Trajectories and Predictors of Health-Related Quality of Life during Childhood

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Objective To identify distinct trajectories of health-related quality of life (HRQOL) during childhood, along with their predictors.

Study design A nationally representative sample of 2700 children aged 4-5 years at baseline was followed up every 24 months through to age 12-13 years. Parents reported the children's HRQOL and data on potential predictors at each wave (5 in total) as part of the Longitudinal Study of Australian Children.

Results Growth mixture modeling identified 5 distinct trajectories of HRQOL during childhood. Eighty-five percent of children had consistently high levels of HRQOL from age 4-5 years to 12-13 years (healthy); 8% of children had a significant and continuous decrease in HRQOL over time (high risk); and a further 5.3% of children had decreases in HRQOL from age 4-5 years to 8-9 years, followed by increases through to 12-13 years (rebound). Finally, a small percentage (1.6%) of children had extremely low levels of HRQOL at age 4-5 years that increased over time (recovery). Maternal smoking, lower household income, living in a non-English speaking household, and nonparticipation in organized sports were predictive of poorer HRQOL trajectories when compared with children in the healthy trajectory.

Conclusion There are distinct trajectories of HRQOL during childhood. Most children (85%) have a healthy, stable pattern, but the remaining children have trajectories indicative of poor HRQOL. Participation in sports, maternal smoking, lower family income, and language spoken at home distinguish among these trajectories. Of these, participation in organized sports has received relatively little attention as a preventative health priority. *(J Pediatr 2015;167:422-7)*.

Positive health-related quality of life (HRQOL) has been prioritized by leading health organizations, including the World Health Organization and Centers for Disease Control, as a goal for all people of all ages worldwide.[1,2] HRQOL assesses subjective well being in relation to physical, social, and psychological functioning.[3,4] Many of the previous studies examining HRQOL were disease-focused and situation-specific or examined the efficacy and cost-effectiveness of treatments, interventions, and programs of care.[3,5] This has been especially so among children, in whom such conditions as obesity,[6] cancer,[7] epilepsy,[8] heart disease,[9] and type 1 and 2 diabetes[10] are predictive of lower HRQOL. However, very little is known about the developmental trajectories of HRQOL in representative samples of children, in which there may be varying patterns of HRQOL.

The purpose of the present study was to provide insight into the developmental changes in HRQOL from early childhood to early adolescence in a representative sample of children. This involved examining whether distinct trajectories of HRQOL–patterns of change in HRQOL over time that are shared by a number of individuals–exist among a national sample of Australian children aged 4-12 years. To inform clinical practice and preventive health policy, we also explored whether factors assessed at baseline predicted these trajectories. We included basic demographic variables (eg, sex, socioeconomic position [SEP], place of residence), modifiable health behaviors and risk factors (eg, physical activity, sleep duration, body mass index [BMI]), and measures of the family health environment known to be associated with child health (eg, maternal smoking, maternal binge drinking, maternal weight status) as potential predictors. An understanding of the predictors of positive HRQOL trajectories during childhood could provide important information for future researchers and policy makers to help establish the efficacy and cost-effectiveness of various preventive health measures at a population level, by shedding light on why some children embark on healthier HRQOL trajectories than others.

BLRT	Bootstrap likelihood ratio test
BMI	Body mass index
GMM	Growth mixture modeling
HRQOL	Health-related quality of life
LSAC	Longitudinal Study of Australian Children
SEP	Socioeconomic position

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Methods

Data were obtained from the kindergarten cohort of the Longitudinal Study of Australian Children (LSAC). The LSAC examines social, environmental, and economic factors influencing development and well being in a representative sample of Australian children. Data are collected every 2 years using face-to-face interviews with the children's primary parent (the child's mother in >96% of cases), parental self-report questionnaires, and parent-reported time use diaries. At wave 1 (2004), 4983 children (response rate of 50%) aged 4-5 years were included in the kindergarten cohort after being randomly selected from the Medicare database, the most comprehensive database of the Australian population. This study used data obtained during waves 1-5. At wave 5 (2012; children aged 12-13 years), 3956 parents participated in the LSAC parental interview, representing an attrition rate of 20.6% across the 5 waves. Ethics approval for the LSAC study was given by the University of Melbourne's Human Research Ethics Committee.

HRQOL

Pediatric HRQOL was assessed via the parent-report version of the PedsQL 4.0,[11] a 23-item scale that assesses 4 distinct domains: physical functioning (8 items) and social, emotional, and school functioning (5 items each). Items were used to compute total HRQOL scores. The parent-report version of the PedsQL has high internal consistency in childhood[12] and has been shown to result in almost identical scores as the child self-report version in an Australian sample.[13] Some evidence suggests that parents tend to under-report HRQOL compared with self-reports, however.[3]

Potential Predictors

Sixteen variables assessed at wave 1 were included as potential predictors of the HRQOL trajectories. These included basic demographic variables (sex, family income, neighborhood-level SEP, maternal education, language spoken at home, and place of residence), modifiable health behaviors and risk factors (child BMI, physical activity, sleep duration, dietary behaviors, and sports participation), and measures of the family health environment (maternal smoking, maternal binge drinking, and maternal weight status). The primary parent reported child sex, language spoken at home (coded as "English" or "Other"), maternal education (coded as "did not finish high school," "high school completion," or "tertiary education" [any post–high school qualification]), family income (consistent with previous work,[14] coded according to understandable cutoff criteria: [<AUD$1000 week^{-1}], [AUD$1000-$1999 week^{-1}], [>AUD$2000 week^{-1}] and given the semantic labels of "low," "medium," and "high"), maternal smoking status (coded as "yes" or "no"), and maternal binge drinking (coded as "yes" or "no"). Maternal weight status was derived from self-reported height and weight, and was used to classify mothers as underweight (BMI >18.5 kg/m^2), healthy weight (BMI 18.5-24.9 kg/m^2), or overweight/obese (BMI >25 kg/m^2). Child BMI was derived from measured height and weight obtained by trained researchers.

Parent-completed 24-hour time use diaries were used to estimate time spent engaging in physical activity (eg, walking for fun or travel, riding bike or trike, other exercise, such as swimming, dancing, or running about) and sleep duration. Weighted weekday and weekend daytime were used to calculate weekly totals. Child sports participation was assessed using 4 items measuring participation in swimming, dancing, gymnastics, and team sports. Parents could answer "yes" or "no" to each item. A child was classified as participating in sports if a parent answered "yes" to at least 1 of the items.

The primary parent reported the child's usual daily servings of fruit and vegetables, high-fat foods, and sugar-sweetened beverages. Based on the participants' home postcode, a measure of neighborhood SEP was determined according to the Socio-Economic Indexes for Areas Index of Relative Socio-Economic Disadvantage.[15] Place of residence was determined from the Accessibility/Remoteness Index of Australia,[16] which includes 5 classes of remoteness: highly accessible, accessible, moderately accessible, remote, and very remote. The Accessibility/Remoteness Index of Australia is a geographic measure of accessibility and remoteness as determined by access along the road network to major population centers.

Statistical Analyses

Growth mixture modeling (GMM) was performed to examine for any distinct trajectories of HRQOL across the 5 time points studied. GMM allows for estimation of distinct growth curves for unobserved populations and provides a meaningful representation of interindividual and intraindividual changes over time.

In the first instance, 923 participants (18.5%) were removed from the sample because they were missing HRQOL data over 3 or more waves. (Participants were required to have completed at least 3 of the 5 waves to be eligible for inclusion in the GMM process.) In line with current recommendations, we followed a 3-step process to examine whether distinct trajectories of HRQOL exist during childhood. First, we conducted a preliminary GMM analysis without covariates in Mplus version 7 (Muthén & Muthén, Los Angeles, California), to identify the number of distinct trajectories (latent classes) within the sample. A distinct trajectory is constituted by a group of individuals who share a common, underlying pattern of HRQOL change over time. Groups are termed latent classes because a set of observed HRQOL scores are used to categorize individuals into latent groups. To achieve this, we ran a GMM series specifying the number of latent classes (trajectories) to be extracted; we specified 1 latent class, then 2 latent classes, and so on.

The optimal number of latent classes was informed by model fit statistics, including the Akaike information criterion, Bayes information criterion, and sample size–adjusted Bayes information criterion; lower relative values indicate a better-fitting model. To avoid overestimating the number of latent classes,