and Shapiro (1976)	1968-72 PSID	Annual expenditures for food used at home	All households (n~3,300)	Dose-response	Participation dummy; bonus value	Multivariate regression
Group IIB: Dose-response estimates—State and local studies						
Breunig et al. (2001)	San Diego cashout demonstration (1990)	At-home Purchased food only Per person per month	FSP participant households receiving coupons (n=487)	Dose-response	Benefit amount	Multivariate regression
Levedahl (1995)	San Diego cashout demonstration (1990)	At-home Purchased food only Per person per month	FSP participant households receiving coupons (n=494)	Dose-response	Benefit amount	Multivariate regression
Ranney and Kushman (1987)	Counties and county groups in California, Indiana, Ohio, Virginia (1979-89)	At-home Nonpurchased food included	FSP-eligible households (n=896)	Dose-response	Participation dummy; bonus value	Multivariate regression
Neenan and Davis (1977)	Polk County, FL (1976)	At-home Purchased food only Per household per month	FSP participant households (n=123)	Dose-response	Participation dummy	Multivariate regression

See notes at end of table.

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Appendix table 1—Studies that examined the impact of the Food Stamp Program on household food expenditures—Continued

Study	Data source[1]	Measure of expenditures[2]	Population (sample size)	Design	Measure of participation	Analysis method
West and Price (1976)	Washington State (1972-73)	At-home Nonpurchased food included Per equivalent adult per month	Households with children ages 8-12[6] (n=995)	Dose-response	Bonus value	Multivariate regression
Group IIIA: Cashout demonstrations—Experimental design						
Fraker et al. (1992)	Alabama cashout demonstration (1990)	At-home, away, total Purchased food only and nonpurchased food included Per household, ENU, and AME per month	FSP participants (n=2,386)	Random assignment of participants to check or coupon	Group membership dummy; benefit amount	Multivariate regression
Ohls et al. (1992)	San Diego cashout demonstration (1990)	At-home, away, total Purchased food only and nonpurchased food included Per household, ENU, and AME per month	FSP participants (n=1,143)	Random assignment of participants to check or coupon	Group membership dummy; benefit amount	Multivariate regression
Group IIIB: Cashout demonstrations—Nonexperimental design						
Cohen and Young (1993)	Washington State cashout demonstration (1990)	At-home, away, total Purchased food only and nonpurchased food included Per household, ENU, and AME per month	Households participating in AFDC and who applied after FIP[7] implementation (n=780)	Comparison of treatment and matched comparison counties	Group membership dummy; benefit amount	Multivariate regression
Davis and Werner (1993)	Alabama ASSETS demonstration (1990)	At-home, away, total Purchased food only Per household and AME per month	ASSETS and FSP participants (n=1,371)	Comparison of treatment and matched comparison counties	Group membership dummy; benefit amount	Multivariate regression

See notes at end of table.

Continued—

Appendix table 1—Studies that examined the impact of the Food Stamp Program on household food expenditures—Continued

Study	Data source[1]	Measure of expenditures[2]	Population (sample size)	Design	Measure of participation	Analysis method
Beebout et al. (1985)	1977 Puerto Rico supplement to the NFCS and 1984 Puerto Rico HFCS	At-home, total Nonpurchased food included Per household and AME per week	Participant and FSP-eligible nonparticipant households using 1977 eligibility criteria (n= 3,995)	Pre-cashout compared with cashout (1977 vs. 1984)	Group membership dummy; participation dummy; benefit amount	2-equation selection-bias models

[1]Data sources:
ASSETS = Avenues to Self-Sufficiency through Employment and Training Services.
BLS-CES = Bureau of Labor Statistics' Consumer Expenditure Survey.
CSFII = Continuing Survey of Food Intakes by Individuals.
HFCS = Household Food Consumption Survey.
NFCS = Nationwide Food Consumption Survey.
NFCS-LI = Nationwide Food Consumption Survey - Low Income Supplement.
PSID = Panel Study of Income Dynamics.

[2]Includes indications of whether the dependent variable corresponds to food consumed at home, food consumed away from home, or all food; whether measure(s) represent only food purchased with cash, credit, or food stamp coupons or include the estimated dollar value of home-grown food, gifts, etc.; whether expenditures are measured per person, per household, per adult male equivalent (AME), per equivalent adult, or per equivalent nutrition unit (ENU); and the time unit for expenditures.

[3]Does not treat FSP as endogenous.

[4]Eligible participants were isolated in the nonparticipant group.

[5]Main effects were not reported.

[6]Eligible participants not isolated in the nonparticipant group.

[7]FIP = Family Independence Program.

Appendix table 2—Studies that examined the impact of the Food Stamp Program on household availability of food energy and nutrients

Study	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group IA: Participant vs. nonparticipant comparisons—Secondary analysis of national surveys						
Hama and Chern (1988)	1977-78 NFCS elderly supplement	Aided recall for food use from household supply (7 days)	FSP-eligible households with elderly members (n=1,454)	Participant vs. nonparticipant	Participation dummy	Simultaneous food expenditure/nutrient availability equation[2]
Kisker and Devaney (1988)	1979-80 NFCS-LI	Record of household food use (7 days)	FSP-eligible households (n~2,900)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Allen and Gadson (1983)	1977-78 NFCS-LI	Aided recall for food use from household supply (7 days)	FSP-eligible households (n=3,850)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Basiotis et al. (1983)	1977-78 NFCS-LI	Aided recall for food use from household supply (7 days)	FSP-eligible households (n=3,562)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Scearce and Jensen (1979)	1972-73 BLS-CES	Food category amount and expenditure diary	FSP-eligible, southern region (n=1,360)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Group IB: Participant vs. nonparticipant comparisons—Local studies						
Lane (1978)	Kern County, CA (1972-73)	24-hour recall of food consumed at home	FSP-eligible households (n=329)	Participant vs. nonparticipant	Participation dummy	Bivariate comparisons
Group II: Dose-response estimates—Secondary analysis of national surveys						
Devaney and Moffitt (1991)	1979-80 NFCS-LI	Record of household food use (7 days)	FSP-eligible households (n=2,925)	Dose-response	Benefit amount	Multivariate regression; selection-bias models
Basiotis et al. (1987)	1977-78 NFCS-LI	Aided recall for food use from household supply (7 days)	FSP-eligible households (n~3,000)	Dose-response	Participation dummy; bonus value	Simultaneous equations for food cost/nutrient availability/nutrient intake relationship
Johnson et al. (1981)	1977-78 NFCS-LI	Aided recall for food use from household supply (7 days)	Low-income households (n=4,535)	Dose-response	Participation dummy; bonus value	Multivariate regression

See notes at end of table.

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Appendix table 2—Studies that examined the impact of the Food Stamp Program on household availability of food energy and nutrients—Continued

Study	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group IIIA: Cashout demonstrations—Experimental design						
Bishop et al. (2000)	Alabama cashout demonstration (1990) and San Diego cashout demonstration (1990)	7-day food use from records and recall	Alabama FSP participants (n=2,184) San Diego FSP participants (n=935)	Random assignment of participants to check or coupon	Group membership dummy	Stochastic dominance methods
Fraker et al. (1992)	Alabama cashout demonstration (1990)	7-day food use from records and recall	FSP participants (n=2,386)	Random assignment of participants to check or coupon	Group membership dummy; benefit amount	Multivariate regression
Ohls et al. (1992)	San Diego cashout demonstration (1990)	7-day food use from records and recall	FSP participants (n=1,143)	Random assignment of participants to check or coupon	Group membership dummy; benefit amount	Multivariate regression
Group IIIB: Cashout demonstrations—Nonexperimental design						
Cohen and Young (1993)	Washington State cashout demonstration (1990)	7-day food use from records and recall	Households participating in AFDC and who applied after FIP[3] implementation (n=780)	Comparison of treatment and matched comparison counties	Group membership dummy; benefit amount	Multivariate regression
Beebout et al. (1985)	1977 Puerto Rico supplement to the NFCS and 1984 Puerto Rico HFCS	7-day food use from records and recall	Participant and FSP-eligible nonparticipant households using 1977 eligibility criteria (n= 3,995)	Pre-cashout compared with cashout (1977 vs. 1984)	Group membership dummy; participation dummy; benefit amount	2-equation selection-bias models

[1] Data sources:
BLS-CES = Bureau of Labor Statistics' Consumer Expenditure Study.
HFCS = Household Food Consumption Survey.
NFCS = Nationwide Food Consumption Survey.
NFCS-LI = Nationwide Food Consumption Survey - Low Income Supplement.
[2] Does not treat FSP as endogenous.
[3] FIP = Family Independence Program.

Appendix table 3—Studies that examined the impact of the Food Stamp Program on dietary intakes of individuals

Study	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group IA: Participant vs. nonparticipant comparisons—Secondary analysis of national surveys						
Dixon (2002)	1988-94 NHANES-III	24-hour recall	Adults ages 20 and older (n=10,545)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Bhattacharya and Currie (2000)	1988-94 NHANES-III	24-hour recall and nonquantified food frequency	Youth ages 12-16 (n=1,358)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Wilde et al. (1999)	1994-96 CSFII	2 nonconsecutive 24-hour recalls	Low-income individuals (n=1,901)	Participant vs. nonparticipant	Participation dummy	Maximum likelihood estimation
Weimer (1998)	1989-91 CSFII	24-hour recall followed by 2 days of food records	Elderly individuals (n=1,566)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Cook et al. (1995)	1986 CSFII-LI	24-hour recall followed by 2 days of food records	Children ages 1-5 in households under 125% of poverty[2]	Participant vs. nonparticipant	Participation dummy	Bivariate chi-squared tests
Rose et al. (1995)	1989-91 CSFII	24-hour recall followed by 2 days of food records	Children ages 1-5 (n=800)	Participant vs. nonparticipant	Participation dummy	Multivariate regression (weights not used)
Bishop et al. (1992)	1977-78 NFCS-LI	24-hour recall followed by 2 days of food records	FSP-eligible individuals (n=2,590)	Participant vs. nonparticipant	Participation dummy	Stochastic dominance methods
Fraker et al. (1990)	1985 CSFII	4 nonconsecutive 24-hour recalls	WIC-eligible women ages 19-50 (n=381) and their children ages 1-5 (n=818)	Participant vs. nonparticipant	Participation dummy	Multivariate regression and bivariate selection model
Gregorio and Marshall (1984)	1971-73 NHANES-I	24-hour recall	Preschool children (n=2,774), School-aged children (n=3,509)	Participant vs. nonparticipant	Participation dummy; participation interacted with poverty index ratio	Bivariate and multivariate regression
Lopez and Habicht (1987a, 1987b)	1971-73 NHANES-I and 1976-80 NHANES-II	24-hour recall	Low-income elderly (n=1,684 and n=1,388)	Participant vs. nonparticipant	Participation dummy	Multivariate analysis of variance

See notes at end of table.

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Appendix table 3—Studies that examined the impact of the Food Stamp Program on dietary intakes of individuals—Continued

Study	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group IB: Participant vs. nonparticipant comparisons—State and local studies						
Fey-Yensan et al. (2003)	Low-income areas in Connecticut (1996-97)	Food frequency questionnaire	Low-income elderly living in subsidized housing (82% female) (n=200)	Participant vs. nonparticipant	Participation dummy	Chi-square tests and analysis of variance
Perez-Escamilla et al. (2000)	2 pediatric clinics in low-income areas of Hartford, CT (1999)	24-hour recall and 2 food frequency questionnaires	Children ages 8 months to 5 years who were participating in WIC or who had participated in past year (n=99)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Perkin et al. (1988)	1 urban family practice center in Florida (dates for data collection not reported)	24-hour recall	Women ages 18-45 (n=102)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Posner et al. (1987)	1980-81 FNS SSI/ECD	24-hour recall via telephone	Elderly (n=1,900)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Butler et al. (1985)	1980-81 FNS SSI/ECD	24-hour recall via telephone	Low-income elderly individuals (n=1,684)	Participant vs. nonparticipant	Participation dummy	Multivariate regression with selection-bias technique
Futrell et al. (1975)	1 county in Mississippi (1971)	4-day record	Black children ages 4-5 (n=96)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Group IIA: Dose-response estimates—Secondary analysis of national surveys						
Gleason et al. (2000)	1994-96 CSFII/DHKS	2 nonconsecutive 24-hour recalls	Low-income individuals (n=3,935)	Dose-response	Benefit amount	Comparison of regression-adjusted means
Basiotis et al. (1998)	1989-91 CSFII	24-hour recall followed by 2 days of food records	Low-income households (n=1,379)	Dose-response	Participation dummy; benefit amount	Multivariate regression

See notes at end of table.

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Appendix table 3—Studies that examined the impact of the Food Stamp Program on dietary intakes of individuals—Continued

Study	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Rose et al. (1998a)	1989-91 CSFII	24-hour recall followed by 2 days of food records	Nonbreastfeeding preschoolers (n=499)	Dose-response	Benefit amount	Multivariate regression; investigated selection bias
Kramer-LeBlanc et al. (1997)	1989-91 CSFII	24-hour recall followed by 2 days of food records	FSP-eligible individuals (n=793)	Dose-response	Benefit amount	Multivariate regression
Akin et al. (1987)	1977-78 NFCS elderly supplement	24-hour recall followed by 2 days of food records	Elderly individuals (n=5,615)	Dose-response	Participation dummy; bonus value; participation interacted with social security income	Multivariate regression
Basiotis et al. (1987)	1977-78 NFCS-LI	24-hour recall followed by 2 days of food records	FSP-eligible individuals (n=3,000)	Dose-response	Participation dummy; bonus value	Simultaneous equations for food cost/nutrient availability/ nutrient intake relationship
Akin et al. (1985)	1977-78 NFCS elderly supplement	24-hour recall followed by 2 days of food records	Elderly individuals (n=1,315)	Dose-response	Participation dummy; bonus value	Multivariate switching regression model
Group IIB: Dose-response estimates—State and local studies						
Butler and Raymond (1996)	1980-81 FNS SSI/ECD and 1969-73 RIME	24-hour recall via telephone and in-person	Low-income elderly individuals (n=1,542) Low-income individuals in rural areas (n=1,093)	Dose-response	Participation dummy; bonus value	Multivariate endogenous switching model with selection-bias adjustment

See notes at end of table.

Continued—

Appendix table 3—Studies that examined the impact of the Food Stamp Program on dietary intakes of individuals—Continued

Study	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Whitfield (1982)	Tulsa, OK (1978)	24-hour recall	FSP-eligible individuals (n=195)	Dose-response	Participation dummy; bonus value	Multivariate regression
West et al. (1978)	Washington State (1972-73)	Unspecified	Children ages 8-12 (n=728)	Dose-response	Bonus value	Multivariate regression

[1] Data sources:
CSFII = Continuing Survey of Food Intakes by Individuals.
DHKS = Diet and Health Knowledge Survey.
FNS SSI/ECD = Food and Nutrition Service Supplementary Security Income/Elderly Cashout Demonstration.
NFCS = Nationwide Food Consumption Survey.
NFCS-LI = Nationwide Food Consumption Survey - Low Income Supplement.
NHANES = National Health and Nutrition Examination Survey.
RIME = Rural Income Maintenance Experiment.

[2] Sample size not stated.

Appendix table 4—Studies that examined the impact of the Food Stamp Program on other nutrition and health outcomes

Study	Data source[1]	Population sample (sample size)	Design	Measure of participation	Analysis method
Food security: Participant vs. nonparticipant comparisons					
Huffman and Jensen (2003)	1997 longitudinal SPD and 1998 experimental SPD	Low-income households (n=3,733)	Participant vs. nonparticipant	Participation dummy	Simultaneous equation model with 3 probits
Jensen (2002)	2000 April FSS-CPS	FSP and FSP-eligible households (n=6,300)	Participant vs. nonparticipant	Participation dummy	Bivariate ordered probit model
Gunderson and Oliveria (2001)	1991 and 1992 SIPP	Low-income households (n=3,452)	Participant vs. nonparticipant	Participation dummy	Simultaneous equation model with 2 probits
Bhattacharya and Currie (2000)	1988-94 NHANES-III	Youth ages 12-16 (n=1,358)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Perez-Escamilla et al. (2000)	2 pediatric clinics in low-income areas of Hartford, CT (1999)	Children ages 8 months to 5 years who were participating in WIC or had participated in past year (n=99)	Participant vs. nonparticipant	Participation dummy	Chi-square analysis
Cohen et al. (1999)	1996-97 NFSPS	Low-income households (n=3,228)	Participant vs. nonparticipant	Participation dummy	Comparisons of proportions
Alaimo et al. (1998)	1988-94 NHANES-III	Low-income households (n=5,285)	Participant vs. nonparticipant	Participation dummy	Logistic regression (survey weights)
Hamilton et al. (1997)	1995 CPS	Low-income households (n=21,810)	Participant vs. nonparticipant	Participation dummy	Comparison of proportions
Cristofar and Basiotis (1992)	1985-86 CSFII-LI	Low-income women (n=3,398) and low-income children ages 1-5 years (n=1,930)	Participants vs. nonparticipant	Participation dummy; benefit amount	Multivariate regression
Kisker and Devaney (1988)	1979-80 NFCS-LI	Low-income (n~2,900)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests

See notes at end of table.

Continued—

Appendix table 4—Studies that examined the impact of the Food Stamp Program on other nutrition and health outcomes—Continued

Study	Data source[1]	Population sample (sample size)	Design	Measure of participation	Analysis method
Food security: Dose-response estimates					
Rose et al. (1998b)	1989-91 CSFII and 1992 SIPP	All households (n=6,620 and n=30,303)	Dose-response	Annual dollar amount of food stamps	Logistic regression
Food security: Cashout demonstrations					
Fraker et al. (1992)	Alabama cashout demonstration (1990)	FSP participants (n=2,386)	Random assignment of participants to check or coupon	Group membership dummy and benefit amount	Multivariate regression
Ohls et al. (1992)	San Diego cashout demonstration (1990)	FSP participants (n=1,143)	Random assignment of participants to check or coupon	Group membership dummy and benefit amount	Multivariate regression
Davis and Werner (1993)	Alabama ASSETS demonstration (1990)	ASSETS and FSP participants (n=1,371)	Comparison of treatment and matched comparison counties	Group membership dummy and benefit amount	Multivariate regression
Birthweight: Participant vs. nonparticipant comparisons					
Korenman and Miller (1992)	1979-88 NLSY	Infants born to poor women with 2 births between 1979 and 1988 (n~2,568)	Participant vs. nonparticipant	Participation dummy	Multivariate regression; fixed-effects models
Currie and Cole (1991)	1979-87 NLSY	Infants born to poor, young women (n~4,900)	Participant vs. nonparticipant	Participation dummy	Multivariate 2-stage least squares and fixed-effects model
Weight and/or height: Participant vs. nonparticipant comparisons					
Fey-Yensan et al. (2003)	Low-income areas in Connecticut (1996-97)	Low-income elderly living in subsidized housing (82% female) (n=200)	Participant vs. nonparticipant	Participation dummy	Chi-square tests and analysis of variance
Gibson (2003)	1985-96 NLSY	Low-income women, ages 20-40 (n=13,390)[2]	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Jones et al. (2003)	1997 PSID-CDS	Children ages 5-12 from households with incomes <185% of poverty	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Gibson (2001)	1997 NLSY-child supplement	Youth ages 12-17 (n=7,920)	Participant vs. nonparticipant	Participation dummy	Multivariate regression

See notes at end of table.

Continued—

Appendix table 4—Studies that examined the impact of the Food Stamp Program on other nutrition and health outcomes—Continued

Study	Data source[1]	Population sample (sample size)	Design	Measure of participation	Analysis method
Bhattacharya and Currie (2000)	1988-94 NHANES-III	Youth ages 12-16 (n=1,358)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Korenman and Miller (1992)	1986 and 1988 NLSY-child supplement	Children ages 0-7 (n=6,598)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Nutritional biochemistries: Participant vs. nonparticipant comparisons					
Dixon (2002)	1988-94 NHANES-III	Adults ages 20 and older (n=10,545)	Participant vs. nonparticipant (albumin, hemoglobin, serum iron, vitamin C, vitamin E, carotenoids)	Participation dummy	Multivariate regression
Bhattacharya and Currie (2000)	1988-94 NHANES-III	Youth ages 12-16 (n=1,358)	Participant vs. nonparticipant (iron, cholesterol, vitamin A, vitamin C, vitamin E)	Participation dummy	Multivariate regression
Lopez and Habicht (1987b)	1971-73 NHANES-I and 1976-80 NHANES-II	Low-income elderly (n=1,684, NHANES-I) and (n=1,388, NHANES-II)	Participant vs. nonparticipant (iron)	Participation dummy	Multivariate ANOVA
General measures of nutrition or health status: Participant vs. nonparticipant comparisons					
Fey-Yensan et al. (2003)	Low-income areas in Connecticut (1996-97)	Low-income elderly living in subsidized housing (82% female) (n=200)	Participant vs. nonparticipant	Participation dummy	Chi-square tests and analysis of variance
Gibson (2001)	1997 NLSY	Youth ages 12-17 (n=7,920)	Participant vs. nonparticipant	Participation dummy	Multivariate regression

[1] Data sources:
ASSETS = Avenues to Self-Sufficiency through Employment and Training Services.
FSS-CPS = Food Security Supplement of the Current Population Survey.
CPS = Current Population Survey.
CSFII = Continuing Survey of Food Intakes by Individuals.
CSFII-LI = Continuing Survey of Food Intakes by Individuals - Low-Income Samples.
NFCS-LI = Nationwide Food Consumption Survey - Low Income Supplement.
NFSPS = National Food Stamp Program Survey.
NHANES = National Health and Nutrition Examination Survey.
NLSY = National Longitudinal Survey of Youth.
PSID-CDS = Panel Study of Income Dynamics - Child Development Supplement.
SIPP = Survey of Income and Program Participation.
SPD = Survey of Program Dynamics.

[2] Multiple observations for each person, collected annually between 1979 and 1994 and biannually thereafter. Sample size represents person-years.

WIC Program

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Group I: National evaluations						
Rush et al. (1988a) (NWE)	Birthweight, gestational age, likelihood of low birthweight, very low birthweight, and premature birth, and neonatal and infant mortality rates	Vital statistics records for 1,392 counties in 19 States and DC (1972-80)	N/A (Aggregate data analysis)	Trends analysis relating WIC program penetration over time to birth outcomes	WIC penetration index	Multivariate regression
Rush et al. (1988d) (NWE)	Birthweight, gestational age, likelihood of premature birth, and fetal mortality rate	Record abstractions in 174 WIC sites and 55 prenatal clinics(1983-84)	Nationally representative sample of pregnant WIC participants and income-eligible nonparticipants receiving prenatal care in surrounding public health clinics or hospitals (n=3,935)[3]	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Edozien et al. (1979)	Birthweight, gestational age	Primary data collection in 19 WIC sites in 14 States. Data were collected at time of WIC enrollment, approximately every 3 months until delivery, and once after delivery (1973-76)	Postpartum WIC participants who participated prenatally (n~1,000)	Participants, before vs. after, separate groups	Newly enrolling participants vs. participants with varying lengths of participation	Multivariate regression
Group II: Secondary analysis of national surveys						
Finch (2003)	Likelihood of low birthweight	1988 NMIHS	WIC and non-WIC women who were White, Black, or Hispanic with live singleton births that were at least 22 weeks gestation (n=12,814)	Participant vs. nonparticipant	Participation dummy with short- (<6 months) and long-term (6+ months) WIC participation	Multivariate regression

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Kowaleski-Jones and Duncan (2002)	Birthweight	1990-96 NLSY	(1) NLSY children born between 1990 and 1996 (n=1,984) (2) NLSY children born between 1990 and 1996, with at least 1 other sibling born during the same period (n=453 sibling pairs)	Participant vs. nonparticipant	Participation dummy	(1) Multivariate regression (2) Fixed-effects model
Hogan and Park (2000)	Likelihood of low birthweight and very low birthweight	1988 NMIHS	WIC and non-WIC women (n=8,145)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Brien and Swann (1999)	Birthweight, likelihood of low birthweight and premature birth, and neonatal and infant mortality rates	1988 NMIHS	(1) WIC and income-eligible non-Hispanic women who were at nutritional risk (n=7,778) (2) WIC and income-eligible non-Hispanic women with at least 1 live birth prior to 1988 (n=6,254 pairs of births)	Participant vs. nonparticipant	(1) Participation dummies: 1 for ever participated and 1 for participated during first trimester (2) Participation status for each pregnancy	(1) Multivariate regression, including attempt to control for simultaneity and several selection-bias-adjustment models (2) Fixed-effects model; separate models estimated for Blacks and Whites
Moss and Carver (1998)	Neonatal mortality rate	1988 NMIHS	WIC and income-eligible non-Hispanic women (n=7,796)	Participant vs. nonparticipant	Participation dummy with and without Medicaid	Logit analysis
Frisbie et al. (1997)	Likelihood of intrauterine growth retardation, premature birth, and heavy preemie[4]	1988 NMIHS	WIC and non-WIC women (n=8,424)	Participant vs. nonparticipants	Participation dummy	Multivariate regression analysis to identify determinants of birth outcomes

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Covington (1995)	Likelihood of low birthweight and very low birthweight	1988 NMIHS	WIC and non-WIC African American women who received some prenatal care (n=3,905)	Participant vs. nonparticipant	Participation dummy	Multivariate regression. Separate models for LBW vs. normal weight and VLBW vs. normal weight for each of 4 subgroups based on combinations of income and receipt of Medicaid and/or AFDC
Gordon and Nelson (1995)	Birthweight, gestational age, likelihood of low birthweight, very low birthweight, and premature birth, and neonatal and infant mortality rates	1988 NMIHS	WIC and income-eligible women (n=6,170)	Participant vs. nonparticipant	Participation dummy	Multivariate regression and logit analysis. Birthweight analysis included separate models for Blacks and Whites, as well as several alternative models to control for simultaneity.[5, 6] Attempted, but rejected, selection-bias adjustment.
Joyce et al. (1988)	Neonatal mortality rate	1977 Census data for large counties in the U.S.	Data for 677 counties with 50,000+ residents for White analysis and 357 counties with 5,000+ Blacks for Black analysis	Cost-effectiveness study using aggregate data	State-specific number of pregnant women enrolled in WIC per 1,000 State-specific eligible women	Multivariate regression, including selection-bias adjustment. Separate models for Blacks and Whites.
Group III: State-level studies using WIC participation files matched with Medicaid and/or birth record files						
Roth et al. (2004)	Likelihood of low birthweight, very low birthweight, neonatal mortality, postneonatal mortality, infant mortality[7]	Linked WIC, Medicaid, and vital statistics records for births in Florida between January 1996 and the end of December 2000	WIC and non-WIC Medicaid recipients who did not participate in high-risk obstetrical program (n=295,599)	Participant vs. nonparticipant	Participation dummy	Multivariate regression

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Gregory and deJesus (2003)	Likelihood of low birthweight, very low birthweight, neonatal mortality, and infant mortality, length of infants' hospital stay, Medicaid costs	Linked WIC, Medicaid, birth and death record, and hospital discharge files for births in New Jersey between May 1992 and December 1993	WIC and non-WIC Medicaid recipients with live singleton births (n=19,614)	Participant vs. nonparticipant	Participation dummy	Multivariate regression. Separate models for Blacks and non-Blacks
Buescher and Horton (2000)	Birthweight, likelihood of low birthweight and very low birthweight, Medicaid costs	Linked WIC, Medicaid, and birth record files for 1997 births in North Carolina	WIC and non-WIC Medicaid recipients who were enrolled in prenatal care and had live singleton births (n=42,965)	Participant vs. nonparticipant	Participation dummy	Multivariate regression, including several alternative models to control for simultaneity[8]
Ahluwalia et al. (1998)	Likelihood of low birthweight	Linked WIC and birth record files for 1992 births in Michigan	WIC and non-WIC women with full-term births (n=53,782)	Participant vs. nonparticipant	Dose response: Length of prenatal WIC "exposure"[9]	Multivariate regression
Buescher et al. (1993)	Likelihood of low birthweight and very low birthweight, Medicaid costs	Linked WIC, Medicaid, and birth record files for 1988 births in North Carolina	WIC and non-WIC Medicaid recipients who were enrolled in prenatal care (n=21,900)	Participant vs. nonparticipant	Participation dummy and dose-response: Percentage of gestation on WIC	Multivariate regression, including attempt to control for simultaneity[10]
Devaney and Schirm (1993)	Likelihood of neonatal and infant mortality	FNS WIC/Medicaid (1987-88)	WIC and non-WIC Medicaid recipients (n=111,958)	Participant vs. nonparticipant	Participation dummy: Enrolled by 30 weeks gestation	Probit analysis
Devaney (1992)	Likelihood of very low birthweight	FNS WIC/Medicaid (1987-88)	WIC and non-WIC Medicaid recipients (n=111,958)	Participant vs. nonparticipant	Participation dummy	Probit analysis, including attempts to control for simultaneity[11]
Devaney et al. (1990/91)	Birthweight, gestational age, likelihood of premature birth, and Medicaid costs	FNS WIC/Medicaid (1987-88)	WIC and non-WIC Medicaid recipients (n=111,958)	Participant vs. nonparticipant	Participation dummy	Multivariate regression and probit analysis, including attempt to control for simultaneity.[12] Attempted but rejected selection-bias adjustment.

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
New York State (1990)	Birthweight, gestational age, likelihood of low birthweight, very low birthweight, and premature birth, and Medicaid costs	Linked WIC, birth record, and hospital discharge files for births in New York State in the last 6 months of 1988	Singleton births to WIC and non-WIC women (n=132,994)	Participant vs. nonparticipant within 3 groups defined on the basis of insurance coverage (Medicaid, private, none)	Participation dummy	Multivariate regression
Simpson (1988)	Likelihood of low birthweight	Aggregate county-level data for North Carolina, including vital statistics, demographic and service infrastructure characteristics, and program penetration and expenditures (1980-85)	Data for 75 (of 100) counties, all of which provided WIC and other prenatal care services for all county residents (rather than sharing responsibility with another county)	Trends analysis relating WIC penetration over time to birth outcomes	Program "intensity" variable based on county-level WIC expenditures	Multivariate regression
Stockbauer (1987)	Birthweight, gestational age, likelihood of low birthweight, very low birthweight, premature birth, small-for-gestational-age, and neonatal mortality	Linked WIC, birth and death record files for 1982 births in Missouri	Matched WIC and non-WIC women with singleton births (n=9,411 pairs)[13]	Participant vs. matched control	Participation dummy and dose response: Dollar value of redeemed vouchers	Analysis of covariance
Schramm (1986)	Birthweight, likelihood of low birthweight, neonatal mortality rate, and Medicaid costs	Linked WIC, Medicaid, birth record, hospital care, and death record files for 1982 births in Missouri	WIC and non-WIC Medicaid recipients (n=8,546)	Participant vs. nonparticipant	Participation dummy and dose response: WIC food costs adjusted for length of pregnancy	Multivariate regression

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Stockbauer (1986)	Birthweight, gestational age, likelihood of low birthweight, and neonatal mortality rate	Linked WIC, birth, and death record files for 1980 births in Missouri	WIC and non-WIC Missouri residents with singleton births (n=6,732 WIC; sample for non-WIC not reported)	Participants vs. 3 different nonparticipant groups: (1) all non-WIC births; (2) random sample of non-WIC births; (3) matched group of non-WIC births[14]	Participation dummy and dose-response: Duration of participation and dollar value of redeemed WIC coupons	Analysis of covariance. Separate analyses for White, non-White, and total group.
Schramm (1985)	Birthweight, likelihood of low birthweight, Medicaid costs	Linked WIC, Medicaid, birth, and hospital care records for 1980 births in Missouri	WIC and non-WIC Medicaid recipients (n=7,628)	Participant vs. nonparticipant	Participation dummy and dose response: WIC food costs adjusted for length of pregnancy	Analysis of covariance
Kotelchuck, et al. (1984)	Birthweight, gestational age, likelihood of low birthweight, premature birth, small-for-gestational-age birth, and neonatal mortality rate	Linked WIC, birth, and death records for 1978 births in Massachusetts	Matched WIC and non-WIC women with singleton births (n=4,126 pairs)[15]	Participant vs. matched control	Participation dummy and dose response: Months on WIC and percent of pregnancy on WIC	Bivariate comparisons
Group IV: Other State and local studies						
Reichman and Teitler (2003)	Birthweight, likelihood of low birthweight	Standardized data collected for women enrolled in New Jersey's HealthStart program for pregnant Medicaid recipients between 1988 and 1996	All WIC and non-WIC HealthStart participants who had a live singleton birth (n=90,117)	Participant vs. nonparticipant	Participation dummy	Multivariate regression, including attempt to control for simultaneity[16]
Brown et al. (1996)	Birthweight, likelihood of low birthweight, and infant mortality rate	Medical records, birth, and death certificates for births in 1 Indiana hospital between January 1988 and June 1989	Non-Hispanic women who delivered at the area's primary hospital for the "underserved" (n=4,707)	Participant vs. nonparticipant	Participation dummy	Multivariate regression

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Mays-Scott (1991)	Birthweight	WIC records in 1 county health department in Texas (1987-89)	Prenatal WIC participants who were ≤17 years and had at least 1 previous pregnancy (n=217)	Participants, before vs. after	Dose response: Number of months enrolled, nutrition education contacts, and voucher pickups	Analysis of variance
Collins et al. (1985)	Birthweight	Primary data collection in public health department clinics in 6 Alabama counties (1980-81)	WIC and non-WIC pregnant women (n=519)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Metcoff et al. (1985)	Birthweight	Primary data collection at a prenatal clinic in 1 hospital in Oklahoma (1983-84)	Income-eligible pregnant women selected at mid-pregnancy based on predicted birthweight; roughly equivalent numbers were predicted to have average-size babies vs. small or large babies (n=410)	Randomized experiment	Participation dummy	Multivariate regression
Heimendinger et al. (1984)	Birthweight	WIC and medical records in 3 WIC clinics and 4 non-WIC clinics in the same Boston neighborhoods (1979-81)	WIC and Medicaid-eligible infants and toddlers up to 20 months of age with at least 2 height and weight measurements[17] (n=1,907)	Participant vs. nonparticipant	Participation dummy based on mother's participation in WIC during pregnancy	Multivariate regression

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Kennedy and Kotelchuck (1984)	Birthweight, gestational age, likelihood of low birthweight and small-for-gestational-age birth, and fetal death rate	WIC and medical records in WIC sites and non-WIC health facilities in 4 geographic areas of Massachusetts (1973-78) (Reanalysis of data from Kennedy et al., 1982)	Matched WIC and non-WIC pairs of pregnant women (n=418 pairs)[18, 19]	Participant vs. matched control	Participation dummy and dose response: Number of months vouchers received	Bivariate comparisons
Bailey et al. (1983)	Birthweight	Primary data collection at 1 WIC site and 1 non-WIC site in Florida (Dates not reported)	WIC and income-eligible nonparticipants who were 30 weeks pregnant at time of recruitment and receiving identical prenatal care (n=101)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Paige (1983)	Medicaid costs, health care utilization	Medicaid records in 4 counties in Maryland, 2 in which WIC was available and 2 in which WIC was not available (1979-80)	WIC and income-eligible non-WIC women who were on Medicaid for at least 16 weeks during pregnancy (n=114)	Participant vs. nonparticipant	N/A	Comparisons of means and proportions (no statistical tests reported)
Kennedy, et al. (1982)	Birthweight, likelihood of low birthweight	WIC and medical records in WIC sites and non-WIC health facilities in 4 geographic areas of Massachusetts (1973-78)	WIC and WIC-eligible women (n=1,297)[18]	Participant vs. nonparticipant	Participation dummy and dose response: Number of vouchers received, months on WIC	Multivariate regression

See notes at end of table.

Continued—

Appendix table 5—Studies that examined the impact of prenatal WIC participation on birth outcomes, including associated health care costs—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Silverman (1982)	Birthweight, likelihood of low birthweight	Medical records for random sample of women enrolled in Maternity and Infant Care Project (MIC) in Allegheny County, PA, before (1971-74) and after (1974-77) initiation of WIC	WIC and income-eligible nonparticipants (n=2,514)	Participants, before vs. after, separate groups	Participation dummy	Multivariate regression

Notes: N/A = Not applicable.

[1] Data sources:
FNS WIC/Medicaid = FNS' WIC/Medicaid database.
NLSY = National Longitudinal Survey of Youth.
NMIHS = National Maternal and Infant Health Survey.

[2] Unless the description of the study sample indicates that a comparison group was limited to nonparticipants who were income-eligible for WIC or known to be Medicaid participants, all income levels were included in the comparison group. Income was generally controlled for in the analysis if the information was available.

[3] Maximum analysis sample; sample varies by outcome. Birth outcome data were available for only about 75 percent of women in the study.

[4] Intrauterine growth retardation defined as fetal growth ratio of less than 85 percent (observed birthweight at gestational age by mean for gestational age of sex-specific fetal growth distribution). Heavy preemie defined as birthweight of 2,500 gm or more and gestation of less than 37 weeks. (Authors report that mortality rate for heavy preemies may be twice that of normal birthweight infants).

[5] Used three alternative definitions of WIC participation to control for simultaneity in analyses of impacts on birthweight and gestational age: (1) during first 8 months; (2) during first 7 months; (3) during first 6 months. Also estimated model for birthweight that controlled for gestational age.

[6] For all outcomes, estimated basic model as well as separate models for four different cohorts defined by length of gestation thresholds: 28 weeks, 32 weeks, 36 weeks, and 40 weeks.

[7] Authors also examined impacts on birth defects, C-section, and complications during pregnancy and delivery. No significant differences were noted for birth defects or complications during pregnancy and delivery. The rate of C-section was significantly greater for WIC participants.

[8] Alternative models included (1) women who enrolled in WIC after 33 weeks gestation included in the nonparticipant group, (2) three separate cohorts, based on gestational age (29, 33, and 37 weeks), and (3) gestational age as a control variable.

[9] Exposure for women who did participate in WIC was considered high = enrolled before 12 weeks gestation, medium = enrolled at 12-20 weeks gestation, and low = enrolled at 21-37 weeks gestation.

[10] In addition to basic model, estimated alternative model that included women who enrolled in WIC at 36 weeks gestation or later in the nonparticipant group.

[11] Alternative models defined WIC participants as those who enrolled in WIC (1) before 32 weeks gestation and (2) by 30 weeks gestation.

[12] Estimated two alternative models: (1) basic model with addition of control for first-trimester WIC participation and gestational age, (2) basic model with WIC participants who enrolled after 36 weeks considered nonparticipants.

[13] Pairs matched on age, race, education, gravidity, number of births this pregnancy, and marital status.

[14] Pairs matched on age, race, education, number births this pregnancy, smoking during pregnancy, and pre-pregnancy weight.

[15] Pairs matched within catchment area on age, race, parity, education, and marital status.

[16] Included separate model to control for gestational-age bias, but sample was restricted based on initiation of prenatal care (1st or 2nd trimester) rather than timing of WIC enrollment.

[17] The main focus of study was impact of WIC on children's growth; however, the authors compared birthweights of subjects whose mothers were and were not in WIC.

[18] WIC-eligible women included in the nonparticipant group were wait-listed for WIC during their pregnancy, enrolled in WIC postpartum, or women who received prenatal care at non-WIC health care facilities in same neighborhood but never enrolled in WIC.

[19] Approximately 80 percent of women were matched on race, age, parity, marital status, and income. The remainder were matched on four of the five variables.

Appendix table 6—Studies that examined the impact of the WIC program on breastfeeding

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Group I: National evaluations						
Rush et al. (1988c) (NWE)	Breastfeeding initiation and duration	Primary data collection in 174 WIC sites and 55 prenatal clinics (1983-84)	Random sample of infants and children of women included in the longitudinal study of women (see Rush et al., 1988d below) (n=2,370)	Participant vs. nonparticipant	Participation dummy based on age of inception into WIC, including prenatally	Multivariate regression
Rush et al. (1988d) (NWE)	Breastfeeding intention and initiation	Primary data collection in 174 WIC sites and 55 prenatal clinics (1983-84)	Nationally representative sample of pregnant WIC participants and comparison group receiving prenatal care in surrounding public health clinics or hospitals (n=3,935)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Group II: Secondary analysis of national surveys						
Chatterji et al. (2002)	Breastfeeding initiation and duration	1989-95 NLSY	(1) NLSY children born between 1990 and 1995 (n=1,282) (2) Low-income NLSY children born between 1991 and 1995 (n=517) (3) NLSY children born between 1989 and 1995, with at least one other sibling born during the same period (n=970)	Participant vs. nonparticipant	Participation dummy	(1) (2) Multivariate regression, including attempt to control for selection bias (3) Fixed-effects model

See notes at end of table.

Continued—

Appendix table 6—Studies that examined the impact of the WIC program on breastfeeding—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Balcazar et al. (1995)	Breastfeeding intention	1988 NMIHS live births	Mexican-American and non-Hispanic White women who were not undecided about infant feeding plans prior to the infant's birth (n=4,089)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
GAO (1993)	Breastfeeding initiation	1989-92 RLMS	Nationally representative sample of mothers of 6-month-old babies. Analysis included all respondents with complete data for questions of interest (n=79,428)[3]	Prenatal participants vs. nonparticipants and postpartum-only participants	Participation dummy	Multivariate regression
Schwartz et al. (1992)	Breastfeeding initiation and duration	1988 NMIHS	WIC participants and income-eligible nonparticipants (n=6,170)	Participants who received advice to breastfeed compared with participants who did not receive advice and to income-eligible nonparticipants	Participation dummy and advice dummy	3-stage regression with selection-bias adjustment
Ryan et al. (1991)	Breastfeeding initiation and duration	1984 and 1989 RLMS	Respondents in 1984 and 1989 (n=120,334)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Group III: State and local studies						
Tuttle and Dewey (1994)	Breastfeeding initiation	Primary data collection in WIC clinics and neighborhoods in 1 northern California community	Hmong and Vietnamese WIC participants whose youngest child was less than 1 year (n=122)	Participant vs. nonparticipant	Dose response: Number of times previously participated in WIC	Multivariate regression

See notes at end of table.

Continued—

Appendix table 6—Studies that examined the impact of the WIC program on breastfeeding—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Burstein et al. (1991)	Breastfeeding initiation and duration	Primary data collection in Florida and North Carolina (1990-91)	Random sample of WIC and income-eligible infants (6 months old) stratified by birthweight (n=807)	Participant vs. nonparticipant	Participation dummy	Multivariate regression, including attempt to control for selection bias

[1]Data sources:

NLSY = National Longitudinal Survey of Youth.

NMIHS = National Maternal and Infant Health Survey.

RLMS = Ross Laboratories Mother's Survey.

[2]Unless the description of the study sample indicates that a comparison group was limited to nonparticipants who were income eligible for WIC or known to be Medicaid participants, all income levels were included in the comparison group.

[3]Overall response rate for survey was approximately 50 percent. After excluding cases with incomplete data, analysis sample comprised only 34 percent of the initial survey sample.

Appendix table 7—Studies that examined the impact of the WIC program on nutrition and health outcomes of pregnant women

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Group I: National evaluations						
Rush et al. (1988d) (NWE)	Dietary intake, prevalence of anemia, pregnancy weight gain	Primary data collection and record abstractions in 174 WIC sites and 55 prenatal clinics (1983-84). Data were collected at time of enrollment into WIC or prenatal care and again at about 8 months gestation	Nationally representative sample of pregnant WIC participants and comparison group receiving prenatal care in surrounding public health clinics or hospitals (n=3,473)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Edozien et al. (1979)	Dietary intake, hemoglobin, prevalence of anemia, pregnancy weight gain	Primary data collection in 19 sites in 14 States (1973-76). Data were collected at time of WIC enrollment, approximately every 3 months until delivery, and once after delivery	Pregnant women who enrolled in WIC (n~2,885)[3]	(1) Nutritional biochemistries: Participants, before vs. after, separate groups (2) Dietary intake: Participants, before vs. after, same women	Dose response: Newly enrolling participants vs. participants with varying length of participation	Multivariate regression
Group II: Secondary analysis of national survey data						
Mardis and Anand (2000)	Dietary intake	1988-94 NHANES-III	WIC and income-eligible women (n=242)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Kramer-LeBlanc et al. (1999)	Dietary intake	1988-94 NHANES-III	WIC and income-eligible women (n=242)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests

See notes at end of table.

Continued—

Appendix table 7—Studies that examined the impact of the WIC program on nutrition and health outcomes of pregnant women—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Group III: State-level studies using WIC participation files matched with Medicaid and/or birth record files						
Roth et al. (2004)	Pregnancy weight gain	Linked WIC, Medicaid, and vital statistics records for births in Florida between January 1996 and the end of December 2000	WIC and non-WIC Medicaid recipients who did not participate in high-risk obstetrical program (n=295,599)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Group IV: Other State and local studies						
Collins et al. (1985)	Pregnancy weight gain	Primary data collection in public health department clinics in 6 Alabama counties (1980-81)	WIC and non-WIC pregnant women (n=519)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Metcoff et al. (1985)	Variety of nutritional biochemistries	Primary data collection at a prenatal clinic in 1 hospital in Oklahoma (1983-84)	Income-eligible pregnant women selected at mid-pregnancy based on predicted birthweight; roughly equivalent numbers were predicted to have average-size babies vs. small or large babies (n=410)	Randomized experiment	Participation dummy	Multivariate regression
Bailey et al. (1983)	Dietary intake, nutritional biochemistries	Primary data collection at 1 WIC site and 1 non-WIC site in Florida (Dates not reported)	WIC and income-eligible nonparti-cipants were 30 weeks pregnant at time of recruitment and receiving identical prenatal care (n=101)	Participant vs. nonparticipant	Participation dummy	Analysis of variance

See notes at end of table.

Continued—

Appendix table 7—Studies that examined the impact of the WIC program on nutrition and health outcomes of pregnant women—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Kennedy and Gershoff (1982)	Hemoglobin and hematocrit levels	WIC and medical records in WIC sites and non-WIC health facilities in 4 geographic areas of Massachusetts (1973-78)	WIC and WIC-eligible women[4] (n=232)	Participants vs. nonparticipants, before and after	Dose response: Number of WIC vouchers received	Multivariate regression
Endres et al. (1981)	Dietary intake	Dietary recalls for sample of pregnant WIC participants in 22 counties in Illinois (1978-79)	Newly enrolling pregnant WIC participants and participants who were on the program for 6 months or more (n=766)	Participants, before vs. after, separate groups	Participation dummy	Bivariate t-tests

[1] Data source: NHANES = National Health and Nutrition Examination Survey.

[2] Unless the description of the study sample indicates that a comparison group was limited to nonparticipants who were income eligible for WIC or known to be Medicaid participants, all income levels were included in the comparison group.

[3] Approximate maximum; sample size varied for each measure and analysis approach.

[4] Subset of participants in larger study focusing on impact of WIC on birthweight (see table 5). WIC-eligible women included in the nonparticipant group were wait-listed for WIC during their pregnancy, enrolled in WIC postpartum, or were women who received prenatal care at non-WIC health care facilities in same neighborhood but never enrolled in WIC.

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Group I: National evaluations						
Rush et al. (1988c) (NWE)	Dietary intake, weight, height, head circumference, arm circumference and skinfold thickness, immunization status, use of preventive health care, behavior, vocabulary, and memory	Primary data collection in 174 WIC sites and 55 prenatal clinics (1983)	Random sample of infants and children ages 0-4 of women included in the longitudinal study of women (see Rush et al. (1988d) in table 17) (n=2,370)	Participant vs. nonparticipant	Participation dummy based on age of inception into WIC, including prenatally	Multivariate regression
Edozien et al. (1979)	Dietary intake, blood iron measures, height, weight, and head circumference	Primary data collection in 19 WIC sites in 14 States. Data collected at time of WIC enrollment and again after 6 and 11 months of participation (1973-76)	WIC infants and children ages 6-47 (n=16,000+)[3]	Participants, before vs. after	Participation dummy	Multivariate regression
Group II: Secondary analysis of national surveys						
Cole and Fox (2004)	Dietary intake, infant feeding practices, height, weight, variety of nutritional biochemistries, general health status, and dental health	1988-94 NHANES-III, usual intake	WIC and income-eligible children ages 1-4 (n=3,006)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Ponza et al. (2004)	Dietary intake	2002 FITS, usual intake	WIC and non-WIC infants and children ages 2-24 months (n=3,022)	Participant vs. nonparticipant	N/A	Comparison of means and proportions (no statistical tests reported)

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Siega-Riz et al. (2004)	Dietary intake	1994-96 and 1998 CSFII	WIC- and income-eligible children ages 2-5 who were not enrolled in school, in 2 income groups: <130% of poverty (n=1,772) and 130-185% of poverty (n=689)	Participant vs. nonparticipant	Participation dummy	Multivariate regression; investigated but did not implement correction for selection bias
Luman et al. (2003)	Immunization status	2000-01 NIS	WIC and non-WIC children ages 19-35 months (n=21,212)	Participant vs. nonparticipant	Participation dummy, with non-WIC children divided by income eligibility and prior WIC participation: Ineligible, eligible and participated in the past, and eligible but never participated	Multivariate regression
Shefer et al. (2001)	Immunization status	1999 NIS	WIC and non-WIC children ages 24-35 months (n=15,500)	Participant vs. nonparticipant	Participation dummy, with non-WIC children divided by income and prior WIC participation: previously on WIC, never on WIC and income-eligible, and never on WIC and not income-eligible	Bivariate t-tests[4]
Carlson and Senauer (2003)	Physician-reported general health status	1988-94 NHANES-III	Children ages 24-60 months (1) WIC sample: WIC and income-eligible (2) Full sample: WIC and non-WIC	Participant vs. nonparticipant	Participation dummy	Ordered probit equations

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Kranz and Siega-Riz (2002)	Added sugar intake	1994-96 CSFII	WIC and income-eligible children ages 2-5 (n=5,652)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Variyam (2002)	Dietary intake	1994-96 and 1998 CSFII	WIC and income-eligible children ages 1-4 (n=2,509)	Participant vs. nonparticipant	Participation dummy	Multivariate regression; quantile regressions
Burstein et al. (2000)	Dietary intake, height, weight, nutritional biochemistries, immunization status, general health status, dental health, use of preventive health care, and physical, emotional, and cognitive development	1988-94 NHANES-III 1993-95 SIPP 1995-97 CCDP	WIC and income-eligible children NHANES-III = 2,979 (12-59 months) SIPP = 1,302 (1-4 years) CCDP = 2,067 (2 years)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Kowaleski-Jones and Duncan (2000)	Motor skills, social skills, and temperament	NLSY, 1990-96 waves	(1) WIC and non-WIC infants and children (n=1,984)[5] (2) WIC and non-WIC infants and children with at least 1 other sibling born during the same period (n=453 sibling pairs)[5]	Participant vs. nonparticipant	Participation dummy	(1) Multivariate regression (2) Fixed-effects model

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Oliveira and Gundersen (2000)	Dietary intake	1994-96 CSFII	WIC and income-eligible children ages 1-4 in households where at least 1 other person also participated in WIC (n=180)	Participant vs. nonparticipant	Participation dummy	Multivariate regression[6]
Kramer-LeBlanc et al. (1999)	Dietary intake	1988-94 NHANES-III	WIC and income-eligible infants and children ages 2 months-4 years (n=6,636)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Rose et al. (1998)	Dietary intake	1989-91 CSFII	WIC and non-WIC children ages 1-4 who were not breastfeeding and resided in FSP-eligible households (n=499)	Participant vs. nonparticipant	Dose response: Value of monthly household per capita WIC benefit	Multivariate regression; investigated but did not implement adjustment for selection bias
Centers for Disease Control (1995)	Dietary intake, height, and weight	1988-91 NHANES-III	WIC and income-eligible infants and children ages 2-59 months (n=3,488)	Participant vs. nonparticipant	Participation dummy	Multivariate regression (height and weight) Comparison of means (dietary intake)
Rose et al. (1995)	Iron intake	1989-91 CSFII	WIC and non-WIC children ages 1-4 who were not breastfeeding (n=800)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Fraker et al. (1990)	Dietary intake	1985 CSFII	WIC and income-eligible children ages 1-4 (n=445)	Participant vs. nonparticipant	Dose response: Proportion of 4 recall days on which child was enrolled in WIC; also tested for combined WIC and FSP participation	Multivariate regression with selection-bias adjustment

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Group III: Secondary analysis of State-level files						
Lee et al. (2004a)	Number of dental visits per year and use of dental services (preventive, restorative, and emergency)	Longitudinal linked data base, including birth, Medicaid, WIC, and Area Resource files for children born in North Carolina in 1992 (1993-97)	WIC and non-WIC Medicaid recipients ages 1-4 (n=49,795)	Participant vs. nonparticipant	Dose-response: Number of months any WIC vouchers redeemed	Multivariate regression and ordered probit analysis, including 2-stage modeling to control for selection bias
Lee et al. (2004b)	Dental-care-related Medicaid costs	Longitudinal linked data base, including birth record, Medicaid, WIC, and Area Resource files for children born in North Carolina in 1992 (1992-96)	WIC and non-WIC Medicaid recipients ages 0-3 (n=49,795)	Participant vs. nonparticipant	Participation dummy (any participation per year)	Multivariate regression
Buescher et al. (2003)	Health care utilization and costs	Longitudinal linked data base, including birth, Medicaid, and WIC records for children born in North Carolina in 1992. Data base includes data through the 5th birthday (1992-97)	WIC and non-WIC Medicaid recipients ages 12-59 months (n=16,335-21,277 for 4 age-specific cohorts)	Participant vs. nonparticipant	Dose response: Cumulative WIC participation defined as none, high, medium, and low[7]	Multivariate regression; investigated but did not implement selection-bias-adjustment models
Lee et al. (2000)	Prevalence of anemia, failure to thrive, nutritional deficiencies, and use of preventive health care services	Longitudinal linked data base, including birth record, Medicaid, AFDC/TANF, FSP, and WIC files for all children born in Illinois from 1990 through 1996	WIC and non-WIC infants and children ages 0-59 months who received Medicaid benefits continuously	Participant vs. nonparticipant	Participation dummy	Multivariate regression and proportional hazards models[8]
Partington and Nitzke (1999)	Dietary intake	CSFII data for Midwest region (1994)[9]	WIC and income-eligible children ages 2-5 (n=183)	Participant vs. nonparticipant	Participation dummy	Bivariate z-tests

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Sherry et al. (2001)	Prevalence of anemia	PedNSS data for Colorado, New Mexico, Oklahoma, Utah, and Vermont (early 1980s-mid-1990s) (most data provided by WIC programs)	Infants and children ages 6-59 months (5,500-48,000 records per State per year)	Prevalence estimates for each State in 5-year intervals overall and by age, race/ethnicity, gender, birthweight, and type of screening visit	N/A	Trends analysis
Sherry et al. (1997)	Prevalence of anemia	PedNSS data for Vermont (1981-94) (most data provided by WIC programs)	Infants and children ages 6-59 months (n=12,000-19,500 records per year)	Prevalence estimates for each year for overall sample by age	N/A	Trends analysis
Yip et al. (1987)	Prevalence of anemia	(1) PedNSS data for Arizona, Kentucky, Louisiana, Montana, Oregon, and Tennessee (1975-85) (Most data provided by WIC programs) (2) Linked PedNSS and birth records for WIC participants in Tennessee PedNSS database (1975-84)	Infants and children ages 6-60 months (1) (n=499,759) (2) (n=72,983)	(1) Overall and age-specific prevalence estimates for each year: Initial measures vs. followup measures (2) Participant vs. nonparticipant	Participation dummy	(1) Linear regression; angular chi-square (2) Multivariate regression
USDA/FNS (1978)	Hemoglobin, hematocrit, height, and weight	WIC records in PedNSS data for Arizona, Kentucky, Tennessee, and Washington (1974-76)	WIC infants and children ages 0-59 months with 3 or more WIC visits at approximately 6-month intervals (n=5,692)[10]	Participants, before vs. after	Participation dummy	Chi-square tests

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Group IV: Other State and local studies						
Black et al. (2004)	Height, weight, caregiver-perceived health status, and household food security	Primary data collection at urban medical centers in Washington, DC, Baltimore, Minneapolis, Boston, Little Rock, and Los Angeles (1998-2001)	WIC and income-eligible infants younger than 12 months (n=5,923)[11]	Participant vs. nonparticipant	Participation dummy, with non-WIC subjects divided into those who did not participate because of access issues and those who did not perceive a need for WIC	Multivariate regression
Kahn et al. (2002)	Prevalence of anemia	Medical records for 3 WIC sites in Chicago (1997-99)	WIC infants and children ages 6-59 months (n=7,053)	Participants, before vs. after	Participation dummy	Not well described
Shaheen et al. (2000)	Immunization status	Primary data collection (interviews and record abstractions) in a predominantly Hispanic low-income area of Los Angeles (dates not reported)	WIC and non-WIC children ages 2-4 (n=270)	Participant vs. nonparticipant	Participation dummy	Age-adjusted odds ratios
James (1998)	Immunization status	Medical records for 1 health care center in Mt. Vernon, NY	Randomly selected sample (matched on age and gender) of children who were up-to-date on immunizations at 12 months of age; equal size groups (n=150)	Participant vs. nonparticipant	Participation dummy	Chi-square tests

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Burstein et al. (1991)	Dietary intake, hemoglobin, hematocrit, height, weight, and head circumference	Primary data collection in Florida and North Carolina (1990-91)	Random sample of WIC and income-eligible infants (6 months old) stratified by birthweight (n=807)	Participant vs. nonparticipant	Participation dummy	Multivariate regression, including attempt to control for selection bias
Brown and Tieman (1986)	Dietary intake, hemoglobin, hematocrit, height, and weight	Primary data collection in low-income areas of 1 county in Minnesota (dates not reported)	WIC and income-eligible children ages 1-5 (n=52)	Participant vs. nonparticipant	Participation dummy	Chi-square test
Smith et al. (1986)	Hemoglobin	Medical records for 1 health center in Los Angeles; initial and 6-month followup measures	Subset of random sample of WIC and non-WIC children ages 1-4 who were diagnosed with anemia; matched on age, gender, and ethnicity (n=25 each group)	Participants vs. nonparticipants, before and after	Participation dummy	Analysis of variance
Miller et al. (1985)	Serum ferritin, hematocrit, and hemoglobin	Medical records for 1 child and youth clinic in Minneapolis (1973-74 and 1977)	WIC and income-eligible children ages 16-23 months (n~2,225)	Participants, before vs. after, separate groups	Participation dummy	Chi-square tests

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Vazquez-Seone et al. (1985)	Hemoglobin	Medical records for children enrolled in an inner-city health center in New Haven, CT, before and after initiation of WIC	WIC and income-eligible infants and children ages 9-36 months (n=583)	Participants, before vs. after, separate groups	Participation dummy	Bivariate t-tests
Hicks and Langham (1985)	IQ scores and school grades	Primary data collection and record abstractions in 3 counties in rural Louisiana (dates not reported)	Sibling WIC pairs ages 8-10; 1 "participated" in WIC prenatally and 1 enrolled after age 1 (n=19 sibling pairs)	Participant vs. sibling control	Participation dummy	Multivariate regression
Heimendinger et al. (1984)	Expected weight gain[12]	Medical records in 3 WIC and 4 non-WIC clinics in the same Boston neighborhoods (1974-79)	WIC- and Medicaid-eligible infants and toddlers up to 20 months with at least 2 height and weight measurements (n=1,907)	Participant vs. nonparticipant, ("value added"or expected growth vs. actual growth)	Participation dummy	Multivariate regression of "value-added" measures by age group (3-month intervals)
Paige (1983)	Medicaid costs and health care utilization	Medicaid records in 4 counties in Maryland, 2 in which WIC was available and 2 in which WIC was not available (1979-80)	WIC and income-eligible infants ages 0-11 months who were on Medicaid for at least 75% of study period (n=138)	Participant vs. nonparticipant	Participation dummy	Comparison of means and proportions (no statistical tests reported)
Hicks et al. (1982)	Hemoglobin, height, weight, and a variety of intellectual and behavioral measures	Primary data collection and record abstractions in 3 rural counties in Louisiana (dates not reported)	Sibling WIC pairs ages 6-8; 1 "participated" in WIC prenatally and 1 enrolled after age 1 (n=21 sibling pairs)	Participant vs. sibling control	Participation dummy	Multivariate regression

See notes at end of table.

Continued—

Appendix table 8—Studies that examined the impact of the WIC program on nutrition and health outcomes of infants and children—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)[2]	Design	Measure of participation	Analysis method
Weiler et al. (1979)	Hemoglobin	WIC records in 1 clinic in Fayette Co, KY (1976-77)	Infants ages 0-6 months initially certified for WIC because of anemia who had followup hemoglobin measure available (n=37)	Participants, before vs. after	Participation dummy	Bivariate t-tests

Note: N/A = Not applicable.

[1]Data sources:

CCDP = Comprehensive Child Development Programs.

CSFII = Continuing Survey of Food Intakes by Individuals.

FITS = Feeding Infants and Toddlers Study.

NHANES-III = Third National Health and Nutrition Examination Survey.

NIS = National Immunization Survey.

NLSY = National Longitudinal Survey of Youth.

PedNSS = Pediatric Nutrition Surveillance System.

SIPP = Survey of Income and Program Participation.

[2]Unless the description of the study sample indicates that a comparison group was limited to nonparticipants who were income-eligible for WIC or known to be Medicaid participants, all income levels were included in the comparison group. Income was generally controlled for in the analysis.

[3]Definition of comparison group varies for different outcomes. Children who never participated in WIC were main comparison group and were compared with former and/or current WIC participants.

[4]Also estimated a multivariate model of the relationship between intensity of WIC immunization activities and immunization coverage rates for WIC participants.

[5]Roughly half of the sample was assessed in the first year of life and half was assessed between their first and second birthdays.

[6]Authors also ran regression for full sample of WIC and income-eligible children. That model resulted in more significant effects.

[7]WIC participation defined based on percentage of months from age 1 through current age in which WIC vouchers had been redeemed. High = more than 66 percent, Medium = 34-66 percent, and Low = 33 percent or less.

[8]To control for the fact that several outcomes under study might be reasons for WIC enrollment, WIC participation was coded as zero if diagnosis of a particular problem preceded the date of WIC enrollment.

[9]CSFII data included two recalls per subject, but authors used only the first recall. Used only data for 1994 because, at the time the study was conducted, only that portion of the 1994-96 data set had been coded for food group consumption.

[10]Maximum sample; sample size varies for each outcome.

[11]Information on income was not collected. Receipt of private health insurance was used as a proxy for income, and the non-WIC sample was limited to infants without private insurance.

[12]A doctoral dissertation completed by Heimendinger in 1981 included data on height and weight-for-height. However, these data were dropped from the peer-reviewed journal article because of substantial problems with missing data.

Appendix table 9—Studies that examined the impact of the WIC program on nutrition and health outcomes of nonbreastfeeding postpartum women, breastfeeding women, all WIC participants, or WIC households

Study	Outcome(s)	Data source[1]	Population (sample size)	Design	Measure of participation	Analysis method
Nonbreastfeeding postpartum women						
Pehrsson et al. (2001)	Dietary iron intake, several biochemical indicators of iron status	WIC sites in Maryland with differing policies for certifying low-risk postpartum women (1994-95)	Low-risk WIC and income-eligible postpartum (nonbreastfeeding) women (n=110)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests, chi-square tests, and analysis of variance
Kramer-LeBlanc et al. (1999)	Dietary intake	1988-94 NHANES-III	WIC and income-eligible postpartum (nonbreastfeeding) women (n=190)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Caan et al. (1987)	Birthweight, birth length, weight status, hemoglobin, prevalence of anemia	47 local WIC agencies in California (1983)	Pregnant WIC participants, some of whom had extended postpartum WIC participation for a previous pregnancy and some of whom had limited or no postpartum WIC participation (n=642)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Breastfeeding women						
Kramer-LeBlanc et al. (1999)	Dietary intake	1988-94 NHANES-III	WIC and income-eligible breastfeeding women (n=56)	Participant vs. nonparticipant	Participation dummy	Bivariate t-tests
Argeanas and Harrill (1979)	Dietary intake	1 local WIC agency in Colorado and 1 unaffiliated prenatal clinic (1978)	WIC and non-WIC breastfeeding women (n=16)	Participant vs. nonparticipant, before and after	Participation dummy	Bivariate t-tests
WIC households or all WIC participants						
Wilde et al. (2000)	Dietary intake	1994-96 CSFII	Low-income households (n=1,901)	Participant vs. nonparticipant	Participation dummy	Maximum likelihood estimation

See notes at end of table.

Continued—

Appendix table 9—Studies that examined the impact of the WIC program on nutrition and health outcomes of nonbreastfeeding postpartum women, breastfeeding women, all WIC participants, or WIC households—Continued

Study	Outcome(s)	Data source[1]	Population (sample size)	Design	Measure of participation	Analysis method
Basiotis et al. (1998)	Dietary intake	1989-91 CSFII	Low-income households (n=1,379)	Dose-response	Participation dummy; benefit amount	Multivariate regression
Arcia et al. (1990)	Food expenditures	NWE (1983-84)	Nationally representative sample of pregnant WIC participants and income-eligible nonparticipants receiving prenatal care in surrounding public health clinics and hospitals (n=3,935)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Taren et al. (1990)	Food intake	Food cooperatives and EFNEP programs in Hillsborough Country, Florida (dates not reported)	Low-income households (n=157)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Rush et al. (1988b)	Food expenditures	Primary data collection (1983-84)	Nationally representative sample of pregnant WIC participants and income-eligible nonparticipants receiving prenatal care in surrounding public health clinics and hospitals (n=3,935)	Participant vs. nonparticipant	Participation dummy	Multivariate regression

[1]Data sources:
CSFII = Continuing Survey of Food Intakes by Individuals.
EFNEP = Expanded Food and Nutrition Education Program.
NWE = National WIC Evaluation.
NHANES-III = Third National Health and Nutrition Examination Survey.

National School Lunch Program

Appendix table 10—Studies that examined the impact of the National School Lunch Program on students' dietary intakes

Study	Outcome(s)	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group I: National evaluations							
Devaney et al. (1993) (SNDA-I)	Nutrient intake at lunch and over 24 hours Food intake at lunch	Nationally representative sample of students from 329 public and private schools (1991-92)	Single 24-hour recall	Children and adolescents in grades 1-12 (n~3,350)	Participant vs. nonparticipant	Ate NSLP lunch on recall day	Multivariate regression with selection-bias-adjustment (nutrients) Bivariate t-tests (foods)
Wellisch et al. (1983) (NESNP)	Nutrient intake at lunch and over 24 hours	Nationally representative sample of students from 276 public schools (1980-81)	Single 24-hour recall	Children and adolescents in grades 1-12 (n=6,556)	Participant vs. nonparticipant	Ate NSLP lunch on recall day	Multivariate regression
Group II: Secondary analysis of national surveys							
Gleason and Suitor (2003)	Nutrient intake at lunch and over 24 hours	1994-96 CSFII	2 nonconsecutive 24-hour recalls	Children and adolescents ages 6-18 with 2 days of intake data (n=1,614)	Participant vs. nonparticipant	Ate NSLP lunch on recall day	Multivariate regression with fixed-effects model to control for selection bias
Gleason and Suitor (2001)	Nutrient intake at lunch and over 24 hours Food intake at lunch and over 24 hours	1994-96 CSFII	2 nonconsecutive 24-hour recalls	Children and adolescents ages 6-18 with 1 or 2 school days of intake data (n=1,866)	Participant vs. nonparticipant	Ate NSLP lunch on recall day	Comparison of regression-adjusted means
Fraker (1987)	Nutrient intake at lunch and over 24 hours	1980-81 NESNP	Single 24-hour recall	Children and adolescents in grades 1-12 (n=6,556)	Participant vs. nonparticipant	Ate NSLP lunch on recall day	Bivariate t-tests for full sample and low-income sample

See notes at end of table.

Continued—

Appendix table 10—Studies that examined the impact of the National School Lunch Program on students' dietary intakes—Continued

Study	Outcome(s)	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Akin et al. (1983a)	Nutrient intake over 24 hours	1977-78 NFCS	24-hour recall plus 2-day food record	Children and adolescents ages 6-18 (n=1,554)	Participant vs. nonparticipant[2,3]	Ratio of number of days ate school lunch to number of days of dietary data	Multivariate regression
Akin et al. (1983b)	Nutrient intake over 24 hours	1977-78 NFCS	24-hour recall plus 2-day food record	Children and adolescents ages 6-18 (n=1,554)	Participant vs. nonparticipant[4]	Ratio of number of days ate school lunch to number of days ate any lunch	Switching regression; Chow tests
Hoagland (1980)	Nutrient intake over 24 hours	1971-74 NHANES-I	Single 24-hour recall	Children and adolescents ages 6-21 (n=3,155)	Participant vs. nonparticipant[2]	Ate school lunch on recall day	Analysis of variance
Group IIIA: State and local studies with large samples							
Rainville (2001)	Nutrient intake at lunch Food intake at lunch	Students in 10 schools in southeastern Michigan (1998)	Visual observation of food selection and waste	Children in grades 2-4 (n=570)	Participant vs. nonparticipant	Ate school lunch on observation day (vs. sack lunch)	Analysis of variance
Melnick et al. (1998)	Food intake over 24 hours	All students in randomly selected classrooms in 25 sampled public and private schools in New York City (1989-90)	Single 24-hour recall (nonquantitative)	Children in grades 2 and 5 (n=1,397)	Participant vs. nonparticipant[2]	Ate school lunch on recall day	Gender-adjusted anlaysis of covariance
Wolfe and Campbell (1993)	Food intake at lunch	Students in 51 schools in New York State, excluding New York City (1987-88)	Single 24-hour recall (nonquantitative)	Children in grades 2 and 5 (n=1,797)	Participant vs. nonparticipant	Ate school lunch on recall day	Bivariate t-tests and chi-square tests

See notes at end of table.

Continued—

Appendix table 10—Studies that examined the impact of the National School Lunch Program on students' dietary intakes—Continued

Study	Outcome(s)	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Price et al. (1978)	Nutrient intake over 24 hours	Students in schools/districts in 8 regions in Washington State, Blacks and Mexican-Americans were oversampled (1971-73)	3 nonconsecutive 24-hour recalls, including 1 weekend day	Children ages 8-12 (n=728)	Participant vs. nonparticipant	Participation dummies based on usual frequency: 0-1 time per week, 2-3 times per week, 4-5 times per week	Multivariate regression
Emmons et al. (1972)	Nutrient intake at lunch and over 24 hours	All students in selected grades in 1 district in rural New York State (1970-71)[5]	Single 24-hour recall	Children in grades 1-4 (n=512)	Participants, before vs. after[6]	Took 70% or more of school meals offered during study period	Comparison of means (type of statistical test not reported)
U.S. Department of Health, Education, and Welfare (HEW) (10-State Nutrition Survey)	Nutrient intake over 24 hours	Sample of children from 10 States, plus volunteers (1972)	Single 24-hour recall	Children and adolescents ages 10-16 (n=8,495)	Participant vs. nonparticipant[2]	Usually ate school lunch at least 3 times/week	Comparison of means (no statistical tests reported)
Group IIIB: State and local studies with small samples							
Cullen et al. (2000)	Food intake at lunch	Students in 1 middle school in Texas (dates not reported)	5 consecutive daily food records	Children in grade 5 (n=282)	Participant vs. nonparticipant	Ate NSLP lunch (vs. home lunch or snack bar lunch) on food record days	Analysis of variance
Ho et al. (1991)	Nutrient intake at lunch	Students in 1 middle school in Salt Lake City (1989)	Visual observation of food selection and waste	Children and adolescents in grades 7 and 8 (n=254)	Participant vs. nonparticipant	Ate NSLP lunch (vs. sack lunch or vending machine lunch) on observation day	Analysis of variance and Student-Newman-Keuls range test
Perry et al. (1984)	Nutrient intake at lunch	All students in selected classrooms in 3 schools in 1 district in Alabama	3-day food record	Children in grades 5 and 6 (n=233)	Participant vs. nonparticipant[7]	Ate NSLP lunch (vs. brown bag lunch) on food record days	Unmatched t-test

See notes at end of table.

Continued—

Appendix table 10—Studies that examined the impact of the National School Lunch Program on students' dietary intakes—Continued

Study	Outcome(s)	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Howe and Vaden (1980)	Nutrient intake at lunch and over 24 hours	Randomly selected students in 1 urban public high school in Kansas	Single 24-hour recall	Adolescents in grades 10 and 11 (n=104)	Participant vs. nonparticipant	Ate NSLP lunch on recall day	2-way analysis of variance
Yperman and Vermeersch (1979)	Food intake over 24 hours	All students in 2 classrooms per grade in 2 schools in California	Food frequency checklist	Children in grades 1-3 (n=307)	Participant vs. nonparticipant	Number of days ate school lunch on 5 days prior to data collection	Multivariate regression

[1] Data sources:
CSFII = Continuing Survey of Food Intakes by Individuals.
NHANES-I = First National Health and Nutrition Examination Survey.
NFCS = Nationwide Food Consumption Survey.

[2] Did not differentiate NLSP and other lunch programs.

[3] Included lunch skippers with nonparticipants.

[4] Accounted for lunch skippers.

[5] Study included a second district where both free lunch and free breakfast were offered. The two districts were considered separately in the analysis, but the analysis of the second district did not separate contributions of breakfast and lunch meals.

[6] Study compared intakes before and after introduction of a free lunch program. Results were reported for four different subgroups based on baseline characteristics: nutritionally adequate, nutritionally needy, low-income (eligible for free lunch), and not low-income.

[7] Unit of analysis was lunches rather than students; 60 percent of students ate NSLP daily.

Appendix table 11—Studies that examined the impact of the National School Lunch Program on other nutrition and health outcomes

Study	Data source[1]	Population (sample size)	Design	Measure of participation	Analysis method
Weight and/or height					
Jones et al. (2003)	1997 PSID, Child Development Supplement	Children ages 5-12 with household incomes ≤185% of poverty (n=772)	Participant vs. nonparticipant	Parent report that child "participates"	Multivariate regression
Wolfe et al. (1994)	Students in 51 schools in New York State, excluding New York City (1987-88)	Children in grades 2 and 5 (n=1,797)	Participant vs. nonparticipant	Parent report that "child eats school lunch"	Multivariate regression
Wellisch et al. (1983) (NESNP)	Nationally representative sample of students from 276 public schools (1980-81)	Children and adolescents in grades 1-12 (n=6,556)	Participant vs. nonparticipant	Average long-term weekly participation	Multivariate regression
Gretzen and Vermeersch (1980)[2]	All students in 2 intervention programs and 2 comparison programs in 1 SFA in California	Children and adolescents in grades 1-8 (n=332)	Participant vs. nonparticipant	Began receiving free school lunch in grade 1 and regularly through grade 8	Analysis of variance; bivariate t-tests
Emmons et al. (1972)	All students in selected grades in 1 district in rural New York State (1970-71)[3]	Children in grades 1-4 (n=844)	Participants, before vs. after[4]	Took 70% or more of school meals offered during study period	Comparison of means (type of statistical test not reported)
Paige (1972)	Students in 4 schools in Baltimore, MD	Children in grades 1, 2, and 6 (n=742)	Participant vs. nonparticipant, before and after	Not reported	Comparison of means (type of statistical test not reported)
Nutritional biochemistries					
Kandiah and Peterson (2001)	Students in 1 school in Indiana	Children/adolescents ages 11-15 (n=3,155)	Participants, before vs. after (cholesterol)	Ate school lunch at least 3 times per week	Multivariate regression
Hoagland (1980)	1971-74 NHANES-I	Children and adolescents ages 6-21 (n=3,155)	Participant vs. nonparticipant[5] (iron, cholesterol, protein)	Ate school lunch on recall day	Linear regression

See notes at end of table.

Continued—

Appendix table 11—Studies that examined the impact of the National School Lunch Program on other nutrition and health outcomes—Continued

Study	Data source[1]	Population (sample size)	Design	Measure of participation	Analysis method
Emmons et al. (1972)	All students in 2 selected grades in 1 district in rural New York State (1970-71)[3]	Children in grades 1-4 (n=844)	Participants, before vs. after (iron)	Took 70% or more school meals offered during study period[4]	Comparison of means (type of statistical test not reported)
Paige (1972)	Students in 4 schools in Baltimore, MD	Children in grades 1, 2, and 6 (n=742)	Participants vs. nonparticipants, before and after (iron)	Not reported	Comparison of means (type of statistical test not reported)
Household food expenditures					
Long (1991)	1980-81 NESNP	Children and adolescents in grades 1-12 (n=5,778)	Participant vs. nonparticipant	Any household member participates in NSLP at least once during a typical week	Multivariate regression with selection-bias adjustment[6]
Wellisch et al. (1983) (NESNP)	Nationally representative sample of students in 276 public schools (1980-81)	Children and adolescents in grades 1-12 (n=6,556)	Participant vs. nonparticipant	Current weekly NSLP participation	Multivariate regression
West and Price (1976)	Students in schools/ districts in 8 regions in Washington State; Blacks and Mexican-Americans were oversampled (1972-73)	Children ages 8-12 (n=992)	Participant vs. nonparticipant	Value of free school lunches (dollars per month)	Multivariate regression. Separate models for Blacks, Whites, Mexican-Americans.

[1] Data sources:
NESNP = National Evaluation of School Nutrition Programs.
NHANES-I = First National Health and Nutrition Examination Survey.
PSID = Panel Study of Income Dynamics, Child Development Supplement.

[2] Study also examined physical fitness, school attendance, and academic performance.

[3] Study included a second district where both free lunch and free breakfast were offered. The two districts were considered separately in the analysis, but the analysis of the second district did not separate contributions of breakfast and lunch meals.

[4] Study compared intakes before and after introduction of a free lunch program. Results reported for four different subgroups based on baseline characteristics: nutritionally adequate, nutritionally needy, low-income (eligible for free lunch), and not low-income.

[5] Did not differentiate NLSP and other lunch programs.

[6] Participation measure not same week as expenditure measure; included NSLP and SBP in expenditures.

School Breakfast Program

Appendix table 12—Studies that examined the impact of the School Breakfast Program on students' dietary intakes

Study	Outcome(s)	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group I: National evaluations							
Devaney and Stuart (1998) (SNDA-I)	Likelihood of eating breakfast	Nationally representative sample of students from 329 public and private schools	Single 24-hour recall	Children and adolescents in grades 1-12 (n=2,966)	Participant vs. nonparticipant	Ate SBP breakfast on recall day	Multivariate regression with selection-bias adjustment
Gordon et al. (1995) (SNDA-I)	Nutrient intake at breakfast and over 24 hours Food intake at breakfast	Nationally representative sample of students from 329 public and private schools	Single 24-hour recall	Children and adolescents in grades 1-12 (n=2,966)	Participant vs. nonparticipant	Ate SBP breakfast on recall day	Multivariate regression with selection-bias adjustment (nutrients) Bivariate t-tests (foods)
Wellisch et al. (1983) (NESNP)	Nutrient intake at breakfast and over 24 hours[2]	Nationally representative sample of students from 276 public schools	Single 24-hour recall	Children and adolescents in grades 1-12 (n=2,180)	Participant vs. nonparticipant	Ate SBP breakfast and NSLP lunch on recall day (nonparticipants ate NSLP lunch only)	Multivariate regression
Group II: Secondary analysis of national surveys							
Gleason and Suitor (2001)	Nutrient intake at breakfast and over 24 hours Food intake at breakfast and over 24 hours	1994-96 CSFII	2 nonconsecutive 24-hour recalls	Children and adolescents in SBP schools ages 6-18 (n=2,693)	Participant vs. nonparticipant	Ate SBP breakfast on recall day	Comparison of regression-adjusted means
Basiotis et al. (1999)	Nutrient intake over 24 hours Food intake over 24 hours	1994-96 CSFII	2 nonconsecutive 24-hour recalls	Low-income children ages 6-18 (sample size not reported)	Participant vs. nonparticipant	Ate SBP breakfast on recall day	Multivariate regression
Devaney and Fraker (1989)	Nutrient intake at breakfast and over 24 hours	1980-81 NESNP	Single 24-hour recall	Children ages 5-10 (n=2,118) and 11-21 (n=2,809)	Participant vs. nonparticipant	Ate SBP breakfast on recall day	Multivariate regression

See notes at end of table.

Continued—

Appendix table 12—Studies that examined the impact of the School Breakfast Program on students' dietary intakes—Continued

Study	Outcome(s)	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Hoagland (1980)	Nutrient intake over 24 hours[2]	1971-74 HANES-I	Single 24-hour recall	Children and adolescents ages 6-21 (n=412)[3]	Participant vs. nonparticipant	Ate school breakfast on recall day	Analysis of variance
Group III: State and local studies							
Nicklas et al. (1993a)	Nutrient intake at breakfast	Bogalusa Heart Study (1984-85 and 1987-88)	Single 24-hour recall	Children age 10 (n=393)	Participant vs. nonparticipant	Ate school breakfast on recall day	Analysis of variance
Nicklas et al. (1993b)	Nutrient intake over 24 hours	Bogalusa Heart Study (1984-85 and 1987-88)	Single 24-hour recall	Children age 10 (n=393)	Participant vs. nonparticipant	Ate school breakfast on recall day	Analysis of variance
Emmons et al. (1972)	Nutrient intake at breakfast and over 24 hours[2]	All students in 2 school districts in rural New York State (1970-71)	Single 24-hour recall	Children in grades 1-4 (n=844)	Participants, before vs. after[4]	Took 70% or more of school meals offered during study period	Comparison of means (type of statistical test not reported)
Hunt et al. (1979)	Nutrient intake over 24 hours	2 schools in Compton, CA (1970-71)	Single 24-hour recall	Children in grades 3-6 (n=555)	Participant vs. nonparticipant[5]	60% participation in SBP on days in school during experimental period	Analysis of variance
Price et al. (1978)	Nutrient intake over 24 hours	Students in schools/districts in 8 regions in Washington State; Blacks and Mexican-Americans were oversampled (1971-73)	3 nonconsecutive 24-hour recalls, including 1 weekend day	Children ages 8-12 (n=728)[6]	Participant vs. nonparticipant	Usually ate school breakfast 4-5 times/week	Multivariate regression

See notes at end of table.

Continued—

Appendix table 12—Studies that examined the impact of the School Breakfast Program on students' dietary intakes—Continued

Study	Outcome(s)	Data source[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group IV: Studies of universal-free breakfast							
McLaughlin et al. (2002)	Nutrient intake at breakfast and over 24 hours Food intake at breakfast and over 24 hours[2,7]	70 matched pairs of school units in 6 school districts[8]	24-hour recall, with second recall for subsample (usual intake)	Children in grades 2-6 (n=4,290)	Randomized experiment	Ate universal-free breakfast on recall day[9]	Multivariate regression with Bloom correction to assess impact on universal-free breakfast participants (subgroup analyses)
Cook et al. (1996)	Nutrient intake at breakfast	Elementary schools in Central Falls, RI, matched with schools in Providence, RI	Single breakfast recall	Children in grades 3-6 (n=225)	Participant vs. nonparticipant	Ate SBP breakfast on recall day	Not well described.

[1] Data sources:
CSFII = Continuing Survey of Food Intake of Individuals.
NHANES-I = First National Health and Nutrition Examination Survey.
NESNP = National Evaluation of School Nutrition Programs.

[2] Also examined impacts on height and/or weight, but reported no significant findings.

[3] The study compared SBP participants with students who did not have access to the SBP. Only three SBP participants were included in the sample.

[4] Study compared intakes before and after introduction of free lunch (one district) and free lunch and breakfast (one district). Results reported for four different subgroups based on baseline characteristics: nutritionally adequate, nutritionally needy, low-income (eligible for free lunch), not low income.

[5] Study examined the effect of introducing a free breakfast program, comparing students in experimental school to control school that had no breakfast program.

[6] School breakfast was not the main focus of the study. Only 20 children in the sample consumed a school breakfast.

[7] The study also examined impacts on BMI and food security and found no significant effects.

[8] The study focused on students in grades 2-6. For sampling/matching purposes, schools with different grade configurations (e.g., K-2 and 3-5) were considered one unit. There were a total of 73 treatment schools and 70 control schools.

[9] The study's main analysis compared outcomes for the entire treatment group with outcomes for the entire control group. Findings discussed in this report, however, are from a separate analysis that estimated impacts on students who actually participated in universal-free breakfast on the day of the recall.

Appendix table 13—Studies that examined the impact of universal-free breakfast programs on school performance and behavioral/cognitive outcomes

Study	Outcomes	Data source	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Peterson et al. (2003)	Attendance, academic achievement, health, and discipline	455 schools in Minnesota (1998-2002)	School records and standardized test scores	All children for attendance measures; children in grades 3 and 5 for academic measures (n=43,067)	Participant vs. nonparticipant	Enrolled in universal-free SBP school	Logistic regression
McLaughlin et al. (2002)	Cognitive functioning, attendance, tardiness, behavior academic achievement, student health status[1]	70 matched pairs of school units in 6 school districts (1999-2001)[2]	School records and standardized test scores	Children in grades 2-6 (n=4,290)	Randomized experiment	Ate universal-free breakfast on day of measurement (short-term cognitive functioning)[3] Cumulative participation in universal-free breakfast over the year (all other measures)[3]	Multivariate regression with Bloom correction to asses impact on universal-free breakfast participants (subgroup analysis)
Murphy et al. (2001a)	Attendance and academic achievement	48 schools in Baltimore (1995-2000)	School records and standardized test scores	All children in sample schools (n=not stated)	Participants, before vs. after, separate groups, plus participants vs. nonparticipants, before and after	Enrolled in universal-free SBP school	Analysis of variance

See notes at end of table.

Continued—

Appendix table 13—Studies that examined the impact of universal-free breakfast programs on school performance and behavioral/cognitive outcomes—Continued

Study	Outcomes	Data source	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Murphy et al. (2001b)	Attendance, tardiness, academic achievement	55 schools in Maryland (1997-2000)	School records and standardized test scores	Varied by outcome for both schools and students	Participants, before vs. after, separate groups, plus participants vs. nonparticipants, before and after	Enrolled in universal-free SBP school	Analysis of variance; bivariate t-tests
Murphy et al. (2000)	Attendance, tardiness, academic achievement, emotional functioning	30 schools in Boston, MA (1998-2000)	School records, standardized test scores, parent and student interviews	All children in sample schools (n=not stated)	Participants, before vs. after	Frequency of eating breakfast during 1 index week	Analysis of variance
Murphy et al. (1998)	Attendance, psychological measures, academic achievement	1 school in Baltimore; 2 schools in Philadelphia (dates not reported)	School records and parent, teacher, and student interviews	Children in grades 3-8 (n=133)[4]	Participants, before vs. after	Frequency of eating breakfast during 1 index week	Logistic regression
Cook et al. (1996)	Attendance, tardiness	All elementary schools in Central Falls, RI, matched with schools in Providence, RI (1994)	School records	Children in grades Pre-K-6 (n=not reported)	Participant vs. nonparticipant	Enrolled in universal-free SBP school	Not well described
Meyers et al. (1989)[5]	Attendance, tardiness, academic achievement	16 schools in Lawrence, MA (1985-87)	School records and standardized test scores	Children in grades 3-6 (n=1,023)	Participant vs. nonparticipant	Ate SBP on 3 of 5 days during 1 selected week during school year	Multivariate regression

[1]The study also examined impacts of BMI and food security and found no effects.

[2]The study focused on students in grades 2-6. For sampling/matching purposes, schools with different grade configurations (e.g., K-2 and 3-5) were considered as one school unit. There were a total of 73 treatment schools and 70 control schools.

[3]The study's main analysis compared outcomes for the entire treatment group with outcomes from the entire control group. Findings discussed in this report, however, are from a separate analysis that estimated impacts based on students' actual participation in universal-free breakfast. Impacts on short-term outcomes were estimated on the basis of participation on the day of measurement and impacts on longer term outcomes were estimated on the basis of cumulative participation over the year.

[4]For school-recorded data (maximum sample). Sample sizes varied for interview data (n=85) and teacher ratings (n=76).

[5]The Meyers et al. study (1989) was not a study of universal-free breakfast. The study compared outcomes in schools that did and did not implement the SBP.

Nutrition Services Incentive Program (formerly the Nutrition Program for the Elderly

Note: This research actually focused on the Elderly Nutrition Program (ENP), which is sponsored by the U.S. Department of Health and Human Services. USDA's Nutrition Program for the Elderly (NPE), now known as the Nutrition Services Incentive Program, provided supplemental commodities to ENP delivery sites, based on a per meal reimbursement rate.

Appendix table 14—Studies that examined the impact of the Elderly Nutrition Program on nutrition and health outcomes

Study	Outcome(s)	Data sources[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Group I: National evaluations							
Ponza et al. (1996) (National Evaluation of the ENP—1993-95)	Dietary intake and social contacts	Random sample of ENP participants (both congregate and home-delivered) and random sample of nonparticipants selected from HCFA Medicare beneficiary file (1993-95)	24-hour dietary recall and in-person interview	ENP-eligible elderly (n=2,699)	Participant vs. nonparticipant	Received ENP meal on dietary recall day (did not necessarily consume it)	Multivariate regression; attempted to control for selection bias
Kirschner and Associates and Opinion Research Corporation - Wave II (1983)	Dietary intake and socialization	Participants in 70 randomly selected ENP sites (both congregate and home-delivered), random sample of participants' neighbors, and former participants (1976-77)	24-hour dietary recall and isolation index	ENP-eligible elderly (n=3,411)	Participant vs. nonparticipant and comparisons to Wave I participants still enrolled in congregate sites	Ate ENP meal on dietary recall day	Chi-square tests
Kirschner and Associates and Opinion Research Corporation - Wave I (1979)	Dietary intake and socialization	Participants in 91 randomly selected ENP sites (congregate only) and random sample of participants' neighbors (1982)	24-hour dietary recall and isolation index	ENP-eligible elderly (n=4,563)	Participant vs. nonparticipant	Ate ENP meal on dietary recall day	No statistical tests conducted
Group IIA: State and local studies of congregate meals							
Gilbride et al. (1998)	Dietary intake and nutritional risk	Residents in HUD elderly housing facilities in metropolitan New York City; nonparticipants from facilities that did not have ENP (dates not reported	2 24-hour dietary recalls, food frequency, 5-day food records, and level-one screen from Nutrition Screening Initiative checklist	ENP-eligible elderly (n=40)	Participant vs. nonparticipant	Currently receiving ENP meals	No statistical tests conducted

See notes at end of table.

Continued—

Appendix table 14—Studies that examined the impact of the Elderly Nutrition Program on nutrition and health outcomes—Continued

Study	Outcome(s)	Data sources[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Neyman et al. (1996)	Dietary intake, weight status, nutritional biochemsitries	Participants and nonparticipants at 9 ENP sites in 2 northern California counties (dates not reported)	3-day food record, venous blood sample, height and weight	ENP-eligible elderly (n=135)	Participant vs. nonparticipant	Ate ENP meal on at least 1 food record day	Multifactorial analysis of variance
Czajka-Narins et al. (1987)	Dietary intake, weight status, and nutritional biochemistries	Participants in 6 ENP sites in Missouri; nonparticipants from senior center that did not serve meals (dates not reported)	1-day food record, 24-hour recall, food frequency, venous blood sample, height, weight, and tricep skinfolds	ENP-eligible elderly, over 75 years old (n=185)	Participant vs. nonparticipant	Regular participation: Ate at ENP meal site 2-5 times per week Irregular participation: Ate at ENP site less than twice per week, but at least once per week during last 4 months	Chi-square tests and analysis of variance
LeClerc and Thornbury (1983)	Dietary intake	Participants in 1 ENP site in central Maine; nonparticipants from federally-subsidized housing units in same area (dates not reported)	3-day food records	ENP-eligible, low-income elderly (n=53)	Participant vs. nonparticipant	Ate ENP meal 3-5 times per week	Bivariate t-tests and analysis of variance
Nordstrom et al. (1982)	Iron intake and iron status	Participants in 6 ENP sites in Missouri; nonparticipants from senior center that did not serve meals (1975)	1-day food record and venous blood sample	ENP-eligible elderly (n=320)	Participant vs. nonparticipant	Ate ENP meal on food record day	Analysis of variance

See notes at end of table.

Continued—

Appendix table 14—Studies that examined the impact of the Elderly Nutrition Program on nutrition and health outcomes—Continued

Study	Outcome(s)	Data sources[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Kohrs et al. (1980)	Dietary intake, weight status, and nutritional biochemistries	Participants in 6 ENP sites in Missouri; nonparticipants from senior center that did not serve meals (1975)	1-day food record, 24-hour recall, food frequency, venous blood sample, height, weight, and tricep skinfolds	ENP-eligible elderly (n=547)	Participant vs. nonparticipant	Regular participation: Ate at ENP meal site 2-5 times per week Irregular participation: Ate at ENP site less than twice per week, but at least once per week during last 4 months	Chi-square tests and analysis of variance
Singleton et al. (1980)	Dietary intake	Participants in 7 ENP sites in southern Louisiana; nonparticipants from 2 senior centers that did not serve meals (dates not reported)	24-hour dietary recall	ENP-eligible, low-income elderly females (n=97)	Participant vs. nonparticipant	Ate ENP meal on dietary recall day	Analysis of variance
Kohrs et al. (1978)	Dietary intake	Participants in 6 ENP sites in Missouri; nonparticipants from senior center that did not serve meals (1973)	1-day food record	ENP-eligible elderly (n=466)	Participant vs. nonparticipant	Ate ENP meal on food record day	Analysis of variance
Group IIB: State and local studies of home-delivered meals							
Edwards et al. (1998)	Food security, diet diversity, and diabetic control	Random sample of diabetic recipients of home-delivered meals in New York State and random sample of nonparticipants from a waiting list (1986-87)	In-person interview and mail survey of respondents' physicians	ENP-eligible, homebound diabetic elderly (n=154)	Participant vs. nonparticipant	Currently receiving ENP meals at least 2 times per week	Multivariate regression

See notes at end of table.

Continued—

Appendix table 14—Studies that examined the impact of the Elderly Nutrition Program on nutrition and health outcomes—Continued

Study	Outcome(s)	Data sources[1]	Data collection method	Population (sample size)	Design	Measure of participation	Analysis method
Ho-Sang (1989)	Dietary intake and weight status	Recipients of home-delivered meals in New York State; nonparticipants from waiting lists for other programs (dates not reported)	24-hour dietary recall, height, weight, and tricep skinfolds	ENP-eligible, homebound elderly (n=448)	Participant vs. nonparticipant	Currently receiving ENP meals	Bivariate t-tests and multivariate regression
Steele and Bryan (1986)	Dietary intake	Recipients of home-delivered meals from 1 site in North Carolina; nonparticipants from a waiting list (1982-83)	24-hour dietary recall and diet history	ENP-eligible, homebound elderly (n=54)	Participant vs. nonparticipant	Currently receiving 1 ENP meal per day, 5 days per week	Bivariate t-tests

[1] All studies were primary data collection efforts.

Nutrition Assistance Program in Puerto Rico, American Samoa, and the Northern Marianas

Appendix table 15—Studies that examined the impact of the Nutrition Assistance Program in Puerto Rico on household food expenditures and/or nutrient availability

Study	Outcome(s)	Data source[1]	Population (sample size)	Design	Measure of participation	Analysis method
Bishop al. (1996)	Household nutrient availability	1977 Puerto Rico supplement to the NFCS and 1984 Puerto Rico HFCS	Participant and income-eligible nonparticipant households using 1977 eligibility criteria (n= 3,995)	Pre-cashout compared with cashout (1977 vs. 1984)	Participation dummy	Stochastic dominance
Hama (1993)	Household food expenditures Household nutrient availability	1984 Puerto Rico HFCS	Participant and nonparticipant (including ineligible) households (n=1,559)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Beebout et al. (1985)	Household food expenditures Household nutrient availability	1977 Puerto Rico supplement to the NFCS and 1984 Puerto Rico HFCS	Participant and income-eligible nonparticipant households using 1977 eligibility criteria (n= 3,995)	Pre-cashout compared with cashout (1977 vs. 1984)	Group membership dummy, participation dummy, and benefit amount	Multivariate regression, with 2-equation selection-bias models

[1] Data sources:
NFCS = Nationwide Food Consumption Survey.
HFCS = Household Food Consumption Survey.

Commodity Supplemental Food Program

Appendix table 16—Studies that examined the impact of the Commodity Supplemental Food Program on nutrition and health outcomes of low-income pregnant women and young children

Study	Outcome(s)	Data source	Population (sample size)	Design	Measure of participation	Analysis method
Mahony-Monrad et al. (1982)	Women: hemoglobin, hematocrit, pregnancy weight gain, birthweight, gestational age, APGAR score, length of newborn hospital stay Children: hemoglobin, hematocrit, height, weight, immunization status	2 CSFP sites in Memphis and 1 in Detroit (CSFP participants) and area hospital/health department clinics (nonparticipants) (1978-80)	Matched pairs of pregnant women (n=421 pairs) and children (n=236 pairs)[1]	Participant vs. nonparticipant	Participation dummy: Received food from CSFP during study period Dose-response: Number of pickups, number of prenatal care visits, and percentage of recommended prenatal visits	t-tests, analysis of covariance, correlations

[1] Women were matched on age, race, number of previous pregnancies, smoking status, marital status, and prepregnancy weight. Children were matched on gender, race, and birthweight.

WIC Farmers' Market Nutrition Program

Appendix table 17—Studies that examined the impact of the WIC Farmers' Market Nutrition Program on self-reported fruit and vegetable consumption

Study	Outcome(s)	Data source	Population (sample size)	Design	Measure of participation	Analysis method
Anliker (1992)	Self-reported fruit and vegetable consumption	Randomly selected WIC participants in 6 sites that participated in FMNP and 3 sites that did not (1989)	FMNP participants (n=172) Nonparticipants (n=44)	Participants vs. nonparticipants, before and after	Received coupons	Analysis of covariance
Galfond (1991)	Self-reported fruit and vegetable consumption	Randomly selected WIC participants in 6 States (1990)	FMNP coupon recipient (n=1,503) FMNP nonrecipients (n=1,126) Recipients in prior but not current season (n=96)	Participant vs. nonparticipant	Received coupons in current growing season	Bivariate t-tests

Special Milk Program

Appendix table 18—Studies that examined the impact of the Special Milk Program on children's milk consumption

Study	Outcome(s)	Data source	Population (sample size)	Design	Measure of participation	Analysis method
Wellisch et al. (1983)	Dietary intake	Nationally representative sample of 90 school districts and 276 schools across the country (1980-81)	Children in grades 1-12 (n=6,566)	Participant vs. nonparticipant	Participation dummy	Multivariate regression
Robinson (1975)	Self-reported milk consumption	Nationally representative sample of 768 schools (1975)	School-age children (n=20,000)	Participant vs. nonparticipant	Participation dummy	Comparison of means and proportions (no statistical tests reported)

Team Nutrition Initiative and Nutrition Education and Training Program

Appendix table 19—Studies that examined the impact of the Team Nutrition Initiative or the Nutrition Education and Training Program on school-age children

Study	Outcome(s)	Data source	Population (sample size)	Design	Measure of participation	Analysis method
USDA, 1998	Nutrition-related knowledge, attitudes, self-reported and observed eating behaviors	4 purposefully selected school districts; 24 schools (1996)	Children in 4th grade (n=144)	Participant vs. nonparticipant, before and after	Participation dummy	Multivariate regression
Shannon and Chen (1988)	Nutrition-related knowledge, attitudes, and self-reported eating behaviors	12 school districts and 35 schools across Pennsylvania (dates not reported)	Children in grades 3-5 (n=1,707 3rd graders in initial sample)	Participants, before and after (sequential nutrition education program that spanned 3 school years)	Participation dummy	Analysis of covariance
Banta et al, (1984)	Plate waste, nutrition-related knowledge, attitudes, and self-reported eating behaviors	48 schools across Tennessee (dates not reported)	Plate waste: Children in grades K-6 (n=1,462) All other outcomes: Children in grades K-12 (n=862)	Participant vs. nonparticipant, before and after	Participation dummy	Not described
Gillespie (1984)	Nutrition-related knowledge, attitudes, and snacking behaviors	6 elementary schools in central New York State (1979-80)	Children in grades K-6 (n=1,157)	Participant vs. nonparticipant, before and after	Participation dummy	Bivariate t-tests, chi-square tests, and Wilcoxon signed ranks tests
St. Pierre and Glotzer (1981)	Nutrition-related knowledge, attitudes, preferences, and self-reported eating behaviors	7 school districts across Georgia (1980)	Children in grades 1-8 (n=1,400)	Participant vs. nonparticipant	Participation dummy	Analysis of covariance, using both children and classrooms as the unit of analysis
St. Pierre et al. (1981)	Nutrition-related knowledge, attitudes, preferences, self-reported eating behaviors, and plate waste	20 schools across Nebraska (1980)	Children in grades 1-6 (n=2,351)	Randomized experiment with random assignment at the school level	Participation dummy	Analysis of covariance, using both children and classrooms as the unit of analysis