



Mothers' health-related quality of life: Its relationship with children's health-related quality of life and behavior in low-income families

Rosa Sze Man Wong¹, Vivian Yawei Guo¹, Patrick Ip², Carlos King Ho Wong¹, Esther Yee Tak Yu¹, Colman Siu Cheung Fung¹, Cindy Lo Kuen Lam¹

Abstract

Objective: To examine the association between mothers' health-related quality of life (HRQOL) and their children's HRQOL and behavior in low-income families.

Methods: Mothers of 278 children aged 6–12 years from low-income families were invited to complete the Child Health Questionnaire Parent Form 50 (CHQ-PF50) and the Strength and Difficulties Questionnaire (SDQ) for their children as well as the 12-item Short-Form Health Survey version 2 (SF-12v2) and the Patient Health Questionnaire-2 (PHQ-2). Multiple linear regressions with mother–child pairs as the unit of analysis were performed to examine the associations between maternal and child variables with adjustment of mother- and child-level confounders.

Results: Compared with the general population, low-income mothers had a lower mean SF-12v2 mental component summary score and their children also had lower mean CHQ-PF50 physical and psychosocial summary scores and SDQ total difficulties score. Children of mothers with SF-12v2 scores below the population mean of 50 had significantly worse CHQ-PF50 scores and higher SDQ total difficulties scores. The mother's PHQ-2 depression status had no association with the child's CHQ-PF50 scores.

Conclusion: Our findings suggest that more attention should be paid to reducing the negative impact of health problems on mothers' daily roles in childcare in low-income families.

Keywords: Health-related quality of life; child health; child behavior; low income

1. Department of Family Medicine and Primary Care, The University of Hong Kong, Ap Lei Chau Clinic, Ap Lei Chau, Hong Kong, China

2. Department of Paediatrics and Adolescent Medicine, The University of Hong Kong, Queen Mary Hospital, Hong Kong, China

CORRESPONDING AUTHOR:
Cindy Lo Kuen Lam, MD
Department of Family Medicine and Primary Care, The University of Hong Kong, 3/F., Ap Lei Chau Clinic, 161 Main Street, Ap Lei Chau, Hong Kong, China
E-mail: clklam@hku.hk

Received 25 July 2016;

Accepted 18 September 2016

Introduction

Health-related quality of life (HRQOL) assessment uses a multidimensional approach to assess an individual's perception of the impact of health problems on the functioning and satisfaction in different domains of life [1]. Such perception is susceptible to the influences of socioeconomic status across age groups [2–5]. A population-based health surveillance conducted in the United States from 1993 to 2002 observed worse HRQOL among low-income women [4]. A similar conclusion was drawn from the 2005–2006 National Health

Measurement Study in the United States [3].

Our earlier study also found that Chinese adults, especially women from low-income families, had poorer HRQOL than the general population [5]. In the European KIDSCREEN project, family socioeconomic status was shown to be a predictor of HRQOL of childhood, with children from low-income households having poorer HRQOL than those from high- and middle-income households [2]. Given these socioeconomic status disparities in health, special attention should be paid to the HRQOL of children from low-income families.



Low-income families are exposed to many stressors that can increase their risk of health problems [6, 7]. Serious mental illnesses such as major depression in mothers can adversely affect child development [8–10]. A meta-analysis of 193 studies found a positive relationship between maternal depression and child internalizing, externalizing, and general mental disorders [8]. Depression often leads to disrupted parenting that can cause tension and conflicts between mothers and their children [11]. Children of depressed mothers were found to exhibit more emotional and behavioral problems [8, 12, 13]. However, it is not clear whether subclinical mental health problems (i.e. not meeting the full diagnostic criteria for mental disorders in the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition) [14–16] in mothers would affect the quality of life and/or behavior of their children. Furthermore, is it the negative moods (e.g. depressive symptoms) per se or the impairment in role functioning from the mental health problem (i.e. HRQOL) in the mother that would affect the child more? Answers to this question will help to establish the significance of HRQOL as a health outcome of mothers. We believe the focus on HRQOL that measures the functional impact of health problems instead of the presence of disease is novel and would open up new intervention possibilities for the improvement of quality of life and behavior in children. This study aimed (1) to assess the HRQOL and behavior of children from low-income families and (2) to examine the association between maternal HRQOL and child HRQOL and behavior. We hypothesized that (1) children from low-income families have poorer HRQOL and more behavioral problems than those from the general population and that (2) poor HRQOL of mothers is associated with poor HRQOL and behavioral problems in children, independent of the presence of maternal depression.

Methods

Participants

The mother–child pairs were identified from participants of a cohort study that evaluated the effect of health empowerment as part of a community family support program on the long-term development of children from low-income families funded by a philanthropic foundation in Hong Kong [17]. Families were enrolled in the program in 2012 if they had (1)

at least one family member working full-time or part-time, (2) one or more dependent young children studying in grade 1–3, (3) a monthly household income less than 75% of Hong Kong's median monthly household income at the time of recruitment, and (4) given written consent to participate in the study. The details of the study were described in previous publications [5, 17]. Mothers who were willing to participate in the research study provided written consent for themselves and their children. They were then asked to complete questionnaires that included an update on their household income, measures of HRQOL, and information on the mental health of themselves and their children. The index child from each household received an assessment on cognitive skills for the estimation of the IQ by a clinical psychologist using the Wechsler Intelligence Scale for Children Fourth Edition – Hong Kong (Short Form) [17].

This study received ethics approval from the Institutional Review Board of the University of Hong Kong (the Hospital Authority Hong Kong West Cluster; reference number UW 12-517).

Study instruments

Child health measures: Trained research staff recorded the age and sex of each child participant reported by the parents. Their HRQOL and behavioral problems were measured by the Chinese Child Health Questionnaire Parent Form 50 (CHQ-PF50) [18] and the Chinese Strengths and Difficulties Questionnaire (SDQ) [19] respectively. Both questionnaires were completed by the child's mother.

The CHQ-PF50 consists of 50 items grouped into 12 domain scales: general health (GH), physical functioning (PF), role/social limitations – emotional/behavioral (REB), role/social limitations – physical (RP), bodily pain/discomfort (BP), behavior (BE), mental health (MH), self-esteem (SE), parent impact – emotion (PE), parent impact – time (PT), family activities (FA), and family cohesion (FC). The raw scale scores are transformed into the 0–100 score range. They can be aggregated by weighted summation by the algorithm published in the Child Health Questionnaire scoring manual. The two aggregated summary scores – physical summary (PhS) score and psychosocial summary (PsS) score – are further converted to norm-based scores where the general population



mean is 50 and the standard deviation is 10 [20]. Higher CHQ-PF50 scores indicate better HRQOL. The SDQ is a 25-item behavioral measure with five subscales (conduct problems, hyperactivity/inattention, emotional symptoms, peer relationship problems, and prosocial behavior). The first four measure "negative" behavior, with higher scores indicating more behavioral problems, which are summated to a total difficulties score [21]. The prosocial behavior subscale assesses the presence of positive behavior in the interaction with others, such as being helpful if someone is hurt and being kind to younger children. Higher scores on the prosocial behavior subscale indicate more positive behavior. The CHQ-PF50 and SDQ have been shown to be valid in the local Chinese population [18, 19].

Mother's sociodemographic and mental health measures: A structured questionnaire was used to collect information on the mother's age, educational level, marital and working status, and monthly household income. Mothers were screened for depression with the Patient Health Questionnaire-2 (PHQ-2) [22]. The PHQ-2 has been shown to be valid in the local Chinese population, with a score of three or greater being indicative of depression [23]. We also assessed the mother's HRQOL by the physical component summary (PCS) and mental component summary (MCS) scores of the Chinese (Hong Kong) version of 12-item Short-Form Health Survey version 2 (SF-12v2). The SF-12v2 is a generic measure of HRQOL that has been validated and normed on the Hong Kong general population [24, 25]. It generates two norm-based summary scores on physical and mental HRQOL respectively. Higher SF-12v2 scores indicate better HRQOL.

Statistical analysis

Descriptive statistics on the means \pm standard deviation (SD) of the children's CHQ-PF50 or SDQ scores and the mothers' SF-12v2 scores and the prevalence of depression as indicated by the PHQ-2 score were calculated. The mothers' SF-12v2 PCS and MCS scores were each categorized into two groups by the population mean threshold of 50 [26]. The mother's marital status and working status were grouped into currently married versus unmarried and currently working versus not working respectively. Their educational level was

grouped into three categories: (1) primary school or below; (2) secondary school; (3) university or above. The monthly household income was also grouped into three categories: (1) HK\$20,000 or more, (2) HK\$10,000 to HK\$19,999, and (3) less than HK\$10,000, with reference to the Hong Kong population median monthly household income of HK\$20,000 (US\$2580) [27], and the poverty line of half of the population median (HK\$10,000 \approx US\$1290) [28].

Multiple linear regressions were used to examine the associations between poor maternal HRQOL (SF12v2 PCS score or MCS score < 50) and screen-detected depression (PHQ-2 score \geq 3) and the children's HRQOL (CHQ-PF50 scores) and behavior (SDQ scores). The unit of analysis was one-to-one mother-child pairs. The data were adjusted for the children's age, IQ and sex, and the mothers' sociodemographic characteristics and household income in the models.

Statistical analysis was performed with the IBM SPSS Statistics version 21.0. Statistical significance was set at $P < 0.05$ unless otherwise indicated.

Results

A total of 345 children aged 6–12 years from 310 families were identified from the database of the Health Empowerment Study [17]. Mothers of 278 children (80.6%) had completed the SF-12v2 and/or the PHQ-2 plus the CHQ-PF50 and/or SDQ for their children, and these families formed the sample of this study. The characteristics of the 278 mother-child pairs are shown in Table 1. The children were on average 8.54 years old (SD 1.19 years), and their mothers were 39.50 years old (SD 5.83 years). The mean SF-12v2 MCS score of mothers was 47.98 (SD 12.46), which was significantly lower than the general population mean of 50, and 124 (53.0%) of them had a score below 50. Further, 12.2% of the mothers had a PHQ-2 score of 3 or greater (i.e. screened positive for depression).

Table 2 shows a comparison of the CHQ-PF50 and SDQ scores between the study children and children sampled from the Hong Kong general population [19, 29]. Compared with the general population, our study children had lower scores (worse health) in all domains of the CHQ-PF50 and higher scores (more problems) on all four negative behavioral subscales of the SDQ.

The independent associations between maternal SF-12v2 PCS and MCS and PHQ-2 status and child CHQ-PF50 and



Table 1. Characteristics of study participants (278 children, 258 mothers)

	<i>n</i> (%) / mean (SD)
Child variables	
Mean age (years)	8.54 (1.19)
Male	140 (50.4%)
Female	138 (49.6%)
Mean IQ	100.28 (14.07)
Maternal variables	
Mean age (years)	39.50 (5.83)
Currently working	
Yes	77 (27.7%)
No	159 (57.2%)
Missing	42 (15.1%)
Currently married	
Yes	192 (69.1%)
No	44 (15.8%)
Missing	42 (15.1%)
Educational level	
Primary or below	38 (13.7%)
Secondary	182 (65.5%)
University	15 (5.4%)
Missing	43 (15.4%)
Monthly household income	
<HK\$10,000	90 (32.4%)
HK\$10,000 to HK\$19,999	106 (38.1%)
≥HK\$20,000	34 (12.2%)
Missing	48 (17.3%)
SF-12v2 MCS (<i>n</i>=234)	
Mean score	47.98 (12.46)
Score < general population mean of 50	124 (53.0%)
Difference from the general population mean	2.02 (<i>P</i> =0.014)
SF-12v2 PCS (<i>n</i>=234)	
Mean score	49.22 (8.83)
Score < general population mean of 50	100 (42.7%)
Difference from the general population mean	0.78 (<i>P</i> =0.178)
PHQ-2 score (<i>n</i>=255)	
Mean score	1.04 (1.40)
Screened positive for depression (score ≥3)	34 (13.3%)

Statistical significance was determined at *P* < 0.05.

MCS, mental component summary; PCS, physical component summary; PHQ-2, Patient Health Questionnaire-2; SF-12v2, 12-item Short-Form Health Survey version 2.

SDQ scores, with adjustment for possible confounding variables related to the children and the mother and household income, are shown in Table 3. A maternal SF-12v2 MCS score below 50 (population mean) was associated with lower scores

on 8 of the 12 CHQ-PF50 subscales (BP: *B* = -6.58, *P* = 0.004; BE: *B* = -7.72, *P* = 0.002; MH: *B* = -10.60, *P* < 0.001; GH: *B* = -7.57, *P* = 0.002; PE: *B* = -8.45, *P* = 0.005; PT: *B* = -13.15, *P* < 0.001; FA: *B* = -10.56, *P* = 0.001; FC: *B* = -8.21, *P* = 0.021), lower PhS (*B* = -3.91, *P* = 0.013) and PsS (*B* = -6.03, *P* < 0.001) scores, and lower scores (worse behavior) on the SDQ prosocial behavior subscale (*B* = -0.74, *P* = 0.010) but higher scores (more problems) on all four negative subscales (emotional symptoms: *B* = 0.78, *P* = 0.010; conduct problems: *B* = 0.64, *P* = 0.006; hyperactivity/inattention: *B* = 0.95, *P* = 0.002; peer relationship problems: *B* = 0.58, *P* = 0.027) and a higher SDQ total behavioral difficulties score (*B* = 2.86, *P* < 0.001). A maternal SF-12v2 PCS score below 50 was associated with lower scores (worse) on the BE (*B* = -5.17, *P* = 0.035), PE (*B* = -8.21, *P* = 0.005), PT (*B* = -10.79, *P* = 0.002), and FA (*B* = -6.81, *P* = 0.027) subscales of the CHQ-PF50, a lower PsS scores (*B* = -3.93, *P* = 0.020), and higher scores (more problems) on the SDQ emotional symptoms (*B* = 0.93, *P* = 0.002) and hyperactivity/inattention (*B* = 0.70, *P* = 0.020) subscales and a higher SDQ total difficulties score (*B* = 2.19, *P* = 0.003). Maternal PHQ-2 depression-positive status was associated with higher scores on the SDQ emotional symptoms (*B* = 0.92, *P* = 0.047) and conduct problems (*B* = 0.94, *P* = 0.008) subscales, but not with any of the CHQ-PF50 scores.

Discussion

Our study confirmed that children from low-income families had significantly poorer HRQOL especially in the psychosocial domains than children from the general population. A population-based study of 128,044 children from low-income families in the United States found that multiple chronic conditions were prevalent and associated with greater rates of urgent health care use [30], which might be part of the reason for poorer HRQOL in these children. However, although our study children were reported to have comparable physical functioning, their general health was perceived to be rather poor by their mothers, with a mean score 5.88 points lower than that of their general population counterparts. This finding suggested that mothers may have concerns about other aspects of child health in addition to physical fitness.

As hypothesized, we found that lower maternal HRQOL scores were associated with lower HRQOL scores and worse



Table 2. Comparison of Child Health Questionnaire Parent Form 50 (CHQ-PF50) and Strength and Difficulty Questionnaire (SDQ) scores between study children and the Hong Kong general child population

Characteristics	This study (n=266)	Hong Kong general child population (n=2721*)	P
HRQOL (measured by CHQ-PF50)			
Age (years; range)	6–12	6–10	
Male (%)	49.2	51.8	
Physical functioning (PF) score	92.62 (15.15)	95 (12)	0.003
Role functioning – emotional and behavioral (REB) score	80.22 (26.66)	94 (16)	<0.001
Role functioning – physical (RP) score	91.04 (19.92)	95 (14)	0.001
Bodily pain (BP) score	87.33 (15.92)	96 (12)	<0.001
General behavior (BE) score	70.11 (18.27)	82 (13)	<0.001
Mental health (MH) score	76.66 (18.02)	85 (12)	<0.001
Self-esteem (SE) score	67.25 (12.40)	69 (12)	0.024
General health perceptions (GH) score	63.12 (16.68)	69 (14)	<0.001
Parental impact – emotional (PE) score	70.30 (23.30)	79 (21)	<0.001
Parental impact – time (PT) score	74.63 (25.40)	86 (20)	<0.001
Family activities (FA) score	80.70 (21.94)	93 (14)	<0.001
Family cohesion (FC) score	60.23 (25.56)	75 (18)	<0.001
Physical summary (PhS) score	46.09 (10.88)	–	–
Psychosocial summary (PsS) score	42.88 (12.59)	–	–
Characteristics	This study (n=275)	Hong Kong general child population (n=3722†)	P
Behavioral problems (measured by SDQ)			
Age (years; range)	6–12	6–12	
Male (%)	50.5	51	
Emotional symptoms score	3.04 (2.13)	2.5 (2.0)	<0.001
Conduct problems score	2.48 (1.78)	2.1 (1.6)	<0.001
Hyperactivity/inattention score	5.01 (2.34)	4.5 (2.3)	<0.001
Peer relationship problems score	2.85 (1.88)	2.6 (1.7)	0.020
Prosocial behavior score	6.83 (2.06)	6.7 (2.0)	0.299
Total difficulties score	13.26 (5.64)	11.7 (5.4)	<0.001

Statistical significance was determined at $P < 0.05$. The standard deviation is given in parentheses.

HRQOL, Health-related quality of life; CHQ-PF50, Child Health Questionnaire-Parent Form-50; SDQ, Strength and Difficulty Questionnaire.

*An independent samples t test was used to test the CHQ-PF50 score differences between study children and a Hong Kong general population sample of 2721 children from the Child Health Survey 2005–2006 [29].

†An independent samples t test was used to test the SDQ score differences between study children and a Hong Kong general population sample of 3722 children of the study reported by Lai et al. [19].

behavior among children in low-income families. The ability to fulfill one's daily roles is an important indicator of quality of life. Impairment of the mother's quality of life implies that she may not be able to cope with her daily role in childcare [31]. Inadequate child care, in turn, can lead to adverse child

development affecting the child's daily activities, emotion, and behavior [32, 33]. Emotional and behavioral problems in children may further aggravate parental stress [31, 34], leading to a vicious cycle, which can be more serious in low-income families, who are lacking resources and support in childcare.



Table 3. Adjusted associations between maternal variables (12-item Short-Form Health Survey version 2 scores and Patient Health Questionnaire-2 [PHQ-2] status and child variables (Child Health Questionnaire Parent Form 50 [CHQ-PF50] and Strength and Difficulty Questionnaire [SDQ] scores)

	Maternal MCS score < 50			Maternal PCS score < 50			Maternal positive PHQ-2 screen		
	Unstandardized regression coefficient (B) [†]	Standardized regression coefficient (β) [*]	P	Unstandardized regression coefficient (B) [†]	Standardized regression coefficient (β) [*]	P	Unstandardized regression coefficient (B) [†]	Standardized regression coefficient (β) [†]	P
HRQOL (measured by CHQ-PF50)									
Physical functioning (PF) score	-1.79 (-6.27, 2.69)	-0.06	0.433	-4.04 (-8.38, 0.29)	-0.13	0.067	0.59 (-5.96, 7.14)	0.01	0.850
Role functioning – emotional and behavioral (REB) score	-5.20 (-12.48, 2.08)	-0.10	0.162	-5.34 (-12.44, 1.76)	-0.10	0.141	-3.00 (-13.73, 7.72)	-0.04	0.583
Role functioning – physical (RP) score	-3.42 (-9.21, 2.38)	-0.08	0.248	-4.10 (-9.72, 1.53)	-0.10	0.153	-0.60 (-9.07, 7.87)	-0.10	0.890
Bodily pain (BP) score	-6.58 (-11.07, -2.09)	-0.20	0.004	-2.33 (-6.79, 2.12)	-0.07	0.305	2.39 (-4.33, 9.11)	0.05	0.486
General behavior (BE) score	-7.72 (-12.58, -2.87)	-0.22	0.002	-5.17 (-9.97, -0.38)	-0.15	0.035	-3.73 (-11.01, 3.55)	-0.07	0.315
Mental health (MH) score	-10.60 (-15.52, -5.67)	-0.30	<0.001	-3.15 (-8.14, 1.84)	-0.09	0.216	-4.96 (-12.48, 2.55)	-0.09	0.196
Self-esteem (SE) score	-2.90 (-6.08, 0.29)	-0.12	0.074	-1.63 (-4.75, 1.49)	-0.07	0.306	1.67 (-3.05, 6.38)	0.05	0.489
General health perceptions (GH) score	-7.57 (-12.25, -2.89)	-0.23	0.002	-1.90 (-6.57, 2.78)	-0.06	0.426	-0.13 (-7.16, 6.91)	0.00	0.972
Parental impact – emotional (PE) score	-8.45 (-14.37, -2.52)	-0.20	0.005	-8.21 (-13.99, -2.43)	-0.19	0.005	-8.22 (-17.02, 0.59)	-0.12	0.067
Parental impact – time (PT) score	-13.15 (-20.26, -6.03)	-0.26	<0.001	-10.79 (-17.78, -3.80)	-0.21	0.002	-6.50 (-17.16, 4.17)	-0.08	0.232
Family activities (FA) score	-10.56 (-16.67, -4.43)	-0.24	0.001	-6.81 (-12.86, -0.76)	-0.15	0.027	0.69 (-8.51, 9.88)	0.01	0.884
Family cohesion (FC) score	-8.21 (-15.21, -1.22)	-0.17	0.021	-3.23 (-10.12, 3.66)	-0.07	0.358	-7.42 (-17.76, 2.92)	-0.10	0.160
Physical summary (PhS) score	-3.91 (-6.99, -0.82)	-0.18	0.013	-2.96 (-5.97, 0.05)	-0.13	0.054	0.88 (-3.62, 5.38)	0.03	0.701
Psychosocial summary (PsS) score	-6.03 (-9.39, -2.67)	-0.25	<0.001	-3.93 (-7.25, -0.62)	-0.16	0.020	-3.41 (-8.38, 1.57)	-0.09	0.179
Behavioral problems (measured by SDQ)									
Emotional symptoms score	0.78 (0.19, 1.37)	0.18	0.010	0.93 (0.35, 1.50)	0.22	0.002	0.92 (0.01, 1.83)	0.14	0.047
Conduct problems score	0.64 (0.18, 1.09)	0.19	0.006	0.38 (-0.70, 0.83)	0.11	0.097	0.94 (0.24, 1.64)	0.17	0.008
Hyperactivity/inattention score	0.95 (0.35, 1.55)	0.21	0.002	0.70 (0.11, 1.30)	0.16	0.020	0.22 (-0.69, 1.13)	0.32	0.629
Peer relationship problems score	0.58 (0.07, 1.09)	0.15	0.027	0.24 (-0.26, 0.75)	0.06	0.347	-0.09 (-0.90, 0.71)	-0.02	0.822
Prosocial behavior score	-0.74 (-1.30, -0.18)	-0.18	0.010	0.24 (-0.32, 0.80)	0.06	0.395	-0.83 (-1.66, 0.01)	-0.13	0.054
Total difficulties score	2.86 (1.40, 4.32)	0.26	<0.001	2.19 (0.74, 3.64)	0.20	0.003	1.45 (-0.87, 3.78)	0.08	0.221

Statistical significance was determined at $P < 0.05$. The 95% confidence interval is given in parentheses.

HRQOL, health-related quality of life; MCS, mental component summary; PCS, physical component summary.

*Adjusted for child age, sex, and IQ as well as maternal age, PHQ-2 status, marital status, and working status, education level, and household income level.

†Adjusted for child age, sex, and IQ as well as maternal age, marital status, working status, education level, and household income level.



The 12.2% prevalence of depression by detected by the PHQ-2 among mothers in this study was higher than the 4.2% reported from the general population [23], calling for more attention to be paid to the prevention and treatment of mental health problems in low-income families. It was expected that PHQ-2-screened depression in the mother would be associated with higher scores on the SDQ emotional symptoms and conduct problems subscales in the child, but it was unexpected that there was no significant association between maternal PHQ-2-screened depression and child HRQOL. Our findings seem contrary to those reported for mothers with clinically diagnosed depression [8–10]. One possible explanation is that the symptoms in screen-detected depression are less severe than those in clinically diagnosed depression, so the former group of mothers can continue to attend to the care and development of their children. Another possible explanation is that depressive symptoms without adverse effect on HRQOL do not affect the mother's roles in childcare. Further studies are needed to confirm our findings and to elucidate how maternal depressive symptoms affect the quality of life and behavior of children. On the other hand, the SF-12v2 MCS score measures the impact of mental health problems on the daily role and social functioning, of which childcare is the most important for mothers. The findings suggest that mental HRQOL may be a more sensitive indicator of the significance of maternal mental health problems than a diagnosis of depression. In the evaluation and promotion of mental health of mothers, we must pay attention to the impact of these problems on the HRQOL on both mothers and children.

A notable finding was a large difference of 20.47 between the CHQ-PF50 scores on the FA and FC subscales, indicating that frequent family activities may not necessarily imply strong cohesion in families. Adults from low-income families often have to work long and irregular hours. It is possible that the need to spend time in family activities may have conflicted with the demands of work and earning, which may not be conducive to family cohesion [35]. This finding highlights the importance of measuring not only the quantity but also the quality of family interactions in the evaluation of family relationships.

The differences in the mean scores between our study children and the Hong Kong general child population in the physical-health-related domains (PF, RP, and GH) of the CHQ-PF50 were small although statistically significant. These

findings suggest that low household income has a greater impact on children's mental health and family interaction than other aspects of their life.

Another notable finding was that poor maternal mental HRQOL was not associated with the CHQ-PF50 scores on the REB subscale in spite of its associations with the CHQ-PF50 mental health and emotional scores and the SDQ scores for behavioral difficulties. The REB subscale captures the extent to which the child's daily functions are disturbed by internalizing (emotion) and/or externalizing behavioral difficulties (e.g. conduct problems). The presence of emotional or behavioral problems and the effects of these problems on functioning are different constructs. The latter could be modulated by other factors such as support from school, peers, the and family. Such findings provide further support for the importance of measuring HRQOL for health evaluation to better understand the true impact and severity of health problems experienced by the person. The lack of association between maternal mental HRQOL and the CHQ-PF50 SE score might be unexpected but is reassuring. Apart from maternal influence, academic performance and peer acceptance may play a more important role in building children's self-esteem.

The strength of this study was the analysis of mother-child paired data. The findings are important because they show that subclinical mental health problems can impair quality of life of mothers, and HRQOL might be the mediator between maternal mental health problems and poor child HRQOL and behavioral problems. This study had several limitations. First, this was a cross-sectional study and hence we could not conclude on any causal relationship between maternal HRQOL and child HRQOL and behavior. Second, we studied volunteer participants from a community family support program, and the findings may not be generalizable to other low-income families in Hong Kong. We also do not know whether the mother-child HRQOL association also applies to families with middle and high incomes. Lastly, the mother reported both of her own and her child's HRQOL, which could have inflated the association, as mothers with poor HRQOL may perceive their children's health or behavior more negatively. A further study using a more representative sample and another informant (e.g. the father) to assess children's health and behavior should be performed to confirm the results of this study.



Conclusion

Children from low-income families had worse HRQOL and more behavioral problems than children from the general population in Hong Kong. There were significant associations of child HRQOL and behavior with maternal HRQOL, which were stronger than those found with maternal screen-detected depression. The lack of association of child HRQOL with screen-detected depression may be due to the symptoms not being severe enough to disrupt the quality of childcare provided by the mother. Our findings suggest the need to take into account not only the presence of depression but also the effect of mental health problems on functioning and quality of life in mothers in the promotion of child health, quality of life, and behavior. HRQOL is an important health outcome measure. More efforts and attention should be paid to improve the HRQOL of mothers and children from low-income families.

Acknowledgments

We are most grateful to Kerry Group Kuok Foundation (Hong Kong) Limited (KGKF) for their support. We thank the Neighborhood Advice-Action Council (NAAC) and Yat Tung (I/II) Estate Property Management in providing venue for our study. A special thanks to Versitech Ltd for granting us a complementary license to use the OPine Software for data collection in our study. The timely completion of the telephone surveys by the HKU Social Science Research Center is much appreciated. The hard work of our research staff in data collection and analysis must be acknowledged.

Conflicts of interest

The authors declare no conflict of interest.

Funding

This study was supported by Kerry Group Kuok Foundation (Hong Kong) Limited.

References

- Guyatt GH, Feeny DH, Patrick DL. Measuring health-related quality of life. *Ann Intern Med* 1993;118(8):622–9.
- Von Rueden U, Gosch A, Rajmil L, Bisegger C, Ravens-Sieberer U. Socioeconomic determinants of health related quality of life in childhood and adolescence: results from a European study. *J Epidemiol Community Health* 2006;60(2):130–5.
- Robert SA, Cherepanov D, Palta M, Dunham NC, Feeny D, Fryback DG. Socioeconomic status and age variations in health-related quality of life: results from the national health measurement study. *J Gerontol B Psychol Sci Soc Sci* 2009;64B(3):gbp012.
- Zahran HS, Kobau R, Moriarty DG, Zack MM, Holt J, Donehoo R, et al. Health-related quality of life surveillance – United States, 1993–2002. *MMWR Surveill Summ* 2005;54(4):1–35.
- Lam CLK, Guo VY, Wong CKH, Yu EYT, Fung CSC. Poverty and health-related quality of life of people living in Hong Kong: comparison of individuals from low-income families and the general population. *J Public Health (Oxf)* 2016. pii: fdw046.
- Santiago CD, Kaltman S, Miranda J. Poverty and mental health: how do low-income adults and children fare in psychotherapy? *J Clin Psychol* 2013;69(2):115–26.
- Spencer N, Thanh TM, Louise S. Low income/socio-economic status in early childhood and physical health in later childhood/adolescence: a systematic review. *Matern Child Health J* 2013;17(3):424–31.
- Goodman SH, Rouse MH, Connell AM, Broth MR, Hall CM, Heyward D. Maternal depression and child psychopathology: a meta-analytic review. *Clin Child Fam Psychol Rev* 2011;14(1):1–27.
- Brennan PA, Hammen C, Andersen MJ, Bor W, Najman JM, Williams GM. Chronicity, severity, and timing of maternal depressive symptoms: relationships with child outcomes at age 5. *Dev Psychol* 2000;36(6):759.
- Propper C, Rigg J, Burgess S. Child health: evidence on the roles of family income and maternal mental health from a UK birth cohort. *Health Econ* 2007;16(11):1245–69.
- Reising MM, Watson KH, Hardcastle EJ, Merchant MJ, Roberts L, Forehand R, et al. Parental depression and economic disadvantage: the role of parenting in associations with internalizing and externalizing symptoms in children and adolescents. *J Child Fam Stud* 2013;22(3):335–43.
- Pearson RM, Evans J, Kounali D, Lewis G, Heron J, Ramchandani PG, et al. Maternal depression during pregnancy and the postnatal period: risks and possible mechanisms for offspring depression at age 18 years. *J Am Med Assoc Psychiatry* 2013;70(12):1312–9.
- Barker ED, Copeland W, Maughan B, Jaffee SR, Uher R. Relative impact of maternal depression and associated risk factors on offspring psychopathology. *Br J Psychiatry* 2012;200(2):124–9.



14. Cuijpers P, Smit F, Van Straten A. Psychological treatments of subthreshold depression: a meta-analytic review. *Acta Psychiatr Scand* 2007;115(6):434–41.
15. Fergusson DM, Horwood LJ, Ridder EM, Beautrais AL. Sub-threshold depression in adolescence and mental health outcomes in adulthood. *Arch Gen Psychiatry* 2005;62(1):66–72.
16. Pincus HA, Davis WW, McQueen LE. 'Subthreshold' mental disorders. A review and synthesis of studies on minor depression and other 'brand names'. *Br J Psychiatry* 1999;174(4):288–96.
17. Fung CS, Yu EY, Guo VY, Wong CK, Kung K, Ho SY, et al. Development of a health empowerment programme to improve the health of working poor families: protocol for a prospective cohort study in Hong Kong. *Br Med J Open* 2016;6(2):e010015.
18. Ng J, Landgraf J, Chiu C, Cheng N, Cheung Y. Preliminary evidence on the measurement properties of the Chinese version of the Child Health Questionnaire, parent form (CHQ-pF50) and child form (CHQ-CF87). *Qual Life Res* 2005;14(7):1775–81.
19. Lai KY, Luk ES, Leung PW, Wong AS, Law L, Ho K. Validation of the Chinese version of the strengths and difficulties questionnaire in Hong Kong. *Soc Psychiatry Psychiatr Epidemiol* 2010;45(12):1179–86.
20. Landgraf JM, Abetz L, Ware JE. *Child Health Questionnaire (CHQ): a user's manual*. 1996: Health Institute, New England Medical Center, Boston.
21. Goodman A, Lamping DL, Ploubidis GB. When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the Strengths and Difficulties Questionnaire (SDQ): data from British parents, teachers and children. *J Abnorm Child Psychol* 2010;38(8):1179–91.
22. Kroenke K, Spitzer RL, Williams JBW. The Patient Health Questionnaire-2: validity of a two-item depression screener. *Med Care* 2003;41(11):1284–92.
23. Yu X, Stewart SM, Wong PT, Lam TH. Screening for depression with the Patient Health Questionnaire-2 (PHQ-2) among the general population in Hong Kong. *J Affect Disord* 2011;134(1):444–7.
24. Lam ETP, Lam CLK, Fong DYT, Huang WW. Is the SF-12 version 2 health survey a valid and equivalent substitute for the SF-36 version 2 health survey for the Chinese? *J Eval Clin Pract* 2013;19(1):200–8.
25. Lam CLK, Lo YYC, Wong CKH, Lam ETP, Huang WW. Population norm of Chinese (HK) SF-12 health survey-version 2 of Chinese adults in Hong Kong. *HK Pract* 2010;32(2):77.
26. Lam CL, Eileen Y, Gandek B. Is the standard SF-12 health survey valid and equivalent for a Chinese population? *Qual Life Res* 2005;14(2):539–47.
27. Census & Statistics Department. [Internet] 2011 Hong Kong population census. 2011 [accessed 2016 Sep 17]. Available from: <http://www.census2011.gov.hk>.
28. Economic Analysis Division, Economic Analysis and Business Facilitation Unit, Financial Secretary's Office, Census and Statistics Department, Government of the Hong Kong Special Administrative Region. *Hong Kong poverty situation report 2012*. 2013.
29. Surveillance and Epidemiology Branch Centre for Health Protection Department of Health. [Internet] *Child Health Survey 2005–2006*. December 2009 [accessed 2016 Sep 17]. Available from: http://www.chp.gov.hk/files/pdf/chs_eng.pdf.
30. Clark NM, Lachance L, Benedict MB, Little R, Leo H, Awad DF, et al. The extent and patterns of multiple chronic conditions in low-income children. *Clin Pediatr (Phila)* 2015;54(4):353–8.
31. Mugno D, Ruta L, D'Arrigo VG, Mazzone L. Impairment of quality of life in parents of children and adolescents with pervasive developmental disorder. *Health Qual Life Outcomes* 2007;5(1):1.
32. Li W, Farkas G, Duncan GJ, Burchinal MR, Vandell DL. Timing of high-quality child care and cognitive, language, and preacademic development. *Dev Psychol* 2013;49(8):1440.
33. Manly JT, Oshri A, Lynch M, Herzog M, Wortel S. Child neglect and the development of externalizing behavior problems associations with maternal drug dependence and neighborhood crime. *Child Maltreat* 2013;18(1):17–29.
34. Baker BL, Blacher J, Crnic KA, Edelbrock C. Behavior problems and parenting stress in families of three-year-old children with and without developmental delays. *Am J Ment Retard* 2002;107(6):433–44.
35. Greenhaus JH, Beutell NJ. Sources of conflict between work and family roles. *Acad Manage Rev* 1985;10(1):76–88.