

Violence Against Women

<http://vaw.sagepub.com/>

Association Between Intimate Partner Violence and Irritable Bowel Syndrome: A Population-Based Study in Nicaragua

Sylvia Becker-Dreps, Douglas Morgan, Rodolfo Peña, Loreto Cortes, Christopher F. Martin and Eliette Valladares

Violence Against Women 2010 16: 832

DOI: 10.1177/1077801210374816

The online version of this article can be found at:

<http://vaw.sagepub.com/content/16/7/832>

Published by:



<http://www.sagepublications.com>

Additional services and information for *Violence Against Women* can be found at:

Email Alerts: <http://vaw.sagepub.com/cgi/alerts>

Subscriptions: <http://vaw.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations: <http://vaw.sagepub.com/content/16/7/832.refs.html>

>> [Version of Record](#) - Jun 17, 2010

[What is This?](#)

Association Between Intimate Partner Violence and Irritable Bowel Syndrome: A Population-Based Study in Nicaragua

Violence Against Women

16(7) 832–845

© The Author(s) 2010

Reprints and permission: <http://www.sagepub.com/journalsPermissions.nav>

DOI: 10.1177/1077801210374816

<http://vaw.sagepub.com>



Sylvia Becker-Dreps,¹ Douglas Morgan,¹
Rodolfo Peña,² Loreto Cortes,²
Christopher F. Martin,¹ and Eliette Valladares²

Abstract

Irritable bowel syndrome (IBS) is a disabling functional gastrointestinal disorder, which serves as a model for abdominal pain syndromes. An association between intimate partner violence and IBS has been shown among White women in the industrialized world. To determine whether this relationship transcends cultural boundaries, we conducted a population-based, cross-sectional survey in Nicaragua using the innovative Health and Demographic Surveillance System in the León province. Women who had experienced physical intimate partner violence had significantly increased risk of IBS (odds ratio [OR] = 2.08; 95% confidence interval [CI] = 1.35, 3.21), as did those who had experienced sexual intimate partner violence (OR = 2.85; 95% CI = 1.45, 5.59). These findings argue for intimate partner violence screening among Latina women with IBS.

Keywords

abuse, irritable bowel syndrome, violence

¹University of North Carolina at Chapel Hill

²Centro de Investigación en Demografía y Salud, Universidad Nacional Autónoma de Nicaragua, León

Corresponding Author:

Sylvia Becker-Dreps, Department of Family Medicine, University of North Carolina at Chapel Hill, 590 Manning Drive, CB No. 7595, Chapel Hill, NC 27599-7595

Email: sbd@unc.edu

Introduction

Intimate partner violence is associated with long-term health problems, beyond the immediate physical trauma. Individuals who have experienced intimate partner violence have higher rates of depression, posttraumatic stress disorder, chronic pelvic pain, migraine syndromes, low-birth-weight deliveries, sexually transmitted infections, HIV/AIDS, and even common colds and influenza (Coker, Smith, Bethea, King, & McKeown, 2000; Leserman, Li, Drossman, & Hu, 1998; Letourneau, Holmes, & Chasedunn-Roark, 1999; Pico-Alfonso et al., 2006; Silverman, Decker, Saggurti, Balaiah, & Raj, 2008; Talley, Helgeson, Zinsmeister, & Melton, 1994; Valladares, Ellsberg, Peña, Högberg, & Persson, 2002). Self-reported gastrointestinal symptoms are also more prevalent among those who have experienced intimate partner violence, including symptoms of irritable bowel syndrome (IBS) and dyspepsia (Talley, Fett, & Zinsmeister, 1995).

IBS is one of the most common gastrointestinal disorders with a global prevalence ranging between 4% and 24% (Kang, 2005). There are no known population-based studies of IBS prevalence in Latin America or among Latinos in the United States. IBS is a noninflammatory disease of the gastrointestinal tract within the family of functional gastrointestinal disorders, characterized by recurrent abdominal pain or discomfort associated with altered bowel function (constipation, diarrhea, or constipation alternating with diarrhea; see Figure 1). IBS can be debilitating, resulting in a lower quality of life, lower work productivity, and psychological distress (Luscombe, 2000; Maxion-Bergemann, Thielecke, Abel, & Bergemann, 2006; ten Berg, Goettsch, van den Boom, Smout, & Herings, 2006). In addition, IBS often leads to increased health care utilization, including diagnostic procedures, medications, and surgery (Leserman & Drossman, 2007). For example, in the United States, IBS accounts for more than 2.1 million outpatient visits annually (Shaheen et al., 2006).

IBS serves as a model for the abdominal pain syndromes. In the evolving biopsychosocial model, complex gene-environment interactions are responsible for the development and maintenance of IBS. These involve the "Brain-Gut Axis," the interplay between the gastrointestinal mucosa, the enteric nervous system, and the central nervous system. Both physiologic factors (motility, sensation, bacterial flora) and psychosocial factors (psychological state, stressors, coping mechanisms, social support) modulate these interactions (Drossman, 2006; Kanazawa et al., 2008). Various forms of trauma stimulate the hypothalamic-pituitary-adrenal axis (Inslicht et al., 2006); this dysregulated axis and the enteric nervous system are thought to be involved in the pathogenesis and maintenance of IBS and related functional gastrointestinal disorders (Dinan et al., 2006; Fukudo, 2007; Heitkemper et al., 1996).

Intimate partner violence has been proposed as an important etiologic factor within the IBS biopsychosocial model. More than one half of patients being treated for functional bowel disorders in specialty clinics report intimate partner violence (Drossman et al., 1990); these patients carry a poorer prognosis for their functional bowel disease (Drossman et al., 1990; Walker, Gelfand, Gelfand, & Katon, 1995). Prior studies that

At least 12 weeks or more, which need not be consecutive, in the preceding 12 months of abdominal discomfort or pain that has two out of three features:

- 1) **Relieved with defecation; and/or**
- 2) **Onset associated with a change in frequency of stool; and/or**
- 3) **Onset associated with a change in form (appearance) of stool.**

Symptoms that Cumulatively Support the Diagnosis of Irritable Bowel Syndrome

- *Abnormal stool frequency (for research purposes “abnormal” may be defined as greater than 3 bowel movements per day and less than 3 bowel movements per week);*
- *Abnormal stool form (lumpy/hard or loose/watery stool);*
- *Abnormal stool passage (straining, urgency, or feeling of incomplete evacuation);*
- *Passage of mucus;*
- *Bloating or feeling of abdominal distension.*

Figure 1. Diagnostic criteria for IBS

Note: In the absence of structural or metabolic abnormalities to explain the symptoms.

Source: Reprinted with permission from the Rome Foundation (Thompson et al., 2000, p. 360).

have examined intimate partner violence as a risk factor for IBS have focused on White participants in the industrialized world. There are no studies of this association in other racial or ethnic groups or in the developing world. It is unclear if the meaning and impact that violence has on an individual is culturally determined or universal.

We examined the relationship between intimate partner violence and IBS in a population of Central American women, using a population-based study design. The University of Nicaragua, León has performed pioneering work defining the prevalence of intimate partner violence in Nicaragua, which in turn facilitated national legislation (Ellsberg, Peña, Herrera, Liljestrang, & Winkvist, 1999).

Studying the relationship between IBS and intimate partner violence in a non-White, nonindustrialized population provides information on whether this relationship transcends cultural boundaries. Moreover, as 72% of the 45.4 million U.S. Latinos have their origins in Mesoamerica (Mexico and Central America), these findings may have implications for the U.S. Latina population (Pew Hispanic Center, 2007).

Method

Study Design

We conducted a cross-sectional study in León, Nicaragua, using a random representative sample from the established Health and Demographic Surveillance Site—León (HDSS-León; Peña, Pérez, Meléndez, Källestål, & Persson, 2008). HDSS-León, established in 1993, includes 11,000 households, 24% of León’s estimated population of 176,915. This is the only Latin American member of the INDEPTH network, an

international network of surveillance systems in developing nations (INDEPTH Demographic Network, 2009). Approximately, 95% of the region's population is of Hispanic mestizo origin. The population distribution is relatively young, with a median age of 26 years.

All consenting adult residents of León municipality within the surveillance system above age 18 were considered for inclusion. The target enrollment was 1,000 women, with random sampling to represent the HDSS-León population distribution. Exclusion criteria included having a history of gastrointestinal disease (e.g., inflammatory bowel disease, gastrointestinal cancer), major abdominal surgery, hospitalization within the past 3 months, or significant comorbidities. Interviews were conducted privately in participants' homes using trained female interviewers.

Rome II Modular Questionnaire

The Rome II Modular Questionnaire for the functional gastrointestinal disorders, based on Rome II diagnostic criteria, was used for IBS case identification (Thompson et al., 2000). The Rome II Questionnaire was the standard international study instrument during the study period. It was created through international consensus (Drossman, 1999) and has been validated in several studies (Caplan, Walker, & Rasquin, 2005; Kwan et al. 2003). Case status was confirmed by physicians, who were blinded to the survey results.

The Conflict Tactics Scales (CTS)

Physical and sexual intimate partner violence and childhood sexual abuse were assessed using the physical aggression scale of the Conflict Tactics Scales (Straus, 1979). This scale has been used extensively in the past, including in this population (Ellsberg, Peña, et al., 1999), and is considered to have construct validity and reliability in the evaluation of violence (Barling, O'Leary, Jouriles, Vivian, & MacEwen, 1987; Smith, 1994). The Universidad Nacional Autónoma de Nicaragua, León study team has extensive experience with the evaluation of intimate partner violence and related study instruments (Ellsberg, Caldera, Herrera, Winkvist, & Kullgren, 1999; Valladares, Peña, Persson, & Högborg, 2005).

A respondent was considered to have experienced physical intimate partner violence if she had been slapped, punched, pushed, cornered, strangled, burned, or threatened with a pistol or knife by a current or past intimate partner. A respondent was considered to have experienced sexual intimate partner violence if a current or past intimate partner coerced or forced her to perform a sexual act against her will, to engage in a sexual act out of fear, or to engage in a sexual act she found humiliating or that she was injured by, irrespective of whether the act was completed. A respondent was considered to have experienced childhood sexual abuse if any of the above sexual activities occurred before the age of 12.

Sociodemographic Variables

Socioeconomic status was assessed by a validated poverty index, the Unsatisfied Basic Need Assessment (Renzi & Agurto, 1993). The Unsatisfied Basic Need Assessment is a scale from 0 to 4 that is based on four indicators: household condition, water and sanitation services, school enrollment, and number of dependents in the household. This scale has been adapted to specific conditions in Nicaragua and has been used in prior studies (Peña, Wall, & Persson, 2000; Zelaya et al., 1996). A score of 0 or 1 implies nonpoverty by Nicaraguan standards, with basic needs being met, whereas 4 suggests severe poverty. Additional demographic information included respondent's age, marital status, educational attainment, and religion. In the analysis, marital status was dichotomized to "in a relationship" or "not in a relationship," and religion was dichotomized to "identifies a religion" or "does not identify a religion."

Data Analysis

We calculated crude and adjusted odds ratios (ORs) for the odds of IBS using STATA version 9 statistical software. Three models were created to assess the association between IBS and the three main factors of interest: physical intimate partner violence, sexual intimate partner violence, or childhood sexual abuse. We adjusted for age, socioeconomic status (poverty index), and relationship status. The proportion of IBS that could be attributed to either physical or sexual intimate partner violence (assuming a causal relationship) was calculated using the formula for population-attributable risk proportion: $([OR - 1] / [OR])f_e$, where f_e is the proportion of cases exposed to intimate partner violence. Quality control measures included double data entry, interviewer observation (10%), and the random reviews of questionnaire data quality (10%). The current study was approved by the institutional review boards of the University of North Carolina, Chapel Hill and the Universidad Nacional Autónoma de Nicaragua, León. Permissions were obtained from the Rome Foundation for the use of the Rome II Modular Questionnaire.

Results

Nearly 1,000 women ($N = 962$) were enrolled in the current investigation, with complete data available on 960 participants. There were 151 cases of IBS (15.7%) identified. The women ranged in age from 18 to 65, with a mean age of 37 (Table 1). More than half (56.1%) were either married or in a stable relationship, and 92.1% identified with a religion. Two thirds (66.4%) reported having their basic needs met (poverty index 0 or 1), and 60.2% had attained schooling beyond the elementary level. The study participation refusal rate was 2%.

Overall, all forms of intimate partner violence were common (Table 2): 14.8% of the women reported having experienced physical violence, 4.4% reported sexual violence, and 7.5% reported childhood sexual abuse. One fifth of women (19.4%)

Table 1. Characteristics of the Sample

Characteristic	Among all Women (n = 962)	Among Women With IBS (n = 151)	Among Women Without IBS (n = 811)	p Value for Difference Between Women With and Without IBS
	% or M (n or SD)	% or M (n or SD)	% or M (n or SD)	
Age (years; M [SD])	37 (±13)	38 (±13)	37 (±13)	.525
Relationship status in a relationship	56.1% (540)	59.6% (90)	55.5% (450)	.876
Identifies a religion	92.1% (886)	94.0% (142)	91.7% (744)	.926
Poverty index				
Basic needs met (0,1)	66.4% (639)	68.9% (104)	66.0% (535)	.771
Moderate poverty (2,3)	29.9% (288)	28.5% (43)	30.2% (245)	
Severe poverty (4)	3.6% (35)	2.6% (4)	3.8% (31)	
Education				
6th grade or less	39.8% (383)	34.4% (52)	40.8% (331)	.220
7th through 12th grade	41.5% (399)	47.7% (72)	40.3% (327)	
Beyond 12th grade	18.7% (180)	17.9% (27)	18.9% (153)	
IBS	15.7% (151)	100.0% (151)	0.0% (0)	N/A

Note: IBS = irritable bowel syndrome; N/A = not applicable.

Table 2. Prevalence of Violence Among Women With and Without IBS

Type of Violence	Among all Women (n = 962)	Among Women With IBS (n = 151)	Among Women Without IBS (n = 811)	p Value for Difference Between Women With and Without IBS
	% (n)	% (n)	% (n)	% (n)
Physical intimate partner violence	14.8 (142)	23.8 (36)	13.1 (106)	.001
Sexual intimate partner violence	4.4 (42)	9.3 (14)	3.5 (28)	.001
Sexual abuse prior to age 12	7.5 (72)	11.3 (17)	6.8 (55)	.056
Any of above types of violence	19.4 (186)	31.1 (47)	17.2 (139)	<.001

Note: IBS = irritable bowel syndrome.

reported at least one form of violence. Nearly all of the women (90.5%) who reported sexual intimate partner violence also reported physical intimate partner violence.

Women who reported physical intimate partner violence and childhood sexual abuse were more likely to be living in poverty. There were no statistically significant differences

Table 3. Relationship Between Violence and IBS

Risk Factor	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)
Physical intimate partner violence	2.08 (1.36, 3.18)	2.08 (1.35, 3.21)
Sexual intimate partner violence	2.85 (1.46, 5.55)	2.85 (1.45, 5.59)
Sexual abuse prior to age 12	1.74 (0.98, 3.09)	1.82 (1.02, 3.25)
Any of above types of violence	2.18 (1.47, 3.22)	2.22 (1.50, 3.32)

Note: IBS = irritable bowel syndrome.

a. Adjusted by age, poverty index, and marital status.

in age, religion, or educational attainment between women with and without physical intimate partner violence. There were no statistically significant differences in age, relationship status, poverty index, religion, or educational attainment between women with and without IBS.

Relationship Between Intimate Partner Violence and IBS

A strong relationship was observed between IBS and prior exposure to violence, which was relatively consistent across the types of violence. A significantly higher percentage of women with IBS (23.8%) had experienced physical intimate partner violence versus women without IBS (13.1%, $p = .001$; Table 2). Similarly, 9.3% of women with IBS versus 3.5% of women without IBS had experienced sexual intimate partner violence ($p = .001$). Finally, 11.3% of women with IBS versus 6.8% of women without IBS had experienced childhood sexual abuse ($p = .056$). In all, 31.1% of women with IBS had experienced either intimate partner violence or childhood sexual abuse. Those who had experienced physical intimate partner violence had 2.08 (95% CI = 1.35, 3.21) times the odds of IBS after adjusting for sociodemographic factors: age, poverty index, and marital status (Table 3). Those who had experienced sexual intimate partner violence had 2.85 (95% CI = 1.45, 5.59) times the odds of IBS, after adjustment. Those who experienced childhood sexual abuse had 1.82 (95% CI = 1.02, 3.25) times the odds of IBS after adjustment.

The population-attributable risk proportion of IBS that could be attributed to intimate partner violence was 15.6%, which increases to 17.1% if childhood sexual abuse is also included.

Discussion

Our population-based study suggests that intimate partner violence is associated with IBS in this Central American population. This is the first study of this relationship among Latinas and in a developing country, where perceptions and manifestations of violence and disease may be different than in a White population in the industrialized world. Our findings are consistent with other studies of this association among Whites in both the United States and Australia (Talley, Boyce, & Jones, 1998; Talley et al., 1994).

In all, 31.1% of women with IBS had experienced either intimate partner or childhood sexual violence. We found that the odds of physical intimate partner violence among women with IBS were about twice that of women without IBS. Sexual intimate partner violence, which may be considered one of the more significant exposures to intimate partner violence, had a stronger relationship, nearly a factor of three. Assuming a causal relationship of this association, 15.6% of IBS among the women in our sample could be attributed to intimate partner violence.

Our findings also support the reality of adult chronic health and pain syndromes resulting from childhood sexual abuse. The relationship between IBS and childhood sexual abuse was statistically significant, although of weaker magnitude. This may reflect a true weaker association or a reporting bias: participants may have been more reluctant to reveal a history of childhood sexual abuse, which is often perpetrated by someone in the child's close social environment. The association between IBS and childhood sexual abuse is consistent with prior research, suggesting that childhood sexual abuse is associated with various health problems in adulthood, including depression, sexually transmitted diseases, alcoholism, and tobacco abuse (Dube, Felitti, Dong, Giles, & Anda, 2003).

As intimate partner violence is prevalent among women of all racial and ethnic groups (Bangdiwala et al., 2004; Field & Caetano, 2004; McFarlane, Groff, O'Brien, & Watson, 2005), a universal association between intimate partner violence and IBS may have broad implications, especially when IBS is considered a model for abdominal pain syndromes. Future studies among other racial and ethnic groups are warranted to confirm these observations.

Our study, using a population-based sample in Nicaragua, more specifically investigated the relationship between intimate partner violence and IBS among Latinas. Latino ethnicity is by no means a homogeneous category, as Latinos originate from more than 20 countries, each with a distinct culture. In addition, Latinos in the United States have varying degrees of acculturation into the mainstream culture. However, Latinos do share much in common, including a common language, a shared history of colonization, and core cultural values, such as dependence on the extended family versus the individual (*familismo*) and the importance of personal relationships (*personalismo*; Bernal, Cumba-Avilés, & Sáez-Santiago, 2006; Bernal & Domenech Rodríguez, 2009; Padilla, 1995). Furthermore, 95% of the study's participants were of mestizo race, which is predominant in Mesoamerica. Although it was hypothesized that these complex cultural and racial factors may influence the individual's response to intimate partner violence, our findings showed a strikingly similar relationship between intimate partner violence and IBS as in White women in the industrialized world.

The findings further support our current understanding of the pathophysiology of IBS, which encompasses a biopsychosocial disease etiology model (Drossman, 2006). Although the exact mechanism for the relationship between intimate partner violence and IBS is unclear, investigators highlight the link between violence-related stress and neuroendocrine signaling (Austin & Leader, 2000; Ellsberg, Caldera, et al., 1999; Leserman & Drossman, 2007). Episodes of intimate partner violence stimulate the

hypothalamic-pituitary-adrenal axis, which in turn is thought to be involved with the pathogenesis and maintenance of IBS (Dinan et al., 2006; Fukudo, 2007; Heitkemper et al., 1996).

A lower prevalence of lifetime intimate partner violence was found in this sample (20%) as compared with a prior cohort study carried out with pregnant women in the same setting, which reported a 54% lifetime prevalence of intimate partner violence (Valladares et al., 2005). Despite our use of an international validated scale and that our interviewers had previous experience with the assessment of intimate partner violence, the main focus of the study was not intimate partner violence but gastrointestinal disorders. It has been previously shown that studies primarily designed for other purposes and not focused solely on violence are more likely to underestimate the prevalence of intimate partner violence (Ellsberg, Heise, Peña, Agurto, & Winkvist, 2001).

Although using a population-based sample allows us to effectively examine this relationship in a community setting, it may limit our ability to generalize our findings to other groups of Latinas, both in their native countries and as immigrants to the United States. As discussed above, we recognize that there may be some differences in this relationship related to country of origin.

The study's findings may have both clinical and public health implications. First, the findings provide support for screening patients with a diagnosis of IBS for intimate partner violence. Positive screening would prompt counseling and appropriate referral. From a public health standpoint, the findings support the ongoing intimate partner violence prevention efforts in Nicaragua and Mesoamerica. In addition, although there may be differences between the sampled Nicaraguan population and the U.S. Latina population, these results may be generalizable to recent immigrant populations from Mesoamerica in the United States. Efforts for prevention of intimate partner violence at the population level should be considered in an effort to prevent adverse health outcomes, including gastrointestinal diseases.

Conclusions

This is the first study to show an association between intimate partner violence and IBS in the developing world and in a non-White population. Future studies in other populations may confirm the strength of this relationship. Our findings support screening for intimate partner violence among women with IBS in this population as well as continued efforts to prevent intimate partner violence in Central America.

Authors' Note

The authors would like to acknowledge Magdaly Torres, Jacobo Morales, Wilton Pérez, and the staff of the *Centro de Investigación en Demografía y Salud* (CIDS) for their contributions to this study.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors disclosed that they received the following support for their research and/or authorship of this article: This study was supported by a grant from the Rome Foundation, the *Centro de Investigación en Demografía y Salud* (CIDS) of the University of Nicaragua, León, as a member of the INDEPTH Network, the UNC Center for Gastrointestinal Biology and Disease (P30 DK034987), and the UNC Center for Functional GI & Motility Disorders (R24 DK067674). Dr. Becker-Dreps was supported by a National Service Award from the Health Resources and Services Administration (5-T32HP14001-19) and by the John E. Fogarty International Center (K01TW008401-01).

References

- Austin, M. P., & Leader, L. (2000). Maternal stress and obstetric and infant outcomes: Epidemiological findings and neuroendocrine mechanisms. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, *40*, 331-337.
- Bangdiwala, S. I., Ramiro, L., Sadowski, L. S., Bordin, I. A., Hunter, W., & Shankar, V. (2004). Intimate partner violence and the role of socioeconomic indicators in WorldSAFE communities in Chile, Egypt, India and the Philippines. *Injury Control and Safety Promotion*, *11*, 101-109.
- Barling, J., O'Leary, D., Jouriles, E. N., Vivian, D., & MacEwen, K. E. (1987). Factor similarity of the Conflict Tactics Scales across samples, spouses, and sites: Issues and implications. *Journal of Family Violence*, *2*, 37-54.
- Bernal, G., Cumba-Avilés, E., & Sáez-Santiago, E. (2006). Cultural and relational processes in depressed Latino adolescents. In S. R. H. Beach, M. Z. Wamboldt, N. J. Kaslow, R. E. Heyman, & M. B. First (Eds.), *Relational processes and DSM-V: Neuroscience, assessment, prevention, and treatment* (pp. 211-224). Washington, DC: American Psychiatric Association.
- Bernal, G., & Domenech Rodríguez, M. M. (2009). Advances in Latino family research: Cultural adaptations of evidence-based interventions. *Family Process*, *48*, 169-178.
- Caplan, A., Walker, L., & Rasquin, A. (2005). Validation of the pediatric Rome II criteria for functional gastrointestinal disorders using the questionnaire on pediatric gastrointestinal symptoms. *Journal of Pediatric Gastroenterology and Nutrition*, *41*, 305-316.
- Coker, A. L., Smith, P. H., Bethea, L., King, M. R., & McKeown, R. E. (2000). Physical health consequences of physical and psychological intimate partner violence. *Archives of Family Medicine*, *9*, 451-457.
- Dinan, T. G., Quigley, E. M., Ahmed, S. M., Scully, P., O'Brien, S., O'Mahony, L., et al. (2006). Hypothalamic-pituitary-gut axis dysregulation in irritable bowel syndrome: Plasma cytokines as a potential biomarker? *Gastroenterology*, *130*, 304-311.
- Drossman, D. A. (1999). The functional gastrointestinal disorders and the Rome II process. *Gut*, *45*(Suppl. 2), ii1-ii5.
- Drossman, D. A. (2006). The functional gastroenterology disorders and the Rome III process. *Gastroenterology*, *130*, 1377-1390.
- Drossman, D. A., Leserman, J., Nachman, G., Li, Z., Gluck, H., & Toomey, T. C. (1990). Sexual and physical abuse in women with functional or organic gastrointestinal disorders. *Annals of Internal Medicine*, *113*, 828-833.

- Dube, S. R., Felitti, V. J., Dong, M., Giles, W. H., & Anda, R. F. (2003). The impact of adverse childhood experiences on health problems: Evidence from four birth cohorts dating back to 1900. *Preventive Medicine, 37*, 268-277.
- Ellsberg, M., Caldera, T., Herrera, A., Winkvist, A., & Kullgren, G. (1999). Domestic violence and emotional distress among Nicaraguan women: Results from a population-based study. *American Psychologist, 54*, 30-36.
- Ellsberg, M., Heise, L., Peña, R., Agurto, S., & Winkvist, A. (2001). Researching domestic violence against women: Methodological and ethical considerations. *Studies in Family Planning, 1*, 1-16.
- Ellsberg, M. C., Peña, R., Herrera, A., Liljestrand, J., & Winkvist, A. (1999). Wife abuse among women of childbearing age in Nicaragua. *American Journal of Public Health, 89*, 241-244.
- Field, C. A., & Caetano, R. (2004). Ethnic differences in intimate partner violence in the U.S. general population: The role of alcohol use and socioeconomic status. *Trauma, Violence, & Abuse, 5*, 303-317.
- Fukudo, S. (2007). Role of corticotropin-releasing hormone in irritable bowel syndrome and intestinal inflammation. *Journal of Gastroenterology, 42*(Suppl. 17), 48-51.
- Heitkemper, M., Jarrett, M., Levy, R. L., Cain, K. C., Burr, R. L., Feld, A., et al. (1996). Increased urine catecholamines and cortisol in women with irritable bowel syndrome. *American Journal of Gastroenterology, 91*, 906-913.
- INDEPTH Demographic Network. (2009). *INDEPTH demographic network surveillance site in Central America*. Retrieved November 16, 2009, from http://www.indepth-network.org/index.php?option=com_content&task=view&id=861&Itemid=
- Inslicht, S. S., Marmar, C. R., Neylan, T. C., Metzler, T. J., Hart, S. L., Otte, C., et al. (2006). Increased cortisol in women with intimate partner violence-related posttraumatic stress disorder. *Psychoneuroendocrinology, 31*, 825-838.
- Kanazawa, M., Palsson, O. S., Thiwan, S. I., Turner, M. J., van Tilburg, M. A., Gangarosa, L. M., et al. (2008). Contributions of pain sensitivity and colonic motility to IBS symptom severity and predominant bowel habits. *American Journal of Gastroenterology, 103*, 2550-2561.
- Kang, J. Y. (2005). Systematic review: The influence of geography and ethnicity in irritable bowel syndrome. *Alimentary Pharmacology & Therapeutics, 21*, 663-676.
- Kwan, A. C., Bao, T. N., Chakkaphak, S., Chang, F. Y., Ke, M. Y., Law, N. M., et al. (2003). Validation of Rome II criteria for functional gastrointestinal disorders by factor analysis of symptoms in an Asian patient sample. *Journal of Gastroenterology and Hepatology, 18*, 796-802.
- Leserman, J., & Drossman, D. A. (2007). Relationship of abuse history to functional gastrointestinal disorders and symptoms: Some possible mediating mechanisms. *Trauma, Violence, & Abuse, 8*, 331-343.
- Leserman, J., Li, D., Drossman, D. A., & Hu, Y. J. B. (1998). Selected symptoms associated with sexual and physical abuse among female patients with gastrointestinal disorders: The impact on subsequent health care visits. *Psychological Medicine, 28*, 417-425.
- Letourneau, E. J., Holmes, M., & Chasedunn-Roark, J. (1999). Gynecologic health consequences to victims of interpersonal violence. *Women's Health Issues, 9*, 115-120.
- Luscombe, F. A. (2000). Health-related quality of life and associated psychosocial factors in irritable bowel syndrome: A review. *Quality of Life Research, 9*, 161-176.

- Maxion-Bergemann, S., Thielecke, F., Abel, F., & Bergemann, R. (2006). Costs of irritable bowel syndrome in the UK and US. *Pharmacoeconomics*, *24*, 21-37.
- McFarlane, J. M., Groff, J. Y., O'Brien, J. A., & Watson, K. (2005). Prevalence of partner violence against 7,443 African American, White, and Hispanic women receiving care at urban public primary care clinics. *Public Health Nursing*, *22*, 98-107.
- Padilla, A. (1995). *Hispanic psychology: Critical issues in theory and research*. Thousand Oaks, CA: Sage.
- Peña, R., Pérez, W., Meléndez, M., Källestål, C., & Persson, L. A. (2008). The Nicaraguan Health and Demographic Surveillance Site, HDSS-Leon: A platform for public health research. *Scandinavian Journal of Public Health*, *36*, 318-325.
- Peña, R., Wall, S., & Persson, L. A. (2000). The effect of poverty, social inequity, and maternal education on infant mortality in Nicaragua, 1988-1993. *American Journal of Public Health*, *90*, 64-69.
- Pew Hispanic Center. (2007). *Statistical portrait of Hispanics in the United States, 2007, detailed Hispanic origin: 2007*. Retrieved November 16, 2009, from <http://pewhispanic.org/files/factsheets/hispanics2007/Table-5.pdf>
- Pico-Alfonso, M. A., Garcia-Linares, M. I., Celda-Navarro, N., Blasco-Ros, C., Echeburúa, E., & Martinez, M. J. (2006). The impact of physical, psychological, and sexual intimate male partner violence on women's mental health: Depressive symptoms, posttraumatic stress disorder, state anxiety, and suicide. *Women's Health (Larchmt)*, *15*, 599-611.
- Renzi, M. R., & Agurto, S. (1993). *Economic and social situation of Leon, Managua, and Granada*. Managua, Nicaragua: International Foundation for Global Economic Development (FIDEG).
- Shaheen, N. J., Hansen, R. A., Morgan, D. R., Gangarosa, L. M., Ringel, Y., Thiny, M. T., et al. (2006). The burden of gastrointestinal and liver diseases. *American Journal of Gastroenterology*, *101*, 2128-2138.
- Silverman, J. G., Decker, M. R., Saggurti, N., Balaiah, D., & Raj, A. (2008). Intimate partner violence and HIV infection among married Indian women. *Journal of the American Medical Association*, *300*, 703-710.
- Smith, M. D. (1994). Enhancing the quality of survey data on violence against women: A feminist approach. *Gender & Society*, *8*, 109-127.
- Straus, M. A. (1979). Measuring intrafamily conflict and violence. The Conflict Tactics (CT) Scales. *Journal of Marriage and the Family*, *41*, 75-88.
- Talley, N. J., Boyce, P. M., & Jones, M. (1998). Is the association between irritable bowel syndrome and abuse explained by neuroticism? A population based study. *Gut*, *42*, 47-53.
- Talley, N. J., Fett, S. F., & Zinmeister, A. R. (1995). Self-reported abuse and gastrointestinal disease in outpatients: Association with irritable bowel-type symptoms. *American Journal of Gastroenterology*, *90*, 366-371.
- Talley, N. J., Helgeson, S. L., Zinsmeister, A. R., & Melton, L. J., III. (1994). Gastrointestinal tract symptoms and self reported abuse: A population-based study. *Gastroenterology*, *107*, 1040-1049.
- ten Berg, M. J., Goettsch, W. G., van den Boom, G., Smout, A. J., & Herings, R. M. (2006). Quality of life of patients with irritable bowel syndrome is low compared to others with chronic diseases. *European Journal of Gastroenterology and Hepatology*, *18*, 475-481.

- Thompson, W. G., Longstreth, G. F., Drossman, D. A., Heaton, K. W., Irvine, E. J., Mueller-Lissner, S. A. (2000). Functional bowel disorders and functional abdominal pain. In D. A. Drossman, N. J. Talley, W. G. Thompson, W. E. Whitehead, & E. Corazziari (Eds.), *Rome II: Functional gastrointestinal disorders: Diagnosis, pathophysiology, and treatment* (2nd ed., pp. 351-432). McLean, VA: Degnon.
- Valladares, E., Ellsberg, M., Peña, R., Högberg, U., & Persson, L. A. (2002). Physical partner abuse during pregnancy: A risk factor for low birth weight in Nicaragua. *Obstetrics and Gynecology, 100*, 700-705.
- Valladares, E., Peña, R., Persson, L. A., & Högberg, U. (2005). Violence against women: Prevalence and characteristics: A population-based study in Nicaragua. *British Journal of Obstetrics and Gynaecology, 112*, 1243-1248.
- Walker, E. A., Gelfand, A. N., Gelfand, M. D., & Katon, W. J. (1995). Psychiatric diagnoses, sexual and physical victimization, and disability in patients with irritable bowel syndrome or inflammatory bowel disease. *Psychological Medicine, 25*, 1259-1267.
- Zelaya, E., Peña, R., Garcia, J., Berglund, S., Persson, L. A., & Liljestrand, J. (1996). Contraceptive patterns among women and men in Leon, Nicaragua. *Contraception, 54*, 359-365.

Bios

Sylvia Becker-Dreps, MD, MPH, is an assistant professor in the Department of Family Medicine at the University of North Carolina at Chapel Hill (UNC), where she performs global health research in maternal and child health. She has performed research, public health, and clinical work in various settings in Mexico and Central America. In her faculty role, she currently practices at Piedmont Health Services, a Community Health Center, which serves many Latino patients in North Carolina. She is also the medical director of the North Carolina Farmworker Health Program.

Douglas Morgan, MD, MPH, is an associate professor in the UNC Division of Gastroenterology. He is a returned Honduras Peace Corps volunteer. He conducts epidemiologic research in gastric cancer and the functional gastrointestinal disorders in Latin America. He directs the UNC Center for Latino Health (CELAH) and is director of the UNC Program in Nicaragua.

Rodolfo Peña, MD, DrPH, is the dean of the School of Medicine at the University of Nicaragua-León and professor of epidemiology and biostatistics. In 1993, with the assistance of the Swedish Development Agency (SAREC), he established the Center for Epidemiology and Health. The Health and Demographic Surveillance Site based at the center has provided population-based data on the health of Nicaraguans, which has informed regional and international health policies, especially in the areas of intimate partner violence and reproductive health. He also serves as an advisor to the Pan American Health Organization (PAHO) and the Nicaraguan Ministry of Health (MINSAs).

Loreto Cortes, MD, MPH, is a gastrointestinal surgeon on the faculty of the University of Nicaragua–León School of Medicine. He received his MPH degree from the University of Nicaragua–León in 2006.

Christopher F. Martin, MSPH, directs the bioinformatics core in the UNC Division of Gastroenterology.

Eliette Valladares, MD, DrPH, is the director of the Center for Epidemiology and Health based at the University of Nicaragua–León. She is a practicing obstetrician and gynecologist and a professor in the Department of Obstetrics and Gynecology at the University of Nicaragua–León. Her research has focused on women’s health, sexual and reproductive health, and violence against women. Her pioneering work on intimate partner violence in Nicaragua paved the way for national legislation to protect women exposed to intimate partner violence.