

Maternal Inactivity: 45-Year Trends in Mothers' Use of Time

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Abstract

Objective: To examine 45-year trends in time use and physical activity energy expenditure (PAEE) in a nationally representative sample of US mothers.

Participants and Methods: We quantified time allocation to physical activity (PA), sedentary behaviors (SED), and PAEE from 1965 to 2010 in mothers with older children (MOC) (>5 to ≤18 years) and mothers with younger children (MYC) (≤5 years). Physical activity was the sum of time allocated to housework, child care, laundry, food preparation, postmeal cleanup, and exercise. Sedentary behavior was the sum of time spent in a vehicle and using screen-based media. Physical activity energy expenditure was calculated using body weights from national surveys and metabolic equivalents.

Results: From 1965 to 2010, the time allocated to PA decreased by 11.1 h/wk (from 32.0 to 20.9 h/wk) in MOC and by 13.9 h/wk (from 43.6 to 29.7 h/wk) in MYC. The time spent in SED increased by 7.0 h/wk in MOC (from 17.7 to 24.7 h/wk) and increased by 5.7 h/wk in MYC (from 17.0 to 22.7 h/wk). Physical activity energy expenditure decreased by 1237.6 kcal/wk (176.8 kcal/d) in MOC (from 5835.3 to 4597.7 kcal/wk), and in MYC, PAEE decreased by 1572.5 kcal/wk (224.6 kcal/d), from 7690.5 to 6118.0 kcal/wk.

Conclusion: There was a significant reallocation of time by mothers from PA (eg, housework) to SED (eg, watching television) between 1965 and 2010. Given the essential role of PA for health and the potential for the intergenerational transmission of obesity and obesogenic behaviors, these results suggest that maternal inactivity may be an important target for the primary prevention of chronic noncommunicable diseases and obesity.

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Over the past 50 years, there have been large and significant decrements in physical activity (PA)¹⁻⁵ with concomitant increments in obesity and many chronic noncommunicable diseases (NCDs) in women and children (eg, type 2 diabetes mellitus and nonalcoholic fatty liver disease).⁵⁻⁸ Given that PA is an absolute prerequisite for health and wellness,^{4,9-11} it is not surprising that inactivity is now a leading cause of death and disease in developed nations.^{4,12} While research has revealed that personal behaviors (eg, PA) are major determinants of an individual's health and energy status (eg, obesity),¹³⁻¹⁶ an emerging body of epidemiological and experimental evidence suggests that maternal behaviors may also play a role in determining the developmental trajectories (ie, physiologic and behavioral) that determine the risk of obesity and chronic NCD in children.¹⁷⁻²¹

Although women are significantly less active and more sedentary than they were 50 years

ago,^{1,2,22-25} trends in the reallocation of time by mothers from PA to sedentary behaviors (SED) and the resulting changes in maternal PA energy expenditure (PAEE) have not been addressed systematically. The purpose of this study was to quantify maternal behavior via an examination of 45-year trends in maternal allocation of time to PA and SED and consequent PAEE. This analysis may provide essential contextual evidence by which to inform public policy on the primary prevention of obesity and chronic NCD.

PARTICIPANTS AND METHODS

Allocation of Time

Data on PA, SED, and time allocation were derived from the American Heritage Time Use Study (AHTUS).²⁶ The AHTUS is a nationally representative database produced via the harmonization of multiple time-use data

sources for comparative analyses of trends in paid and unpaid work^{26,27} and consists of more than 50,000 diary days spanning 1965-2010. The number of weighted diaries from mothers with children 18 years or younger available for analysis was 586 for the 1960s, 1050 for the 1970s, 539 for the 1980s, 1313 for the 1990s, 10,103 for 2003-2005, and 13,846 for 2006-2010.

Time-use data are considered more reliable and accurate for nonoccupational PA than other surveillance systems²⁸ and allow examinations of the reallocation of time between activities. For example, if mothers spend less time performing housework, they may spend more time exercising or watching television (TV).

PA and SED Variables

Time-use data on more than 90 behavioral subcategories for mothers with children 18 years or younger were examined for changes in time allocation. Subcategories that exhibited statistically significant trends were retained for analyses and divided into 2 groups: physically active behaviors (ie, PA) and SED. Behavioral subcategories that did not exhibit statistically significant trends were excluded from further analyses. Physically active behaviors were operationally defined as the aggregate time spent in meal preparation and cleanup (eg, cooking, washing dishes), general cleaning (eg, vacuuming), clothing maintenance (eg, laundry), general child care and playing with children, and leisure time PA, defined as sport and exercise participation. SED were the aggregate time spent in screen-based media use (ie, nonoccupational use of TV or computer) and the time spent in a vehicle.

Relative Allocation of Time Across the Study Period

The relative allocation of time to PA and SED for each survey cohort (ie, 1960s, 1970s, etc) was examined by subtracting SED hours per week (SED-h/wk) from PA hours per week (PA-h/wk) (ie, PA-h/wk - SED-h/wk) for each respondent. The resulting value provided a measure of the relative allocation of time to PA and to SED (ie, the number of hours spent in energetically costly activities vs sedentary pursuits). A positive value indicates more time spent in PA than SED, and a negative value indicates the converse.

Maternal Subcategories and Employment Status

Women were grouped in 2 categories on the basis of the age of their children: mothers with older children (MOC) (>5 to ≤18 years) and mothers with younger children (MYC) (≤5 years). Mothers who had at least one child 5 years or younger were included only in the MYC group, regardless of the age of their other children. These categories provided data on the PA required when children of varying ages are present and capture maternal behaviors spanning from the antenatal period through adolescence.

Employment impacts the allocation of time²⁴; therefore, mothers were categorized by employment status as employed or unemployed, based on self-reported work (in hours per week). Full-time employment was defined in the harmonized data sets as more than 21 hours of paid work per week for 1965-1990 and more than 35 hours per week for 1990-2010.^{26,27} Employment-related intragroup differences have been examined extensively.^{22,23,25} Because the foci of our study were the overall trends in the time allocated to PA, SED, and consequent PAEE, our analyses did not statistically examine employed vs unemployed women. The grouping of participants by employment status was an aid in depicting the longitudinal changes of these respective groups.

Physical Activity Energy Expenditure

Physical activity consisted of numerous tasks of varying intensity. As per previous research, metabolic equivalent tasks (MET) values of 2.8 were assigned to household activities, 2.5 MET for child care, and 4.5 MET for all leisure time PA.^{1,29} These values represent the energy expenditure per unit of time based on the Food and Agriculture Organization of the United Nations, World Health Organization, and United Nations University (FAO/WHO/UNU) report on human energy expenditure³⁰ and the 2011 Compendium of Physical Activities.²⁹

Energy Expenditure and Body Mass

Because women of childbearing age were heavier in 2010 than in 1965, increments in the body weight used for the estimation of the PAEE for each survey period were necessary. Because body weights were not included in the AHTUS, increments were calculated from 2 representative

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