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J Pain. Author manuscript; available in PMC 2009 September 1.

Published in final edited form as:
J Pain. 2008 September ; 9(9): 833–840. doi:10.1016/j.jpain.2008.04.002.

Daily functioning and quality of life in children with sickle cell disease pain: Relationship with family and neighborhood socioeconomic distress

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Abstract

The aim of this study was to examine the relationship between individual/family and neighborhood socioeconomic distress, pain, and functional outcomes in children with sickle cell disease (SCD). We hypothesized that both individual economic distress as well as residence in neighborhoods of severe economic distress would predict children's level of pain-related functional disability and health related quality of life (HRQOL). Participants (mean age = 12.14 years, 57% male, *n* = 56) were recruited from an outpatient hematology clinic at a Midwestern tertiary referral hospital. Questionnaires assessing pain, depression, functional disability, and HRQOL were completed by children and their caregivers. Individual socioeconomic data including parental education and family income was reported by caregivers. Neighborhood socioeconomic distress was identified using publicly available census tract data, and was based on neighborhood poverty, female head of household, male unemployment, and high school dropout levels. Multivariate regression analyses revealed that individual/family socioeconomic distress was a significant predictor of children's functional disability and physical and psychosocial HRQOL. Neighborhood socioeconomic distress emerged as a significant independent predictor of physical HRQOL only, where living in a distressed neighborhood predicted diminished physical HRQOL. Findings suggest that individual socioeconomic status and neighborhood economic distress play similar but independent roles in predicting children's functional outcomes related to SCD pain.

Keywords

sickle cell disease; socioeconomic status; functional disability; quality of life; children

Introduction

Pain is a common consequence of sickle cell disease (SCD). Pain in the form of vaso-occlusive episodes can begin as early as six months of age[22], can be frequent and severe[32], and may last

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Perspective
Little is known about the influence of either individual/family or neighborhood socioeconomic factors on pain and functioning in children with SCD. Our findings suggest that socioeconomic distress defined at both the individual level and at the neighborhood/community level are significant independent predictors of pain-related disability and HRQOL in children with SCD.

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from hours to weeks[34]. In one daily diary study over a two week period, 65% of children experienced a painful episode associated with SCD[10], and SCD pain was associated with increased impairment in daily activities such as school[27]. Additional consequences of SCD include having fewer friends and being less athletic[16], and potentially impairing adjustment in every major area of daily functioning: physical, emotional, recreational, educational, and vocational[4]. Assessment of quality of life in children with SCD has found limitations due to complications of the disease and treatment requirements[3]. Children with mild SCD have been reported to have more optimal health-related quality of life (HRQOL) than those with severe SCD[20], and as a group, children with SCD have more limited physical, psychological, and social well-being than demographically matched healthy children[17]. Because SCD affects predominantly ethnic minorities in the U.S. and there are tremendous disparities in wealth between White Americans and African-American and Hispanic Americans[1], the relevance of socioeconomic conditions to children's pain, functioning, and HRQOL is high in this population.

Various forms of the social ecological model have been used to describe children's adaptation to chronic disease in the context of influencing systems; one such model, adapted by Radcliffe, Barakat, and Boyd, describes adjustment to pediatric SCD[23]. In this model, reciprocal influences of four nested systems, individual, family, broader community, and society, are conceptualized as being impacted by illness-related characteristics. In the present study, we focus on the first three systems, individual, family, and community. Individual and family influences on children's pain and functional outcomes are best represented in the literature, and broader influences have been less thoroughly investigated. At the individual level, more intense pain in children and adolescents with SCD has been shown to be associated with increased social anxiety[31], and symptom internalization[30]. Additionally, more severe SCD was found to be associated with more depressive symptoms[13] and worse quality of life[20]. At the family level, lower family income has been associated with more severe pain intensity[2,12], and lower income has also been associated with more negative thinking in adolescents with SCD[2]. However, there is a gap in knowledge of factors at the neighborhood or community level that may impact pain and functional outcomes in youth with SCD. Therefore, the purpose of this study was to investigate the relationship between individual and neighborhood socioeconomic conditions and pain-related functional outcomes, specifically functional disability and health-related quality of life in youth with SCD.

Studies have demonstrated that socioeconomic status has a profound influence on health with higher rates of morbidity and mortality for individuals with lower socioeconomic status across multiple health conditions[7]. Apart from individual resources and wealth, the neighborhood/community context is also important to consider. Residence in disadvantaged neighborhoods has been linked with poorer health, developmental, and psychosocial outcomes for children. Several studies have reported an effect of neighborhood conditions on children's health independent of family or individual socioeconomic status[21]. Neighborhoods of severe distress are characterized by high poverty, unemployment, and high school dropout rates, and a large proportion of single, female-headed households[28]. Neighborhood socioeconomic status more closely represents the community resources and support available to an individual versus the family resources which are more accurately defined by individual socioeconomic characteristics[7]. Using census tract data to identify these neighborhood socioeconomic characteristics, we examined the relationship between residence in a distressed neighborhood and child pain-related functional outcomes. We also accounted for several individual factors that are known to be related to functional outcomes including depressive symptoms and illness-related variables (pain and disease severity). In previous studies of children with sickle cell disease, depressive symptoms have been associated with functional outcomes[12,13,30,31]. We hypothesized that after controlling for individual factors, including SCD pain, disease severity, and depressive symptoms, family socioeconomic status and neighborhood socioeconomic

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distress would independently predict increased functional disability and decreased physical and psychosocial HRQOL in children with SCD.

Materials and Methods

This study was approved by the Institutional Review Board of the University Hospitals of Cleveland. Written informed consent was obtained from parents/caregivers and oral assent was obtained from all children and adolescents for their study participation.

Sampling

Children with sickle cell disease aged 8–17 and their caregivers were recruited from an outpatient hematology clinic at a large tertiary referral hospital in the Midwest. Inclusion criteria required the children be diagnosed with either HbSS (n = 47), HbSC (n = 5), or sickle beta + thalassemia (n = 4), lack a developmental disability, and be literate in English. Of all children approached about study participation, 90% (n = 56) were enrolled. The only reason for refusal to participate was a lack of time. All children were African-American and 57% were males, with a mean age of approximately 12 years (SD = 2.5). No differences between participants and non-participants were observed from basic demographic data. There were 47 different census tracts represented with 52 of 56 patients living in Cuyahoga County, the county in which the hospital is located. Additional descriptive statistics of the sample can be seen in Table 1. A summary of the patient's sickle cell disease characteristics is provided in Table 2.

Procedure

Potential participants were identified through an outpatient hematology clinic and enrolled by a trained research assistant between January, 2001 and August, 2002. At the time of study entry, questionnaires were completed at the clinic by participants and their caregivers. Children and parents completed questionnaires assessing pain, depression, functional disability, and quality of life, and their caregiver completed an additional demographic questionnaire. Families were compensated with gift cards to local stores for their participation.

Measures

Household Sociodemographics—Caregivers completed a questionnaire assessing participants' age, gender, family composition, parental marital status, occupation, family income, home address, and caregiver's educational background.

Neighborhood Sociodemographics—The child home address was used to determine which census tract each family was located in using the U.S. Census Bureau's American Fact Finder program (http://factfinder.census.gov). Using the methods described by Spilsbury and colleagues[28], the poverty rate, male unemployment rate, percentage of families headed by a female only and percentage of high school dropouts were obtained and used to define the composite measure of severely distressed neighborhoods. Distress for each criterion was defined as a neighborhood rate greater than or equal to one standard deviation away from the U.S. mean: 27.4% poverty rate, 37.1% female head of household rate, 34.0% male unemployment rate, and 23.0% high school dropout rate. A neighborhood was defined as distressed if it met three out of four of these specific distress characteristics. All neighborhood characteristics were found online at NEO CANDO system, Center on Urban Poverty and Community Development, MSASS, Case Western Reserve University (http://neocando.case.edu) using data from the 2000 U.S. Census.

Average Pain Intensity and Frequency—Children completed a questionnaire assessing their average or usual pain over the previous 4 weeks. Pain intensity was rated using the validated Faces Pain Scale[5]. This scale consists of a series of 7 faces with a 'no pain' anchor

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(representing a score of 0) at one end and a 'worst pain ever' anchor (representing a score of 6) at the other end. Reported reliability and validity for the scale is adequate. Previous literature has demonstrated significant relationships between child-reported pain intensity and functional outcomes[18]. At the time of data collection, the Faces Pain Scale Revised version was not yet available. Pain frequency was assessed using a Likert scale with response options ranging from none/less than once a month to daily occurrence of pain.

Disease severity—One attending hematologist (the attending physician for all of the children) completed a provider assessment form which included disease complications and treatment information as well as ratings of perception of the child's current disease severity. Disease severity was assessed using a 10-cm visual analog scale with anchors at the two ends representing "not severe at all" to "extremely severe." Similar assessments of physician perception of disease have been used in previous research with children with chronic health conditions[25]. The physician was blind to the results of participants' other study measures.

Depressive symptoms—The major depressive disorder (MDD) subscale of the Revised Child Anxiety and Depression Scale (RCADS) was used to assess depressive symptoms. Children respond to questions about their experiences with symptoms over the previous week. T-scores are calculated based on child gender and grade in school. This measure has demonstrated good internal consistency (alpha = 0.77 for the MDD subscale) and adequate one-week test-retest reliability. Validity has previously been established through relationships with other depression measures. Raw scores greater than or equal to 11 have been predictive of MDD in clinical samples[8].

Health-related quality of life—The Child Health Questionnaire—Parent Report Version (CHQ-PF50)[14] was used to assess child health-related quality of life. The CHQ-PF50 is a 50-item questionnaire of health related quality of life (HRQOL) completed by the parent, measuring the child's physical, emotional, and social functional status and well-being. Respondents take into consideration health and functioning over the previous 4 weeks. Each of the CHQ dimensions is measured with multiple items. For each item, parents rate an aspect of their child's functioning on a 4-, 5-, or 6- point Likert scale, taking into consideration functioning over the previous 4 weeks. The CHQ individual sub-scales consist of: physical functioning, role/social physical, general health perceptions, bodily pain, role/social-emotional behavior, role/social-physical behavior, bodily pain, behavior, mental health, self-esteem, general health perceptions, family activities, family cohesion, parental impact, global general health, and global behavior. The Child Health Questionnaire Parent—Report Version has been previously used in children with sickle cell disease[17,20]. Physical and Psychosocial summary scores are calculated from weighted combinations of individual sub-scales in the CHQ-PF50. Higher scores indicate better HRQOL.

Functional disability—Children and parents both completed the Functional Disability Inventory (FDI), a 15-item questionnaire assessing children's ability to participate in functional activities including school, home, recreation, and social activities[33]. Sample activities include walking up stairs, eating regular meals, reading, watching TV and doing homework. Difficulty is rated on a 5-point scale ranging from '0 – no trouble' to '4 – impossible' to complete each activity over the previous week. Acceptable internal consistency and test-retest reliability have been reported[33]. The measure has been used in previous studies to examine functional disability of children with SCD[15].

Statistical Analysis

The Statistical Package for the Social Sciences, Version 15.0, was used for statistical analyses. Descriptive statistics were summarized using frequencies and means. Spearman's rho and

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Pearson's product moment correlations were used to examine bivariate relationships between potential predictor variables, including socioeconomic variables, pain, functional disability, and health-related quality of life. Hierarchical multiple regressions were used to test our model that individual and neighborhood socioeconomic distress would predict children's functional disability and HRQOL. Consistent with the social ecological model, individual and disease characteristics were entered on the first step, including child age, pain intensity, disease severity, and depression. Individual SES characteristics, family income and parent education, were entered on the second step. Family income and education have most commonly been used as surrogates for individual socioeconomic status[7]. Neighborhood distress was entered on the third and final step, to test the hypothesis that after controlling for relevant individual and disease characteristics, family socioeconomic status and living in a distressed neighborhood would be independently associated with increased functional disability and diminished physical and psychosocial HRQOL in children with SCD.

Results

Descriptive statistics: population and neighborhood

Nearly half of the children in this sample lived in households containing more than four people, and 64% of parents were not currently married. The highest educational level attained by caregivers in the study was predominantly a high school diploma or equivalent (61%), and approximately half of the sample population had reported family incomes of less than $20,000. Census tract data revealed which distressed neighborhood criteria – poverty rate, female head of household rate, male unemployment rate, and high school dropout rate greater than one standard deviation higher than the U.S. mean – were met by our participants. The poverty level criterion of neighborhood distress was met by 55% of the participants. High female head of household rates were found in 73% of participants. Only 4% of the census tracts investigated had significant male unemployment rates. High school dropout rates were high in 29% of the census tracts inhabited by participants in this sample. Based on the criteria for a distressed neighborhood described above, we found that 25% of the participants lived in a distressed neighborhood. Complete descriptive statistics are shown in Table 1.

Descriptive statistics: pain and assessments

Mean average pain intensity was in the moderate range ($\underline{M}$ = 4.5, $\underline{SD}$ = 1.9), as was disease severity ($\underline{M}$ = 3.8, $\underline{SD}$ = 3.3). Approximately 1/3 of children reported experiencing pain at least once a week. A summary of the disease characteristics of the sample are included in Table 2. Twenty-five percent of children had a raw score equal to or greater than 11 on the major depressive disorder subscale, which is predictive of MDD. Functional disability summary scores were in the mild to moderate range by child ($\underline{M}$ = 11.5, $\underline{SD}$ = 10.7) and parental report ($\underline{M}$ = 13.4, $\underline{SD}$ = 14.0). The mean Physical HRQOL score was 38.8 ($\underline{SD}$ = 13.1), and the mean Psychosocial HRQOL score was 45.6 ($\underline{SD}$ = 11.5), similar to those observed in another SCD sample in a previous study by Palermo and colleagues[17].

Relationship between individual and socioeconomic variables, and functional outcomes

Bivariate correlations were computed to test the relationships between pain, family, and neighborhood variables, functional disability, and health-related quality of life (see Table 3). Higher average pain intensity correlated with greater child and parent reported disability, and strongly correlated with diminished physical HRQOL. Pain did not show a significant bivariate correlation with family or neighborhood socioeconomic distress. Greater depression was strongly associated with greater pain-related disability in both the parent and child assessments. Higher family income was associated with less child-reported disability and greater physical HRQOL.

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Family and neighborhood socioeconomic conditions as predictors of functional disability and HRQOL

Hierarchical multiple regressions were used to examine the effects of individual, family SES, and neighborhood distress variables on functional disability and HRQOL. As shown in Table 4, 62% of the variance in child reported functional disability was explained by the model (F (7,31) = 5.77, $p \leq 0.001$). The first step with individual characteristics was significant, accounting for 39% of the variance ($p \leq 0.01$). Depression was a significant individual predictor (B = 0.41, $p \leq 0.05$), as increased depression correlated with increased disability. The second step incorporated individual/family SES variables and was also significant, accounting for an additional 20% of the variance ($p \leq 0.01$). Family income was a strong predictor of child reported functional disability, with higher income being associated with less disability (B = −0.41, $p \leq 0.05$). After controlling for child age, disease severity, pain intensity, depression, family income and parent education, neighborhood socioeconomic distress did not account for additional unique variance. In the model for parent-reported functional disability (F (7,31) = 1.78, p = 0.14), 33% of the variance was explained, of which 32% was accounted for by individual age, disease severity, pain, and depression. Neither individual/family SES or neighborhood socioeconomic distress contributed any additional unique variance. Depression was the only significant individual predictor in this model (B = 0.46, $p \leq 0.05$), where greater child depression was associated with increased parent reported functional disability.

Separate regressions were conducted for physical and psychosocial HRQOL (see Table 5). The physical HRQOL model was significant (F (7,31) = 4.57, $p \leq 0.01$), explaining 56% of the variance. Step 1, child characteristics, accounted for 20% of the variance (p = 0.17), but revealed no significant predictors. Step 2, individual/family SES, was significant, accounting for an additional 23% of the variance ($p \leq 0.05$), predominantly explained by parent education (B = 0.53, $p \leq 0.01$) where higher parental education was associated with better child physical HRQOL. Finally, neighborhood socioeconomic distress explained an additional 13% of the variance in the model ($p \leq 0.01$). As hypothesized, neighborhood distress was a significant individual predictor (B = −0.42, $p \leq 0.05$), where residence in a distressed neighborhood was associated with diminished physical HRQOL. With regards to psychosocial HRQOL, 48% of the variance was explained by the model (F (7,31) = 3.30, $p \leq 0.05$). Depression emerged as a significant individual predictor (B = −0.77, $p \leq 0.001$), as did disease severity (B = −0.50, $p \leq 0.01$), where greater depression and more severe disease were associated with worse psychosocial HRQOL. Step 2, individual/family SES, was significant, accounting fro 26% unique variance. Family income (B = −0.53, $p \leq 0.05$) and parent education (B = 0.51, $p \leq 0.01$) were both significant individual predictors, where unexpectedly higher income associated with worse psychosocial HRQOL, and higher parent education was associated with better psychosocial HRQOL. Step 3, neighborhood distress did not contribute any unique variance to prediction of psychosocial HRQOL.

Discussion

These findings support and extend previous research on individual, family, and community factors that influence pain-related functional outcomes in youth with SCD. We found at the individual level, associations between depression and functional disability in children with SCD, which has been observed previously[12,13,30,31]. In this study, depression significantly accounted for variance in both parent and child functional disability assessments, as well as in psychosocial HRQOL. As hypothesized, family socioeconomic conditions were significant independent predictors of physical HRQOL, psychosocial HRQOL and child reported functional disability. At the neighborhood/community level, after controlling for child characteristics and individual/family socioeconomic status, our hypothesis that residing in an

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economically distressed neighborhood independently contributes to decreased functional outcomes was partially supported.

Family socioeconomic factors, which we conceptualized as best representing personal and family resources, were significant predictors of functional outcomes. These findings extend and support previous work[12], demonstrating a relationship between family income and child reported functional disability. Parent education was significantly associated with both physical and psychosocial HRQOL, also consistent with previous work[19]. These results lend further support to the relationship between family socioeconomic factors and quality of life in the pediatric sickle cell population.

At the neighborhood/community level, we found that after controlling for child characteristics and family SES, neighborhood socioeconomic distress was predictive of physical HRQOL (but not the other functional outcomes). The processes by which neighborhood conditions may influence health outcomes are likely multifaceted. For example, a predominance of female headed households suggests an absence of male role models in the family and neighborhood. There is some support in the literature for males' explicit modeling being predictive of boys' level of physical activity in urban youth[24]. In addition, the combined effects of SCD pain[27] and low socioeconomic status[6] on school attendance may limit opportunities for recess and physical education, reducing physical HRQOL. Moreover, economically distressed neighborhoods are likely to be associated with economically distressed schools, which may lack the financial resources to provide playground equipment, physical education, and physical extra-curricular activities. Therefore, children with SCD who live in distressed neighborhoods may be at increased risk for diminished physical HRQOL due to lack of opportunities to engage physically. Children living under poorer economic conditions are more often the victims of peer aggression and community violence than those living under superior socioeconomic conditions[9], and violent crime within a half mile of the residence of inner city youth has been shown to be inversely proportional to their level of outdoor physical activity[11]. These factors may limit children from venturing outside and participating in activities, thereby lowering their physical HRQOL. Future research is needed to understand the role of specific neighborhood factors on children's pain and functional outcomes. The distinction between family resources versus community resources may help explain the independent effects of family SES and neighborhood SES. Neighborhood socioeconomic status more closely represents the community resources and support available to an individual versus the family resources which are more accurately defined by individual socioeconomic characteristics[7].

Our results should be interpreted in the context of a number of limitations. First, the study sample is limited by the number of participants and resultant loss of power. The sample includes patients from one sickle cell center making it difficult to generalize these results to populations in other regions or with a distinctly non-urban socioeconomic composition, such as rural populations. All of the patients in this study were African American which limits the generalization of results to other ethnic groups affected by SCD such children of Caribbean or Hispanic descent. Another sampling limitation is that inclusion of children on chronic transfusion therapy and hydroxyurea may have skewed the physician assessment of disease severity to more severe disease in the context of treatments that may reduce pain. Second, because this was a cross-sectional study, no inferences can be made regarding causality, and the consequences of changes in socioeconomic condition, pain, and functional outcomes over time cannot be understood. Third, HRQOL of the child was assessed by parent report. In future studies, child self report of HRQOL should also be incorporated. Finally, this study did not examine potential mediators (e.g. neighborhood violence) of the relationship between family and neighborhood socioeconomic distress and functional outcomes.

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Future studies should investigate potential mechanistic factors in the family and neighborhood that may link SES with pain-related disability and HRQOL in youth with SCD. These include factors such as neighborhood environmental conditions, neighborhood violence, parental stress, perceived financial hardship, and the economics of nearby schools. Moreover, it will be important to understand the threshold at which neighborhood distress becomes a risk or disadvantage. In research examining the association between family SES and morbidity in individuals with chronic disease, monotonic effects have been reported[7] such that children with low SES are more functionally impaired than children with higher SES across all SES strata. It is unknown whether a monotonic versus a threshold effect will be found for neighborhood distress. While we were focused on the first three nested systems in the social-ecological model, there has been very little consideration of the fourth level, societal level influences such as cultural and political constructs that may play a role in pain management in youth with SCD. For example, assessment of racial factors may include identity development, disparities in health service, and beliefs about SCD[29]. Finally, in order to better define the effects of neighborhood socioeconomic conditions, prospective investigations that consider the effects of changes in family socioeconomic status conditions over time on pain and functional outcomes are needed.

There are several clinical implications of our findings, including enhancing methods of assessing socioeconomic distress and related factors and broadening the context in which clinicians intervene with youth with SCD. A thorough assessment of children's socioeconomic and neighborhood environments may assist clinicians in understanding both resources and barriers that families face in managing their child's SCD pain. Assessment tools and interview questions designed to account for the multiple socioeconomic stressors experienced by ethnic minority children and families that may impact pain-related functional outcomes are needed. Apart from direct assessment of family and neighborhood SES, measures of life stress, perceived hardship, and community violence exposure may be useful for understanding the experience of poverty in patients with SCD. Recognition of important neighborhood factors could guide the clinician to identify specific subgroups of children with SCD who are at-risk for poorer health and functional outcomes. Family education and advocacy for available resources is critical for those at-risk. Such enhancements in assessment may in turn lead to tailored, culturally sensitive pain management interventions for youth with SCD.[26]

Acknowledgements

This work was partially supported by NIMH Grant K23MH01837 awarded to the first author.

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Table 1

Demographic Variables

Variable	SCD (*n* = 56)
Child age, M (SD), Range	12.1 (2.46), 8–17
Child gender	
Male	32 (57%)
Female	24 (43%)
Number of people in household	
2–4	28 (50%)
5–9	26 (46%)
Missing	2 (4%)
Marital status	
Currently married	14 (25%)
Not currently married	36 (64%)
Missing	6 (11%)
Ethnicity	
African American	56 (100%)
Parental education	
No high school diploma	8 (14%)
High school/general equivalency diploma	34 (61%)
College graduate or above	13 (23%)
Missing	1 (2%)
Family Income	
<10,000—20,000	26 (46%)
20,000—40,000	14 (25%)
40,000—60,000	5 (9%)
60,000 to >70,000	6 (11%)
Missing	5 (9%)
Neighborhood criteria (census tract)	
Poverty rate ≥ 27.4%	31 (55%)
Female head of household ≥ 37.1%	41 (73%)
Male unemployment ≥ 34.0%	2 (4%)
Dropout rate ≥ 23.0%	16 (29%)
Distressed neighborhood†	14 (25%)

† Distressed neighborhoods meet ≥ 3 of the 4 census tract criteria

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Table 2

Patient Sickle Cell Disease Characteristics

Variable	(n=56)
Sickle Cell Disease Type	
Hemoglobin SS	47(83.9%)
Hemoglobin Sβ thalasemia	4(7.2%)
Hemoglobin SC	5(8.9%)
Disease Complications	
Acute Chest Syndrome	15(26.8%)
Pneumonia	16(28.6%)
Stroke	3(5.4%)
Priapism	2(3.6%)
Hydroxyurea	9(16.1%)
Chronic Transfusion	7(12.5%)
Pain Frequency (Child Reported)	
Less than once/month	25(44.6%)
1–3x/month	7(12.5%)
1x/week	4(7.2%)
2–6x/week	8(14.3%)
Daily	5(8.9%)
Missing	7(12.5%)
Pain Intensity M (SD), Range (Child Reported)	4.5 (1.9), 1–7
Disease severity M (SD), Range [Hematologist rating]	3.8 (3.3), 0.1–9.3

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Table 3

Bivariate correlations

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age	−0.13	0.08	0.09	0.33*	−0.05	0.12	0.03	0.16	−0.07	−0.22
2. Disease Severity		0.02	−0.12	−0.11	−0.05	0.16	−0.10	−0.04	−0.22	−0.20
3. Pain Intensity[a]			0.18	0.21	−0.01	0.09	0.36*	0.32*	−0.42**	−0.05
4. Depression				−0.05	−0.25	0.09	0.65**	0.39**	−0.12	−0.25
5. Parent Education[a]					0.28*	0.05	−0.15	0.13	0.27	0.20
6. Family Income[a]						−0.20	−0.33*	−0.24	0.38*	0.07
7. Distressed Neighborhood[a]							0.22	0.11	−0.31*	0.10
8. Child FDI								−0.45**	−0.33**	−0.07
9. Parent FDI									−0.46**	−0.33*
10. Physical HRQOL										0.38**
11. Psychosocial HRQOL										1.0

[a]Spearman's rho

*$p < .05$.

**$p < .01$

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Table 4

Results of Hierarchical Multiple Regression Analyses for Predicting Functional Disability Scores in Children with SCD

Variable	Cumulative R^2	F	β	R^2 increment
Child FDI				
Step 1	0.394	4.55**		0.394**
Child age			−0.22	
Disease severity			−0.14	
Pain intensity			0.13	
Depression			0.41*	
Step 2	0.595	6.36**		0.200**
Family income			−0.41*	
Parent education			−0.17	
Step 3	0.618	5.77**		0.023
Distressed neighborhood			0.18	
Parent FDI				
Step 1	0.326	3.38*		0.326
Child age			−0.03	
Disease severity			0.03	
Pain intensity			0.19	
Depression			0.46*	
Step 2	0.332	2.15		0.006
Family income			−0.06	
Parent education			0.09	
Step 3	0.333	1.78		0.001
Distressed neighborhood			0.04	

* $p < .05$.

** $p < .01$.

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Table 5

Results of Hierarchical Multiple Regression Analyses for Predicting HRQOL Scores in Children with SCD

Variable	Cumulative R^2	F	B	R^2 increment
Physical HRQOL				
Step 1	0.199	1.73		0.199
Child age			0.20	
Disease severity			0.02	
Pain intensity			−0.26	
Depression			−0.25	
Step 2	0.428	3.24*		0.229*
Family income			−0.01	
Parent education			0.53**	
Step 3	0.561	4.57**		0.133**
Distressed neighborhood†			−0.42*	
Psychosocial HRQOL				
Step 1	0.204	1.80		0.204
Child age			−0.22	
Disease severity			−0.50**	
Pain intensity			0.06	
Depression			−0.77**	
Step 2	0.465	3.76**		0.261**
Family income			−0.53*	
Parent education			0.51**	
Step 3	0.480	3.30*		0.016
Distressed neighborhood			0.15	

* $p < .05$.

** $p < .01$.

† Negative values are in the direction of not distressed