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# Individual and Family Correlates of Calcium-Rich Food Intake among Parents of Early Adolescent Children

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## ABSTRACT

**Background** Most adults do not meet calcium intake recommendations. Little is known about how individual and family factors, including parenting practices that influence early adolescents' intake of calcium-rich foods, affect calcium intake of parents. This information could inform the development of effective nutrition education programs.

**Objective** To identify individual and family factors associated with intake of calcium-rich foods among parents of early adolescents (aged 10 to 13 years).

**Design** A cross-sectional survey was used with 14 scales to assess attitudes/preferences and parenting practices regarding calcium-rich foods and a calcium-specific food frequency questionnaire (2006-2007).

**Participants/setting** A convenience sample of self-reporting non-Hispanic white, Hispanic, and Asian (n=661) parents was recruited in nine states. Parents were the primary meal planner/preparer and completed questionnaires in homes or community settings.

**Main outcome measures** Predictors of calcium intake from three food groupings—all food sources, dairy foods, and milk.

**Statistical analyses performed** Multivariate regression analyses identified demographic, attitude/preference, and behavioral factors associated with calcium intake.

**Results** Most respondents were women (~90%) and 38% had a college degree. Education was positively associated with calcium intake from all three food groupings, whereas having an Asian spouse compared to a non-Hispanic white spouse was negatively associated with calcium intake only from all food sources and from dairy foods. Expectations for and encouragement of healthy beverage intake for early adolescents were positively associated with calcium intake from dairy foods and milk, respectively. Parental concern regarding adequacy of intake was negatively associated, whereas perception of health benefits from calcium-rich foods was positively associated with calcium intake from all food sources and from dairy foods. Between 20% and 32% of the variance in calcium intake from all food groupings was explained in these models.

**Conclusions** Individual factors and positive parenting practices may be important considerations for nutrition education programs targeted to parents.

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Fewer than half of non-Hispanic white (46%) and only about one third of Mexican-American (33%) men and women aged >19 years in the United States meet the recommendation for calcium intake, based on national dietary intake data from 1999-2002 (1). Mean daily calcium intakes of Asian women living in Auckland, New Zealand, were at about 70% of recommended levels (2). Adult bone health is optimized with an adequate intake of dietary calcium and vitamin D within a healthy diet (3); therefore, long-term calcium intake that is below recommendations is a concern. Dairy foods, including milk, are important sources of calcium for many adults (4,5). However, intake may be marginal for some race/ethnic groups because dairy foods are often associated with real or perceived lactose intolerance (4) or not included in basic cultural food patterns (6,7). Despite such concerns, a large percentage of people who might be lactose intolerant still rely on dairy foods as their main calcium source (8,9). Because food sources of calcium vary by race/ethnicity, evaluating both individual and environmental factors that influence intake by race/ethnicity is important. When research resources are limited, examining factors that influence calcium intake among those at highest risk may be a priority. For example, results from a previous longitudinal study involving healthy adolescents (aged 9 to 25 years) showed that Asian, Hispanic, and non-Hispanic white youth had significantly lower areal and volumetric bone density at all skeletal sites than African American youth (10), indicating possible group differences in risk of developing osteoporosis.

Calcium intakes among adults may be mediated by household composition, including the presence of children and their dependence on adults in the home for food acquisition and preparation. The Social Cognitive Theory proposes that individual, behavioral, and socioenvironmental factors interrelate to influence behavior (11). Individual factors such as perceptions of health benefits or concern about the adequacy of calcium intake (12), knowledge of calcium sources, concerns about weight gain from eating calcium-rich foods (13,14), and dairy or milk intolerance (15) may directly or indirectly influence calcium intakes by parents. Behavioral factors, such as eating food away from home, may also play an important role. Lack of time and work stress can lead parents to eat more meals in the car or at restaurants rather than at home (16). Food prepared and consumed away from home tends to contain less dietary calcium per kilocalorie than food prepared and consumed at home (17). Socioenvironmental factors that may influence calcium intake by parents include parenting practices that enable intake of calcium-rich foods by children in the household.

Research studies have examined the influence of various parenting practices on children's dietary intake, including making healthy foods available, role modeling, setting rules and providing encouragement, and eating dinner together (18-22). However, few studies have examined how parenting practices that enable improved

intake of healthy foods by children may also affect intake among parents themselves. In one study, Tibbs and colleagues (23) found that for African-American parents, parental modeling of healthful dietary behaviors was positively related to their own fruit and vegetable intake and negatively related to energy intake from fat. Mothers involved in a previous osteoporosis intervention trial (24) reported making efforts to increase calcium intake among their children. Other mothers indicated that making calcium-rich foods accessible and role modeling were strategies that could improve calcium intake among children (25). Therefore, having calcium-rich foods available and role modeling intake would be expected to improve calcium intake of parents as well as children. Surprisingly, studies to examine this phenomenon are very limited. The purpose of this study was to identify associations between parental and household factors and calcium intake from three food groupings (all food sources, dairy foods, and milk) in Asian, Hispanic, and non-Hispanic white parents of early adolescent children.

## METHODS

### Study Design and Sample Recruitment

This cross-sectional study involved administering separate questionnaires to a convenience sample of children aged 10 to 13 years and the adult responsible for food acquisition and preparation in the child's household. In most cases (98%), the adult respondent was the child's parent; therefore, the adult respondent is referred to as "parent" throughout this article. Other inclusion criteria included having lived in the United States for at least 12 months; being able to read/speak English; and self-identifying as non-Hispanic white, Hispanic or Latino, or Asian or Asian American, or a mixture of any of these three groups. Due to variation in race/ethnic group distribution within the recruitment area of each state, the recruitment goals for race/ethnic groups reflected the distribution of each area. A total of 661 parents from nine states (Arizona, California, Colorado, Hawaii, Michigan, Minnesota, Oregon, Utah, and Washington) completed paper-based questionnaires during 2006-2007. This article focuses on information from adult respondents only.

Participants were recruited using fliers, verbal announcements, written announcements in bulletins or newsletters, personal contacts, and presentations at groups. Organizations and groups involved in this study included Cooperative Extension Service (eg, Expanded Food Nutrition Education Program, Supplemental Nutrition Assistance Program-Education, and 4-H), faith-based groups, after-school programs, sports teams, scouting groups, and adult groups. The study protocols were approved by the institutional review board of each participating university, and each participant provided written informed consent.

### Data Collection

A standardized data collection protocol was developed and used to administer questionnaires in a consistent manner across sites. Researchers met with parents and children to administer questionnaires in the home or in community settings (eg, community centers, libraries,

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