JSPR

Article

Journal of Social and
Personal Relationships
30(2) 179–188

DOI: 10.1177/0265407512457102
spr.sagepub.com
SAGE

Using daily diaries to study family settings, emotions, and health in everyday life

Theodore F. Robles
Bridget M. Reynolds
Rena L. Repetti
Paul J. Chung
University of California, USA

Abstract

Despite well documented links between family functioning and long-term physical health problems, prior studies using cross-sectional, laboratory, or traditional longitudinal designs are limited in their ability to address everyday family encounters, emotions, biological processes, and physical health. Here, we describe our ongoing study of family settings and upper respiratory infections (URIs) to demonstrate the value of daily diary approaches. Families completed a daily diary assessing social interactions within and outside the family, daily mood, health behaviors, and URIs every day for two months. We collected objective assessments of URI symptoms when parents or children reported they were sick. This paper demonstrates feasibility in terms of compliance and acceptance by families, and describes methods for assessing URI symptoms and episodes.

Keywords

Family, children, physical health, daily diary, upper respiratory infection, physical symptoms

The quality of the family environment has important mental and physical health ramifications across the lifespan (Repetti, Taylor, & Seeman, 2002; Troxel & Matthews,

Corresponding author:
Theodore F. Robles, Department of Psychology, Box 951563, 1285 Franz Hall, CA, 90095, USA.
Email: robles@psych.ucla.edu

2004). Over the past two decades, a significant literature emerged to explain the specific mechanisms whereby stressful family environments impact health. Moreover, important strides are being made in understanding the contributing role of stress-responsive biological systems, particularly the neuroendocrine and immune systems (Repetti, Robles, & Reynolds, 2011; Saxbe, 2008).

While these emerging findings show promise in explaining how family settings get under our skin to influence health, the significance of this research in the eyes of the public and policymakers rests on its *clinical relevance*. Put another way, changes in stress- or immune-related biomarkers within normal ranges may not sufficiently convince a pediatrician to consider the role of chronic family stress in influencing a child's health. Instead, the degree to which chronic family stressors influence observable changes in patient health, based on criteria regularly employed in real-world settings, will have a greater public health impact. Such work requires incorporating clinical endpoints: measures of how a patient "feels, functions, or survives" (Biomarker Definitions Working Group, 2001), which are assessed as part of normal patient evaluation and often used as outcomes in clinical biomedical research.

This paper illustrates how we combine daily diaries assessing day-to-day family dynamics and mood with assessments of clinical endpoints, to provide an unprecedented look into how daily family experiences can impact clinically relevant health outcomes. We describe the feasibility of our approach, focusing on methods for maintaining compliance with our two-month diary protocol, and measuring our clinical endpoint of interest: naturally occurring upper respiratory infections (URI) in children. Despite the focus on URIs, our approach can be extended to understanding how social relationships influence clinical endpoints in other illness contexts; namely issues related to sampling frequency and ruling out potential alternative causes for symptom exacerbations.

The most prevalent causes of URIs are the common cold (rhinovirus) and influenza, and URIs result in significant direct medical costs and indirect societal and economic costs (Heikkinen & Jarvinen, 2003). URIs are extremely common, and can be studied in relatively healthy individuals, thus avoiding potential confounds that complicate biobehavioral research in individuals with chronic illness (e.g., differing illness duration, severity, and treatment). To date, research has primarily focused on the common cold and flu (Boyce et al., 1977; Cohen, 2005); thus our conceptualizations of how family stressors may impact URIs are primarily driven by those disease models, even though URIs can be caused by a wide variety of respiratory viruses.

Studying URIs presents measurement challenges that are similar to other clinical endpoints that fluctuate, such as respiratory symptoms in asthma, or pain in inflammatory diseases. URI incidence, while predictable at the population level (cold and flu season), is unpredictable at the individual level. The window of time during which symptoms are assessed must be sufficiently wide to maximize the probability that a URI occurs, but not so wide as to create significant participant burden. Another issue is sampling frequency – while assessing the presence of symptoms on a weekly basis decreases participant burden, it increases retrospection bias and may make pinpointing the onset of a URI infection less reliable. Finally, URI symptoms are similar to symptoms of other conditions like allergic rhinitis (nasal allergies), various bacterial

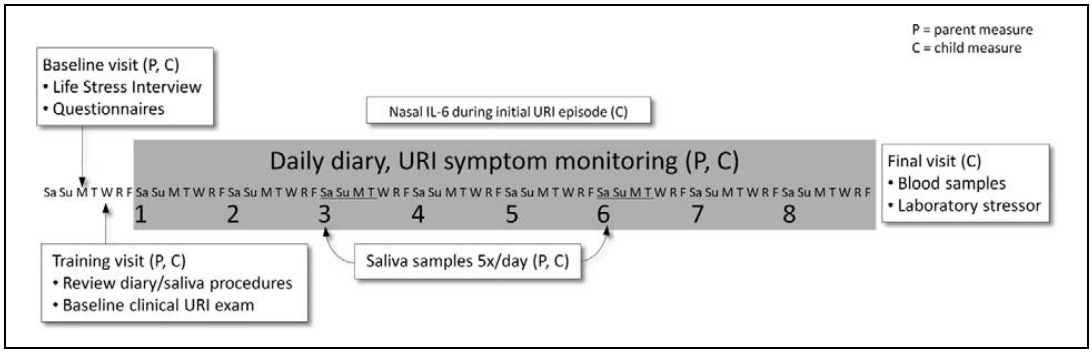

Figure 1. Overview of study procedures.

infections, and lower respiratory infections (Heikkinen & Jarvinen, 2003). A URI episode could also precede, co-occur with, or follow these conditions. Thus, a runny nose and nasal congestion could be due to rhinovirus, allergies, or even both at the same time. Assessment thus requires having specific criteria for diagnosing a URI and the means to rule out potential alternative causes.

Most research on family environments, emotions, and health has primarily focused on "snapshots" of functioning through one-time self-report measures, retrospective interviews, or behavioral observation. While more innovative designs that increase temporal resolution such as multiple repeated assessments of families, and even intensive at-home observation of families, provide rich information about families, they can be burdensome on family schedules and routines. Thus, much of the methodology we describe below, including at-home visits, online diaries, and compensation, was designed to minimize inconveniences to our family participants.

Methods

Participants

We recruited two-parent families in the Los Angeles area through public schools, UCLA pediatrics clinics, community centers, newspaper advertisements, and direct mailings based on a youth marketing address list. At least one parent and a target child between the ages of 8 and 13 were screened for a variety of mental and physical health problems to yield a generally healthy sample free of major chronic illness.

Our current sample of 37 families includes 37 mothers (mean age = 42.62, SD = 6.71), 31 fathers (mean age = 43.00, SD = 8.72), and 45 children (18 boys, 27 girls; mean age = 11.09, SD = 1.66), of whom 37 were target children and eight were eligible siblings. Parents in our sample reported a median personal income within the US$32,000–64,000 tax bracket and were 47% non-Hispanic white, 22% African-American, 15% Latino/Hispanic, 13% Asian, 1.5% Native American and 1.5% "Other". According to parent report, children were 40% non-Hispanic white, 20% African-American, 6.7% Latino/Hispanic, 13.3% Asian, and 20% "Other" (primarily mixed ethnicity).

Procedures

Figure 1 provides an overview of the study design.[1] During an initial visit, we interviewed participating parents and target children to assess stressful life events, followed by another visit involving training on daily diaries and saliva collection. The following Saturday families began the eight-week daily diary (including eight days of saliva samples), followed by a final visit involving blood samples, a laboratory stressor, and exit interviews to assess the acceptability of our study procedures. Each parent and child could earn up to US$350 and US$300, respectively, for completing all study procedures, including a US$5 bonus gift card per week of 100% diary compliance (i.e., all diaries were completed on the evening due or before 9am the next morning). The eight-week diary period was chosen to balance maximizing URI detection with minimizing participant burden. Data collection occurred during the 2009–2011 cold and flu seasons which span from October to May in Los Angeles County. The protocol was approved by UCLA's Institutional Review Board.

Daily diaries

Family members completed daily diaries online before bedtime by logging onto a personalized "home" page. The current-day diary (blocks of items were randomly ordered each day) was administered through surveymonkey.com, which automatically date/time stamped each survey. While not a condition for eligibility, all families had internet access, but were also given paper diaries in case of technical problems. Paper diaries were stamped with an electronic date/time stamp (Dymo #47002) and mailed to our laboratory the day after completion.

Children's daily experiences and activities (e.g., school events, family interactions) and daily mood were assessed with items from the Youth Everyday Social Interaction and Mood measure (Repetti, 1996), the Child Home Data Questionnaire (Margolin, 1990), and positive (e.g., *cheerful, calm*) and negative emotion words (e.g., *sad, angry*) from prior work in adults (Cohen, Doyle, & Skoner, 1999). Parents reported on family interactions and child mood/behavior using items from the Parent Home Data Questionnaire (Doumas, Margolin, & John, 2003).

Child URI symptoms were self-assessed using a checklist (0 = absent, 1 = present) of eight common signs and symptoms ("Jackson" symptoms; Cohen et al., 1999; Turner Cobb & Steptoe, 1996): congestion, runny nose, sneezing, cough, sore throat, malaise, headache, and chills. Family members were instructed to contact the laboratory when a target child or sibling might be sick. In addition, URI symptoms from the online diaries were monitored by lab staff using the algorithm described below.

URI classification and verification

Prior attempts to develop diagnostic algorithms for URI infection typically assessed symptoms and used molecular biology techniques to verify viral infection using nasal secretion samples (Taylor, Weber, Martin, McCarty, & Englund, 2010), an essential procedure in biomedical research on respiratory illnesses, but costly for biobehavioral

researchers (roughly US$15–20 per target virus, per sample). To more cost-effectively determine whether a child met criteria for a URI episode, we applied an algorithm based on prior empirical research, which assigned a URI diagnosis each day that any two of runny nose, nasal congestion, or cough were present, or runny nose or nasal congestion was present given a prior-day algorithm-assigned URI diagnosis (Doyle & Alper, 2007). Runny nose, cough, and congestion were similarly identified as key diagnostic symptoms in prior studies of naturally occurring, biologically verified viral URIs (Pappas, Hendley, Hayden, & Winther, 2008; Taylor, et al., 2010).

When algorithm criteria were met or when a family member contacted the lab, two clinical researchers (typically nursing students trained by Dr. Chung) visited the family's home no more than 48 hours after initial symptoms were reported to verify suspected URIs and collect a nasal wash sample. The physical examination included noting the child's temperature and respiratory rate; noting symptoms of cough, congestion, and sneezing; visual inspection of the eyes for redness and discharge, and the nose and throat for redness, edema, and secretions; palpitation of the neck to note size and tenderness of lymph nodes; visual inspection of the chest; and listening to participants' lungs for signs of respiratory congestion.

Results

Daily diary feasibility

Parents and children completed a total of 5875 daily diaries. On average, parents ($M = 52.15$, $SD = 7.79$) and children ($M = 51.76$, $SD = 7.14$) completed approximately 52 of the 56 daily diaries (93%), out of which the vast majority (98%) were compliant (see Table 1). Families completed most diaries online (94%), which allowed estimates of time-to-complete (parents $M = 7.23$ min, $SD = 3.99$; children $M = 3.85$ min, $SD = 2.35$). An electronic date/time stamp was present on 99% of all diaries. Figure 2 shows the average number of compliant and non-compliant diaries for parents and children across study weeks. Multilevel models with weeks nested within individuals nested within families suggested no significant linear ($\gamma_{100} = -.05$, $SE = .05$, *ns*) or quadratic ($\gamma_{200} = -.004$, $SE = .006$, *ns*) change in the number of compliant diaries across time.

URI symptoms and episodes

Table 2 shows mean symptom severity on days that met algorithm criteria for a URI episode (algorithm-positive days) and days that did not meet criteria for a URI episode. Symptom severity was greater, on average, on algorithm-positive days compared to algorithm-negative days for target children, $t(17) = 10.88$, $p = .00$. Among the 37 target children, 18 URI episodes were identified via algorithm, and of those, nine were clinically verified. Among the eight siblings, three URI episodes were identified via algorithm, and none were clinically verified. During verified episodes, symptoms lasted between 2–15 days, with a mean daily severity of between 2–4.8 symptoms. Figure 3 shows symptom reports, and positive and negative mood data for comparison, from one

Table 1. Daily diary compliance.

	Completed diaries				Compliant diaries			
Family member	*N*	Mean (*SD*)	Range	% of expected*	Mean (*SD*)	Range	% of completed	% of expected*
Parent	68	52.15 (*7.79*)	21–61	93	50.87 (*8.62*)	21–61	98	91
Child	45	51.76 (*7.14*)	28–58	92	50.67 (*7.85*)	24–58	98	90

* 8 weeks (56 days).

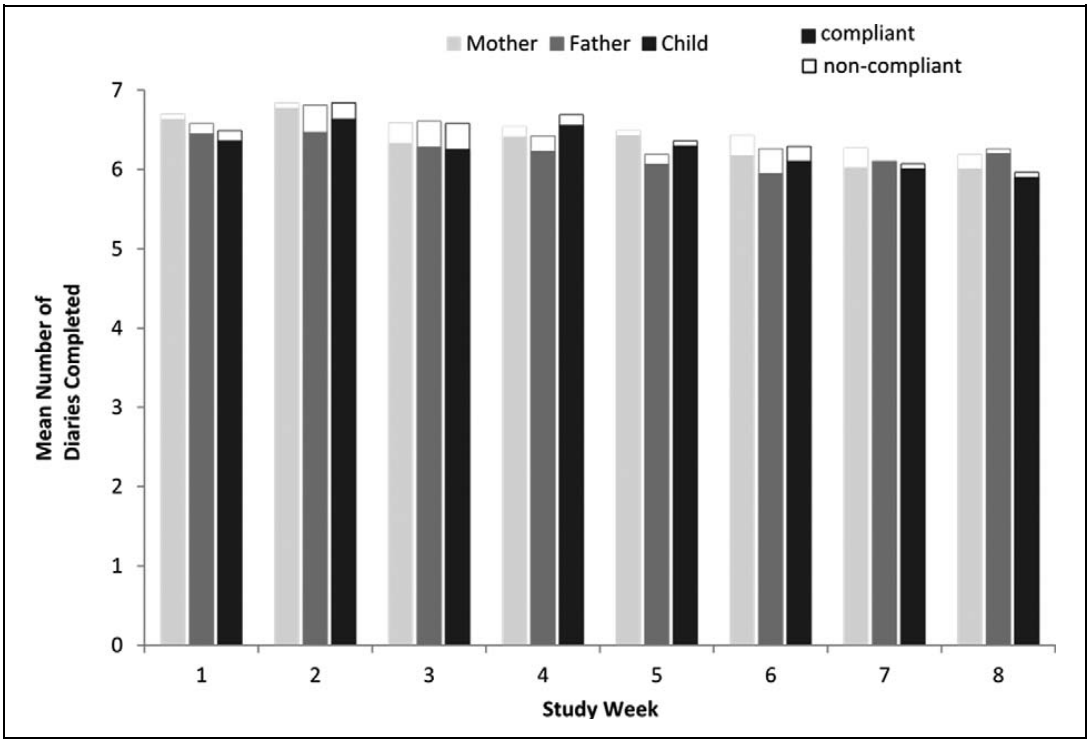

Figure 2. Average number of daily diaries completed each study week.

child across the 56 days. Despite several days where the child reported more than two symptoms (runny nose, cough, sore throat, and feeling sick on days 2 and 3) only one period was a clinically verified URI episode. The symptoms initially began on day 31 with runny nose and nasal congestion, and became more severe including sore throat, feeling sick, and headache on days 33 and 35. The verification visit for the child occurred during day 34.

Discussion

The primary goal of our study design was to conduct repeated assessments of family functioning with enhanced temporal resolution, across a sufficient sampling window to capture the natural occurrence of URIs while minimizing participant burden. Our

Table 2. URI symptom severity and length across children.

		Mean severity/day		URI episodes			
Family member	*N*	Algorithm-positive days	Algorithm-negative days	$N_{algorithm\text{-}positive}$	$N_{verified}$	Mean length	Mean severity
Target children	37	3.04 (1.02)	0.26 (0.36)	18	9	8.44 days (4.74)	3.14 (0.82)
Siblings	8	5.17 (2.57)	0.34 (0.37)	3	0	–	–

Note. Symptom severity reflects the total number of URI symptoms. SDs are in parentheses.

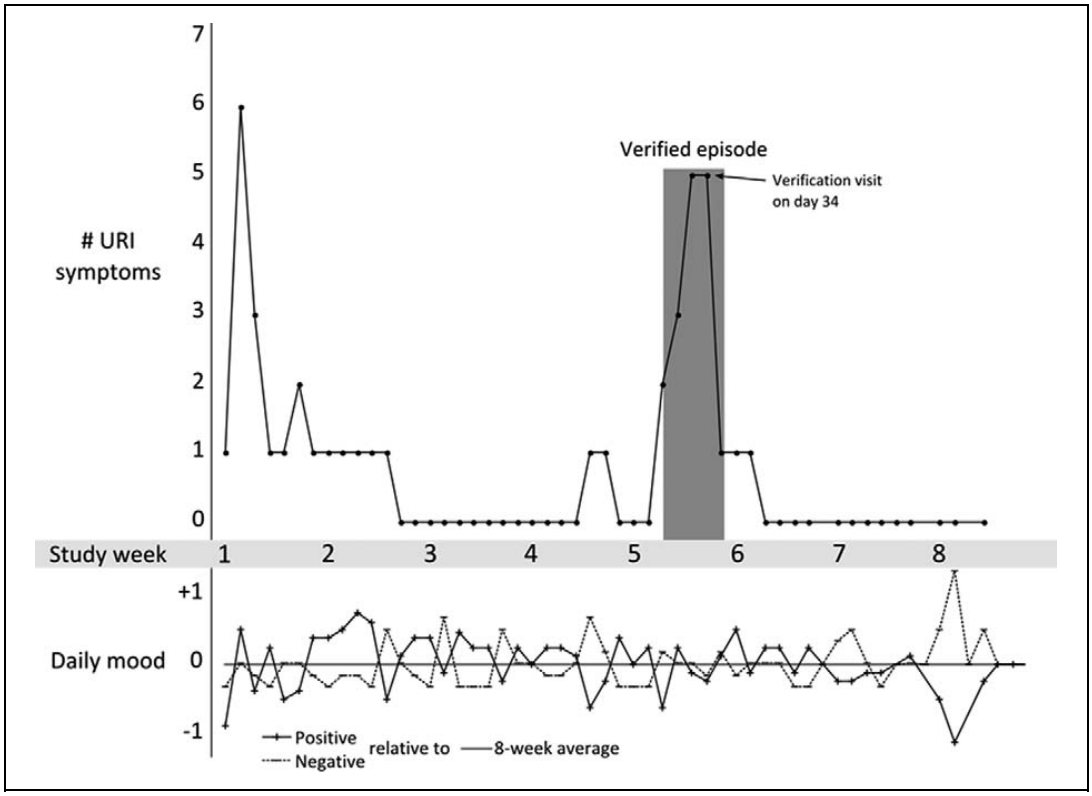

Figure 3. URI symptoms and daily mood over two months in an example child.

compliance data clearly suggest that families were able to maintain good completion rates, with the average participant completing over 90% of their diaries. The length of time to complete diaries was brief, with most diaries taking between 4–11 minutes to complete for parents and 1–6 minutes for children. In addition, compliance rates did not significantly change over the course of the study.

Because lengthy monitoring periods are required to capture naturally occurring family stressors and URI episodes, we took multiple steps to reduce participant burden. We trained laboratory staff to provide responsive support to families through regular email and phone contact. Our ability to monitor daily diary completion in real time also

allowed us to troubleshoot with families before non-compliance became a concern. Electronic diaries also allowed for randomization of item order each day, which helps reduce participant boredom. Finally, our incentives for diary completion were similar to previous work demonstrating increased participant compliance with intensive repeated assessments (Beckham et al., 2008). Anecdotally, most families reported only minor inconvenience in the feedback interview and many participants said they enjoyed the insight garnered through nightly diary completion. This feedback, combined with the relatively high compliance rates reported above, provides support for the feasibility of an eight-week daily diary study involving reports from multiple family members.

For URI symptoms, we demonstrated that a combination of self-report data, an a priori diagnostic algorithm, and clinical verification can be used to assess the presence of URIs over a two-month period. Our approach to examining clinical endpoints as they naturally occur, integrating both repeated self-report and clinical assessment, can be extended to other common health conditions of interest to family and relationship researchers, such as chronic inflammatory (e.g., psoriasis), respiratory (e.g., asthma), and pain conditions.

Our findings also highlight the challenges to studying clinical symptoms as they unfold in natural settings, particularly in the context of URIs. In our sample, roughly half of the target children had an algorithm-identified URI, and one-quarter had a clinically verified URI. Moreover, despite living in the same household, we did not identify clinically verified URI episodes in the small subset of sibling participants. In future work, lengthening the sampling window to six months may be beneficial; URIs on average occur 2–4 times per year in children in our study age range. Still, participant burden is a serious concern and should be monitored carefully.

Our methods rely heavily on families having home broadband access. Fortunately, 98% of families *screened* reported in-home broadband access. While wireless broadband technology allows for assessments in locations that do not have broadband service, the overhead costs for maintaining such capability via broadband-enabled laptops or tablet devices are still high. Moreover, while families could potentially complete diaries on their own mobile devices, using mobile bandwidth incurs greater financial costs to the family compared to ''wired'' bandwidth. As the technology progresses, we envision seamless integration of mobile broadband with daily diary methods at low cost to both participants and research teams.

Fully understanding the impact of early childhood adversity on health in later life necessitates moving beyond snapshots of families and examining how family environments impact health over weeks and months, in addition to years and decades (Repetti et al., 2011). As we showed, families can comply with intensive daily diary assessments of social, emotional, and physical functioning. Moreover, repeated assessments are valuable when trying to capture clinical health outcomes that occur naturally; the primary challenge is optimizing the sampling window to capture clinically relevant, but low base-rate events. Combined with naturalistic assessment of biologically plausible neuroendocrine and immune mediators (Miller, Chen, & Cole, 2009), intensive diary designs have great promise for unpacking the mechanisms that explain how family settings impact emotions and health.

Acknowledgement

We would like to thank Richard Slatcher and Gayla Margolin for their important contributions to the project, and the graduate students, laboratory staff, and undergraduate research assistants on the project for their significant amount of time and effort working with families.

Funding

This research was supported by a Research Grant (9333) from the William T. Grant Foundation.

Note

1. Due to page limits, we are unable to provide detailed descriptions of all study procedures.

References

Beckham, J. C., Wiley, M. T., Miller, S. C., Dennis, M. F., Wilson, S. M., McClemon, F. J., & Calhoun, P. S. (2008). Ad lib smoking in post-traumatic stress disorder: an electronic diary study. *Nicotine and Tobacco Research*, *10*, 1149-1157. doi: 10.1080/14622200802123302

Biomarker Definitions Working Group (2001). Biomarkers and surrogate endpoints: preferred definitions and conceptual framework. *Clinical Pharmacology and Therapeutics*, *69*, 89-95. doi: 10.1067/mcp.2001.113989

Boyce, W. T., Jensen, E. W., Cassel, J. C., Collier, A. M., Smith, A. H., & Ramey, C. T. (1977). Influence of life events and family routines on childhood respiratory tract illness. *Pediatrics*, *60*(4 Pt 2), 609-615.

Cohen, S. (2005). The Pittsburgh Common Cold Studies: psychosocial predictors of susceptibility to respiratory infectious illness. *International Journal of Behavioral Medicine*, *12*, 123-131. doi: 10.1207/s15327558ijbm1203_1

Cohen, S., Doyle, W. J., & Skoner, D. P. (1999). Psychological stress, cytokine production, and severity of upper respiratory illness. *Psychosomatic Medicine*, *61*, 175-180.

Doumas, D. M., Margolin, G., & John, R. S. (2003). The relationship between daily marital interaction, work, and health-promoting behaviors in dual-earner couples. *Journal of Family Issues 24*(1), 3-20.

Doyle, W. J., & Alper, C. M. (2007). Use of diagnostic algorithms and new technologies to study the incidence and prevalence of viral upper respiratory tract infections and their complications in high risk populations. *Current Opinion in Allergy and Clinical Immunology*, *7*(1), 11-16. doi: 10.1097/ACI.0b013e3280115157

Heikkinen, T., & Jarvinen, A. (2003). The common cold. *The Lancet*, *361*(9351), 51-59. doi: 10.1016/S0140-6736(03)12162-9

Margolin, G. (1990). *Child Home Data Questionnaire*. Los Angeles, CA: University of Southern California.

Miller, G. E., Chen, E., & Cole, S. W. (2009). Health psychology: developing biologically plausible models linking the social world and physical health. *Annual Review of Psychology*, *60*, 501-524. doi: 10.1146/annurev.psych.60.110707.163551

Pappas, D. E., Hendley, J. O., Hayden, F. G., & Winther, B. (2008). Symptom profile of common colds in school-aged children. *The Pediatric Infectious Disease Journal*, *27*(1), 8-11. doi: 10.1097/INF.0b013e31814847d9

Repetti, R. L. (1996). The effects of perceived daily social and academic failure experiences on school-age children's subsequent interactions with parents. *Child Development*, *67*, 1467-1482. doi: 10.2307/1131712

Repetti, R. L., Robles, T. F., & Reynolds, B. (2011). Allostatic processes in the family. *Development and Psychopathology*, *23*, 921-938. doi: 10.1017/S095457941100040X

Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: family social environments and the mental and physical health of offspring. *Psychological Bulletin*, *128*, 330-366. doi: 10.1037/0033-2909.128.2.330

Saxbe, D. E. (2008). A field (researcher's) guide to cortisol: tracking HPA axis functioning in everyday life. *Health Psychology Review*, *2*, 163-190. doi: 10.1080/17437190802530812

Taylor, J. A., Weber, W. J., Martin, E. T., McCarty, R., & Englund, J. A. (2010). Development of a symptom score for clinical studies to identify children with a documented viral upper respiratory tract infection. *Pediatric Research*, *68*, 252-257. doi: 10.1203/PDR.0b013e3181e9f3a0

Troxel, W. M., & Matthews, K. A. (2004). What are the costs of marital conflict and dissolution to children's physical health? *Clinical Child and Family Psychology Review*, *7*, 29-57.

Turner Cobb, J., & Steptoe, A. (1996). Psychological stress and susceptibility to upper respiratory tract illness in an adult population sample. *Psychosomatic Medicine*, *58*, 404-412.