

Gestational Weight Gain

Social Predictors or Relationships

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List of factors, 1990 vs. 2006

1990 IOM report

- n **Cigarette smoking**
- n **Alcohol and Illegal substances**
- n **Socioeconomic status**
- n **Work or physical activity**
- n **Energy intake**

Possible social determinants, 2006

- n **Cigarette smoking**
- n **Alcohol and Illegal substances**
- n **Socioeconomic status/education**
- n **Work or physical activity**
- n **Energy Intake**
- n Depression
- n **Food insecurity and maternal starvation**
- n Anxiety
- n Built/social/food environment
- n Family influences
- n Social support
- n **Overall health status**
- n **Unintended pregnancy**
- n **Eating habits**
- n Marketing/impact of media
- n **Eating disorders**
- n **Provider advice**
- n **Domestic Violence**
- n **Short Interpregnancy Interval**
- n Group prenatal care

Possible Social Predictors of Inadequate and Excessive GWG - 1990 vs 2006

Inadequate GWG

- n Lower SES/education
- n Cigarette smoking
- n Low energy intake
- n Use of illegal substances
- n **Food insecurity**
- n **Low dairy intake**
- n **Unintended pregnancy**
- n **Domestic violence**
- n **Anorexia nervosa**
- n **Short interpregnancy interval**
- n **Lack of provider advice/advice < guidelines**

Excessive GWG

- n High energy intake
- n Increase in energy intake
- n Alcohol
- n **Decrease in physical activity**
- n **High-glycemic diet**
- n **High fat diet**
- n **Consumption of sweets**
- n **Lack of provider advice/advice > guidelines**

Overview of Key Studies

Gestational Weight Gain

Social Predictors or Relationships

Siega-Riz, 1997

Predictors of poor maternal weight gain from baseline anthropometric, psychosocial, and demographic information in a Hispanic population

n **Prospective cohort of Hispanic women attending public clinics, n=4791, 1983-1986**

n **For women low/normal weight, no social factors were associated with inadequate GWG**

n **For women low/normal weight, being U.S. born, primiparous and under 29 years old, planning the pregnancy, and having a close relative die during the pregnancy all decreased the risk of inadequate GWG**

n **For overweight/obese, physical abuse increased the risk, and financial support from FOB decreased the risk of low GWG**

Hickey, 1999

Low prenatal weight gain among adult WIC participants delivering term singleton infants

- n WIC program data for 19,017 women delivering in 1994, linked to birth certificate data
- n African-American and Caucasian
- n Short interpregnancy interval, tobacco use, and 2nd trimester entry into prenatal care associated with inadequate GWG
- n AORs varied by race/ethnicity and pre-pregnancy BMI

Olson, 2003

Modifiable behavioral factors in a biopsychosocial model predict inadequate and excessive GWG

- n Prospective cohort, n=622, mailed questionnaires in Upstate New York.
- n Sample was 96% Caucasian, otherwise diverse
- n Change in amount of food intake, change in physical activity, and number of packs of cigarettes smoked were independently related to GWG
- n In combination, the behavioral, psychosocial, sociodemographic, and biomedical variables account for 27% of the variance in GWG as a continuous variable

Wells, 2006

Factors influencing inadequate and excessive weight gain in pregnancy: Colorado, 200-2002

- n Used data from Colorado's Pregnancy Risk Assessment Monitoring System (PRAMS)
- n 9,115 women were selected to participate in PRAMS and 6,625 (73%) completed surveys. 4,944 were eligible and included in this analysis (full-term, singleton) *Non-participants may have been at higher risk*
- n In multivariate analysis, inadequate GWG assoc with underweight and obesity, rural residence, low education, and smoking.
- n Excessive GWG associated with overweight and obesity and having 12 years of education

Individual Predictors

Gestational Weight Gain

Social Predictors or Relationships

Cigarette Smoking

- n Most post-1990 studies show increased risk of inadequate GWG associated with tobacco use
- n Olson 2003 – smoking 1.5 packs/day associated with inadequate GWG (AOR 7.63, 1.9-30.2)
- n Furuno 2004 – found trend for increased risk of low GWG with smoking but not statistically significant (N=265)
- n Colorado PRAMS study (Wells 2006, n=4,528) smoking associated with inadequate GWG (AOR 1.35, 1.05-1.81)
- n This is consistent with pre-1990 data and the IOM report

Alcohol and Illegal Substances

- n Alcohol – most post-1990 studies show no association between alcohol use and GWG, or slightly higher gain among drinkers
- n Among adolescents, alcohol during pregnancy associated with increased risk of excessive GWG (AOR 7.33, 1.70-31.50) (Stevens-Simon 1992)
- n This is consistent with pre-1990 data and the IOM report

Education

Education

- n Lower education status associated with increased odds of inadequate weight gain
- n Hickey 1999 – AOR for inadequate GWG decreased 5-6% with each additional year of maternal education ($P < 0.001$)
- n Wells 2006 - < 12 years education AOR 1.64 (1.14-2.37) for inadequate GWG compared to > 12 years education
- n This is consistent with pre-1990 data and the IOM report

Socio-economic Status

SES

- n Limited data available in 1990 and 2006, conflicting results
- n Many studies of GWG predictors limited to low-income women so cannot assess SES
- n Family income < 185% of poverty line approx. 2.6 times **more** likely to have excessive weight gain compared to women with higher incomes (Olson 2003)
- n Among overweight/obese subgroup in Hispanic cohort, receiving financial support from baby's father decreased risk of inadequate gain (Siega-Riz 1997)
- n Colorado PRAMS study found no association between SES indicators and inadequate or excessive GWG (Wells 2006)
- n This is consistent with the 1990 IOM report
- n *Women most at risk may not be sampled in studies (e.g. no prenatal care)*

Work/Physical Activity

- n 1990 IOM report cited no studies on work/physical activity and GWG, only on other pregnancy outcomes
- n Current data are conflicting and show either no difference or decreased GWG with increased PA
- n 2 meta-analyses reported no difference in GWG by physical activity; these meta-analyses included heterogeneous studies
- n Other small studies reported reduced GWG in women who exercised compared to (non-randomized) controls
- n Olson 2003 found decreased self-reported physical activity associated with excessive GWG (AOR 1.68, 1.1-2.6)

Energy Intake

- n Pre-1990 studies/IOM report – studies of supplementation in developing world – supplementation resulted in increased GWG and birth weight
- n Few studies post-1990 examining EI as primary predictor of GWG

Energy Intake

- n Olson 2003 – prospective cohort
N=622 in NY state; survey done mid-pregnancy
- n Proxy measure for EI was “How has amount of food you eat now changed compared with when not pregnant?”
- n “Much more” food compared with “little more” had AOR 2.35 (1.2 – 4.5) for excessive GWG

Energy Intake

- n Icelandic study (Olafsdottir 2006)
- n Observational prospective cohort of 406 women
- n Semiquantitative FFQ and lifestyle factors for previous 3 months done at 2 points in pregnancy
- n **Higher EI** in late (34-37 wks) pregnancy were associated with lower risk of inadequate GWG and higher risk of excessive GWG (OR 2.04, 1.17-3.58)
- n Women with excessive GWG significantly **increased their total EI** in late pregnancy
- n No difference in GWG by EI in early pregnancy (11-15 weeks)

Macronutrient Intake

- n Icelandic study (Olafsdottir 2006)
- n E% from macronutrients only assoc with GWG among **overweight women** and only in late pregnancy
- n Women with inadequate gain had lower E% from **fat** and higher E% from **carbohydrate** than women with optimal or excessive GWG

Eating Habits

- n Icelandic study-consumption of **dairy and sweets** in **late pregnancy** associated with decreased risk of inadequate GWG and increased risk of excessive GWG
- n Olson 2003 – women consuming 3 or more servings of **fruits and vegetables**/day gained 1.81 lbs less (adjusted, $p < 0.05$) than women who consumed < 3 servings
- n Stevens-Simon 1992 - Among adolescents, failure to consume 3 or more snacks/day assoc with slow gain (AOR 5.39, 1.89-15.56)

Carbohydrate Intake

- § Small RCT of low-glycemic (LG) vs. high-glycemic (HG) diet in pregnancy (Clapp 1998)
- § Women on LG diet gained less weight, 10.4 kg vs. 18.6 kg, $P < 0.01$

Food Insecurity

- n Limited data available
- n Siega-Riz 1997, Hispanic cohort :
“have enough money for food” not associated with GWG
- n Brawarsky 2005 : “insufficient money for food” not associated with GWG

Women most at risk may not be represented in studies

Overall Health Status

- n Chronic or gestational diabetes associated with increased odds of inadequate gain (AOR 2.70, 95% CI 1.18-2.19, Brawarsky 2005)

Unintended Pregnancy

Data are conflicting:

- n Hickey 1997 – 536 non-obese African-American women, mistimed/unplanned pregnancy had AOR 2.0 (1.2-3.2) of inadequate GWG; no assoc seen among Caucasian women

- n Siega-Riz 1997 - Planned pregnancy had borderline statistically-significant decreased AOR of inadequate GWG only among low/normal-weight subjects in cohort of Hispanic women (AOR 0.82, 0.67-1.00)

- n Colorado PRAMS study showed no assoc between intendedness of pregnancy and risk of inadequate or excessive GWG

Eating Disorders

- n Kouba 2005; prospective observational cohort, 49 with eating disorders and 68 controls
- n Overall no difference in weight gain between groups
- n Anorectic subgroup had significantly lower mean gain than controls (10.4 vs. 12.1 kg, $P < 0.05$)

Domestic Violence/History of Abuse

- n Limited data available
- n Siega-Riz 1997 – physical abuse by FOB increased risk of inadequate GWG for overweight and obese only (AOR 3.19, 1.27-8.01)
- n McFarlane 1996 – increased RR of inadequate GWG among abused women (but no multivariable analysis of this association)

Provider Advice and Women's Target GWG

Cogswell 1999, mailed survey, predominantly Caucasian, middle-class cohort, N=2237:

- n African-American women more likely to report advice to gain less than IOM guidelines
- n Advised and target gains strongly correlated with actual weight gain
- n Receiving no advice on GWG associated with GWG outside guidelines
- n **Advice < guidelines** AOR 3.6 (2.3-5.5) for GWG below guidelines (*compared to advice=guidelines*)
- n **Advice > guidelines** AOR 3.6 (2.4-5.5) for GWG above guidelines (*compared to advice=guidelines*)
- n No advice AOR 1.8 (1.3-2.5) for GWG below guidelines, and AOR 2.0 (1.5-2.7) for GWG above guidelines (*compared to advice=guidelines*)

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- n High fat diet
- n Consumption of sweets
- n Lack of provider advice/advice > guidelines
- n Type of provider
- n Type of prenatal care

Areas for Future Research

- n Group Prenatal Care/Centering Pregnancy/Type of provider
- n Provider advice interventions
- n Maternal dietary factors beyond EI: vegetarian diets, low-glycemic load diets, low-fat diets, “junk food” diet
- n Differences by race/ethnicity – especially Asian women
- n Physical activity and exercise – especially interventions
- n Predictors of excessive GWG