NORTHWESTERN UNIVERSITY

Identifying the Risk and Protective Factors of Anxiety and Depression in Inflammatory Bowel Disease

A DISSERTATION

SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

for the degree

DOCTOR OF PHILOSOPHY

Field of Clinical Psychology

By

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EVANSTON, ILLINOIS

September 2020

ABSTRACT

Inflammatory bowel disease (IBD) is a chronic, progressive disease associated with physical, financial, and psychological burdens. Depression and anxiety, common comorbidities, are associated with poor outcomes including worse disease course, higher disability, decreased health related quality of life and reduced medication adherence. Prevention of psychological comorbidities and promotion of well-being are increasingly recognized as imperative in IBD management. Approaches inherent in the fields of public health and positive psychology provide frameworks to guide prevention and promotion research. This dissertation study utilized these frameworks through a multi-site cross-sectional study to identify the risk and protective factors of anxiety and depression, and to identify factors associated with well-being. The presence of disparities in prevalence of emotional disorders was also explored. One hundred and two adults with endoscopy-confirmed IBD completed an online survey that assessed clinical, psychological, and psychosocial factors. Perceived stress was identified as an influential covariate. When stress was controlled for, perceived discrimination was a significant risk factor for clinical anxiety and IBD activity increased the risk for clinical depression. In terms of protective factors, self-compassion and resilience buffered against clinical anxiety and depression. Additionally, resilience and self-compassion significantly predicted well-being. Our exploratory analysis revealed potential disparities in anxiety/depression based on SES (income and education), ethnicity, and experiences of discrimination. The results of this dissertation study identify two aspects of psychological capital that can be fostered to potentially prevent emotional disorders and promote well-being in IBD.

ACKNOWLEDGMENTS

As I reach the culmination of my PhD journey, as reflected in this dissertation, I know that I could not have reached the finish line without the support of numerous individuals.

First, I want to acknowledge and express gratitude for my dissertation committee. Dr. Laurie Keefer, my research mentor and dissertation committee chair, is the reason I am here today. I have always admired Laurie's authentic and charismatic style, which imbues her approach to mentorship. Her constant encouragement, patience, and ability to recognize and foster one's gifts allowed me to feel supported and confident in my growth as a researcher and clinician. I am also grateful for Dr. John Pandolfino, my dissertation co-chair. John's unique mentorship style encouraged me to think critically and creatively not just about research but also about myself. I also want to express my appreciation for Dr. Helene Moore, a critical member of my committee, whose expertise and embodiment of positive psychology encouraged my own strengths as well as those of this dissertation.

Second, I wish to express my appreciation for the CPRGI lab. Dr. Tiffany Taft stepped up as a mentor, sharing her immense GI and statistical knowledge generously, including in this dissertation. Words cannot express my gratitude for my labmates and friends, Dr. Alyse Bedell and Dr. Livia Guadagnoli. It meant so much to be able to travel on this journey with two intelligent, hardworking, and cool people. Finally, I am deeply appreciative of my family. My husband, Nate Clancy, was a reservoir of endless encouragement, love, and importantly humor – never judging when I fell but helping me rise stronger. My parents, Debra and William, have always challenged me to use my passion to create change. I am immensely grateful for their love, encouragement, and conviction in my ability to succeed.

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Chapter I: Statement of the Problem

Significance and Purpose of the Study

Inflammatory bowel disease (IBD) is a chronic and burdensome condition that requires ongoing self-management and coping (Keefer & Kane, 2016). Patients with IBD are at an increased risk for the development of psychological comorbidities, the two most common being anxiety and depression (Byrne et al., 2017). These emotional disorders have been associated with worse clinical and psychosocial outcomes (IsHak et al., 2017), and can be viewed as consequences of maladaptive coping (McCombie, Mulder, & Gearry, 2013). While certain risk factors for anxiety/depression have been identified, there is a dearth of research investigating protective factors. Additionally, there is a gap of knowledge regarding the elements that contribute to living the "good life" even with IBD. Through the frameworks of positive psychology and public health, we aim to identify the risk and protective factors of anxiety and depression, as well as predictors of well-being. We also begin to explore whether disparities exist in the drivers of psychological comorbidities in IBD.
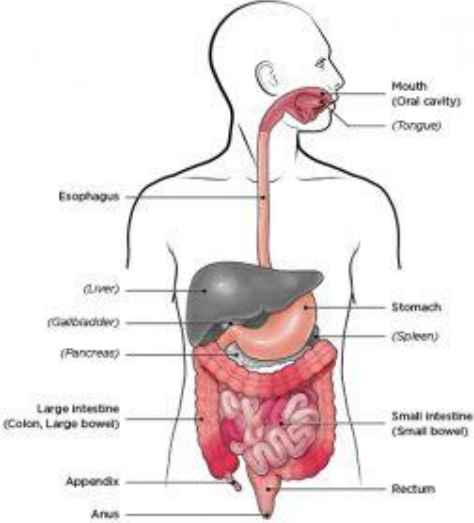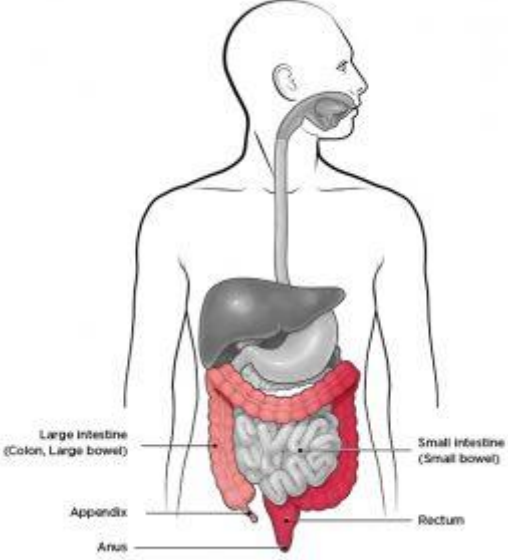
Review of Relevant Literature

Burden of IBD

Inflammatory bowel diseases (IBD), including Crohn's disease (CD) and ulcerative colitis (UC), are chronic autoimmune gastrointestinal diseases (Ellul et al., 2016) (see Table 1 for more information). Most commonly diagnosed during adolescence and emerging adulthood (Loftus, 2004), IBD is characterized by relapsing and remitting symptoms including abdominal pain, diarrhea, weight loss, fatigue, and extraintestinal symptoms like joint pain or eye inflammation (Center for Disease Control and Prevention, 2018). The estimated prevalence of IBD is 1.3% of the U.S. adult population, impacting 3 million American adults (Dahlhamer,

2016) and demonstrating an increase in prevalence since the 1999 rate of 0.9% (2 million adults)

(Nguyen, Chong, & Chong, 2014). This increasing prevalence and incidence appears to be a

global trend (Molodecky et al., 2012); this is concerning as IBD has a significant impact on both

an individual and on a systemic level. On an individual level, IBD is associated with depression

and anxiety (Byrne et al., 2017; Häuser, Janke, Klump, & Hinz, 2011; Neuendorf, Harding,

Stello, Hanes, & Wahbeh, 2016), decreased health-related quality of life (IsHak et al., 2017;

Sajadinejad, Asgari, Molavi, Kalantari, & Adibi, 2012), malnutrition, opportunistic infections,

disrupted sleep, and an increased risk for colon cancer (Carter, Lobo, & Travis, 2004; Kaser,

Zeissig, & Blumberg, 2010; Mowat et al., 2011). On a systemic level, the indirect and direct

costs associated with IBD result in $15-32 billion per year, with IBD adults more likely to be

unemployed or underemployed and more likely to utilize healthcare (Mehta, 2016). High

healthcare costs can also result from inappropriate or suboptimal treatment and a lack of

treatment adherence, leading many to encourage IBD management that is focused on

individualized treatment and prevention of disease progression (Keefer, 2018; Mehta, 2016).

Table 1. Distinct clinical characteristics of Crohn's Disease and Ulcerative Colitis

Crohn's Disease	Ulcerative Colitis
• Most disabling form of IBD • Heterogeneous symptoms that include: diarrhea, abdominal pain, and weight loss • Transmural inflammation (multiple layers of GI wall); can affect any part of the GI tract • Damaged areas are in patches • Clinical characteristics of fistulas, granulomas, peri-anal disease • Extraintestinal manifestations common (eye inflammation, joint pain, skin lesions) • Slight excess of mortality first 2 years of diagnosis • Smoking increases risk	• Most common form of IBD • Most common symptom: bloody diarrhea • Mucosal inflammation (inner most layer) limited to large intestine (colon) and rectum • Damaged areas are continuous • Clinical characteristics of strictures • Extraintestinal manifestations uncommon • Slight excess of mortality first 2 years of diagnosis • Smoking decreases risk

Information from: (Center for Disease Control and Prevention, 2018); (Mowat et al., 2011); Images from (Center for Disease Control and Prevention, 2018) *There is a small percentage of patients who do have symptoms of both CD and UC (5%); these patients are given the diagnosis of 'IBD, type unclassified (IBDU) (Mowat et al., 2011).

This chapter will focus on the pathophysiology of IBD, its physical and psychosocial impacts, and the associated management approaches, making the case for the promotion of well-being and prevention of deleterious mental health disorders. It will close with the presentation of theoretical models and study aims for this dissertation proposal.

Pathophysiology: how is IBD diagnosed and what is impacted?

A diagnosis of IBD is given after a thorough collection and investigation of a personal history and biological findings. Patients are asked about their travel, medication, sexual, and vaccination history (Mowat et al., 2011). They also provide details on stool frequency, consistency and urgency, and warning signs of IBD such as rectal bleeding, weight loss, and extraintestinal symptoms (Mowat et al., 2011). Further, their physicians will inquire about the known risk factors of smoking, family history of IBD, and any recent infections or surgeries (Mowat et al., 2011). The physical evaluation may include an upper endoscopic (Crohn's Disease), colonoscopic (ulcerative colitis and Crohn's disease), hematological, radiological, or histological examination in addition to investigations of the perianal region and abdomen for tenderness or distention (Mowat et al., 2011; Center for Disease Control and Prevention, 2018; Stange et al., 2006). Finally, Mowat and colleagues (2011) note the importance of laboratory investigations to help rule out or identify infections that are common among IBD patients, such as Clostridium difficile. Once an IBD diagnosis is confirmed, the gastroenterologist can classify the patient's disease phenotype according to the Montreal Classification (Mowat et al., 2011). Disease is further risk stratified (low risk vs. moderate/high risk) as determined by the American Gastroenterological Association Guidelines (Dassopoulos et al., 2015; Feuerstein, Nguyen, Kupfer, Falck-Ytter, & Singh, 2017; Peyrin-Biroulet et al., 2015; Sandborn, 2014). Disease

activity is also reported as remission vs. not remission/relapse. Remission is further broken into clinical, laboratory/biomarker or endoscopic/histological.

While the exact etiology of IBD has yet to be identified, research has identified several factors that appear to play a role in the pathogenesis of IBD. The prevailing theory posits that IBD is the result of an interaction between a genetically-vulnerable individual, environmental factors, and internal factors, specifically the gut microbiota (Ananthakrishnan, 2015; Ko & Auyeung, 2014; Podolsky, 2002; Center for Disease Control and Prevention, 2018). The role of genetic susceptibility/predisposition in IBD has been demonstrated in several studies and is an area of continuing research. Multiple monozygotic twin studies illustrate genetic disposition through the high concordance of IBD and clinical features, including disease location and course (Halfvarson, Bodin, Tysk, Lindberg, & Jarnerot, 2003; Orholm, Binder, Sorensen, Rasmussen, & Kyvik, 2000). These findings are supported by research of concordance in families, the identification of disease associated genes, and genome-wide association studies (Hugot et al., 2001; Ogura et al., 2001; Van Limbergen, Wilson, & Satsangi, 2009; VanDussen et al., 2014).

Along with genetic predisposition, several environmental factors have also been implicated in the pathogenesis of IBD including cigarette smoking, infections, vaccinations, diet, childhood hygiene, and a history of an appendectomy (Molodecky & Kaplan, 2010; Mowat et al., 2011) (Loftus, 2004). Differences in geographic incidence of IBD suggest additional environmental factors may be modifying risk (Ananthakrishnan, 2015; Loftus, 2004). However, due to inconsistent study outcomes, the exact role and mechanisms of environmental determinants of IBD remains unclear (Molodecky & Kaplan, 2010).

It is clear that IBD is associated with a dysfunctional immune response and a modified relationship between the immune system and the gut microbiota (Kaser et al., 2010; Loftus,

2004). When working correctly, the immune system plays an integral role in maintaining the body's health and protecting it from foreign organisms, like bacteria and viruses (Center for Disease Control and Prevention, 2018). In IBD the immune system is deficient, likely due to luminal gut bacteria crossing the intestinal epithelial barrier (Kugathasan & Amre, 2006). This crossing leads to gut immune cells signaling for the recruitment of T-cell lymphocytes, which are hypothesized to affect the immune system's response to gut bacteria (Cho & Abraham, 2007). Research suggests that an abnormal immune response to the gut microbiota leads to the chronic intestinal inflammation observed in IBD (Kaser et al., 2010; Van Limbergen et al., 2009). Additionally, it appears that altered gut microbiota itself may have a function in disease pathogensis (Ananthakrishnan, 2015). Early life environmental factors known to influence adulthood gut microbiota, such as interactions with pets and farm animals, family size, more siblings, and breastfeeding, have also been identified as risk and protective factors in IBD (Ananthakrishnan, 2015; Castiglione et al., 2012; Ng et al., 2015; Timm et al., 2014). Further, multiple studies have demonstrated differences in microbial diversity between IBD patients and healthy individuals (Gevers et al., 2014; Kostic, Xavier, & Gevers, 2014; Manichanh, Borruel, Casellas, & Guarner, 2012; Morgan et al., 2012; Nagalingam & Lynch, 2012).

Differences based on diagnosis

CD and UC share pathological features, but the clinical presentation, response to treatment, and complications can differ - contributing to differences in the level of psychosocial burden (Wijmenga, 2005).

CD symptoms are more systemic and can be more severe (Mowat et al., 2011), contributing to CD patients reporting a significantly more decreased physical quality of life compared to UC patients (Farmer, Easley, & Farmer, 1992; S. R. Knowles et al., 2018; A. A. Mikocka-Walus et al., 2008). Indeed, CD tends to be associated with greater general disability (Lo et al., 2018), work disability (Mowat et al., 2011), and higher rates of comorbid IBS (Keohane et al., 2010).

Surgical rates are high in CD (50-80%) and UC (30%) and each has unique challenges (Mowat et al., 2011). Surgery in CD is used to manage the impact of the disease; however, the recurrence of disease is likely, and most patients need subsequent surgeries (Mowat et al., 2011; Rutgeerts, 2006). For example, CD symptoms of strictures, fistulae, and abscesses can cause intestinal obstruction which may require surgical intervention (Mowat et al., 2011). Surgery in UC is a potentially curative option (Mowat et al., 2011). However, post-colectomy, up to 50% of UC patients suffer from pouchitis - inflammation within the pouch that is associated with abdominal pain, urgency, and increased frequency of bowel movements (Ferrante et al., 2008).

Finally, the psychosocial burden may differ between CD and UC. A large survey found that adults with CD were significantly more likely to experience an impact of IBD on interpersonal relationships (Becker et al., 2015). Rates of anxiety and depression are higher among IBD patients compared to healthy controls, and may be different between UC and CD (Mikocka-Walus, Knowles, Keefer, & Graff, 2016). A recent systematic review identified a trend of higher levels of anxiety and depression in CD compared to UC (Mikocka-Walus et al., 2016). While there are some differences in burden between CD and UC, the similarities are more extensive. Rather, the differences in physical and psychological impact appear to be more for active versus inactive IBD (Farrell, McCarthy, & Savage, 2016; Mikocka-Walus et al., 2016).

Race, ethnicity and IBD disparities

As research into the pathophysiology and epidemiology of IBD has expanded, important findings related to race and ethnicity have been identified. There appears to be differences in disease characteristics, outcomes, and risk based on race/ethnicity and a potential increase in incidence among minority populations (Nguyen et al., 2014). A systematic review of 198 studies from around the globe compared the phenotype and outcomes of IBD between White, Asian, Hispanic, and Black populations (Shi et al., 2018). The authors identified increased perianal disease among Blacks and Asians, male predominance in CD among Asians, female predominance in CD among Blacks, and lower rates of surgery among Asians (Shi et al., 2018). In addition to differences in phenotype and outcomes, certain groups may be at an increased risk for IBD. An epidemiological review of studies comparing the incidence/prevalence of IBD between migrants and the country's indigenous population identified patterns of increased risk for multiple immigrant populations. South Asians were found to have higher incidence of UC compared to the indigenous population in five countries; Hispanics appeared to have more extensive disease compared to Whites in the US and United Kingdom; and Bangladeshis were found to be at an increased risk of CD with perianal disease compared to Whites in the United Kingdom (Misra, Faiz, Munkholm, Burisch, & Arebi, 2018). These findings provide further evidence for the complex relationship of biology and environment in IBD. They also emphasize the need for increased inclusion of minority populations in research, especially as minorities are more likely to be exposed to environmental hazards (Morello-Frosch, Zuk, Jerrett, Shamasunder, & Kyle, 2011).

In addition to differences in phenotype and risk, IBD research has demonstrated differences and disparities in healthcare delivery, use, and outcomes based on socioeconomic

status (SES) and/or race. A 2013 systematic review of 40 studies from around the world

described disparities in several domains (Sewell & Velayos, 2013). Sewell and Velayos (2013)

identified disparities in 1) treatment (example: Whites more often treated with biologics

compared to Blacks despite similarities in disease severity), 2) medical adherence (example:

African Americans had reduced adherence compared to Whites), 3) outcomes (example: lower

SES was associated with increased risk of mortality), and 4) health literacy (example: Hispanics

had worse disease knowledge compared to Whites). Additionally, several studies have

demonstrated disparities in post-surgical outcomes, including findings that Black patients had

higher readmission rates post-surgery, longer admissions, and increased risk of death and serious

morbidity compared to White patients (Gunnells et al., 2016; Montgomery Jr et al., 2018). These

disparities may be an outcome of several factors including cultural differences, insurance status,

access to healthcare and/or provider bias (Hall et al., 2015; Sewell & Velayos, 2013). A recent

review investigating the drivers of healthcare disparities identified two risks for increasing

providers' susceptibility to unconscious bias: 1) a lack of social contact with minorities and 2)

dealing with complex health conditions in a time-limited encounter (James, 2017). Although

healthcare disparity research in IBD is limited, there is a growing interest through which several

disparities and their associated risks have been identified. Thus, there is a critical need to include

diverse populations in IBD research to ensure the further identification and prevention of health

disparities related to treatment and outcomes.

Medical Management of IBD

Several therapeutic options are available for the management of IBD, including

medications and surgery (Mowat et al., 2011) (see Table 2). Traditionally, therapeutic

approaches were focused on the induction and maintenance of remission based on patient-reported symptoms; however recent advances have allowed for a shift towards a "treat to target" approach (Colombel, Narula, & Peyrin-Biroulet, 2017). This approach utilizes objective measures, such as endoscopic grade, to maintain tighter control over disease activity and to prevent longer-term negative outcomes such as surgery or colon cancer (Colombel et al., 2017).

Current pharmacotherapies for IBD are effective in producing a remission state; however, they are not curative, can have bothersome side-effects, and do not guarantee long-term remission (Mowat et al., 2011). Further, medication nonadherence appears to be common, with 17.4% to 45% reporting difficulty with adherence to therapy, making continued remission less likely (M. L. Herman & Kane, 2015; Zelante, De, Borgoni, Trevisani, & Gallerani, 2014).

Surgical approaches can be used when patients have failed to respond to medications or as a preventive measure (Mowat et al., 2011). Among patients with CD, more than 50% may require surgery within the first decade of the disease and 70-80% may undergo surgery within their lifetime, while 30% of UC patients will ultimately require surgery (Mowat et al., 2011).

Finally, comprehensive management of IBD includes diet and psychological approaches. As malnutrition is a common risk among IBD patients, it is important for patients to maintain a healthy diet (Mowat et al., 2011). Psychological approaches can address many of the psychosocial implications of disease symptoms and/or treatment side-effects (Mowat et al., 2011).

Table 2. Medical Management of IBD

Medical Treatments	Delivery Method and Use	Side-Effects
Corticosteroids (prednisone, budesonide, methylprednisolone, hydrocortisone)	Oral tablet Intravenous Topical agent: enema or suppository Induce remission for moderate to severe relapses in UC and CD (not a maintenance therapy)	Mood disorders, sleep disturbances, acne Prolonged use: cataracts, osteoporosis, increased risk of infection
Aminosalicylates (5-aminosalicylic acid; 5-ASA or mesalamine)	Oral tablet, sachet or suspension Topical agent: enema or suppository Maintain remission mild-moderate UC and CD	Nausea, epigastric pain, diarrhea, decreased fertility in men Rare reactions: pancreatitis, Stevens-Johnson syndrome, alveolitis
Thiopurines (azathioprine or mercaptopurine)	Oral tablet Induce and maintain remission in UC and CD	Allergic reactions (fever, rash), flu-like illness, abdominal pain, pancreatitis, leucopenia Prolonged use: bone marrow toxicity
Biological agents (anti-TNF therapies: infliximab or adalimumab)	Intravenous Injection Used for CD and UC patients who have failed to respond to other treatments	Increased risk of infection, cancer, and central nervous system demyelinating disorders
Jak-2 Inhibitors (tofactinib, vedolizumab, ustekinumab)	Oral tablet Injection UC and CD, particularly for moderate to severe cases	Increased risk of infection, elevations in cholesterol, anemia
Surgery	Sub-total colectomy Ileo-anal pouch procedure (proctoclectomy) Strictureplasty Ileocolonic resection For patients with severe UC or CD who have failed to respond to other treatments or for those at an early stage of UC who have yet to initiate medication therapy	High morbidity rate, failure of healing, sepsis, pouchitis, nocturnal seepage, surgical complications can lead to fecundity and impotence

Information from: (Feagan, 2016; Mowat et al., 2011; Prefontaine, Sutherland, MacDonald, & Cepoiu, 2009)

Psychological Adjustment and IBD

IBD management requires coordination between the healthcare team and the IBD patient, with most of the responsibility in the hands of the patient. The patient must be able to continuously and flexibly practice adjustment and self-management given the chronic, often unpredictable nature of the IBD disease course (Keefer & Kane, 2016). This is a lifelong endeavor, yet it is beneficial as adjustment has been associated with greater bowel and systemic health, decreased pain, improved symptom tolerance, more engagement in activities, and decreased healthcare utilization (Kiebles, Doerfler, & Keefer, 2010). However, adjustment to IBD can be challenging due to the physical consequences of IBD, the associated psychosocial challenges, and the demanding treatment regimen (Keefer & Kane, 2016; Kiebles et al., 2010).

Physical symptoms of IBD include fatigue, urgent and sometimes bloody diarrhea, joint pain, and abdominal pain (Center for Disease Control and Prevention, 2018). Many patients also experience incontinence during flares, or leaking fistulas (Lesnovska, Frisman, Hjortswang, & Börjeson, 2016). These symptoms can be embarrassing, are often stigmatized, and can negatively impact psychosocial functioning related to body image, sexuality, and self-esteem (Lesnovska et al., 2016; McDermott et al., 2015; Taft & Keefer, 2016). IBD symptoms can also make disease management behaviors more difficult to accomplish (Keefer & Kane, 2016). While these consequences can be experienced by all IBD patients, they can be particularly burdensome for the younger population as IBD is most commonly diagnosed during adolescence and emerging adulthood (Loftus, 2004).

The diagnosis and symptoms can impact psychosocial domains of personal development, social relationships, and work functioning. Receiving a chronic illness diagnosis can lead to a

period of mourning and a sense of loss of independence (Lesnovska et al., 2016). The uncertain nature of IBD can disrupt one's self-image and contribute to a sense of loss of control, fear of not reaching one's expectations or full potential, and frustrations from changing behaviors but still experiencing symptoms (Lesnovska et al., 2016). Burdensome symptoms often lead to maladaptive behaviors such as increased social isolation, avoidance of social events and increased vigilance around bathroom locations (Lesnovska et al., 2016). Individuals may feel they cannot make friends or pursue romantic relationships because of embarrassing symptoms or feeling unattractive post-surgery (Lesnovska et al., 2016; Lonnfors et al., 2014). The impact of IBD can be significant on romantic relationships as it most often occurs during reproductive years (McConnell & Mahadevan, 2016). IBD is associated with decreased sexual functioning, reduced fertility, potentially increased risk for pregnancy complications, and possibly higher rates of voluntary childlessness due to fear of passing the disease to children (Ellul et al., 2016; McConnell & Mahadevan, 2016; Selinger, Ghorayeb, & Madill, 2016; Yarur & Kane, 2013).

The physical demands of IBD can also negatively impact one's ability to work full-time, with IBD patients experiencing increased disability, underemployment, and decreased productivity at work (Cosnes, Gower–Rousseau, Seksik, & Cortot, 2011; Lesnovska et al., 2016; Lonnfors et al., 2014; Shafer et al., 2018). Unsurprisingly, work impairments such as reduced productivity have been associated with lower quality of life and emotional distress (Shafer et al., 2018). Patients may also have increased absenteeism from work due to symptoms or fear of having embarrassing symptoms around colleagues (Lonnfors et al., 2014). Work impairment among IBD patients can be particularly burdensome as the peak onset occurs during prime earning years, and the symptom burden can prevent promotion opportunities (Cosnes et al., 2011; Lesnovska et al., 2016).

Difficulties at work are not just due to the symptoms but also due to feelings of judgment and discrimination (Lonnfors et al., 2014). Experiences of stress and discrimination have been linked to increased inflammation, IBD bowel symptoms, and associated with inflammatory biomarkers including C-reactive protein (Gouin, Glaser, Malarkey, Beversdorf, & Kiecolt-Glaser, 2012; Kershaw et al., 2016; Tené T Lewis, Aiello, Leurgans, Kelly, & Barnes, 2010; Singh, Graff, & Bernstein, 2009; Targownik et al., 2015). Additionally, the inflammatory nature of IBD can impact the brain, with chronic inflammation associated with emotional difficulties such as depression (Szigethy et al., 2014). Given the increased psychological distress associated with IBD, it is unsurprising that a decreased health-related quality of life has been well-established among this population (Agostini et al., 2014; Jones, Wessinger, & Crowell, 2006; Larsson, Lööf, Rönnblom, & Nordin, 2008).

In addition to the challenges presented by symptoms and their associated psychosocial responses, the behavioral modifications required for IBD treatment regimens can be burdensome. Difficulty with medication adherence is common; patients express concerns about treatment side-effects and treatment costs, and experience frustration with ineffective, non-curative treatments (Lesnovska et al., 2016) (Devlen et al., 2014; M. L. Herman & Kane, 2015; Zelante et al., 2014). Treatment side-effects, like acne or weight fluctuations, can negatively impact body-image and self-esteem, while high costs can lead to financial burdens in a population already suffering from work impairment (Casati, Toner, De Rooy, Drossman, & Maunder, 2000; Lesnovska et al., 2016; McDermott et al., 2015).

Procedures and surgery can be particularly burdensome physically and psychologically. Colonoscopies can be painful, embarrassing, and even traumatic for some patients (Casati et al., 2000; Nicolai et al., 2014). A seton or ostomy bag can irritate the skin and can make some

patients feel less sexually attractive or be fearful of body stigma (Canavan, Abrams, Hawthorne, Drossman, & Mayberry, 2006; Lesnovska et al., 2016). Clearly, there are many challenges to adjustment in IBD.

Coping and Adjustment in IBD

An important determinant of quality of life and adjustment in IBD is one's ability to cope with physical and psychosocial stressors. Coping influences the degree to which stressors impact a person and helps determine one's level of functioning and well-being (S. Knowles, Wilson, Connell, & Kamm, 2011). Coping can either be adaptive in that it reduces distress or maladaptive in that it impairs health-related quality of life and increases distress (McCombie et al., 2013).

Very few studies have investigated adaptive coping in IBD; however, the research that has been done is promising. A recent qualitative study found that patients who practiced acceptance and resilience and who defined their identity beyond an IBD diagnosis were able to have a sense of "new normal" (Matini & Ogden, 2016). A qualitative survey among 378 adults with IBD found that the majority of participants could identify a positive impact of IBD on their life, including deepening personal relationships and realizing their ability to be resilient (Purc-Stephenson, Bowlby, & Qaqish, 2015). Finally, self-compassion has been associated with increased use of adaptive coping strategies and decreased stress among IBD patients (Fuschia M Sirois, Molnar, & Hirsch, 2015). It appears that IBD patients who are able to practice adaptive coping strategies have better adjustment and outcomes.

Perceived social support appears to be an important factor related to coping, adjustment, and outcomes in IBD. Perceived social support has been strongly correlated with adjustment, health-related quality of life and IBD-related quality of life (Gick & Sirois, 2010; Katz et al., 2016; Moradkhani, Beckman, & Tabibian, 2013). It has also been identified as an important predictor to postsurgical quality of life (Moskovitz, Maunder, Cohen, McLeod, & MacRae, 2000). Social support appears to be important both in the immediate and long-term. A cross-sectional study found that satisfaction with social support was protective against psychological distress among IBD patients with high levels of stress (Sewitch et al., 2001). A recent prospective study, using two survey time points, highlighted the importance of perceived social support in adjustment outcomes of at three levels: loss, resilience, and thriving (Sirois & Hirsch, 2017). Sirois and Hirsch (2017) were interested in the differences between IBD patients who struggle to adapt (experience loss) versus those who adaptively cope (resilience and thriving) in multiple domains of adjustment. In addition to coping efficacy and illness acceptance, perceived social support was identified as an important factor in adjustment at both time points (Sirois & Hirsch, 2017). At time 1, perceived social support was associated with resilience and thriving in the domains of life satisfaction and personal growth; at time 2 perceived social support predicted resilience and thriving in the domain of life satisfaction (Sirois & Hirsch, 2017) . The authors also investigated the adjustment domain of relationships, finding that those who experienced loss in this domain reported less disease acceptance and worse efficacy in coping, compared to those who experienced resilience or thriving in the relationship domain (Sirois & Hirsch, 2017). While the study was limited in that only one-third of the participants were male, 93% of participants were White, and the participants self-reported their IBD diagnoses, this study provides important information on the significance of perceived social support to adjustment and the need to identify

what differentiates resilience from loss in IBD. Furthering this work was a recent cross-sectional study among 257 IBD patients that found perceived social support was associated with higher quality of life and lower distress (Slonim-Nevo et al., 2018). Perceived social support also predicted less disease activity among UC patients, path analysis revealed this was due to its influence on reducing psychological distress (Slonim-Nevo et al., 2018). Clearly perceived social support is influential to coping and adjustment, and thus outcomes in IBD.

On the other hand, IBD research has demonstrated the range of consequences of maladaptive coping. A recent systematic review of 39 articles identified that maladaptive coping strategies, such as avoidance or distraction, were negatively associated with psychological well-being (McCombie et al., 2013). Additionally, poor coping tended to be associated with depression, anxiety, disease activity, lower perceived health, and worse adjustment (McCombie et al., 2013; Voth & Sirois, 2009).

Psychopathology and functional overlap reflects poor adjustment in IBD

Depending on disease state (active versus remission), rates of anxiety and depression can be double that of general population rates (Mikocka-Walus et al., 2016; Mowat et al., 2011). A recent systematic review identified significantly higher rates of comorbid depression (21.2%) and anxiety (19.1%) among IBD adults compared to general population rates of 13.4% and 9.6%, respectively (Mikocka-Walus et al., 2016). Having an emotional disorder can also impair one's ability to use effective coping strategies, potentially impairing self-management (Vigano et al., 2016). Indeed, the development or worsening of anxiety and/or depression can be viewed as a

failure to adjust to or appropriately cope with an IBD diagnosis (Kiebles et al., 2010; S. Knowles et al., 2011).

Depression and anxiety are associated with negative outcomes in multiple domains including decreased health-related quality of life (Luo et al., 2017), increased disease-related disability (Chan et al., 2017), decreased medication adherence (Gray, Denson, Baldassano, & Hommel, 2012), and worse disease course including increased risk for hospitalization and surgery (Gaines et al., 2016; D. J. Gracie, Guthrie, Hamlin, & Ford, 2018). Unfortunately, it appears that emotional disorders are undertreated in IBD patients (Bennebroek et al., 2012).

As previously noted, disparities have been identified in IBD services and outcomes based on race and socioeconomic status. There is the potential for disparities in rates of anxiety and depression and associated outcomes in patients with IBD. There are a variety of mental health risk factors that minorities tend to be more vulnerable to or experience more, including poverty, experiences of discrimination, early adverse life experiences, and exposure to violence (Organization, 2013). Surprisingly, despite the increased exposure and higher levels of stress, rates of anxiety and depression in the general population do not significantly differ based on race (Breslau et al., 2006; Kessler et al., 2005). However, research into the risk factors for anxiety and depression among diverse IBD patients and whether disparities exist remains limited.

While anxiety and depression can reflect poor adjustment in IBD, there is increasing evidence for a bidirectional relationship between IBD activity and comorbid psychological disorders through the brain-gut axis and metabolic, endocrine, and psychoneuroimmunological mechanisms (D. J. Gracie et al., 2018; Moulton et al., 2019).

The brain-gut axis is a bidirectional system in which psychosocial, environmental, and central nervous system pathways integrate to influence the gastrointestinal tract through neurotransmitters and the microbiome (Moulton et al., 2019; Tougas, 2000). Much of the research on the brain-gut axis has focused on centrally-mediated disorders/disorders of Brain-Gut interactions, such as centrally-mediated abdominal pain syndrome and irritable bowel syndrome, identifying that physiological changes and symptoms are often correlated with stress, anxiety, depression, and vice versa (Camilleri, 2014; Koloski et al., 2012; Tanaka, Kanazawa, Fukudo, & Drossman, 2011). There is increasing evidence that stress, through the brain-gut axis, can also impact IBD symptoms contributing to increased gastrointestinal inflammation, increased intestinal permeability, changes in motility, and increased experiences of pain (Drossman & Ringel, 2000; Hollander, 2004; Kelly et al., 2015; Kiank, Taché, & Larauche, 2010). Given the inflammatory nature of stress, it is unsurprising that early life stress is a risk factor for both IBD and depression (Danese et al., 2009). Results from a 2018 longitudinal study provide further support for the bidirectional nature of the brain-gut axis in an IBD population (Gracie, Guthrie, Hamlin, & Ford, 2018). Gracie and colleagues (2018) followed 405 adults with IBD for five years and observed the following: 1) a significant association of baseline clinically active disease with the development of abnormal anxiety at follow-up; 2) a significant association of baseline abnormal anxiety with a disease flare or the need for a glucocorticosteroid prescription at follow-up, among those in clinical remission at baseline; and 3) a significant association of baseline abnormal anxiety with escalation of medical therapy and hospitalization at follow-up. While the researchers were unable to perform regressions related to depression, due to a limited incidence, a sensitivity analysis found an association between abnormal depression and the development of clinically active IBD (Gracie, Guthrie, Hamlin, & Ford, 2018). These

findings are advanced by two 2018 studies. Kocahar and colleagues (2018) longitudinal study of over 4,000 IBD participants demonstrated a link between baseline depression and increased risk for relapse, surgery, or hospitalization at follow-up (Kochar et al., 2018). Frolkis and colleagues (2018) identified that a history of a depression diagnosis was associated with increased incidence of IBD in 403,665 participants, whereas antidepressant medications were identified as protective.

In addition to the brain-gut axis, psychoneuroimmunological mechanisms also appear to play an important role in the relationship between mental health and IBD outcomes. Psychoneuroimmunology is the study of how the nervous system and behaviors influence immune functioning at systemic and gut mucosal levels (J. Mawdsley & D. Rampton, 2005). Studies have identified that acute and chronic psychological stress are associated with changes in immune and mucosal inflammatory function (J. Mawdsley & D. Rampton, 2005). Research suggests that the cytokines produced by inflammation of IBD can lead to depressive and anxious symptoms (Bonaz & Bernstein, 2013). On the other hand, depressive symptoms have been found to be immunosuppressive (Fortes et al., 2003; Frank, Wieseler Frank, Hendricks, Burke, & Johnson, 2002), associated with increased C-reactive protein (Danner, Kasl, Abramson, & Vaccarino, 2003), and associated with enhanced inflammation to a stressor (Fagundes, Glaser, Hwang, Malarkey, & Kiecolt-Glaser, 2013). This has direct implications in IBD, with findings suggesting that depression can worsen disease course, increase risk of flare, exacerbate symptoms, and inhibit remission response to IBD treatment (Alexakis, Kumar, Saxena, & Pollok, 2017; Graff, Walker, & Bernstein, 2009; Mittermaier et al., 2004; Persoons et al., 2005). Anxiety has also been associated with clinical recurrence (Mikocka-Walus, Pittet, Rossel, & von Kanel, 2016).

The development of irritable bowel syndrome (IBS) may also be viewed as a reflection of poor adjustment in IBD. While the exact etiology of IBS is unknown, IBS is considered a disorder of gut-brain interactions: As such its' associated symptoms of abdominal discomfort and changes in defecation are strongly influenced by stress via the brain-gut axis (Moloney et al., 2016). Patients with IBS are significantly more likely to experience significant symptoms of anxiety and depression, compared to controls, which can negatively influence outcomes related to symptom severity, self-management and response to treatment (Fond et al., 2014; C. Lee et al., 2017). IBD patients appear to be at an increased risk of developing IBS, it has found to impact up to 38% of UC patients and 59% of CD patients, compared to general population rates of 10-20% (Drossman, Camilleri, Mayer, & Whitehead, 2002; Keohane et al., 2010). Although IBD and IBS share symptom overlap and can be burdensome, they are distinct in their pathology and treatment (Abdul Rani, Raja Ali, & Lee, 2016). A recent cross-sectional analysis of more than 6,000 participants (20% with overlapping IBD and IBS) found significant differences between those with IBD compared to those with comorbid IBD and IBS (Abdalla et al., 2017). Participants with overlapping disorders had significantly higher healthcare utilization, more narcotic use, and worse quality of life (Abdalla et al., 2017). Comorbid IBD and IBS was also found to significantly predict anxiety, depression, and lower social satisfaction (Abdalla et al., 2017). These results are supported by a cross-sectional study that also found overlapping IBS and IBD as significantly associated with psychological comorbidity and that IBS symptoms occurring in the absence of mucosal inflammation had a similar impact on well-being and quality of life as active IBD (Gracie et al., 2017). Further, it appears that as the number of functional GI disorder symptoms increase, so too do symptoms of anxiety and depression (Bryant, van Langenberg, Holtmann, & Andrews, 2011). Among adults with IBD, risk factors for the

development of IBS include higher anxiety and reduced vitality, as measured via a well-being

index (J. W. Berrill, Green, Hood, & Campbell, 2013; Simren et al., 2002). Given the distinct

pathologies between IBS and IBD, the risk factors of IBS in IBD, and the associated negative

outcomes, it can be argued that that comorbid IBS and IBD reflect poor adjustment and coping in

IBD.

Psychological Approaches in IBD

Given the significant impact of anxiety and depression on health-related quality of life,

self-management, and on the inflammatory process, effective psychological interventions are

imperative in IBD management. Indeed, the 2017 American Gastroenterological Association task

force recommended behavioral interventions as the first line treatment for psychological

comorbidities in IBD (Szigethy et al., 2017). Theoretically, therapy could potentially decrease

IBD distress and inflammation through decreased activation of the HPA axis (Moulton et al.,

2019). Some therapeutic approaches, such as Cognitive Behavioral Therapy (CBT), stress

management, and Mindfulness-Based Cognitive Therapy (MBCT), have shown promise (Garcia-

Vega & Fernandez-Rodriguez, 2004; Schoultz, Atherton, & Watson, 2015; Sibaja, Moreno, &

Hesse, 2007). A 2015 study among older adolescents with CD found that CBT was associated

with a significantly greater reduction of depression, somatic symptoms, and CD inflammation

compared to supportive therapy (Szigethy et al., 2015) . While there is increasing evidence for

the effectiveness of behavioral interventions in IBD, many challenges to feasibility exist. There

is a dearth of qualified psycho-gastroenterologists integrated into IBD centers, there is a lack of

manualized interventions, and the focus of treatment is often centered on current distress.

Theoretical Models and Study Aims

To address the current challenges in care, the proposed study focuses on mental health promotion and prevention. Specifically, the aim of this study is to identify the risk and protective factors of anxiety and depression in IBD, along with the factors that predict well-being in IBD. This study is guided by two complementary frameworks: public health and positive psychology.

The Public Health Promotion and Prevention Approach

The public health approach of health promotion through the prevention of disease and healthcare disparities provides a good framework for the current project (Kirch, 2008). Public health differs from medicine in that the focus is on the general population, rather than on one individual patient (Kirch, 2008). Public health prevention works at three levels. Primary prevention focuses on intervening prior to the onset of a health condition through actions like vaccinations and decreasing risk behaviors (e.g. anti-smoking campaigns) (Kirch, 2008; Centers for Disease Control and Prevention, 2018). Secondary prevention uses screening/regular testing (e.g. mammography) to detect and treat disease prior to symptom onset among those with risk factors (Kirch, 2008; Centers for Disease Control and Prevention, 2018). Tertiary prevention targets individuals who have already received a diagnosis, with the goal to mitigate symptoms and to slow or stop health consequences (e.g. chemotherapy) (Kirch, 2008; Centers for Disease Control and Prevention, 2018). This project is utilizing a secondary prevention approach as it targets those who are more susceptible to anxiety and depression because of a health condition, IBD.

According to the CDC and Institute of Medicine, mental health prevention and health promotion are closely related and involve creating environmental conditions that support the adoption and maintenance of health behaviors (Centers for Disease Control and Prevention, 2018). In order to create environments that prevent anxiety and depression, and promote mental health, it is important to identify the risk and protective factors for these mental health disorders. Identifying risk and protective factors facilitates the determination of appropriate prevention and intervention targets. It also improves our ability to identify and address health disparities. These risk and protective factors can be identified at multiple levels using the socio-ecological model.

The socio-ecological model (SEM) is a public health framework for understanding health behaviors and outcomes, and for identifying areas where health promoting interventions could be targeted (McLeroy, Bibeau, Steckler, & Glanz, 1988). (See Figure 1) The SEM posits that an individual's behavior is determined by the interaction of five levels of influence or context, including the individual, interpersonal relationships, institutions, community, and public policy (McLeroy et al., 1988). The most effective interventions are those that target multiple levels through collaboration (Sallis, Owen, & Fisher, 2015; Stokols, 1996)**.** The SEM has been used to guide work by various organizations, including the CDC and World Health Organization, and in hundreds of interventions (Golden & Earp, 2012; H. Herman, Saxena, & Moodie, 2005; Centers for Disease Control and Prevention, 2018). A 2017 issue of the journal *Advances in Mental Health,* highlighted the many studies that have demonstrated the usefulness of SEM in mental health prevention and promotion (Dove & Costello, 2017; Reupert, 2017; Reupert, Maybery, Cox, & Scott Stokes, 2015). Within the context of IBD, the SEM helps to 1) organize known factors that can influence outcomes related to IBD and psychological state, 2) guide the

identification of variables of interest, and 3) support the eventual formation of multi-level

intervention or prevention programs.

Figure 1. The Socio-ecological Model: multiple contexts and levels of influence. Adapted from: (Centers for Disease Control and Prevention, 2018)
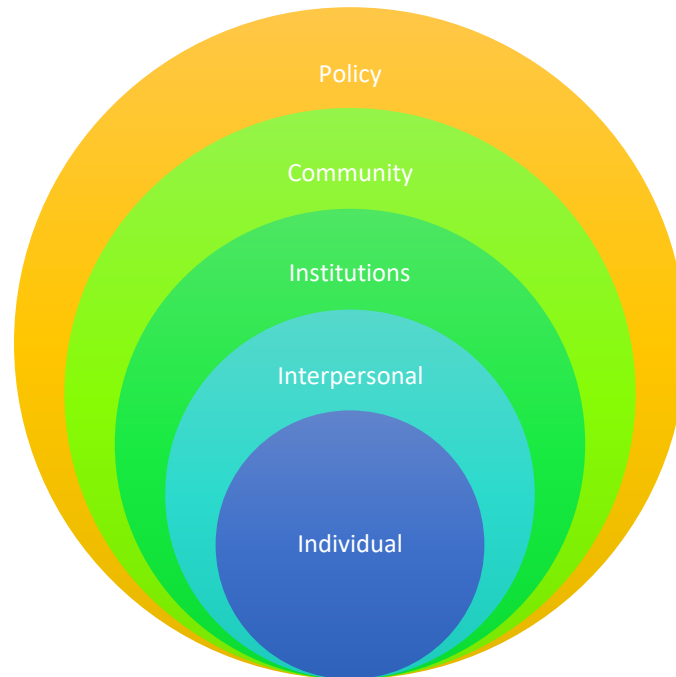
The Positive Psychology Promotion and Prevention Approach

The SEM works well with and has similarities to the field of positive psychology. Indeed,

there is a growing recognition of the benefits of pairing public health prevention and promotion

theories with positive psychology perspectives and interventions (Kobau et al., 2011). Positive

psychology is a scientific field focused on identifying the "good life" and promoting positive

qualities, skills, and strengths that encourage well-being, thriving, and flourishing even in

adverse conditions (M. Seligman & Csikszentmihalyi, 2000). Similar to public health, positive

psychology recognizes that "what is good in life is not simply the absence of what is problematic" (Peterson, 2008). Further, positive psychology is also grounded in prevention; thus, rather than a focus on fixing the problem, the approach is to nurture psychological assets and strengths that buffer psychopathology (Seligman & Csikszentmihalyi, 2000). Psychological capital, a construct drawn from positive psychology, is an individual's positive psychological state or their psychological resources that can be developed (Luthans, Luthans, & Luthans, 2004; Luthans & Youssef-Morgan, 2017). These resources and strengths are reflected in the way one thinks, feels, and behaves, and can promote well-being at and through the individual, family and community level (Seligman & Csikszentmihalyi, 2000). Thus, analogous to the SEM, positive psychology acknowledges that prevention, promotion, and treatment can and should occur at multiple levels (Seligman, 2002). Further, positive psychology recognizes that one of its primary focuses – well-being -- is dependent on multiple contexts (Seligman, 2002).

Applying public health and positive psychology concepts into the care of patients with IBD provides an opportunity to improve patient outcomes and identify future research and intervention opportunities across diverse groups and settings (See Table 3). Psychogastronterology has provided the needed foundation for this next step. Through validated and effective brain-gut psychotherapies, psychogastroenterology has focused on the psychologically vulnerable and has demonstrated significant coping and symptom improvement (Keefer, 2018). The field now has an opportunity to shift towards a preventive psychological capital-based science of digestive disease. The impact of enhanced psychological capital can be clinically relevant and observable. Enhancing our understanding of how individual aspects of psychological capital relate to important outcomes can facilitate our ability to foster them through preventive psychological care.

Table 3. Socio-ecological levels and Positive Psychology: associated description, risk/protective factors, and ways to address

SEM Level	Description, Risk and Protective Factors, and Opportunities
Individual	• Individual biological and personal characteristics that influence behaviors and psychological state: IBD health status, medication adherence, psychological capital, knowledge, attitudes, self-efficacy, developmental history, gender, age, religious identity, racial/ethnic identity, sexual orientation, economic status, financial resources, values, experiences of discrimination, job, literacy, stigma, insurance status, and others • Prevention and promotion: promote positive traits, foster psychological capital; focus on attitudes, beliefs and behaviors
Interpersonal	• Formal (and informal) social networks and social support systems that can influence individual behaviors and provide cultural norms, including family, friends, peers, co-workers, religious networks, and healthcare providers • Prevention and promotion: focus on increasing social support, providers screen for depression and anxiety, Physicians and GI psychologists provide care focused on identifying and building psychological capital
Institutions	• Healthcare systems, academic medical institutions, or social institutions with rules and regulations for operations that impact access and quality of psychological preventive care, promotion, and treatment • Prevention and promotion: Healthcare facility adopting mental health prevention and promotion policies including screening and creating environments that foster patients' psychological capacities, encouraging insurance to cover and expand behavioral medicine, support organizations providing information and resources
Community	• Relationships among organizations, institutions (schools and hospitals), and informational networks that influence and promote health behaviors and settings that increase mental health risks such as exposure to community violence • Prevention and promotion: organizations collaborating with community organizations to increase screening and to increase access to mental health resources including psychological capital -building interventions
Policy/Enabling Environment	• Local, state, tribal, national and global laws and policies, including policies promoting screening and health behaviors and allocating of resources. • Prevention and promotion: creating regulations for mental health parity, translating policies to be easily understood (campaign promoting mental health)

Adapted from (UNICEF, 2009) (Promotion, 2015)

Variables of Interest

Through the lens of positive psychology and public health several variables of interest were identified. Considering the probable bidirectional nature of depression and anxiety, and worsening disease course, the two most common comorbid emotional disorders in IBD - anxiety and depression, were identified as the two main dependent variables. Well-being was identified as an outcome of interest, as most of the IBD psychological literature has focused on negative psychological states. Health is not simply the absence of illness; it is now consistently viewed as "physical, mental and social well-being" (Herman et al., 2005) . Thus, a comprehensive view of IBD health should include well-being.

Well-being is viewed as a construct with five contributing elements including positive emotion, engagement, positive relationships, meaning, and accomplishment (PERMA) (Seligman, 2012). There is a growing empirical base in positive psychology that has identified several traits that buffer against mental health disorders and promote well-being (Seligman, 2012). Depending on the buffer, they are referred to as strengths, skills, or psychological capital and when enhanced can become self-reinforcing, effectively preventing emotional disorders including anxiety and depression (Luthans & Youssef-Morgan, 2017; Seligman, 2012).

Two aspects of psychological capital were identified for this proposal: resilience and self-compassion. They were chosen because they have been researched in IBD/gastrointestinal literature and have been associated with biological or psychological outcomes. Further, these variables are modifiable characteristics and thus can be targets for intervention (Hamby, 2015).

Resilience is the ability to persist during challenges, adapt, and maintain healthy psychological functioning despite an adverse event (Bonanno, 2004; Reivich, Seligman, &

McBride, 2011). Essentially, resilience is one's ability to "bounce back" after a stressful experience (Carver, 1998). The majority of people who experience an adverse or traumatic event do not develop chronic psychological problems (Bonanno, 2004). Although they tend to experience a period of distress, most are able to be resilient and experience positive emotions and experiences (Bonanno, 2004; Bonanno, Papa, & O'Neill, 2001). Indeed, several studies have identified resilience as positively associated with psychological and physiological recovery after a stressful event (Ong, Bergeman, Bisconti, & Wallace, 2006; Tugade, Fredrickson, & Feldman Barrett, 2004). Resilience is beginning to be studied in IBD with promising results. Similar to research in trauma and other chronic diseases, most adults with IBD do not develop psychological comorbidities (Mikocka-Walus et al., 2016) and many appear to have high levels of resilience (Sehgal, Abrahams, Ungaro, Dubinsky, & Keefer, 2017). Resilience has been identified as a predictor for readiness to transition to adult care among adolescents with IBD (Carlsen et al., 2017). It has been associated with improved cognitive, emotional, and social outcomes among adults with IBD; while low resilience has been associated with anxiety, depression, and poor quality of life among adults with IBD (Sehgal et al., 2017). A longitudinal study performed by Sirois and Hirsch (2017) identified profiles of resilient IBD patients across life domains. They identified coping efficacy, illness acceptance, and fewer depressive symptoms as important distinguishers for participants with resilient profiles compared to loss profiles. A recent poster presentation of a cross-sectional study among 157 IBD participants demonstrated a positive correlation between resilience and quality of life (Lozano Lanagran, Camacho Martel, Camargo Camero, Lopez Megias, & Alcain Martine, 2016). Finally, a 2018 systematic review of factors associated with pain in IBD identified that resilience may buffer against chronic IBD-related pain (Sweeney et al., 2018).

Self-compassion, a second aspect of psychological capital, is a positive attitude towards oneself that involves being open, non-judgmental, and sympathetic towards experiences of suffering (Neff, 2003). It also involves viewing one's pain as part of the human experience and cultivating the motivation to heal and relate to oneself with kindness (Neff, 2003). Self-compassion is a self-focused version of compassion or kindness; it has been positively associated with psychological strengths, well-being, health behaviors, improved physical health, lower cortisol levels, and romantic relationship quality (Gedik, 2018; Herriot, Wrosch, & Gouin, 2018; Horan & Taylor, 2018; Jacobson, Wilson, Solomon Kurz, & Kellum, 2018; Neff, 2003; Fuschia M. Sirois, Kitner, & Hirsch, 2015). Although it has not been extensively studied in the IBD population, preliminary research is encouraging. Self-compassion was identified as a buffer to the negative impact of anxiety on quality of life among 193 Portuguese adults with IBD in a recent conference abstract (Trindade, Ferreira, & Pinto-Gouveia, 2015). Self-compassion may also support adjustment in IBD. A recent global online survey study among adults with IBD used path-analysis to investigate the link between self-compassion and stress through coping strategies (Sirois et al., 2015). Self-compassion was associated with increased use of adaptive coping strategies, which were linked to coping efficacy and finally decreased stress (Sirois et al., 2015) . Additionally, a direct relationship between self-compassion and lower stress was identified (Sirois et al., 2015).

Statement of Hypotheses

Based on the abovementioned theoretical models, three primary aims and one exploratory aim were proposed:

Specific Aim 1: Determine the risk factors of anxiety and depression in IBD.

Hypothesis: Disease activity and certain psychosocial factors (lower income, lower education, more disability, and/or more experiences of discrimination) will be risk factors for anxiety and depression in IBD.

Specific Aim 2: Determine the protective factors of anxiety and depression in IBD.

Hypothesis: Resilience and self-compassion, two aspects of psychological capital, will protect against anxiety and depression in IBD.

Specific Aim 3: Determine the factors that predict well-being in IBD.

Hypothesis: Resilience and self-compassion, two aspects of psychological capital, will predict well-being in IBD.

Exploratory aim: Determine if there are disparities in rates of anxiety and depression.

Hypothesis: There will be disparities in mental health outcomes based on socioeconomic status, and experiences of discrimination

Chapter II: Methods

Participants

Recruitment

This dissertation was supported by NIH T32DK101363 grant. This study recruited adults with a confirmed diagnosis of IBD through physician diagnosis (see Inclusion/Exclusion Criteria). Given the potential for disparities and per the advice of the NIH/IOM, we sought to recruit an urban sample. As such, recruitment took place in two culturally rich cities, Chicago and New York.

Recruitment occurred at two sites: the outpatient gastroenterology clinics at Northwestern University (NU) and Mount Sinai (MS). Recruitment was direct taking place in clinic and over

the phone. At NU, recruitment in clinic was consecutive unless their gastroenterologist identified them as inappropriate for the study. Subjects were approached during their routine visits to the outpatient clinic. The study was briefly described to the patient and if the patient was interested, their email address was collected. The study information and link to the online survey using approved IRB language were then emailed to participants to complete the survey, which included informed consent, at home. At NU, recruitment also took place over the phone. Potential participants were identified via a medical record query of patients with IBD, with an endoscopy report between 2008 to 2018, and who met basic inclusion and exclusion criteria. Potential participant names were then sent to their gastroenterologist to receive permission to contact the patient via telephone. The potential participants were called using an IRB-approved telephone script. The study was briefly described to the patient and if the patient was interested, their email address was collected. The trained graduate student then sent the study information and link to the online survey using approved IRB language. At MS, potentially eligible participants were identified and called ahead of their already scheduled IBD appointment. The trained graduate student used a MS-modified and IRB approved version of the telephone script to describe the study. If the person expressed interest, they completed the consent when they came in for their appointment and were emailed a link to the online survey. All subjects were informed that participation is voluntary and that the time commitment to complete the online questionnaires was approximately 45-60 minutes. Recruitment took place over a 6 month period at each site.

Inclusion/Exclusion Criteria

Individuals must have met the following criteria to participate: 1) Has endoscopy confirmed IBD characterized by the Montreal classification in terms of disease location, severity,

age of onset and disease behavior; 2) At least six months post initial diagnosis of IBD; 3) English or Spanish speaking; and 4) Between the ages of 18-70 years old. The following are exclusion criteria: 1) Severe MI (e.g., schizophrenia or drug/alcohol abuse) and 2) Presence of end ileostomy or colostomy (difficult to assess disease activity indices).

Patient Safety

During recruitment, no clinic patient expressed suicidal tendencies or severe psychiatric disturbance. However, if this had occurred they would have been offered a psychiatric evaluation through the GI Behavioral Medicine Programs at NU or MS. While online participants were not screened for suicidal ideation, contact information for the PI was provided as well as resources if they were currently experiencing distress.

Determination of Sample Size:

We aimed to recruit 114-150 participants, with 57-75 from each recruitment site (NU/MS). We conducted an a priori power analyses to determine sample size needed to support the primary and secondary outcomes. For the regression analyses, with an effect size of 0.6, power of 0.8, and $p = .05$, we would need a sample size of 34 (df = 8). To account for possible predictors and to increase power, we added 10 participants for each possible predictor, increasing the sample size by 80 (N = 114). Additionally, for possible attrition, we increased our recruitment aim to 150. We chose an effect size of 0.6 from the depression literature. The sample size is also sufficient to power statistical analyses of correlations and linear multiple regressions.

Procedures

Survey

This study leveraged a descriptive, cross-sectional research design. Participants were partially screened for appropriateness during clinic recruitment. Participants were given a link to the survey which they accessed via the Northwestern RedCap Research website or the Mount Sinai RedCap Research website. The data were collected and managed using the electronic data capture tool, Redcap (Harris et al., 2019; Harris et al., 2009). On the first page of the Northwestern version of the survey, participants completed a HIPAA-compliant online consent. Next, they answered screening questions to ensure study criteria were met. If a participant did not meet the study criteria, they were taken to a page informing them they were ineligible to participate and thanking them for their time. Eligible participants started the survey by answering questions related to basic demographics, general mental health, and IBD questions of disease type, disease duration, current pharmacological treatments, and surgical history. This was followed by the general health (PROMIS Global Health Scale and Work Productivity and Activity Impairment Questionnaire) and IBD questionnaires (Short Inflammatory Bowel Disease Questionnaire, modified Harvey-Bradshaw Index, and Patient Simple Colitis Clinical Activity Index). If participants indicated they had IBS, they completed a symptoms severity scale (IBS-SSS). Participants then completed psychological assessments (PHQ-8, GAD-7, Perceived Stress, and Experiences of Discrimination) and positive psychology assessments (Self-Compassion Scale, Brief Resilience Scale, and the PERMA-Profiler). Participants were compensated with a $15 amazon card.

Figure 2. Recruitment and Online Questionnaire Flow
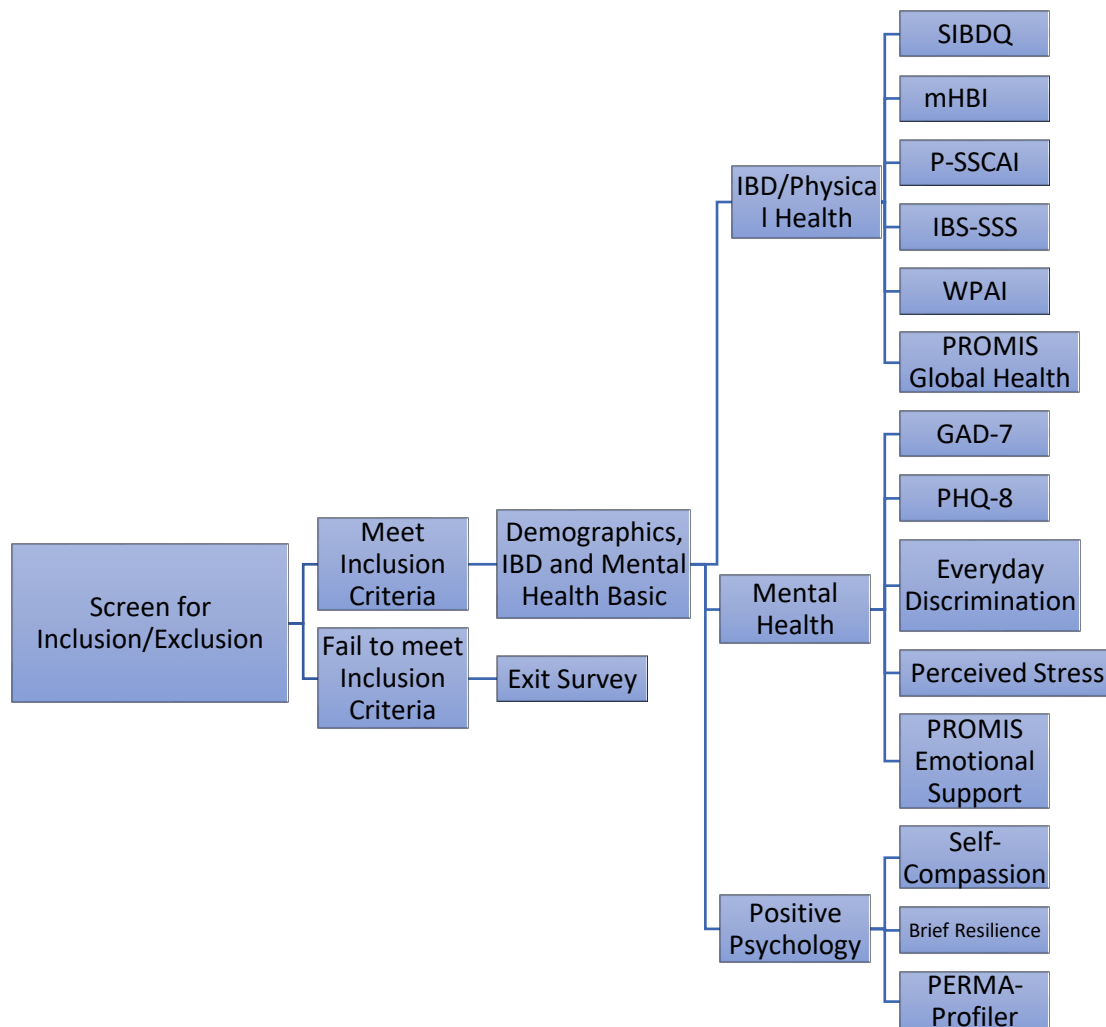
Measures

Self-report assessments occurred at one time point. We administered the self-report assessments through RedCap. Descriptions of assessment measures are as follows and are all self-report:

<u>Demographics:</u> Participants reported the following basic demographic information: age, gender, height, weight, smoking status, race, ethnicity, country of origin, relationship status, education level, employment status, and income.

IBD and Physical Health Related Variables

<u>IBD information:</u> Participants reported the following basic IBD information: diagnosis type (Crohn's disease or Ulcerative colitis), age at diagnosis, pharmacological treatments (immunomodulators, anti-TNF, corticosteroids, etc.), surgical history, and extra-intestinal symptoms. They were also be asked if they had received a diagnosis of irritable bowel syndrome.

<u>Short Inflammatory Bowel Disease Questionnaire (SIBDQ):</u> The SIBDQ is a 10-item questionnaire, derived from the Inflammatory Bowel Disease Questionnaire (IBDQ), to assess health-related quality of life (HRQOL) in the social, emotional and physical domains of IBD patients (Irvine, Zhou, & Thompson, 1996). Participants respond to statements via a 7-point Likert scale (1 *All of the time* to 7 *None of the time*) regarding how they have been feeling over the past two weeks. Sample items include "How often during the last 2 weeks have you had to delay or cancel a social engagement because of your bowel problem?" and "How often during the last 2 weeks have you felt relaxed and free from tension?" A final HRQOL score is calculated by summing the responses, with scores ranging from 10-70; higher scores signify higher HRQOL. The IBDQ has demonstrated good test-retest reliability, strong correlation with clinical changes in HRQOL and has been used in multiple IBD studies (Jowett, Seal, Barton, & Welfare, 2001{Kochar, 2018 #216)}.

Modified Harvey Bradshaw Index (mHBI): The Harvey Bradshaw Index (HBI) is a 5-item validated clinical index designed to assess symptom severity in patients with Crohn's disease (Harvey & Bradshaw, 1980). Typically, the HBI is completed by a physician, however it is common to use a modified version for use among patients, particularly in research (Kochar et al., 2018; Targownik et al., 2015). The HBI is modified through the removal of a question regarding the presence of an abdominal mass, thus becoming a self-report measure. The mHBI can be used to assess symptoms at the present moment or over the last week. This study will assess symptoms over the last week. Sample items include "How would you rate your abdominal pain over the last week?" and "How many liquid stools did you pass over the last week?" A score below 5 indicates disease remission (Harvey & Bradshaw, 1980; Vermeire, Schreiber, Sandborn, Dubois, & Rutgeerts, 2010). The modified, patient report version of the HBI has been found to have comparable results compared to the physician administered version (Sexton et al., 2014).

Patient Simple Colitis Clinical Activity Index (P-SCCAI): The SCCAI is a five-item validated, symptom based clinical index that is commonly used to assess disease severity in patients with Ulcerative Colitis (Walmsley, Ayres, Pounder, & Allan, 1998). The SCCAI has demonstrated correlation with more invasive assessments including lab data and the Powell-Tuck Index (Walmsley et al., 1998).The SSCAI is typically completed by a physician but a patient version, the P-SCCAI has demonstrated good correlation with the physician evaluated SSCAI, particularly during remission (Evertsz et al., 2013). The P-SCCAI has also demonstrated significant correlation with other measures of UC activity including C-reactive protein and the Physician's Global Assessment (Evertsz et al., 2013). The P-SSCAI is a 12-item validated measure that instructs patients to consider their UC symptoms over the previous week. Domains include bowel frequency

(day and night), blood in stool, well-being, urgency of defecation, and extracolonic features. Sample items include "During the previous week, how many times did you see blood in your stool?" and "During the previous week, have you ever woken up from joint pain?" A score below 2 indicates remission (Evertsz et al., 2013). .

IBS Severity Scoring System (IBS-SSS): The IBS-SSS is a 5-item scale that evaluates the severity of IBS symptoms over a 10 day period (Francis, Morris, & Whorwell, 1997). The scale assesses abdominal pain, distension, stool frequency, stool consistency, and interference with life. Sample items include 'How dissatisfied are you with your bowl habits?' and 'Please indicate how much abdominal pain or discomfort or altered bowel habits are affecting or interfering with your life in general.' A total score is generated by summing the 5 items, with a range of 0 to 500, higher scores reflect worse symptom severity with mild (75-175), moderate (175-300), or severe (>300) IBS. The IBS-SSS has been found to be valid and can be used to indicate response to treatment (Carruthers et al., 2009; Coffin, Dapoigny, Cloarec, Comet, & Dyard, 2004; Francis et al., 1997).

PROMIS Global Health Scale (PROMIS GHS): The PROMIS GHS is a 10-item measure that captures the physical, mental, and social aspects of HRQOL in general and over the past 7 days (Hays, Bjorner, Revicki, Spritzer, & Cella, 2009). Sample items include 'In general, would you say your health is' and 'How would you rate your fatigue on average?' Each item can be scored separately to provide insight into the participant's perspective on that health domain or two scores can be computed to represent Global Physical Health or Global Mental Health. Higher scores denote greater health. It has demonstrated high internal consistency reliability and can be used as an indicator of physical and mental health in patient-reported outcome studies (Hays et al., 2009).

Work Productivity and Activity Impairment Questionnaire (WPAI): The WPAI is a 6-item validated questionnaire that measures level of impairment due to a health problem (Reilly, 2008). The WPAI evaluates the domains of work and activity level. Sample items include "During the past seven days, how much did your IBD affect your productivity while you were working?" and "Are you currently employed?" The WPAI can result in four scores: absenteeism, presenteeism, work productivity loss, and activity impairment. The scores are expressed in impairment percentages, with lower percentages indicating less impairment. The WPAI has demonstrated high convergent and discriminate validity and has been used in a variety of chronic illness populations, including IBD, and among diverse participants (Agarwal et al., 2015; Andreasson, Svensson, & Berggren, 2003; Gawlicki, Reilly, Popielnicki, & Reilly, 2006; Michael et al., 2014; Vergara et al., 2011).

Other Health: Participants will also be asked whether they have used any of the following complementary and alternative medicine: yoga, meditation, massage, and acupuncture.

Basic Mental Health Variables

Mental Health basic information: Participants will be asked if they have ever received a mental health diagnosis (anxiety, depression, posttraumatic stress disorder, other: fill in blank), who gave mental health diagnosis, pharmacological treatments (classes: antidepressants, mood stabilizers, sleeping pills, atypical antipsychotics), and current/past psychological treatment (related to IBD or general).

Perceived Stress Scale 4 (PSS-4): The PSS-4 is a 4-item validated measure designed for the assessment of perceived stress over the last month (Cohen, Kamarck, & Mermelstein, 1983). The PSS-4 is a shorter version of the original 14-item PSS. Items are measured on a 5-point Likert scale (0 *Never* to 4 *Very Often*), with scores ranging from 0 to 16. Two items are reverse scored then summed, with higher scores correlated with more stress. It has demonstrated acceptable reliability and concurrent validity with measures of mental health and mental health quality of life in various populations, including adults with chronic illness (Andreou et al., 2011; E. H. Lee, Chung, Suh, & Jung, 2015; Mitchell, Crane, & Kim, 2008).

Everyday Discrimination Scale (EDS): The EDS is a 9-item validated scale that captures subjective experiences of discrimination (Williams, Yan, Jackson, & Anderson, 1997). Participants respond to a prompt asking how often they experience different forms of discrimination in their day-to-day life. Items are measured on a 6-point Likert scale (0 *Never* to 5 *Almost every day*), scores range from 0 to 45, higher scores indicating greater frequency of daily discrimination. The EDS captures experiences of discrimination across several domains, sample items include "You are treated with less courtesy or respect than other people" and "People act as if they are afraid of you". The items are not framed with a specific racial/ethnic/gender/sexual background. The EDS has been used and validated among diverse racial/ethnic groups and has been found to capture perceived discrimination equivalently across groups, and is one of the most widely used discrimination measures in medical research (Ben, Cormack, Harris, & Paradies, 2017; Kim, Sellbom, & Ford, 2014; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005). It has demonstrated high test-retest reliability and construct validity (Krieger et al., 2005).

PROMIS Emotional Support 4a (ES 4a) – The ES is a 4-item validated scale that assesses perceptions of being cared for and being in confidant relationships (Cella et al., 2010). Participants respond to a 5-point Likert scale (1 *Never* to 5 *Always*), responses are summed with scores ranging from 4 to 20. Higher scores reflect greater emotional support. Sample items include "I have someone who will listen to me when I need to talk" and "I have someone who makes me feel appreciated." The ES has been found to be reliable and precise and has been used in diverse samples (Cella et al., 2010; Shensa, Sidani, Lin, Bowman, & Primack, 2016).

Predictor Variables of Interest: Psychological Capital

Self-Compassion Scale (SCS) – The SCS is a 26-item validated questionnaire devised to evaluate overall self-compassion and the three facets of self-compassion (self-kindness, common humanity, and mindfulness) (Neff, 2003). Participants use a 5-point Likert scale (1 *Almost never* to 5 *Almost always*) to denote how often they engage in actions described in the statements. Sample items include "I try to see my failings as part of the human condition" and "When I'm feeling down I tend to obsess and fixate on everything that's wrong". Six subscales measure a positive and negative side of each component (self-kindness: self-judgment; common humanity: isolation; and mindfulness: over-identification). A total self-compassion score is reached by reverse scoring the negative items and then summing the means of the six subscales to create a grand mean, with higher scores reflecting more self-compassion. The SCS has good construct validity and internal reliability (Garcia-Campayo et al., 2014; Neff, 2016). It has been found to be a predictor of psychological symptom severity and quality of life (Van Dam, Sheppard, Forsyth, & Earleywine, 2011) and has been associated with decreased anxiety and depression and increased life satisfaction (Neff, 2003).

Brief Resilience Scale (BRS) – The BRS is a 6-item validated questionnaire designed to measure the "ability to bounce back or recover from stress" (Smith et al., 2008). It was created for use among populations with health-related stressors. Three of the six items are positively worded, with the other three negatively worded. Participants use a 5-point Likert scale (1 *Strongly disagree* to 5 *Strongly agree*) to indicate how much they agree with each statement. Items include 'I tend to bounce back quickly after hard times', 'It is hard for me to snap back when something bad happens', and 'I usually come through difficult times with little trouble'. The BRS total score is calculated by reverse scoring the negatively worded items and then finding the mean of all six items. Scores range from 1 to 5, with higher scores reflecting greater resilience to bounce-back. It has acceptable reliability, good internal consistency, and good convergent validity (Smith et al., 2008). It was validated in samples with cardiac conditions or chronic pain and has been used among populations with gastroenterology disorders (Park et al., 2018; Rodriguez-Rey, Alonso-Tapia, & Hernansaiz-Garrido, 2016; Smith et al., 2008). Finally, the BRS received one of the best psychometric ratings in an analysis of 19 resilience measures (Windle, Bennett, & Noyes, 2011).

Outcome Variables of Interest

Patient Health Questionnaire (PHQ-8): The PHQ-9 is a measure that has been validated for diagnosing Major Depressive Disorder (MDD) in primary care patients, as it closely follows MDD criteria cited in the Diagnostic and Statistical Manual for Psychiatric Disorders (Spitzer, Kroenke, Williams, & Group, 1999). The PHQ-8 is a modified version of the PHQ-9, with the removal of the last question regarding suicidal ideation; it has been identified as effective at identifying depression as PHQ-9 (Shin, Lee, Han, Yoon, & Han, 2019). Participants are instructed to consider how often they have been bothered by various symptoms over the past 2 weeks via a

4-point Likert scale (0 *Not at all* to 3 *Nearly every day*). A final score is reached by summing the responses with a range from 0 to 24. Higher scores indicate worse depression. Scores above 10 was identified as the cut-off for a probable clinical diagnosis of depression, as it has been identified as a sensitive and specific cut-off score (Shin et al., 2019). The PHQ-8 has demonstrated good internal consistency and test-retest reliability (Shin et al., 2019). It is currently used as a screening tool (minus the suicide question for liability purposes) in both New York and Chicago IBD clinics. While the Beck Depression Inventory is often used to assess depression, its inclusion of somatic symptoms can lead to overestimates of depression in illness populations (Mikocka-Walus et al., 2016; Smarr & Keefer, 2011). The PHQ-9 is an American Gastroenterological Association recommended measure for assessing depression among those with IBD (Szigethy et al., 2017).

Generalized Anxiety Disorder-7 (GAD-7): The GAD-7 is a 7-item measure that has been validated for the assessment of symptoms consistent with anxiety disorders (Spitzer, Kroenke, Williams, & Löwe, 2006). Similar to the PHQ-9 participants are instructed to consider how often they have been bothered by various symptoms over the past 2 weeks via a 4-point Likert scale (0 *Not at all* to 3 *Nearly every day*). A final score is reached by summing the responses with a range from 0 to 21. Higher scores indicate worse anxiety. Scores above 10 was identified as the cut-off for a probable clinical diagnosis of generalized anxiety disorder, as it has been identified as a sensitive and specific cut-off score (Spitzer et al., 2006). It has demonstrated excellent consistency and good test-retest reliability (Spitzer et al., 2006). The GAD-7 has demonstrated sensitivity and specificity for the diagnosis of anxiety in patient populations (Spitzer et al., 2006) and is

recommended by the American Gastroenterological Association for assessing anxiety among those with IBD (Szigethy et al., 2017).

PERMA-Profiler: The PERMA-Profiler is a 23-item multidimensional measure validated for measuring the five pillars of well-being (positive emotion, engagement, relationships, meaning, and accomplishment) as identified by Dr. Seligman, one of the founders of the positive psychology field (Butler & Kern, 2016; Seligman, 2012). The PERMA-Profiler also assesses negative emotion, loneliness, and physical health. Participants use an 11-point Likert scale (0 *Not at all* to 10 *Completely*) to provide a general rating for how often they have an experience or emotion. Questions include 'How often do you become absorbed in what you are doing?', 'How much of the time do you feel you are making progress towards accomplishing your goals?', and 'In general, how often do you feel joyful?' The measure is scored by computing the mean of each domain (positive emotion, engagement, relationships, meaning, accomplishment, negative emotion, loneliness, and physical health) to represent the multidimensional nature of well-being. Individual and/or group scores can be presented as a visual profile, with each domain presented. An overall well-being score is computed by averaging the PERMA items and an overall happiness item. While not yet validated in a digestive diseases sample, the PERMA-Profiler has demonstrated acceptable internal and cross-time consistency as well as content, convergent, and divergent validity across large and diverse samples (Butler & Kern, 2016).

Rationale for Statistical Analyses

Statistical analysis was performed in RStudio (Version 1.2.5001); all levels of significance were set at $p < .05$. We computed total scores for each measure and tested for normality via

skewness and kurtosis. If data were non-normally distributed non-parametric tests were used. Some variables were collapsed or converted to categorical variables to ensure statistical power and/or to prevent the removal of outliers due to skewness; these variables included age, BMI, race, relationship status, country of origin, income, education, and employment. While participants were able to identify their gender, biological sex based on chart information was used. If data was missing, we used mean values to replace missing data but only if fewer than 10% of items were missing on a scale (Parent, 2013).

Demographic and Clinical Information

We performed basic descriptive statistics, calculating frequencies and percentages, to evaluate demographics, illness characteristics, psychological characteristics and capital, and well-being. Anxiety and depression were classified as clinical or not (diagnostic cut-off score of 10), creating a two level categorical variable. Bivariate analyses using Pearson's chi-square ($\chi2$) test or Pearson's correlation (Spearman if nonparametric) were conducted to determine which demographic variables were associated with clinical anxiety and depression, and whether there were significant differences in their prevalence. We also performed Pearson's chi-square ($\chi2$) and Pearson's correlations to evaluate the relationships between risk factors identified in literature (disease activity, activity impairment, IBS overlap, and experiences of discrimination) and outcomes of clinical depression and anxiety. Variables found to be significant ($p < .05$) were included in later regression analyses. Correlations also assessed for relationships between all variables significantly associated with clinical depression and anxiety. Finally, we compared self-reported diagnosis of anxiety/depression to those meeting clinical criteria using chi-square analysis. Prevalence rates and associations are presented below.

Aim 1: Identify Risk Factors of Clinical Anxiety and Depression

Hierarchical multiple logistic regressions were calculated to identify risk factors of clinical anxiety and depression (nonclinical was the reference category). Covariates in the regression models were variables found to be significant in bivariate analysis and variables that have been previously identified as potential confounders (IBD type and perceived stress) in IBD literature. Covariates in the clinical anxiety regression model included potential confounders (IBD type and perceived stress) and IBS overlap, experiences of discrimination, and activity impairment. Covariates in the clinical depression regression model included potential confounders (IBD type and perceived stress) and IBS overlap, disease activity, ethnicity, employment, BMI, activity impairment, education and income. To maintain power, we limited the number of predictors in the regression model to 10 (VanVoorhis & Morgan, 2007). As this is an exploratory study, we removed perceived stress from the regressions to identify influential factors outside of stress. Model assumptions were assessed. Significant associations (p < .05) were reported as odds ratios (ORs) and 95% confidence intervals (CIs).

Aim 2: Identify Protective Factors of Clinical Anxiety and Depression

Hierarchical multiple logistic regressions were calculated to identify protective factors of clinical anxiety and depression (nonclinical was the reference category). Resilience and self-compassion were previously identified independent variables of interest; they were analyzed in separate regressions given their high association (>0.8) and to avoid multicollinearity. Covariates in the regression models were variables found to be significant in the risk factor analysis. For anxiety this included experiences of discrimination, IBS diagnosis, and perceived stress; for depression this included disease activity, perceived stress, experiences of discrimination, IBS

overlap, activity impairment, and BMI. As this is an exploratory study, we removed perceived stress from the regressions to identify influential factors outside of stress. Model assumptions were assessed. Significant associations ($p < .05$) were reported as odds ratios (ORs) and 95% confidence intervals (CIs). Moderation analyses were also performed to identify if social support, as measured by the PROMIS emotional support instrument, changed the relationship between aspects of psychological capital and psychological outcomes. After centering all variables included in the regressions, interaction terms (self-compassion*social support) (resilience*social support) were added to the models. If significant, interaction plots were created and examined to interpret effects.

Aim 3: Determine factors that predict well-being

The primary endpoint for Aim 3 was to determine factors that predict well-being, as assessed by the PERMA-Profiler. Cronbach's Alpha was used to determine reliability of the PERMA-Profiler. Bivariate analyses using Pearson's correlation coefficients were conducted to determine which demographic variables potentially contribute to well-being. We also performed Pearson's correlations to evaluate the relationships between factors identified in literature (perceived social support and IBD quality of life) and the outcome of well-being. Variables found to be significant ($p < .05$) were included in later regression analyses. We performed hierarchical linear regressions to predict well-being across the independent predictors of resilience and self-compassion (separate analyses), after controlling for social support, IBD quality of life, IBD activity, experiences of discrimination, activity impairment, education, biological sex, ethnicity, and income. Model assumptions were assessed.

Exploratory Aim: Determine whether disparities exist in rates of anxiety and depression.

Our exploratory analyses reflect two established definitions of health disparities. 1) The Agency for Healthcare Research and Quality's definition is a difference in means or proportions between groups (Prevention & Promotion, 2000) and 2) the Institute of Medicine's definition is a difference not due to clinical need, thus factors and variables highly correlated with clinical need should be controlled for in analysis (Nelson, 2002). For definition one, we performed Pearson's chi-square ($\chi2$) analysis or Fisher's exact test, as appropriate, to test for differences between socio-demographic factors (race, ethnicity, socioeconomic status, and experiences of discrimination) and prevalence of clinical anxiety/depression (categorical variable). Logistic regressions were applied in line with the second definition, and were used to identify whether experiences of discrimination, SES (education, income), and race/ethnicity were predictors of clinical depression/anxiety, controlling for potential confounders identified in disparities literature (biological sex, age, and disease activity) (Lê Cook, McGuire, & Zuvekas, 2009).

Chapter III: Results

Results as Related to the Hypotheses

Demographic characteristics

A total of 102 participants with chart-confirmed IBD completed the survey. Full demographic variables are presented in Appendix A. The majority of the sample were biologically female (62%), ethnically Non-Hispanic (84%), partnered (57%), non-smokers (92%), high income (58%), with a college education or above (75%). Most participants identified their race as White (81%), followed by Black/African American (6%), Latinx/Hispanic (4%),

Asian (4%), and Other (4%). Eight percent of subjects identified their ethnicity as

Hispanic/Latinx. Their mean age was 40 (*SD* = 13.61, *range* 20 -70 years) and mean body mass

index (BMI) of 25.18 (*SD* = 5.95, *range* 17.2 – 52.0). Most of the sample identified their country

of origin as the United States (89%), with the rest born in 11 different countries; the mean time

in the US was 38 years (*SD* = 14.62, range 5 – 70 years).

In terms of GI clinical characteristics, 58% had CD, 44% met criteria for active disease at

time of completing the survey, the mean age of IBD diagnosis was 25 (*SD* = 11.57, range 1 – 65

years), 70% were prescribed a biologic medication, 36% had received surgery for IBD, and 45%

had tried a complementary or alternative approach to help manage their IBD, with meditation

and yoga the most popular methods. Twenty-five percent of subjects reported a comorbid

diagnosis of IBS, the majority of which had a moderate level of IBS symptom severity.

Participants were asked if they had previously received a diagnosis of anxiety or

depression; 31% endorsed receiving an anxiety diagnosis while 21% endorsed receiving a

depression diagnosis. Based on responses to the GAD-7 and PHQ-8 (using a cut-off score of 10

to define clinical), 21% of participants met criteria for clinical anxiety; 25% of the sample met

criteria for clinical depression. Self-report diagnosis of anxiety/depression was compared to those

meeting clinical criteria using chi-square analysis. Of the subjects who denied receiving an

anxiety diagnosis, 14% met criteria; of those who denied receiving a depression diagnosis, 20%

met criteria; these results were statistically significant. In terms of IBD type, there was a higher

proportion of clinical anxiety (27%) and depression (32%) among CD participants compared to

clinical anxiety (12%) and depression (16%) in participants with UC, however these differences

were not statistically significant.

The mean well-being score ($M = 7.08$, $SD = 1.48$, *range* 3.4 – 9.6) reflects a normal level of functioning (Butler & Kern, 2016). The domains with the highest mean scores were relationships ($M = 7.70$, $SD = 1.82$), meaning ($M = 7.44$, $SD = 1.79$), and accomplishment ($M = 7.07$, $SD = 1.64$). The lowest mean scores were in the domains of negative emotion ($M = 4.09$, $SD = 1.90$) and loneliness ($M = 4.12$, $SD = 2.92$). The mean score on the physical health domain was 6.09 ($SD = 2.11$).

Bivariate analyses

Table 4 summarizes bivariate relationships between demographic characteristics and clinical anxiety and depression (cut-off score of 10). Analyses demonstrated a significant relationship between disease activity (p = .02) and clinical anxiety, while ethnicity (p = .02), BMI (p = .01), employment (p < .01), income (p < .01), education (p < .01), and disease activity (p < .01) were significantly associated with clinical depression. Analyses to evaluate risk factors identified in literature found activity impairment (p < .01), comorbid IBS (p < .001), and experiences of discrimination (p = .01) to be significantly associated with clinical anxiety; significant relationships between clinical depression and activity impairment (p < .001) and comorbid IBS (p = .02) were identified. Significant variables were included in appropriate regressions.

Bivariate analyses using Pearson's correlation were conducted to determine which demographic and literature identified variables potentially contribute to well-being. Statistically significant correlations were observed for biological sex (p = .03), education (p = .01), ethnicity (p = .02), income (p = .04), disease activity (p < .001), activity impairment (p < .001),

discrimination (p < .001), perceived social support (p < .001), and IBD quality of life (p < .001), and the outcome of well-being. Variables found to be significant (p < 0.05) were included in later regression analyses.

Table 4. Demographic and Clinical Characteristics: Bivariate Associations

	Total n=102	Clinical Anxiety n=21 (21%) n (%)	p	Clinical Depression n=26 (25%) n (%)	p
IBD					
UC	43 (42%)	5 (24%)	.06	7 (27%)	.07
CD	59 (58%)	16 (76%)		19 (72%)	
Age, mean (SD)	40 (13.6)				
20-39		14 (66%)	.43	17 (65%)	.42
40-59		6 (29%)		7 (27%)	
60+		1 (5%)		2 (8%)	
Biological Sex					
Female	63 (62%)	14 (67%)	.60	17 (65%)	.66
Male	39 (38%)	7 (33%)		9 (35%)	
Race					
White	83 (81%)	16 (76%)	.4	19 (73%)	.4
Nonwhite	18 (18%)	5 (24%)		6 (23%)	
Ethnicity					
Non-Hispanic	84 (91%)	17 (81%)	.24	20 (77%)	**.02***
Hispanic/Latinx	8 (8%)	3 (14%)		5 (19%)	
BMI					
Normal	60 (59%)	9 (43%)	.1	10 (38%)	**.01***
Overweight	42(41%)	12 (57%)		16 (62%)	
Relationship					
Partner(ed)	58 (57%)	10 (48%)	.5	14 (54%)	.7
Single	43 (42%)	10 (48%)		12 (46%)	
Employed					
Yes	83 (81%)	15 (71%)	.35	16 (62%)	**.006****
No	18 (18%)	5 (24%)		9 (35%)	
Income					
<$50K	40 (40%)	11 (52%)	.14	16 (62%)	**.005****
>$50K	59 (58%)	9 (43%)		9 (35%)	
Education					
Below College	24 (24%)	5 (24%)	.88	11 (42%)	**.006****
College +	77 (75%)	15 (71%)		14 (54%)	

Country Origin					
USA	91 (89%)	17 (81%)	.17	22 (85%)	.38
Abroad	11 (11%)	4 (19%)		4 (15%)	
Recruitment					
Clinic	63 (62%)	16 (76%)	.13	18 (69%)	.36
Phone	39 (38%)	5(24%)		8 (31%)	
Smoking					
Yes	8 (8%)	3 (14%)	.22	3 (12%)	.42
No	94 (92%)	18 (86%)		23 (88%)	
Disease Activity					
Active	45 (44%)	14 (67%)	**.02***	21 (81%)	**<.001****
Remission	57 (56%)	7 (33%)		5 (19%)	
Age of Dx					
0-16	23 (23%)	5 (24%)	.78	5 (19%)	.63
17-40	60 (59%)	12 (57%)		15 (58%)	
40+	14 (14%)	4 (19%)		5 (19%)	
IBS			**<.00**		
Yes	25 (25%)	11 (52%)	**1****	11 (42%)	**.02***
No	76 (74%)	10 (48%)		15 (58%)	

Weight Status: "Normal Weight": BMI= 17.2- 24.99; "Overweight": BMI ≥ 25
Employed: "Yes": Part-time employment, Student, Full-time employment, Employed, but on medical/sick leave;
"No": Unemployed/looking for work, Homemaker, Retired, Disabled/unable to work
Income: "<$50K": < 25,000,   25,001 - 50,000, Prefer not to say; ">$50K": 50,001 - 75,000,
75,001 - 100,000, >100,000
Education: "Below College" includes: Less than high school, High school or equivalent, Vocational or Technical
school, Associates, Some College; "College+": Bachelor's Degree, Master's Degree, Doctoral level degree (Ph.D.,
M.D., etc or higher)
Race: "White": White; "Non-White": Black/AA, Asian, Latinx, Other
Relationship Status: "Partnered" includes: Married/Life partner and Cohabitating, "Single" includes: Divorced,
Widowed, Separated, Single/never married

Aim 1: Risk Factors of Anxiety and Depression

Results from hierarchical multiple logistic regressions confirm that discrimination and

disease activity significantly predicted mood disorders in IBD, when perceived stress was not a

covariate. Results are presented in Tables 5 and 6.

Anxiety

Discrimination [*B* = 0.14 (odds ratio 1.15), *p* < .01] significantly predicted clinical

anxiety such that, when holding all other covariates constant, a one point increase in experiences

of discrimination increased the odds of clinical anxiety by 1.15.

Depression

Disease activity [*B* = 2.29 (odds ratio 9.94), *p* = .01] significantly predicted clinical

depression. As IBD moved from remission to active, the odds of clinical depression increased by

a factor of 9.94 times, with all other covariates held constant.

Table 5. Odds Ratios and 95% Confidence Intervals for Risk Factors of Anxiety

	OR	**Confidence Interval**	**_p_**
IBD type	1.75	0.48 – 6.41	.39
IBS overlap	**5.37**	**1.53 – 18.77**	**.009****
Discrimination	**1.15**	**1.05 – 1.26**	**.003****
IBD Active	2.67	0.63 – 11.42	.18
Activity impairment	1.00	0.98 – 1.03	.76

Table 6. Odds Ratios and 95% Confidence Intervals for Risk Factors of Depression

	OR	**Confidence Interval**	**_p_**
Activity impairment	1.01	0.98 – 1.05	.35
IBD Active or Not	**9.94**	**1.66 – 59.41**	**.01***
Ethnicity	0.30	0.02 – 3.64	.35
IBS overlap	1.85	0.40 – 8.58	.43
Income	0.42	0.10 – 1.73	.22
Employment	0.74	0.15 – 3.62	.71
Overweight v Normal	**3.58**	**1.27 – 10.12**	**.02***
Education	0.38	0.08 – 1.84	.23
IBD type	1.22	0.29 – 5.09	.77

Aim 2: Protective Factors of Anxiety and Depression

Anxiety

Self-compassion [*B*= -1.63 (odds ratio 0.19), *p* = .01] significantly predicted clinical anxiety, when stress was included as a covariate. As self-compassion increased by one point, participants were 5 times less likely to meet criteria for clinical anxiety.

Without stress in the models, both self-compassion [*B* = -2.29 (odds ratio 0.10), *p* < .001] and resilience [*B* = -1.46 (odds ratio 0.23), *p* < .01] were significant predictors of anxiety. As self-compassion increased by one point, participants were 10 times less likely to meet criteria for clinical anxiety. As resilience increased by one point, participants were 4 times less likely to meet criteria for clinical anxiety.

Depression

Resilience [*B* = -1.23 (odds ratio 0.27), *p* < .01] was a significant predictor of clinical depression, when stress was included as a covariate. As resilience increased by one point, participants were 3 times less likely to meet criteria for clinical depression.

Without stress in the regression models, both resilience (BRS) [*B* = -1.45 (odds ratio 0.23), *p* < .01] and self-compassion [*B* = -0.88 (odds ratio 0.41), *p* = .02] significantly predicted depression. As self-compassion increased by one point, participants were 2 times less likely to meet criteria for clinical depression. As resilience increased by one point, participants were 4 times less likely to meet criteria for clinical depression. Results are presented in Tables 7 – 10.

Table 7. Odds Ratios and 95% Confidence Intervals for Protective Factors of Anxiety (with stress)

	OR	Confidence Interval	*p*
Resilience	0.44	0.14 – 1.37	.16
Self-Compassion	**0.19**	**0.06 – 0.69**	**.01***

Table 8. Odds Ratios and 95% Confidence Intervals for Protective Factors of Anxiety (without stress)

	OR	Confidence Interval	*p*
Resilience	**0.23**	**0.09 – 0.59**	**.002****
Self-Compassion	**0.10**	**0.03 – 0.32**	**.0001*****

Table 9. Odds Ratios and 95% Confidence Intervals for Protective Factors of Depression (with stress)

	OR	Confidence Interval	*p*
Resilience	**0.29**	**0.10 – 0.84**	**.02***
Self-Compassion	1.11	0.43 – 2.82	.82

Table 10. Odds Ratios and 95% Confidence Intervals for Protective Factors of Depression (without stress)

	OR	Confidence Interval	*p*
Resilience	**0.23**	**0.09 – 0.57**	**0.002****
Self-Compassion	**0.41**	**0.20 – 0.85**	**0.02***

We also hypothesized that perceived social support would moderate the relationship between resilience and/or self-compassion and anxiety and depression. With stress in model, social support moderated the relationship between self-compassion and anxiety. The strength of the relationship between self-compassion and anxiety was significantly influenced by social support (B = -0.29, SE = 0.13, p = .02). Examination of the interaction plot demonstrated that perceived social support enhanced the relationship between self-compassion and clinical anxiety.

Aim 3: Predictors of Well-Being

We hypothesized that two aspects of psychological capital, resilience and self-compassion, would predict well-being, as measured by the PERMA-Profiler. The internal consistency estimate for the PERMA-Profiler was high ($\alpha = 0.94$). As demonstrated in Figure 3, results from linear regressions confirm that resilience ($B = 0.64$, $\beta = 0.36$, t = 5.35, $p < .001$) and self-compassion ($B = 0.64$, $\beta = 0.35$, t = 4.66, $p < .001$) were significant predictors of well-being. The beta values indicate that as resilience and self-compassion increase, well-being also increases. Both models were significant, with the resilience model accounting for 71% of the variance in well-being, and the model with self-compassion accounting for 68% of the variance of well-being.

Figure 3. Aspects of psychological capital that predict well-being
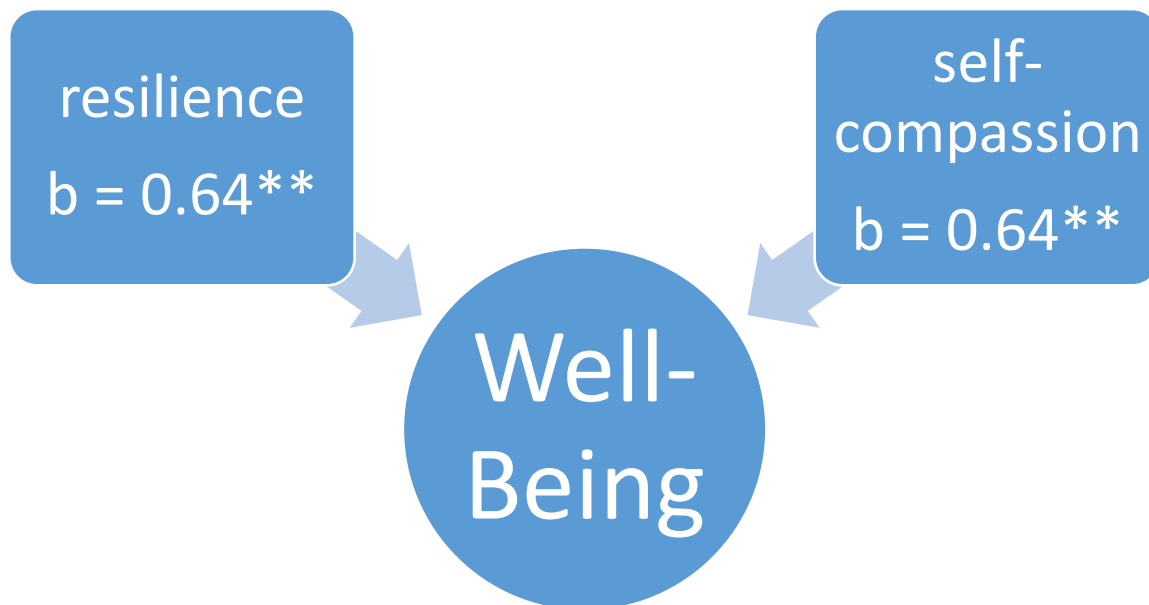
Exploratory Aim: Disparities in Anxiety and Depression

Potential disparities were identified depending on analysis used/definition used. In accordance with the Agency for Healthcare Research and Quality's definition of health disparities, the proportion of participants meeting criteria for clinical depression did differ by income level $\chi 2$ (1, N = 99) = 7.73 p = .005. Participants with lower income were 3.33 times more likely to have clinical depression compared to those in the higher income group. There was also a significant relationship between education and clinical depression $\chi 2$ (1, N = 101) = 7.51 p = .006. The odds of subjects with lower education meeting criteria for clinical depression was 3.86 times higher than those with more education. Fisher's exact test identified a significant relationship between ethnicity and clinical depression $\chi 2$ (1, N = 94) = 5.77 p = .03, with Hispanic participants 5 times more likely to meet criteria for clinical depression compared to Non-Latinx subjects. This result should be interpreted with caution given the small number of Hispanic participants.

In accordance with the Institute of Medicine's definition of disparities, we performed logistic regressions to identify whether experiences of discrimination, SES (education, income), and race/ethnicity were predictors of clinical depression/anxiety when controlling for potential confounders identified in disparities literature (gender, age, and disease severity). Results demonstrate that when controlling for clinical need and potential confounders, experiences of discrimination [b = 0.13 (odds ratio 1.14), p = .006] continued to be a significant predictor of clinical anxiety. In terms of clinical depression, education [b = -1.43 (odds ratio 0.23), p = .04] was identified as a significant predictor, even when controlling for clinical need and potential confounders.

Non-Hypothesized Findings

Aim 1: Risk Factors of Anxiety and Depression

Anxiety

IBS was a significant predictor of clinical anxiety in models that included and excluded perceived stress. Without stress in the model, IBS [$B = 1.68$ (odds ratio 5.37), $p < 0.01$] increased the odds of clinical anxiety by 5.37. When perceived stress was included, IBS overlap [$B = 1.61$ (odds ratio 4.98), $p = .03$] increased the odds of clinical anxiety by 4.98 times, while stress [$B = 0.62$ (odds ratio 1.85), $p < .001$] increased the odds of clinical anxiety by 1.85 times.

Depression

Perceived stress [$B = 0.77$ (odds ratio 2.17), $p < 0.01$] and BMI [$B = 1.80$ (odds ratio 6.05), $p = 0.02$], were significant predictors of clinical depression. Without stress in the previous model, both IBD activity [$B = 2.29$ (odds ratio 9.94), $p = 0.01$] and BMI [$B = 1.28$ (odds ratio 3.58), $p = 0.02$] were significant predictors of clinical depression. As IBD moved from remission to active, the odds of clinical depression increased by a factor of 9.94 times. As BMI moved from normal to overweight/obese, the odds of clinical depression increased by 3.58 times.

Aim 3: Predictors of Well-being

In the regression model including resilience - social support ($B = 0.18$, $\beta = 0.44$, t = 7.00, $p < .001$), biological sex ($B = 0.43$, $\beta = 0.14$, t = 2.33, $p = .02$), and discrimination ($B = -0.06$, $\beta = -0.27$, t = -4.53, $p < .001$) were also identified as a predictors of well-being. In the regression

model including self-compassion – social support ($B = 0.18$, $\beta = 0.42$, t = 6.58, $p < .001$) and discrimination ($B = -0.05$, $\beta = -0.20$, t = -3.14, $p < .01$) were significant predictors of well-being. The beta values indicate that as IBD becomes active, and discrimination increases, well-being decreases. The beta value indicates that as biological sex shifts from male to female sex, well-being increases. Based on standardized beta values, perceived social support is the most substantive predictor of well-being, followed by self-compassion, resilience, discrimination, active disease, and biological sex.

Chapter IV: Discussion

This dissertation study was designed to improve the field's understanding of the determinants of anxiety, depression, and well-being in IBD through the frameworks of public health and positive psychology. Through multi-site recruitment in two major US cities, 102 participants with endoscopy-confirmed IBD completed a cross-sectional survey assessing demographic, clinical, and psychosocial factors. Through the primary aims, we sought to identify modifiable characteristics that could be enhanced to buffer or even prevent psychological comorbidities and to promote well-being. Our exploratory aim to identify disparities in risk factors of emotional disorders is an effort to advance the field's recognition of the importance of disparities research in IBD. Results support and specify our model of variables influential to outcomes in IBD (Figure 4).

Figure 4. Aspects of psychological capital that predict well-being

Figure 4. Updated model of variables influential to outcomes in IBD
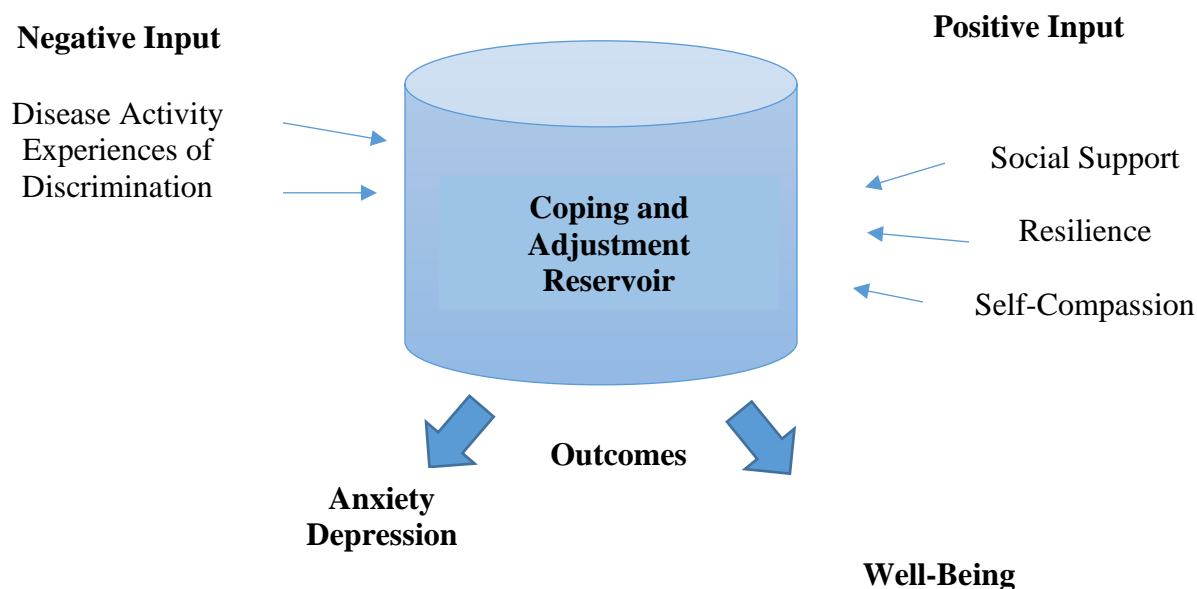
Adapted from: (Dunn, Iglewicz, & Moutier, 2008)

Results as Related to the Hypotheses

Aim 1: Risk Factors of Anxiety and Depression in IBD

It was hypothesized that disease activity and certain psychosocial factors (lower income, lower education, more impairment, and/or more experiences of discrimination) would be risk factors of clinical anxiety and depression in IBD. Our hypothesis was somewhat supported and was influenced by whether perceived stress was included as a covariate.

Anxiety and Experiences of Discrimination

When perceived stress was not included in the model, our findings suggest that participants with more experiences of discrimination were at a slightly increased risk for clinical

anxiety. The relationship between discrimination (both racial and nonracial) and anxiety has been established in multiple populations, with most research focused on minority populations (Gee, Spencer, Chen, Yip, & Takeuchi, 2007; McLaughlin, Hatzenbuehler, & Keyes, 2010; Soto, Dawson-Andoh, & BeLue, 2011). While discrimination literature in IBD is limited, multiple studies have investigated chronic-illness stigma, which can include enacted stigma or experiences of discrimination due to having IBD. Enacted stigma appears to be most prevalent within the workplace, with employers and managers endorsing that an employee's or applicant's IBD could limit promotion or employment opportunities (J. F. Mayberry, 1999; M. K. Mayberry, Probert, Srivastava, Rhodes, & Mayberry, 1992). There has been a call for more research on experiences of discrimination within IBD and its impact on outcomes (Taft & Keefer, 2016).

Research in other populations has identified a compelling relationship between experiences of discrimination and worse health outcomes including, increased inflammation (Tené T Lewis et al., 2010), obesity (Hunte, 2011), higher blood pressure (Moody et al., 2019), all-cause mortality (Barnes et al., 2008), and visceral fat (Tené T. Lewis, Kravitz, Janssen, & Powell, 2011). A meta-analysis performed by Pascoe & Richman (2009) identified several potential pathways through which percieved discrimination may impact health, including through heightened physiological and psychological stress responses and through decreased health behaviors/engagement in health (Pascoe & Smart Richman, 2009). This could have direct implications in IBD such as worse disease course/severity (through immunological and inflammatory processes), increased risk of psychological comorbidities (as demonstrated in this study), and decreased adherence to medical recommendations.

Interestingly, the literature provides compelling evidence that both race and non race-based discrimination (i.e., gender, weight, sexual orientation) can negatively impact mental and

physical health (T. T. Lewis, Cogburn, & Williams, 2015; Pascoe & Smart Richman, 2009). In

our sample, when subjects identified the main reason for their experiences of discrimination,

gender was the most popular response (followed by age, race, weight, IBD , ancestry/national

origin, and religion). While the mean score on the Everyday Discrimination Scale was lower

compared to other populations, suggesting participants were experiencing overall less

discrimination, we still see a significant association between discrimination and anxiety (T. T.

Lewis et al., 2015). Further, as one's membership in disadvantaged groups grows, so do their

experiences of discrimination, correlating with more psychological distress and worse health (T.

T. Lewis et al., 2015). All of our subjects have IBD and are thus members of a group that may

experience discrimination. The most identified reason for experiencing discrimination, gender,

was reported by only women. This may partially explain the relationship between discrimination

and anxiety as women are more likely to be diagnosed with clinical anxiety (McLean, Asnaani,

Litz, & Hofmann, 2011). The majority of the sample who identified as non-White did not

indicate a demographic reason for their experiences of discrimination. Nonetheless, research

suggests that both race and non race-based discrimination have similar health consequences. Our

results demonstrate the deleterious impact of discrimination on psychological health in IBD

patients. More research on the physiological effects of discrimination in IBD is warranted.

However, given the abundance of evidence linking discrimination to worse physical health, we

can posit that a similar relationship exists in IBD. As such, preventing discrimination and

providing patients tools to cope with discrimination may help prevent clinical anxiety among

patients with IBD.

Depression and Disease Activity

Similar to anxiety, our hypothesis regarding the predictors of clinical depression was influenced by whether perceived stress was included in the model. Having active IBD significantly increased the odds of meeting criteria for clinical depression when stress was not a covariate. These results align with a rapidly growing body of research focused on the bidirectional relationship between IBD activity and comorbid psychological disorders. Both cross-sectional and longitudinal research have demonstrated significant associations between IBD activity and depression via the brain-gut axis and psychoneuroimmunological mechanisms (Gracie et al., 2018; Mikocka-Walus et al., 2016) (Bonaz & Bernstein, 2013). The associations between IBD and depression have been in both directions, with findings demonstrating IBD activity as an independent predictor of depression and depression as a predictor of IBD incidence, activity, surgery, and hospitalization (Mikocka-Walus et al., 2016).

As aforementioned, the bidirectional relationship between IBD activity and depression appears to be driven by several pathways including the brain-gut connection and psychoneuroimmunology. Inflammation has been recognized as a component in these pathways; the inflammatory nature of IBD has been shown to influence the brain, with chronic inflammation associated with depression (Szigethy et al., 2014). On the other hand, depression has been associated with enhanced inflammation to a stressor (Fagundes et al., 2013). In other words, inflammation can influence depression and depression can influence inflammation.

In addition to inflammation, behaviors appear to play a critical role in the relationship between IBD activity and depression. IBD requires ongoing engagement in a multitude of behaviors related to self-management (i.e. medical management, meaningful life engagement,

and psychological management) (Keefer & Kane, 2016). Performing self-management behaviors during a flare can be more difficult as social and emotional functioning can be impacted, as well as one's sense of control over illness (Kiebles et al., 2010). The negative impact on health behaviors may then increase one's risk for the development of depression as their IBD worsens and their life becomes restricted. In fact, research suggests that the development or worsening of depression can be viewed as a failure to adjust to or appropriately cope with an IBD diagnosis (Kiebles et al., 2010; S. Knowles et al., 2011). Alternatively, depression has been negatively associated with self-management, contributing to increased risk of flare (Lopez-Sanroman & Bermejo, 2006).

Finally, access to mental healthcare may be influencing the significant association between IBD activity and depression. Our study found that almost 20% of subjects that denied ever receiving a depression diagnosis met criteria based on the PHQ-8, suggesting depression was underdiagnosed in this sample. Work by Bennebroek and colleagues (2012) identified that emotional disorders are undertreated in IBD patients. Given the bidirectional relationship between IBD activity and comorbid psychological disorders, increasing access to mental health evaluation and care, especially if a patient is experiencing a flare, may help prevent depression.

Non-Supported Findings

We believed that certain psychosocial factors previously identified as associated with the development and worsening of anxiety and depression, including lower income, lower education, and more activity impairment would be risk factors in our study (Blanco et al., 2014; NIMH, 2016; Pinto-Meza et al., 2013). However our predications did not hold, suggesting that anxiety

and depression are more influenced by variables associated with inflammation (i.e., perceived stress, discrimination, and disease activity).

Aim 2: Protective Factors of Anxiety and Depression in IBD

We posited that two aspects of psychological capital, resilience and self-compassion, would protect against clinical anxiety and depression in IBD. Regression analyses confirmed our hypothesis that resilience and self-compassion were significant predictors of nonclinical depression and anxiety, when stress was removed from the models. In other words, participants with more self-compassion and resilience were at significant decreased risk for clinical depression and anxiety.

Resilience

The protective nature of resilience has been established in the wider field of positive psychology. As previously discussed, resilience is one's ability to "bounce back" from or persist during challenges while maintaining healthy psychological functioning (Bonanno, 2004; Reivich et al., 2011). Our findings contribute to a limited body of research investigating the role of resilience in IBD. While this is one of the early studies to examine resilience in IBD in the context of clinical anxiety/depression, the findings are corroborated by the work that has been done.

One of the first studies to evaluate resilience in IBD subjects demonstrated a similar relationship between resilience and psychological health. Sehgal and colleagues (2017) identified

a negative correlation between resilience and anxiety and depression, and a potentially mediating effect of resilience on the relationship between anxiety/depression and disease activity. Additionally subjects with low resilience were significantly more likely to have clinical depression (Sehgal et al., 2017). One study observed a significant negative association between resilience and depression among IBD patients with an ostomy (Hwang & Yu, 2019). While a 2017 longitudinal study identified that fewer depressive symptoms was one distinguishing factor between subjects with resilient profiles and those with loss profiles (Fuschia M. Sirois & Hirsch, 2017). There is a clear pattern demonstrating the relationship between resilience and psychological health in IBD.

Resilience has also been demonstrated to influence behavioral and physiological processes, and appears to be an important aspect of disease management. Within IBD, resilience has been identified as a predictor of readiness to transition to adult care among adolescents, suggesting resilience enhances disease management behaviors (Carlsen et al., 2017). Important aspects of IBD disease management include emotional regulation and engagement in a meaningful life (Keefer & Kane, 2016). It appears that resilience may contribute to these processes, as seen in a 2016 study that found significantly higher levels of resilience among subjects with greater ostomy adjustment (Scardillo, Dunn, & Piscotty, 2016). Further, resilience has been shown to alleviate the consequences of discrimination both in IBD and in other chronic disease populations (Dibley, Norton, & Whitehead, 2018; Logie, James, Tharao, & Loutfy, 2013).

Evidence suggests that resilience to a stressor is a process that involves the central nervous system and the autonomic nervous system, including the hypothalamic–pituitary–

adrenal (HPA) axis (Cathomas, Murrough, Nestler, Han, & Russo, 2019). From a central nervous

system perspective, resilience has been associated with decreased vulnerability to pain,

potentially via neurogenesis in the hippocampus (Vasic & Schmidt, 2017). This negative

association between resilience and pain has been observed in IBD patients (Sweeney et al.,

2018). The autonomic nervous system and HPA axis mediate the physiological response to

stress, including the gastrointestinal response (Cathomas et al., 2019). An influential relationship

between the HPA axis and resilience has been demonstrated: protective HPA axis adaptations are

associated with resilience stress response and resilience is associated with decreased hormonal

(e.g. adrenocorticotropic hormone and corticosterone) reactions to stress (Russo, Murrough, Han,

Charney, & Nestler, 2012). This has implications in our research as the dysregulation of normal

HPA functioning is correlated with anxiety and depression (Russo et al., 2012). Further,

alterations of HPA axis functioning in response to stress is associated with gastrointestinal

symptoms and increased susceptibility to GI disorders (Kano et al., 2017; Rhee, Pothoulakis, &

Mayer, 2009). Indeed, a 2017 study among a cohort of Swedish men found increased risk of IBD

among those with lower stress resilience (i.e. more susceptible to stress), identifying a possible

influence of inflammation on HPA axis functioning (Melinder, Hiyoshi, Fall, Halfvarson, &

Montgomery, 2017). Finally, emerging evidence has linked both brain-gut axis functioning and

gut microbiota composition to resilience (Cathomas et al., 2019; Russo et al., 2012). This

budding work suggests there may be a relationship between resilience and gastrointestinal

symptoms, mediated by systems that also influence anxiety and depression.

Enhancing resilience among IBD patients has the potential to decrease psychological

symptoms or to perhaps even prevent psychological comorbidities, enhance disease management

through disease acceptance, optimism, and self-efficacy, and potentially improve disease outcomes.

Self-Compassion

Our findings align with a growing body of evidence demonstrating the buffering effect of self-compassion against psychological comorbidities in patients with chronic health conditions (Brion, Leary, & Drabkin, 2014). While there is a dearth of research investigating self-compassion in IBD, results are promising. Our findings further previous research that demonstrates self-compassion buffers the negative impact of anxiety on quality of life (Trindade et al., 2015). Self-compassion has also been linked to adaptive coping styles and decreased stress among adults with IBD (Sirois et al., 2015). Among other chronic disease populations, self-compassion is correlated with fewer psychopathological symptoms of stress and depression, decreased risk of anxiety and depression, and improved quality of life (Neff, 2003; K. D. Neff, Kirkpatrick, & Rude, 2007; Pinto-Gouveia, Duarte, Matos, & Fráguas, 2014).

As aforementioned, self-compassion consists of three qualities: self-kindness, common humanity, and mindfulness. Neff (2007) proposed that these assets facilitate self-regulation in response to negative emotions that may arise during uncontrollable or unforeseeable situations. Neff's predictions are supported by findings that self-compassion may facilitate improved coping and adjustment to chronic illness, including IBD, through adaptative cognitive strategies, such as acceptance and positive reframing (Fuschia M Sirois et al., 2015). Further, it appears that self-compassion protects against anxiety/depression as those with more self-compassion tend to have decreased ruminative worry, a maladaptive coping strategy (Raes, 2010). In the context of our

work, we argue that the development of anxiety/depression could be viewed as reflective of poor adjustment. Given the strong link between self-compassion and adaptive coping, the cultivation of self-compassion may be a meaningful way to improve outcomes in IBD.

From a physiological perspective, the findings in self-compassion literature are exciting. For example, a 2014 study examining associations of stress-induced inflammation via interleukin-6 (IL-6) concentrations, found a buffering effect of self-compassion (Breines et al., 2014). Although the sample consisted of healthy young adults, the findings could still be consequential in IBD, as IL-6 pathways have been implicated in the development of IBD (Mitsuyama, Sata, & Rose-John, 2006). Self-compassion may also be helpful in addressing a common and taxing symptom of IBD that involves physiological and cognitive components - pain. The potential benefits of self-compassion in pain management are reflected in the cross-sectional analysis of chronic pain patients that found significant associations between self-compassion and improved pain acceptance and use of coping strategies (Edwards et al., 2019).

Our results, in addition to others, identify self-compassion as an important source of psychological capital that may not only buffer against the development of mental health conditions but may also promote improved adjustment and coping to illness. From this, we posit that enhancing self-compassion in IBD patients could lead to better psychological and physiological outcomes.

Social Support

We also predicted that perceived social support would moderate the relationship between resilience and/or self-compassion and anxiety and depression. Our hypothesis was somewhat supported, depending on whether stress was included as a covariate. With stress in model, social support moderates the relationship between self-compassion and clinical anxiety, such that social support strengthened the buffering effect of self-compassion. This suggests that participants with more self-compassion and a high level of perceived social support are at decreased risk for clinical anxiety.

Further, it intimates that perceived stress influences the role of social support, as this moderation effect does not occur when stress is excluded from the model. One could posit a few implications including, that social support may alleviate the impact of stress on mental health and that stress is a potential confounder as we know it predicts anxiety and is significantly negatively correlated with self-compassion and social support. It is also possible these results reflect multicollinearity. Perceived stress was significantly negatively correlated with resilience and self-compassion. However the correlations were not above 0.8. Further, we checked the assumption of multicollinearity, using variance inflation factor, and did not find evidence of this.

We did not find a significant moderation effect of perceived social support on the relationship between resilience and anxiety and depression

Perceived Stress

Perceived stress was a highly influential variable in this study. We identified the need to limit discussions of the risk factors of anxiety and depression without perceived stress because stress is not a diagnostic symptom. However, within general IBD literature stress has been widely explored and while results remain mixed, IBD is recognized as a stress sensitive disease (Andrews & Holtmann, 2011). For example, stress has been associated with inflammation, gut motility alterations and increased risk of disease flare among subjects with IBD (Bernstein et al., 2010; Cámara, Ziegler, Begré, Schoepfer, & von Känel, 2009; J. E. Mawdsley & D. S. Rampton, 2005). On the other hand, stress has also been associated with positive psychological and physiological changes (Crum, Akinola, Martin, & Fath, 2017). The range of results in relation to stress may reflect the subjects' mindsets, or the way they think about stress (Crum, Salovey, & Achor, 2013). Given its influential nature, we decided to investigate the predictors of clinical anxiety/depression with and without the inclusion of perceived stress. When included in the models, perceived stress significantly increased the risk of both clinical anxiety and depression. Additionally, the inclusion of stress impacted other variables that had been identified as risk factors. Discrimination and IBD activity were no longer significant predictors of anxiety and depression, respectively when perceived stress was included.

Although stress is recognized as a potentially influential variable in IBD research, it appears to be excluded from or poorly defined in the literature that examines the interactions between anxiety/depression and IBD. For example, Mikocka-Walus and colleagues (2016) identified significant relationships between anxiety/depression and clinical recurrence in a large prospective IBD cohort study. While they did not include stress as a covariate, they

acknowledged that the scale used to assess anxiety/depression, the Hospital Anxiety and Depression Scale (HADS), may actually reflect general distress rather than distinct psychological disorders (A. Mikocka-Walus et al., 2016). This raises the question, is it stress, the mindset about stress, or a specific psychological disorder that is leading to worse outcomes in IBD? When stress is explicitly included, the mechanisms regarding its influence on IBD outcomes in the context of psychological comorbidities remain unclear (Langhorst, Hofstetter, Wolfe, & Häuser, 2013; Mittermaier et al., 2004). One prospective study among subjects with UC in clinical remission found that short-term stress, not depression nor mucosal healing, predicted flare (Langhorst et al., 2013). Whereas Mittermaier and colleagues (2004) found significant correlations between depression/anxiety and number of relapses, but not between stress and relapse. However, those with higher depression scores had higher levels of perceived stress (Mittermaier et al., 2004). Our findings are similar to those of Goodhand and colleagues (2012), which found perceived stress independently increased anxiety and depression scores. It appears that our study population viewed stress through a negative mindset.

Similar to our findings regarding the risk factors of anxiety and depression, perceived stress also impacted protective factors. When controlling for stress, only self-compassion remained a significant predictor for clinical anxiety, while only resilience continued to significantly predict clinical depression. These findings further support the influential role of perceived stress on psychological health in IBD, with the models including stress demonstrating significantly better fits. While the inclusion of perceived stress improves our ability to predict clinical anxiety and depression, it can be argued its exclusion expands our ability to explain them. Of note, this does not mean that self-compassion no longer has a protective effect against

depression or that the buffering effect of resilience is absent. Rather, this provides further support for our argument that perceived stress should be considered when investigating psychological outcomes in IBD.

In the context of our results and others, we propose that future IBD research investigating psychological health include perceived stress as a covariate. The inclusion of perceived stress and/or other forms of stress (i.e. experiences of discrimination) will enhance our understanding of the pathophysiologic mechanisms driving the relationship between psychological factors and IBD outcomes. Additionally, investigating subjects' mindsets of whether they perceive stress as negative or positive may clarify the mixed findings regarding stress and IBD. Helping us answer the question, what is the role of perceived stress in the relationship between psychological health and IBD outcomes?

Specific Aim 3: Factors that predict well-being in IBD

A major finding from this study was the identification of two modifiable aspects of psychological capital that significantly predicted well-being. Well-being was assessed using the PERMA-Profiler, a subjective measure that characterizes well-being as positive functioning across emotional, social, behavioral and cognitive domains (Black & Kern, 2020). The PERMA-Profiler has not been previously validated in digestive diseases, however it was shown to have high internal consistency in this population and our population mean score was reflective of validation studies (Butler & Kern, 2016). Per our hypothesis, resilience and self-compassion significantly predicted well-being, such that as resilience and self-compassion increased, so too did well-being. Additionally self-compassion and resilience were the second and third most

substantive predictors of well-being. This is one of the first studies among an IBD cohort to identify aspects of psychological capital that directly enhance well-being.

As aforementioned, much of the psychological research in IBD has focused on poor outcomes, such as maladaptive coping and emotional disorders. When well-being has been researched, it is most often focused on negative predictors, that is identifying factors that diminish well-being (McCombie et al., 2013). A comprehensive understanding of IBD health should include that which augments well-being. Our work furthers the literature as we establish two aspects of psychological capital that can augment well-being in IBD. Initial research of resilience in IBD has demonstrated positive associations between resilience and better emotional and social outcomes (Sehgal et al., 2017) and quality of life (Lozano Lanagran et al., 2016). Self-compassion has been associated with increased use of adaptive coping strategies, which has been associated with improved psychological well-being (McCombie et al., 2013).

Our findings align with general positive psychology literature and research among other chronic conditions. Resilience and self-compassion have both been positively associated with well-being in numerous studies, including general and clinical populations, and among a wide diversity of samples (i.e., nationality, age, mental and physical health conditions, job/education status) (Avey, Wernsing, & Mhatre, 2011; Burns, Anstey, & Windsor, 2011; Burton, Pakenham, & Brown, 2010; Lai & Mak, 2009; Rose & Kocovski; Zessin, Dickhäuser, & Garbade, 2015). Further, intervention studies have successfully targeted resilience and self-compassion to promote well-being (Afshani, Abooei, & Abdoli, 2019; Burton et al., 2010). Considering our own findings in the context of the breadth of positive psychology studies, we hypothesize that nurturing resilience and self-compassion could have major implications in IBD, from both promotion and prevention perspectives.

Well-being can be thought of as "feeling good and doing well" from both a mind and body perspective (Black & Kern, 2020). Well-being is recognized as an important indicator of health and has been associated with numerous benefits including enhanced immune functioning, lower disease risk, healthier behaviors, increased work productivity, improved economic outcomes, longevity and more community and social engagement (Diener & Biswas-Diener, 2011; Diener & Seligman, 2004; L. Fredrickson & Levenson, 1998; Ostir, Markides, Black, & Goodwin, 2000; Ostir, Markides, Peek, & Goodwin, 2001; Pressman & Cohen, 2005). It appears these associations may be bi-directional, with well-being often predicting positive outcomes (Diener & Seligman, 2004). Focusing on well-being in IBD allows for a more holistic approach to care that can serve as an additional prognosticator of health, in addition to standard clinical indices. Additionally, as well-being considers mind and body, its assessment may give additional insight into IBD outcomes and intervention points as brain-gut functioning is implicated in IBD. Further research into the behavioral and physiological benefits of well-being in IBD should be considered, in addition to research into the specific domains of well-being (positive emotions, engagement, positive relationships, meaning, and accomplishment).

Exploratory aim: Determine if there are disparities in rates of anxiety and depression

We sought to explore whether disparities existed in rates of anxiety and depression. While health and healthcare disparities have been identified in several domains of IBD, there does not appear to be research in the domain of disparities in rates of anxiety and depression (Sewell & Velayos, 2013). Our hypothesis was somewhat supported depending on the

definition/analysis of disparities. Results suggest that disparities may be present based on SES (income and education), and/or experiences of discrimination.

Analyses based on the Agency for Healthcare Research and Quality's definition of health care disparities revealed that lower SES (income and education) and Hispanic ethnicity were significantly associated with clinical depression.

Analyses based on the Institute of Medicine's definition of health care disparities demonstrated that when controlling for clinical need and potential confounders, discrimination was a significant predictor of clinical anxiety. In terms of clinical depression, education was identified as a significant predictor.

These findings advance disparity research in IBD and highlight the importance of sociocontextual factors in health. Our results mirror those of prior research. Lower socioeconomic status has been associated with and predictive of depression in a variety of settings and populations (Dolbier et al., 2013; Miller & Taylor, 2012; Zimmerman & Katon, 2005). In terms of ethnic differences, a 2006 literature review found that depression was less likely to be detected and treated in Hispanics compared to Whites (Simpson, Krishnan, Kunik, & Ruiz, 2007). Our results suggest our Hispanic participants were more likely to meet criteria for clinical depression compared to Non-Hispanic subjects. However, this result should be interpreted with caution given the small number of Latinx participants. Finally, as previously discussed, the connection between discrimination and anxiety has been established in multiple populations (Gee et al., 2007; McLaughlin et al., 2010; Soto et al., 2011). We posit that female gender plays a moderating role in the relationship between discrimination and anxiety, given the higher prevalence of anxiety in women in the general population (McLean et al., 2011).

IBD is recognized as burdensome, with many disease-specific stressors. It appears that the additional load that anxiety/depression can bring may be disproportionately suffered by certain groups. Disparities research is particularly salient at this time. COVD-19 has highlighted the unequal distribution of resources and institutionalized discrimination that are experienced by disadvantaged populations. Disparities can drive treatment delays and worse outcomes, including increased morbidity (Gwyn et al., 2004; Madison, Schottenfeld, James, Schwartz, & Gruber, 2004). As such, disparities can hinder one's ability to optimize health and well-being. The identification and prevention of disparities in IBD is a worthwhile pursuit that will further the literature and also contribute to our pursuit of equity.

Non-Hypothesized Findings

Comorbid Conditions

In our sample, two comorbid conditions were identified as predictive for worse mental health. Participants with IBS were almost 5 times more likely to meet criteria for clinical anxiety compared to those without IBS. While the odds of overweight/obese subjects meeting criteria for clinical depression was 6 times higher than those with a normal BMI. Our findings are unsurprising given previous literature. A recent meta-analysis found similar rates of anxiety between IBS and IBD subjects, but noted that participants with IBS had more severe symptoms of anxiety (Geng et al., 2018). In addition to IBS independently increasing the risk for anxiety, it appears that its presence in the context of IBD can significantly worsen outcomes, as observed by Abdalla and colleagues in their 2017 study. Their cross-sectional analysis of more than 6,000 subjects found that comorbid IBD and IBS significantly predicted anxiety, and that subjects with

these overlapping conditions had lower quality of life and more healthcare utilization (Abdalla et al., 2017). In terms of BMI, both cross-sectional and longitudinal assessments demonstrate its influence. Specifically, Jain and colleagues performed a cohort study that investigated the influence of BMI on psychological and clinical outcomes among more than 15,000 IBD patients (Jain et al., 2019). Cross-sectionally, obesity was associated with higher depression, while longitudinally obesity was associated with worsening depression among CD patients. Further, obesity was found to increase the risk for persistent disease activity and relapse (Jain et al., 2019). Our results and previous research underscore the negative impact IBS and obesity can have on psychological and clinical outcomes in IBD. Fortunately, these two conditions are preventable and modifiable via behavioral and contextual avenues and may be important avenues of research in IBD.

Clinical Implications

As previously described, this study is guided by the fields of positive psychology and public health, both of which elevate the concepts of promotion of and prevention. The use of these frameworks have allowed for the identification of intervention points in IBD, namely two aspects of psychological capital: resilience and self-compassion. Our results suggest that enhancing resilience and self-compassion could bolster well-being and buffer against emotional disorders, while indirectly improving clinical outcomes in IBD.

Psychogastroenterology has laid the groundwork to address these treatment targets, as it has demonstrated the clinical effectiveness of brain-gut psychotherapies among the psychologically vulnerable (Keefer, 2018). While there is growing evidence for the effectiveness

of psychotherapeutic interventions to address mood disorders in IBD, many challenges to

feasibility exist, including access to trained providers. As such, there has been increasing

recognition that using the strengths-based approach from positive psychology with IBD patients

before the onset of deleterious outcomes may be a worthwhile endeavor (J. Feingold, Murray, &

Keefer, 2019; Keefer, 2018). Our findings identify specific treatment targets that could buffer or

even prevent psychological disorders and promote well-being in IBD, allowing the field of

psychogastroenterology to advance in its shift towards preventive approaches to care. Focusing

on secondary prevention and promotion of well-being could not only have clinically meaningful

and observable implications but also potentially be cost-saving, address and prevent health

disparities, and improve access to care. Aligned with our frameworks of positive psychology and

public health, fostering resilience and self-compassion at multiple levels/sources of context may

be more effective than just targeting the individual patient.

On an individual level, self-compassion and resilience can be cultivated through the

application or modification of behavioral and positive psychology interventions that have shown

benefit in IBD. Mindfulness-based and informed interventions, such as Mindfulness-based stress

reduction (MBSR), Mindfulness-based cognitive therapy (MBCT), Mindfulness-Based Strengths

Practice (MBSP), or Acceptance and Commitment Therapy (ACT) may be promising options.

MBSR has demonstrated efficacy among IBD patients with overlapping brain-gut disorders,

(James W Berrill, Sadlier, Hood, & Green, 2014) while MBCT has been associated with

decreased anxiety and depression scores in IBD patients (Schoultz et al., 2015). Additionally,

cognitive behavioral therapy (CBT), the foundational orientation in MBCT is regularly and

effectively used in the IBD population (Ballou & Keefer, 2017). While MBSP and ACT have not

been extensively studied in IBD, mindfulness is central to their processes. Mindfulness is non-judgmental awareness and acceptance of the present moment from a stance of curiosity (Kabat-Zinn, 2015). Mindfulness is an essential aspect of self-compassion and has been associated with increased resilience (Breckman, 2012). Within the context of IBD, the utilization of mindfulness could enhance a patient's ability to treat themselves with kindness and to bounce back from, at times, unavoidable setbacks. The trajectory of IBD can be particularly taxing as a person can adhere to all recommendations but still experience a painful flare. Through mindfulness, a patient can practice acceptance of their current state and the symptoms that may arise. As one's self-compassion is cultivated through focus on the present moment, they can learn to avoid maladaptive cognitive-affective and behavioral processes such as self-blame - which creates a cycle of shame that can lead to decreased self-management. Further, through non-judgment and curiosity, the patient's resilience may be enhanced, allowing them to continue to engage in a meaningful life despite a flare. Utilizing mindfulness-based interventions to cultivate self-compassion and resilience may be an effective way to enhance outcomes on an individual level in IBD, and thus warrants more research. One potential area of study is whether just enhancing mindfulness itself is beneficial outside of mindfulness-based interventions. This could be particularly exciting from a public health and cost-saving perspective as mindfulness can be learned in non-clinical settings and is easily accessible through free phone apps and websites.

Another approach to promoting resilience and self-compassion on an individual level could be through targeting perceived stress. Our study aligns with previous IBD research, demonstrating that perceived stress is an influential variable, with our results finding that perceived stress predicted clinical anxiety/depression and impacted the influence of predictors of

well-being. An exciting and growing area of study has begun to focus on the benefits of stress and the power of mindset. Crum and colleagues (2013) have been investigating if one's perception of stress, or their stress mindset, can influence their reactions to stress. Through multiple studies, they found that a positive or "stress-is-enhancing" mindset is associated with adaptive cognitive, behavioral, emotional, and physiological responses to stress, including increased attentional bias towards stimuli deemed positive (i.e., happy faces), enhanced cognitive flexibility, production of anabolic hormones, and heightened positive affect (Crum et al., 2017; Crum et al., 2013). As a result of their findings, the Rethinking Stress Toolkit was created (http://sparqtools.org/rethinkingstress/). This online intervention uses approaches from their work to help individuals change their mindsets regarding the nature of stress. Although not yet studied in IBD, this intervention could help patients change their mindset in response to ongoing IBD-related stressors, and thus potentially foster their ability to bounce back or practice self-compassion. For example, viewing the stressor of medication management as something that is meaningful to health, rather than as an annoyance, could make it easier to engage in these tasks. This could also enhance one's ability to bounce back if they experience a flare, despite good adherence. Additionally, being able to first acknowledge and then shift one's attention away from the stress of painful symptoms to something positive like meaningful activities could facilitate engagement in other tasks related to health and well-being. This could foster one's self-compassion as they view their stressors as inherent to the human experience and as a result shift towards healing themselves with kindness. Helping IBD patients shift their stress mindsets to foster self-compassion and resilience may be a novel way to improve outcomes on an individual level in IBD, and thus warrants more research.

On an interpersonal level, our results suggest that strengthening perceived social support could be an important treatment target, especially when considering that social support bolsters the buffering effect of self-compassion on anxiety. While we did not see a moderating effect of perceived social support on the relationship between resilience and emotional disorders, prior research demonstrates an association between resilience and social support (Ozbay et al., 2007). Additionally, more social support is associated with improved outcomes in IBD (Sewitch et al., 2001; Fuschia M. Sirois & Hirsch, 2017). One meaningful way to target social support, in service of enhancing the buffering effects of self-compassion and resilience, could be through IBD support groups. IBD support groups have shown benefits for social and emotional functioning (Szigethy, Hardy, Craig, Low, & Kukic, 2009). Engaging in IBD support groups could not only improve and enhance one's perceived social support but also provide salient examples of ways patients use self-compassion and resilience to maintain well-being, especially in the face of stressors like discrimination. Additionally, if led by a trained provider, support groups may be a cost-effective way to increase access to brief positive psychological interventions that enhance resilience and self-compassion, like mindfulness. An additional way to foster resilience and self-compassion on an interpersonal level is through engagement with healthcare providers, like physicians, GI psychologists, and nurses. A recent model of care, REVAMP, provides a framework for healthcare providers to integrate positive psychology interventions into their standard clinical work to enhance well-being (J. H. Feingold, 2016). REVAMP offers specific, cost-effective interventions that target resilience and self-compassion and that can be easily integrated into individual appointments and into support groups (J. Feingold et al., 2019). Although still in its nascency, REVAMP may be a favorable way to

promote well-being on an interpersonal level and as such deserves research investigating its feasibility and efficacy.

On an institutional level, healthcare organizations could adopt mental health prevention and promotion policies that foster patients' psychological capacities. One approach could be to standardize screening for mental health comorbidities and for aspects of psychological capital. One institutional model that has demonstrated promising outcomes in IBD is the GRITT (Gaining Resilience Through Transitions) approach (Gorbenko et al., 2018; Keefer et al., 2018). This model of care uses resilience screening to identify potentially vulnerable IBD patients and to offer psychological care before the development of worse outcomes. GRITT has been shown effective in improving outcomes and reducing hospitalizations. Although the GRITT model is focused on those with low resilience, our results demonstrated that self-compassion and resilience were highly correlated with each other, as such it is likely that targeting one will naturally enhance the other (K. D. Neff et al., 2007). Other institutional approaches include the hiring of GI psychologists and working with insurance companies to cover GI behavioral medicine interventions.

Although more research is necessary, our results suggest that IBD patients could significantly benefit from interventions that target self-compassion and resilience. In addition to their buffering effect against anxiety and depression, these aspects of psychological capital predicted well-being. We posit that targeting resilience and self-compassion through interventions at multiple levels of context could also facilitate more effective self-management and have clinically observable and meaningful implications. Future research investigating

specific ways to foster resilience and self-compassion, as well as their impacts on physiological

processes implicated in IBD (e.g. inflammation and HPA axis) is warranted.

Limitations

While this dissertation has a number of strengths, including the integration of multiple

fields in an immune mediated disease and the examination of an understudied area in the

literature in a well-defined IBD population, certain limitations must be acknowledged. First, the

cross-sectional nature of the study design prohibits us from making any conclusions regarding

causation. While our analyses suggest that those with higher self-compassion and resilience are

less likely to have clinical depression/anxiety and have higher levels of well-being, we are

unable to make temporal conclusions. Future studies using longitudinal approaches will help

clarify these associations.

Second, we are limited by the racial and ethnic homogeneity of the sample, reducing the

generalizability of our findings. We identified that experiences of discrimination are associated

with increased risk of anxiety and that disparities in depression may exist based on ethnicity.

However, we were unable to examine whether discrimination based on race or ethnicity was

influential, as very few participants identified this as the reason why they were discriminated

against. Additionally, the small number of Hispanic participants limited our ability to interpret

the disparities outcomes. Future IBD studies should focus on ways they can include more diverse

participants. This is important for culturally competent interventions, the identification and

prevention of disparities, and as incidence of IBD may be increasing in minority populations.

Finally, we utilized self-report measures to assess both clinical and psychosocial

variables, including disease activity, aspects of psychological capital, and psychological

comorbidities. While most of the measures have been widely used in IBD research, they are still subjective and thus are open to bias and limit the interpretations and inferences of the results. Future research that includes biomarkers of IBD, as well as biomarkers and behaviors associated with resilience and self-compassion would better elucidate the processes and mechanism through which resilience and self-compassion can benefit outcomes in IBD.

Conclusions

The presence of comorbid anxiety and/or depression in IBD is associated with worse disease course, decreased health-related quality of life, increased disease-related disability and impaired self-management. Our study sought to fill a gap in the literature through the identification of risk and protective factors of anxiety/depression as well as the predictors of well-being, using complementary frameworks of public health and positive psychology. Analyses confirmed our hypotheses, when perceived stress was excluded from models. Experiences of discrimination was a significant risk factor for clinical anxiety and IBD activity increased the risk for clinical depression. Self-compassion and resilience protected against clinical anxiety and depression, and significantly predicted well-being. Exploratory analysis revealed potential disparities in anxiety/depression based on SES (income and education), ethnicity, and experiences of discrimination. The use of behavioral and positive psychology interventions to foster resilience and self-compassion could have the potential to prevent emotional disorders and promote well-being in IBD.

References

Abdalla, M. I., Sandler, R. S., Kappelman, M. D., Martin, C. F., Chen, W., Anton, K., & Long, M. D. (2017). Prevalence and Impact of Inflammatory Bowel Disease-Irritable Bowel Syndrome on Patient-reported Outcomes in CCFA Partners. *Inflamm Bowel Dis, 23*(2), 325-331. doi:10.1097/mib.0000000000001017

Abdul Rani, R., Raja Ali, R. A., & Lee, Y. Y. (2016). Irritable bowel syndrome and inflammatory bowel disease overlap syndrome: pieces of the puzzle are falling into place. *Intest Res, 14*(4), 297-304. doi:10.5217/ir.2016.14.4.297

Afshani, S. A., Abooei, A., & Abdoli, A. M. (2019). Self-compassion training and psychological well-being of infertile female. *International Journal of Reproductive BioMedicine, 17*(10), 757.

Agarwal, U., Mishra, S., Xu, J., Levin, S., Gonzales, J., & Barnard, N. D. (2015). A multicenter randomized controlled trial of a nutrition intervention program in a multiethnic adult population in the corporate setting reduces depression and anxiety and improves quality of life: the GEICO study. *American Journal of Health Promotion, 29*(4), 245-254.

Agostini, A., Moretti, M., Calabrese, C., Rizzello, F., Gionchetti, P., Ercolani, M., & Campieri, M. (2014). Attachment and quality of life in patients with inflammatory bowel disease. *Int J Colorectal Dis, 29*(10), 1291-1296. doi:10.1007/s00384-014-1962-3

Alexakis, C., Kumar, S., Saxena, S., & Pollok, R. (2017). Systematic review with meta-analysis: the impact of a depressive state on disease course in adult inflammatory bowel disease. *Aliment Pharmacol Ther, 46*(3), 225-235. doi:10.1111/apt.14171

Ananthakrishnan, A. N. (2015). Epidemiology and risk factors for IBD. *Nature reviews Gastroenterology & hepatology, 12*(4), 205.

Andreasson, E., Svensson, K., & Berggren, F. (2003). PRP11 The validity of the work productivity and activity impairment questionnaire for patients with asthma (WPAIASTHMA): Results from a web-based study. *Value in Health, 6*(6), 780.

Andreou, E., Alexopoulos, E. C., Lionis, C., Varvogli, L., Gnardellis, C., Chrousos, G. P., & Darviri, C. (2011). Perceived stress scale: reliability and validity study in Greece. *International journal of environmental research and public health, 8*(8), 3287-3298.

Andrews, J. M., & Holtmann, G. (2011). IBD: Stress causes flares of IBD—how much evidence is enough? *Nature reviews Gastroenterology & hepatology, 8*(1), 13.

Avey, J. B., Wernsing, T. S., & Mhatre, K. H. (2011). A longitudinal analysis of positive psychological constructs and emotions on stress, anxiety, and well-being. *Journal of Leadership & Organizational Studies, 18*(2), 216-228. doi:10.1177/1548051810397368

Ballou, S., & Keefer, L. (2017). Psychological interventions for irritable bowel syndrome and inflammatory bowel diseases. *Clinical and translational gastroenterology, 8*(1), e214.

Barnes, L. L., de Leon, C. F. M., Lewis, T. T., Bienias, J. L., Wilson, R. S., & Evans, D. A. (2008). Perceived discrimination and mortality in a population-based study of older adults. *Am J Public Health, 98*(7), 1241-1247. doi:10.2105/AJPH.2007.114397

Becker, H. M., Grigat, D., Ghosh, S., Kaplan, G. G., Dieleman, L., Wine, E., . . . Barkema, H. W. (2015). Living with inflammatory bowel disease: a Crohn's and Colitis Canada survey. *Canadian Journal of Gastroenterology and Hepatology, 29*(2), 77-84.

Ben, J., Cormack, D., Harris, R., & Paradies, Y. (2017). Racism and health service utilisation: A systematic review and meta-analysis. *PloS one, 12*(12), e0189900.

Bennebroek, E., Thijssens, N. A., Stokkers, P. C., Grootenhuis, M. A., Bockting, C. L., Nieuwkerk, P. T., & Sprangers, M. A. (2012). Do Inflammatory Bowel Disease patients with anxiety and depressive symptoms receive the care they need? *J Crohns Colitis, 6*(1), 68-76. doi:10.1016/j.crohns.2011.07.006

Bennebroek Evertsz, F., Nieuwkerk, P. T., Stokkers, P. C., Ponsioen, C. Y., Bockting, C. L., Sanderman, R., & Sprangers, M. A. (2013). The patient simple clinical colitis activity index (P-SCCAI) can detect ulcerative colitis (UC) disease activity in remission: a comparison of the P-SCCAI with clinician-based SCCAI and biological markers. *J Crohns Colitis, 7*(11), 890-900. doi:10.1016/j.crohns.2012.11.007

Bernstein, C. N., Singh, S., Graff, L. A., Walker, J. R., Miller, N., & Cheang, M. (2010). A prospective population-based study of triggers of symptomatic flares in IBD. *Am J Gastroenterol, 105*(9), 1994-2002. doi:10.1038/ajg.2010.140

Berrill, J. W., Green, J. T., Hood, K., & Campbell, A. K. (2013). Symptoms of irritable bowel syndrome in patients with inflammatory bowel disease: examining the role of sub-clinical inflammation and the impact on clinical assessment of disease activity. *Aliment Pharmacol Ther, 38*(1), 44-51. doi:10.1111/apt.12335

Berrill, J. W., Sadlier, M., Hood, K., & Green, J. T. (2014). Mindfulness-based therapy for inflammatory bowel disease patients with functional abdominal symptoms or high perceived stress levels. *Journal of Crohn's and Colitis, 8*(9), 945-955.

Black, B. A., & Kern, M. L. (2020). A qualitative exploration of individual differences in wellbeing for highly sensitive individuals. *Palgrave Communications, 6*(1), 1-11.

Blanco, C., Rubio, J., Wall, M., Wang, S., Jiu, C. J., & Kendler, K. S. (2014). Risk factors for anxiety disorders: common and specific effects in a national sample. *Depress Anxiety, 31*(9), 756-764.

Bonanno, G. A. (2004). Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist, 59*(1), 20.

Bonanno, G. A., Papa, A., & O'Neill, K. (2001). Loss and human resilience. *Applied and Preventive Psychology, 10*(3), 193-206.

Bonaz, B. L., & Bernstein, C. N. (2013). Brain-gut interactions in inflammatory bowel disease. *Gastroenterology, 144*(1), 36-49. doi:10.1053/j.gastro.2012.10.003

Breckman, B. (2012). Mindfulness as a key resource for development and resilience. *Nursing Standard (Royal College of Nursing (Great Britain): 1987), 26*(47), 32-32.

Breines, J. G., Thoma, M. V., Gianferante, D., Hanlin, L., Chen, X., & Rohleder, N. (2014). Self-compassion as a predictor of interleukin-6 response to acute psychosocial stress. *Brain, behavior, and immunity, 37*, 109-114.

Breslau, J., Aguilar-Gaxiola, S., Kendler, K. S., Su, M., Williams, D., & Kessler, R. C. (2006). Specifying race-ethnic differences in risk for psychiatric disorder in a USA national sample. *Psychological medicine, 36*(1), 57-68.

Brion, J. M., Leary, M. R., & Drabkin, A. S. (2014). Self-compassion and reactions to serious illness: The case of HIV. *Journal of health psychology, 19*(2), 218-229.

Bryant, R. V., van Langenberg, D. R., Holtmann, G. J., & Andrews, J. M. (2011). Functional gastrointestinal disorders in inflammatory bowel disease: impact on quality of life and psychological status. *Journal of gastroenterology and hepatology, 26*(5), 916-923.

Burns, R. A., Anstey, K. J., & Windsor, T. D. (2011). Subjective well-being mediates the effects of resilience and mastery on depression and anxiety in a large community sample of

young and middle-aged adults. *Australian and New Zealand Journal of Psychiatry, 45*(3), 240-248. doi:10.3109/00048674.2010.529604

Burton, N. W., Pakenham, K. I., & Brown, W. J. (2010). Feasibility and effectiveness of psychosocial resilience training: A pilot study of the READY program. *Psychology, Health & Medicine, 15*(3), 266-277. doi:10.1080/13548501003758710

Butler, J., & Kern, M. L. (2016). The PERMA-Profiler: A brief multidimensional measure of flourishing. *International Journal of Wellbeing, 6*(3).

Byrne, G., Rosenfeld, G., Leung, Y., Qian, H., Raudzus, J., Nunez, C., & Bressler, B. (2017). Prevalence of anxiety and depression in patients with inflammatory bowel disease. *Canadian Journal of Gastroenterology and Hepatology, 2017*.

Cámara, R. J., Ziegler, R., Begré, S., Schoepfer, A. M., & von Känel, R. (2009). The role of psychological stress in inflammatory bowel disease: quality assessment of methods of 18 prospective studies and suggestions for future research. *Digestion, 80*(2), 129-139. doi:10.1159/000226087

Camilleri, M. (2014). Physiological underpinnings of irritable bowel syndrome: neurohormonal mechanisms. *The Journal of physiology, 592*(14), 2967-2980.

Canavan, C., Abrams, K., Hawthorne, B., Drossman, D., & Mayberry, J. (2006). Long-term prognosis in Crohn's disease: factors that affect quality of life. *Alimentary pharmacology & therapeutics, 23*(3), 377-385.

Carlsen, K., Haddad, N., Gordon, J., Phan, B. L., Pittman, N., Benkov, K., . . . Keefer, L. (2017). Self-efficacy and resilience are useful predictors of transition readiness scores in adolescents with inflammatory bowel diseases. *Inflammatory bowel diseases, 23*(3), 341-346.

Carruthers, H. R., Miller, V., Morris, J., Evans, R., Tarrier, N., & Whorwell, P. J. (2009). Using art to help understand the imagery of irritable bowel syndrome and its response to hypnotherapy. *Int J Clin Exp Hypn, 57*(2), 162-173. doi:10.1080/00207140802665401

Carter, M. J., Lobo, A. J., & Travis, S. P. (2004). Guidelines for the management of inflammatory bowel disease in adults. *Gut, 53*(suppl 5), v1-v16.

Carver, C. S. (1998). Resilience and thriving: Issues, models, and linkages. *Journal of social issues, 54*(2), 245-266.

Casati, J., Toner, B. B., De Rooy, E. C., Drossman, D. A., & Maunder, R. G. (2000). Concerns of patients with inflammatory bowel disease. *Digestive diseases and sciences, 45*(1), 26-31.

Castiglione, F., Diaferia, M., Morace, F., Labianca, O., Meucci, C., Cuomo, A., . . . D'Onofrio, C. (2012). Risk factors for inflammatory bowel diseases according to the "hygiene hypothesis": a case–control, multi-centre, prospective study in Southern Italy. *Journal of Crohn's and Colitis, 6*(3), 324-329.

Cathomas, F., Murrough, J. W., Nestler, E. J., Han, M. H., & Russo, S. J. (2019). Neurobiology of Resilience: Interface Between Mind and Body. *Biol Psychiatry, 86*(6), 410-420. doi:10.1016/j.biopsych.2019.04.011

Cella, D., Riley, W., Stone, A., Rothrock, N., Reeve, B., Yount, S., . . . Choi, S. (2010). Initial adult health item banks and first wave testing of the patient-reported outcomes measurement information system (PROMIS™) network: 2005–2008. *Journal of Clinical Epidemiology, 63*(11), 1179.

Chan, W., Shim, H. H., Lim, M. S., Sawadjaan, F. L. B., Isaac, S. P., Chuah, S. W., . . . Kong, C. (2017). Symptoms of anxiety and depression are independently associated with inflammatory bowel disease-related disability. *Dig Liver Dis, 49*(12), 1314-1319. doi:10.1016/j.dld.2017.08.020

Cho, J. H., & Abraham, C. (2007). Inflammatory bowel disease genetics: Nod2. *Annu. Rev. Med., 58*, 401-416.

Coffin, B., Dapoigny, M., Cloarec, D., Comet, D., & Dyard, F. (2004). Relationship between severity of symptoms and quality of life in 858 patients with irritable bowel syndrome. *Gastroenterol Clin Biol, 28*(1), 11-15.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of health and social behavior*, 385-396.

Colombel, J.-F., Narula, N., & Peyrin-Biroulet, L. (2017). Management strategies to improve outcomes of patients with inflammatory bowel diseases. *Gastroenterology, 152*(2), 351-361. e355.

Cosnes, J., Gower–Rousseau, C., Seksik, P., & Cortot, A. (2011). Epidemiology and natural history of inflammatory bowel diseases. *Gastroenterology, 140*(6), 1785-1794. e1784.

Crum, A. J., Akinola, M., Martin, A., & Fath, S. (2017). The role of stress mindset in shaping cognitive, emotional, and physiological responses to challenging and threatening stress. *Anxiety, Stress, & Coping, 30*(4), 379-395.

Crum, A. J., Salovey, P., & Achor, S. (2013). Rethinking stress: The role of mindsets in determining the stress response. *Journal of personality and social psychology, 104*(4), 716.

Dahlhamer, J. M. (2016). Prevalence of inflammatory bowel disease among adults aged≥ 18 years—United States, 2015. *MMWR. Morbidity and mortality weekly report, 65*.

Danese, A., Moffitt, T. E., Harrington, H., Milne, B. J., Polanczyk, G., Pariante, C. M., . . . Caspi, A. (2009). Adverse childhood experiences and adult risk factors for age-related disease: depression, inflammation, and clustering of metabolic risk markers. *Archives of pediatrics & adolescent medicine, 163*(12), 1135-1143.

Danner, M., Kasl, S. V., Abramson, J. L., & Vaccarino, V. (2003). Association between depression and elevated C-reactive protein. *Psychosom Med, 65*(3), 347-356.

Dassopoulos, T., Cohen, R. D., Scherl, E. J., Schwartz, R. M., Kosinski, L., & Regueiro, M. D. (2015). Ulcerative colitis care pathway. *Gastroenterology, 149*(1), 238-245.

Devlen, J., Beusterien, K., Yen, L., Ahmed, A., Cheifetz, A. S., & Moss, A. C. (2014). The burden of inflammatory bowel disease: a patient-reported qualitative analysis and development of a conceptual model. *Inflammatory bowel diseases, 20*(3), 545-552.

Dibley, L., Norton, C., & Whitehead, E. (2018). The experience of stigma in inflammatory bowel disease: An interpretive (hermeneutic) phenomenological study. *J Adv Nurs, 74*(4), 838-851. doi:10.1111/jan.13492

Diener, E., & Biswas-Diener, R. (2011). *Happiness: Unlocking the mysteries of psychological wealth*: John Wiley & Sons.

Diener, E., & Seligman, M. E. (2004). Beyond money: Toward an economy of well-being. *Psychological science in the public interest, 5*(1), 1-31.

Dolbier, C. L., Rush, T. E., Sahadeo, L. S., Shaffer, M. L., Thorp, J., & Investigators, C. C. H. N. (2013). Relationships of race and socioeconomic status to postpartum depressive

symptoms in rural African American and non-Hispanic white women. *Maternal and child health journal, 17*(7), 1277-1287.

Dove, C., & Costello, S. (2017). Supporting emotional well-being in schools: a pilot study into the efficacy of a mindfulness-based group intervention on anxious and depressive symptoms in children. *Advances in Mental Health, 15*(2), 172-182.

Drossman, Camilleri, M., Mayer, E. A., & Whitehead, W. E. (2002). AGA technical review on irritable bowel syndrome. *Gastroenterology, 123*(6), 2108-2131. doi:10.1053/gast.2002.37095

Drossman, & Ringel, Y. (2000). Psychosocial factors in ulcerative colitis and Crohn's disease. *Inflammatory bowel disease, 5*, 342-357.

Dunn, L. B., Iglewicz, A., & Moutier, C. (2008). A conceptual model of medical student well-being: promoting resilience and preventing burnout. *Academic Psychiatry, 32*(1), 44-53.

Edwards, K. A., Pielech, M., Hickman, J., Ashworth, J., Sowden, G., & Vowles, K. E. (2019). The relation of self-compassion to functioning among adults with chronic pain. *European Journal of Pain, 23*(8), 1538-1547.

Ellul, P., Zammita, S. C., Katsanos, K. H., Cesarini, M., Allocca, M., Danese, S., . . . Mantzaris, G. (2016). Perception of Reproductive Health in Women with Inflammatory Bowel Disease. *J Crohns Colitis, 10*(8), 886-891. doi:10.1093/ecco-jcc/jjw011

Evertsz, F. B., Nieuwkerk, P. T., Stokkers, P. C., Ponsioen, C. Y., Bockting, C. L., Sanderman, R., & Sprangers, M. A. (2013). The Patient Simple Clinical Colitis Activity Index (P-SCCAI) can detect ulcerative colitis (UC) disease activity in remission: a comparison of the P-SCCAI with clinician-based SCCAI and biological markers. *Journal of Crohn's and Colitis, 7*(11), 890-900.

Fagundes, C. P., Glaser, R., Hwang, B. S., Malarkey, W. B., & Kiecolt-Glaser, J. K. (2013). Depressive symptoms enhance stress-induced inflammatory responses. *Brain, behavior, and immunity, 31*, 172-176.

Farmer, R. G., Easley, K. A., & Farmer, J. M. (1992). Quality of life assessment by patients with inflammatory bowel disease. *Cleve Clin J Med, 59*(1), 35-42.

Farrell, D., McCarthy, G., & Savage, E. (2016). Self-reported Symptom Burden in Individuals with Inflammatory Bowel Disease. *J Crohns Colitis, 10*(3), 315-322. doi:10.1093/ecco-jcc/jjv218

Feagan, B. (2016). Update on tofacitinib for inflammatory bowel disease. *Gastroenterology & hepatology, 12*(9), 572.

Feingold, J., Murray, H. B., & Keefer, L. (2019). Recent advances in cognitive behavioral therapy for digestive disorders and the role of applied positive psychology across the spectrum of GI care. *Journal of clinical gastroenterology, 53*(7), 477-485.

Feingold, J. H. (2016). Toward a Positive Medicine: Healing our Healers, from Burnout to Flourishing.

Ferrante, M., Declerck, S., De Hertogh, G., Van Assche, G., Geboes, K., Rutgeerts, P., . . . D'Hoore, A. (2008). Outcome after proctocolectomy with ileal pouch-anal anastomosis for ulcerative colitis. *Inflammatory bowel diseases, 14*(1), 20-28.

Feuerstein, J., Nguyen, G., Kupfer, S., Falck-Ytter, Y., & Singh, S. (2017). American gastroenterological association institute clinical guidelines committee. American Gastroenterological Association Institute Guideline on Therapeutic Drug Monitoring in inflammatory bowel disease. *Gastroenterology, 153*(3), 827-834.

Fond, G., Loundou, A., Hamdani, N., Boukouaci, W., Dargel, A., Oliveira, J., . . . Boyer, L. (2014). Anxiety and depression comorbidities in irritable bowel syndrome (IBS): a systematic review and meta-analysis. *Eur Arch Psychiatry Clin Neurosci, 264*(8), 651-660. doi:10.1007/s00406-014-0502-z

Fortes, C., Farchi, S., Forastiere, F., Agabiti, N., Pacifici, R., Zuccaro, P., . . . Ebrahim, S. (2003). Depressive symptoms lead to impaired cellular immune response. *Psychother Psychosom, 72*(5), 253-260. doi:10.1159/000071896

Francis, C. Y., Morris, J., & Whorwell, P. J. (1997). The irritable bowel severity scoring system: a simple method of monitoring irritable bowel syndrome and its progress. *Aliment Pharmacol Ther, 11*(2), 395-402.

Frank, M. G., Wieseler Frank, J. L., Hendricks, S. E., Burke, W. J., & Johnson, D. R. (2002). Age at onset of major depressive disorder predicts reductions in NK cell number and activity. *J Affect Disord, 71*(1-3), 159-167.

Gaines, L. S., Slaughter, J. C., Horst, S. N., Schwartz, D. A., Beaulieu, D. B., Haman, K. L., . . . Kappelman, M. D. (2016). Association Between Affective-Cognitive Symptoms of Depression and Exacerbation of Crohn's Disease. *Am J Gastroenterol, 111*(6), 864-870. doi:10.1038/ajg.2016.98

Garcia-Campayo, J., Navarro-Gil, M., Andrés, E., Montero-Marin, J., López-Artal, L., & Demarzo, M. M. P. (2014). Validation of the Spanish versions of the long (26 items) and short (12 items) forms of the Self-Compassion Scale (SCS). *Health and quality of life outcomes, 12*(1), 1.

Garcia-Vega, E., & Fernandez-Rodriguez, C. (2004). A stress management programme for Crohn's disease. *Behaviour research and therapy, 42*(4), 367-383.

Gawlicki, M. C., Reilly, M. C., Popielnicki, A., & Reilly, K. (2006). Linguistic validation of the US Spanish work productivity and activity impairment questionnaire, general health version. *Value Health, 9*(3), 199-204. doi:10.1111/j.1524-4733.2006.00101.x

Gedik, Z. (2018). Self-compassion and health-promoting lifestyle behaviors in college students. *Psychology, Health & Medicine*. doi:10.1080/13548506.2018.1503692

Gee, G. C., Spencer, M., Chen, J., Yip, T., & Takeuchi, D. T. (2007). The association between self-reported racial discrimination and 12-month DSM-IV mental disorders among Asian Americans nationwide. *Soc Sci Med, 64*(10), 1984-1996. doi:10.1016/j.socscimed.2007.02.013

Geng, Q., Zhang, Q.-E., Wang, F., Zheng, W., Ng, C. H., Ungvari, G. S., . . . Xiang, Y.-T. (2018). Comparison of comorbid depression between irritable bowel syndrome and inflammatory bowel disease: A meta-analysis of comparative studies. *Journal of Affective Disorders, 237*, 37-46.

Gevers, D., Kugathasan, S., Denson, L. A., Vázquez-Baeza, Y., Van Treuren, W., Ren, B., . . . Yassour, M. (2014). The treatment-naive microbiome in new-onset Crohn's disease. *Cell host & microbe, 15*(3), 382-392.

Gick, M. L., & Sirois, F. M. (2010). Insecure attachment moderates women's adjustment to inflammatory bowel disease severity. *Rehabil Psychol, 55*(2), 170-179. doi:10.1037/a0019358

Golden, S. D., & Earp, J. A. L. (2012). Social ecological approaches to individuals and their contexts: twenty years of health education & behavior health promotion interventions. *Health Education & Behavior, 39*(3), 364-372.

Gorbenko, K., Mendelev, E., Manning, L., Conlon, K., Tse, S., Thomas, N., . . . Keefer, L. (2018). *Building a Medical Home for Patients with Inflammatory Bowel Disease: Qualitative Study of the Development of the GRITT-IBD Program.* Paper presented at the 2018 Annual Research Meeting.

Gouin, J.-P., Glaser, R., Malarkey, W. B., Beversdorf, D., & Kiecolt-Glaser, J. (2012). Chronic stress, daily stressors, and circulating inflammatory markers. *Health Psychology, 31*(2), 264.

Gracie, D. J., Guthrie, E. A., Hamlin, P. J., & Ford, A. C. Bi-directionality of Brain–Gut Interactions in Patients With Inflammatory Bowel Diseases. *Gastroenterology*.

Gracie, D. J., Guthrie, E. A., Hamlin, P. J., & Ford, A. C. (2018). Bi-directionality of Brain-Gut Interactions in Patients With Inflammatory Bowel Disease. *Gastroenterology, 154*(6), 1635-1646.e1633. doi:10.1053/j.gastro.2018.01.027

Gracie, D. J., Williams, C. J., Sood, R., Mumtaz, S., Bholah, M. H., Hamlin, P. J., & Ford, A. C. (2017). Negative Effects on Psychological Health and Quality of Life of Genuine Irritable Bowel Syndrome-type Symptoms in Patients With Inflammatory Bowel Disease. *Clin Gastroenterol Hepatol, 15*(3), 376-384.e375. doi:10.1016/j.cgh.2016.05.012

Graff, L. A., Walker, J. R., & Bernstein, C. N. (2009). Depression and anxiety in inflammatory bowel disease: a review of comorbidity and management. *Inflammatory bowel diseases, 15*(7), 1105-1118.

Gray, W. N., Denson, L. A., Baldassano, R. N., & Hommel, K. A. (2012). Treatment adherence in adolescents with inflammatory bowel disease: the collective impact of barriers to adherence and anxiety/depressive symptoms. *J Pediatr Psychol, 37*(3), 282-291. doi:10.1093/jpepsy/jsr092

Gunnells, D. J., Morris, M. S., DeRussy, A., Gullick, A. A., Malik, T. A., Cannon, J. A., . . . Chu, D. I. (2016). Racial disparities in readmissions for patients with inflammatory bowel disease (IBD) after colorectal surgery. *Journal of Gastrointestinal Surgery, 20*(5), 985-993.

Gwyn, K., Bondy, M. L., Cohen, D. S., Lund, M. J., Liff, J. M., Flagg, E. W., . . . Coates, R. J. (2004). Racial differences in diagnosis, treatment, and clinical delays in a population-based study of patients with newly diagnosed breast carcinoma. *Cancer: Interdisciplinary International Journal of the American Cancer Society, 100*(8), 1595-1604.

Halfvarson, J., Bodin, L., Tysk, C., Lindberg, E., & Jarnerot, G. (2003). Inflammatory bowel disease in a Swedish twin cohort: a long-term follow-up of concordance and clinical characteristics. *Gastroenterology, 124*(7), 1767-1773.

Hall, W. J., Chapman, M. V., Lee, K. M., Merino, Y. M., Thomas, T. W., Payne, B. K., . . . Coyne-Beasley, T. (2015). Implicit Racial/Ethnic Bias Among Health Care Professionals and Its Influence on Health Care Outcomes: A Systematic Review. *Am J Public Health, 105*(12), e60-76. doi:10.2105/ajph.2015.302903

Hamby, S. (2015). On the use of race and ethnicity as variables in violence research.

Harris, P. A., Taylor, R., Minor, B. L., Elliott, V., Fernandez, M., O'Neal, L., . . . Kirby, J. (2019). The REDCap consortium: Building an international community of software platform partners. *Journal of biomedical informatics, 95*, 103208.

Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research electronic data capture (REDCap)—a metadata-driven methodology and workflow

process for providing translational research informatics support. *Journal of biomedical informatics, 42*(2), 377-381.

Harvey, R., & Bradshaw, J. (1980). A simple index of Crohn's-disease activity. *The Lancet, 315*(8167), 514.

Häuser, W., Janke, K. H., Klump, B., & Hinz, A. (2011). Anxiety and depression in patients with inflammatory bowel disease: comparisons with chronic liver disease patients and the general population. *Inflammatory bowel diseases, 17*(2), 621-632.

Hays, R. D., Bjorner, J. B., Revicki, D. A., Spritzer, K. L., & Cella, D. (2009). Development of physical and mental health summary scores from the patient-reported outcomes measurement information system (PROMIS) global items. *Qual Life Res, 18*(7), 873-880. doi:10.1007/s11136-009-9496-9

Herman, H., Saxena, S., & Moodie, R. (2005). Promoting mental health: Concepts, emerging evidence, practice. *Geneva: World Health Organization*.

Herman, M. L., & Kane, S. V. (2015). Treatment nonadherence in inflammatory bowel disease: identification, scope, and management strategies. *Inflammatory bowel diseases, 21*(12), 2979-2984.

Herriot, H., Wrosch, C., & Gouin, J.-P. (2018). Self-compassion, chronic age-related stressors, and diurnal cortisol secretion in older adulthood. *Journal of Behavioral Medicine*. doi:10.1007/s10865-018-9943-6

Hollander, D. (2004). Inflammatory bowel diseases and brain-gut axis. *Journal of physiology and pharmacology, 55*, 183-190.

Horan, K. A., & Taylor, M. B. (2018). Mindfulness and self-compassion as tools in health behavior change: An evaluation of a workplace intervention pilot study. *Journal of Contextual Behavioral Science, 8*, 8-16. doi:10.1016/j.jcbs.2018.02.003

Hugot, J.-P., Chamaillard, M., Zouali, H., Lesage, S., Cézard, J.-P., Belaiche, J., . . . Gassull, M. (2001). Association of NOD2 leucine-rich repeat variants with susceptibility to Crohn's disease. *Nature, 411*(6837), 599.

Hunte, H. E. (2011). Association between perceived interpersonal everyday discrimination and waist circumference over a 9-year period in the Midlife Development in the United States cohort study. *American journal of epidemiology, 173*(11), 1232-1239.

Hwang, J. H., & Yu, C. S. (2019). Depression and resilience in ulcerative colitis and Crohn's disease patients with ostomy. *International wound journal, 16*, 62-70.

Irvine, E. J., Zhou, Q., & Thompson, A. K. (1996). The Short Inflammatory Bowel Disease Questionnaire: a quality of life instrument for community physicians managing inflammatory bowel disease. CCRPT Investigators. Canadian Crohn's Relapse Prevention Trial. *Am J Gastroenterol, 91*(8), 1571-1578.

IsHak, W. W., Pan, D., Steiner, A. J., Feldman, E., Mann, A., Mirocha, J., . . . Melmed, G. Y. (2017). Patient-reported outcomes of quality of life, functioning, and GI/psychiatric symptom severity in patients with inflammatory bowel disease (IBD). *Inflammatory bowel diseases, 23*(5), 798-803.

Jacobson, E. H. K., Wilson, K. G., Solomon Kurz, A., & Kellum, K. K. (2018). Examining self-compassion in romantic relationships. *Journal of Contextual Behavioral Science, 8*, 69-73. doi:10.1016/j.jcbs.2018.04.003

Jain, A., Nguyen, N. H., Proudfoot, J. A., Martin, C. F., Sandborn, W. J., Kappelman, M. D., . . . Singh, S. (2019). Impact of obesity on disease activity and Patient-Reported Outcomes

Measurement Information System (PROMIS) in inflammatory bowel diseases. *American Journal of Gastroenterology, 114*(4), 630-639.

James, S. A. (2017). The strangest of all encounters: racial and ethnic discrimination in US health care. *Cad Saude Publica, 33Suppl 1*(Suppl 1), e00104416. doi:10.1590/0102-311x00104416

Jones, M. P., Wessinger, S., & Crowell, M. D. (2006). Coping strategies and interpersonal support in patients with irritable bowel syndrome and inflammatory bowel disease. *Clinical Gastroenterology and Hepatology, 4*(4), 474-481.

Jowett, S. L., Seal, C. J., Barton, J. R., & Welfare, M. R. (2001). The short inflammatory bowel disease questionnaire is reliable and responsive to clinically important change in ulcerative colitis. *The American journal of gastroenterology, 96*(10), 2921.

Kabat-Zinn, J. (2015). Mindfulness. *Mindfulness, 6*(6), 1481-1483.

Kano, M., Muratsubaki, T., Van Oudenhove, L., Morishita, J., Yoshizawa, M., Kohno, K., . . . Fukudo, S. (2017). Altered brain and gut responses to corticotropin-releasing hormone (CRH) in patients with irritable bowel syndrome. *Scientific reports, 7*(1), 12425-12425. doi:10.1038/s41598-017-09635-x

Kaser, A., Zeissig, S., & Blumberg, R. S. (2010). Inflammatory bowel disease. *Annu Rev Immunol, 28*, 573-621. doi:10.1146/annurev-immunol-030409-101225

Katz, L., Tripp, D. A., Ropeleski, M., Depew, W., Curtis Nickel, J., Vanner, S., & Beyak, M. J. (2016). Mechanisms of Quality of Life and Social Support in Inflammatory Bowel Disease. *J Clin Psychol Med Settings, 23*(1), 88-98. doi:10.1007/s10880-015-9431-x

Keefer, L. (2018). Behavioural medicine and gastrointestinal disorders: the promise of positive psychology. *Nat Rev Gastroenterol Hepatol*. doi:10.1038/s41575-018-0001-1

Keefer, L., & Kane, S. V. (2016). Self-management techniques in IBD. In *Telemanagement of Inflammatory Bowel Disease* (pp. 55-70): Springer.

Keefer, L., Washington, J., Thomas, N., Mendelev, E., Lazio, P., Tse, S., . . . Dubinsky, M. (2018). Mo1910-Gaining Resilience Through Transitions in IBD [Gritt™-IBD], a Subspecialty Outpatient Medical Home is Feasible, Acceptable and Associated with Positive Outcomes in Year 1. *Gastroenterology, 154*(6), S-848.

Kelly, J. R., Kennedy, P. J., Cryan, J. F., Dinan, T. G., Clarke, G., & Hyland, N. P. (2015). Breaking down the barriers: the gut microbiome, intestinal permeability and stress-related psychiatric disorders. *Frontiers in cellular neuroscience, 9*, 392.

Keohane, J., O'Mahony, C., O'Mahony, L., O'Mahony, S., Quigley, E. M., & Shanahan, F. (2010). Irritable bowel syndrome-type symptoms in patients with inflammatory bowel disease: a real association or reflection of occult inflammation? *Am J Gastroenterol, 105*(8), 1788, 1789-1794; quiz 1795. doi:10.1038/ajg.2010.156

Kershaw, K. N., Lewis, T. T., Roux, A. V. D., Jenny, N. S., Liu, K., Penedo, F. J., & Carnethon, M. R. (2016). Self-reported experiences of discrimination and inflammation among men and women: The multi-ethnic study of atherosclerosis. *Health Psychology, 35*(4), 343.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry, 62*(6), 593-602.

Kiank, C., Taché, Y., & Larauche, M. (2010). Stress-related modulation of inflammation in experimental models of bowel disease and post-infectious irritable bowel syndrome: role of corticotropin-releasing factor receptors. *Brain, behavior, and immunity, 24*(1), 41-48.

Kiebles, J. L., Doerfler, B., & Keefer, L. (2010). Preliminary evidence supporting a framework of psychological adjustment to inflammatory bowel disease. *Inflammatory bowel diseases, 16*(10), 1685-1695.

Kim, G., Sellbom, M., & Ford, K.-L. (2014). Race/ethnicity and measurement equivalence of the Everyday Discrimination Scale. *Psychological Assessment, 26*(3), 892.

Kirch, W. (2008). *Encyclopedia of Public Health: Volume 1: A-H Volume 2: I-Z*: Springer Science & Business Media.

Knowles, S., Wilson, J., Connell, W., & Kamm, M. (2011). Preliminary examination of the relations between disease activity, illness perceptions, coping strategies, and psychological morbidity in Crohn's disease guided by the common sense model of illness. *Inflammatory bowel diseases, 17*(12), 2551-2557.

Knowles, S. R., Keefer, L., Wilding, H., Hewitt, C., Graff, L. A., & Mikocka-Walus, A. (2018). Quality of life in inflammatory bowel disease: a systematic review and meta-analyses— part II. *Inflammatory bowel diseases, 24*(5), 966-976.

Ko, J. K., & Auyeung, K. K. (2014). Inflammatory bowel disease: etiology, pathogenesis and current therapy. *Curr Pharm Des, 20*(7), 1082-1096.

Kobau, R., Seligman, M. E., Peterson, C., Diener, E., Zack, M. M., Chapman, D., & Thompson, W. (2011). Mental health promotion in public health: Perspectives and strategies from positive psychology. *Am J Public Health, 101*(8), e1-e9.

Kochar, B., Barnes, E. L., Long, M. D., Cushing, K. C., Galanko, J., Martin, C. F., . . . Sandler, R. S. (2018). Depression is associated with more aggressive inflammatory bowel disease. *The American journal of gastroenterology, 113*(1), 80.

Koloski, N. A., Jones, M., Kalantar, J., Weltman, M., Zaguirre, J., & Talley, N. (2012). The brain–gut pathway in functional gastrointestinal disorders is bidirectional: a 12-year prospective population-based study. *Gut, 61*(9), 1284-1290.

Kostic, A. D., Xavier, R. J., & Gevers, D. (2014). The microbiome in inflammatory bowel disease: current status and the future ahead. *Gastroenterology, 146*(6), 1489-1499.

Krieger, N., Smith, K., Naishadham, D., Hartman, C., & Barbeau, E. M. (2005). Experiences of discrimination: validity and reliability of a self-report measure for population health research on racism and health. *Social science & medicine, 61*(7), 1576-1596.

Kugathasan, S., & Amre, D. (2006). Inflammatory bowel disease—environmental modification and genetic determinants. *Pediatric Clinics, 53*(4), 727-749.

L. Fredrickson, B., & Levenson, R. W. (1998). Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition & emotion, 12*(2), 191-220.

Lai, J. C.-L., & Mak, A. J.-H. (2009). Resilience moderates the impact of daily hassles on positive well-being in Chinese undergraduates. *Journal of Psychology in Chinese Societies, 10*(2), 151-168. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2010-25406-004&site=ehost-live

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Langhorst, J., Hofstetter, A., Wolfe, F., & Häuser, W. (2013). Short-term stress, but not mucosal healing nor depression was predictive for the risk of relapse in patients with ulcerative colitis: a prospective 12-month follow-up study. *Inflamm Bowel Dis, 19*(11), 2380-2386. doi:10.1097/MIB.0b013e3182a192ba

Larsson, K., Lööf, L., Rönnblom, A., & Nordin, K. (2008). Quality of life for patients with exacerbation in inflammatory bowel disease and how they cope with disease activity. *Journal of psychosomatic research, 64*(2), 139-148.

Lê Cook, B., McGuire, T. G., & Zuvekas, S. H. (2009). Measuring trends in racial/ethnic health care disparities. *Medical Care Research and Review, 66*(1), 23-48.

Lee, C., Doo, E., Choi, J. M., Jang, S. H., Ryu, H. S., Lee, J. Y., . . . Kim, Y. S. (2017). The Increased Level of Depression and Anxiety in Irritable Bowel Syndrome Patients Compared with Healthy Controls: Systematic Review and Meta-analysis. *J Neurogastroenterol Motil, 23*(3), 349-362. doi:10.5056/jnm16220

Lee, E. H., Chung, B. Y., Suh, C. H., & Jung, J. Y. (2015). Korean versions of the Perceived Stress Scale (PSS-14, 10 and 4): psychometric evaluation in patients with chronic disease. *Scandinavian journal of caring sciences, 29*(1), 183-192.

Lesnovska, K. P., Frisman, G. H., Hjortswang, H., & Börjeson, S. (2016). Critical situations in daily life as experienced by patients with inflammatory bowel disease. *Gastroenterology Nursing, 39*(3), 195.

Lewis, T. T., Aiello, A. E., Leurgans, S., Kelly, J., & Barnes, L. L. (2010). Self-reported experiences of everyday discrimination are associated with elevated C-reactive protein levels in older African-American adults. *Brain, behavior, and immunity, 24*(3), 438-443.

Lewis, T. T., Cogburn, C. D., & Williams, D. R. (2015). Self-reported experiences of discrimination and health: scientific advances, ongoing controversies, and emerging issues. *Annu Rev Clin Psychol, 11*, 407-440. doi:10.1146/annurev-clinpsy-032814-112728

Lewis, T. T., Kravitz, H. M., Janssen, I., & Powell, L. H. (2011). Self-reported experiences of discrimination and visceral fat in middle-aged African-American and Caucasian women. *American journal of epidemiology, 173*(11), 1223-1231. doi:10.1093/aje/kwq466

Lo, B., Prosberg, M., Gluud, L., Chan, W., Leong, R. W., van der List, E., . . . Peyrin-Biroulet, L. (2018). Systematic review and meta-analysis: assessment of factors affecting disability in inflammatory bowel disease and the reliability of the inflammatory bowel disease disability index. *Alimentary pharmacology & therapeutics, 47*(1), 6-15.

Loftus, E. V. (2004). Clinical epidemiology of inflammatory bowel disease: incidence, prevalence, and environmental influences. *Gastroenterology, 126*(6), 1504-1517.

Logie, C., James, L., Tharao, W., & Loutfy, M. (2013). Associations between HIV-related stigma, racial discrimination, gender discrimination, and depression among HIV-positive African, Caribbean, and Black women in Ontario, Canada. *AIDS Patient Care STDS, 27*(2), 114-122. doi:10.1089/apc.2012.0296

Lonnfors, S., Vermeire, S., Greco, M., Hommes, D., Bell, C., & Avedano, L. (2014). IBD and health-related quality of life -- discovering the true impact. *J Crohns Colitis, 8*(10), 1281-1286. doi:10.1016/j.crohns.2014.03.005

Lopez-Sanroman, A., & Bermejo, F. (2006). how to control and improve adherence to therapy in inflammatory bowel disease. *Alimentary pharmacology & therapeutics, 24*, 45-49.

Lozano Lanagran, M., Camacho Martel, L., Camargo Camero, R., Lopez Megias, J., & Alcain Martine, G. (2016). *Do positive psychological factors affect the perception of health-related quality of life in inflammatory bowel disease patients?* Paper presented at the European Crohn's and Colitis Organisation, Amsterdam, the Netherlands.

Luo, X. P., Mao, R., Chen, B. L., Qiu, Y., Zhang, S. H., He, Y., . . . Chen, M. H. (2017). Over-reaching beyond disease activity: the influence of anxiety and medical economic burden on health-related quality of life in patients with inflammatory bowel disease. *Patient Prefer Adherence, 11*, 23-31. doi:10.2147/ppa.s118589

Luthans, F., Luthans, K. W., & Luthans, B. C. (2004). Positive psychological capital: Beyond human and social capital.

Luthans, F., & Youssef-Morgan, C. M. (2017). Psychological capital: An evidence-based positive approach. *Annual Review of Organizational Psychology and Organizational Behavior, 4*, 339-366.

Madison, T., Schottenfeld, D., James, S. A., Schwartz, A. G., & Gruber, S. B. (2004). Endometrial cancer: socioeconomic status and racial/ethnic differences in stage at diagnosis, treatment, and survival. *Am J Public Health, 94*(12), 2104-2111.

Manichanh, C., Borruel, N., Casellas, F., & Guarner, F. (2012). The gut microbiota in IBD. *Nature reviews Gastroenterology & hepatology, 9*(10), 599.

Matini, L., & Ogden, J. (2016). A qualitative study of patients' experience of living with inflammatory bowel disease: A preliminary focus on the notion of adaptation. *Journal of health psychology, 21*(11), 2493-2502.

Mawdsley, J., & Rampton, D. (2005). Psychological stress in IBD: new insights into pathogenic and therapeutic implications. *Gut, 54*(10), 1481-1491.

Mawdsley, J. E., & Rampton, D. S. (2005). Psychological stress in IBD: new insights into pathogenic and therapeutic implications. *Gut, 54*(10), 1481-1491. doi:10.1136/gut.2005.064261

Mayberry, J. F. (1999). Impact of inflammatory bowel disease on educational achievements and work prospects. *J Pediatr Gastroenterol Nutr, 28*(4), S34-36. doi:10.1097/00005176-199904001-00005

Mayberry, M. K., Probert, C., Srivastava, E., Rhodes, J., & Mayberry, J. F. (1992). Perceived discrimination in education and employment by people with Crohn's disease: a case control study of educational achievement and employment. *Gut, 33*(3), 312-314. doi:10.1136/gut.33.3.312

McCombie, A. M., Mulder, R. T., & Gearry, R. B. (2013). How IBD patients cope with IBD: a systematic review. *Journal of Crohn's and Colitis, 7*(2), 89-106.

McConnell, R. A., & Mahadevan, U. (2016). Pregnancy and the Patient with Inflammatory Bowel Disease: Fertility, Treatment, Delivery, and Complications. *Gastroenterol Clin North Am, 45*(2), 285-301. doi:10.1016/j.gtc.2016.02.006

McDermott, E., Mullen, G., Moloney, J., Keegan, D., Byrne, K., Doherty, G. A., . . . Mulcahy, H. E. (2015). Body image dissatisfaction: clinical features, and psychosocial disability in inflammatory bowel disease. *Inflamm Bowel Dis, 21*(2), 353-360. doi:10.1097/mib.0000000000000287

McLaughlin, K. A., Hatzenbuehler, M. L., & Keyes, K. M. (2010). Responses to discrimination and psychiatric disorders among Black, Hispanic, female, and lesbian, gay, and bisexual individuals. *Am J Public Health, 100*(8), 1477-1484. doi:10.2105/ajph.2009.181586

McLean, C. P., Asnaani, A., Litz, B. T., & Hofmann, S. G. (2011). Gender differences in anxiety disorders: prevalence, course of illness, comorbidity and burden of illness. *Journal of psychiatric research, 45*(8), 1027-1035.

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Educ Q, 15*(4), 351-377.

Mehta, F. (2016). Report: economic implications of inflammatory bowel disease and its management. *The American journal of managed care, 22*(3 Suppl), s51-60.

Melinder, C., Hiyoshi, A., Fall, K., Halfvarson, J., & Montgomery, S. (2017). Stress resilience and the risk of inflammatory bowel disease: a cohort study of men living in Sweden. *BMJ open, 7*(1), e014315.

Michael, M. D., Bálint, A., Lovász, B. D., Gulácsi, L., Strbák, B., Golovics, P. A., . . . Mohás, A. (2014). Work disability and productivity loss in patients with inflammatory bowel diseases in Hungary in the era of biologics. *The European Journal of Health Economics, 15*(1), 121-128.

Mikocka-Walus, Knowles, S. R., Keefer, L., & Graff, L. (2016). Controversies Revisited: A Systematic Review of the Comorbidity of Depression and Anxiety with Inflammatory Bowel Diseases. *Inflamm Bowel Dis, 22*(3), 752-762. doi:10.1097/mib.0000000000000620

Mikocka-Walus, A., Pittet, V., Rossel, J. B., & von Kanel, R. (2016). Symptoms of Depression and Anxiety Are Independently Associated With Clinical Recurrence of Inflammatory Bowel Disease. *Clin Gastroenterol Hepatol, 14*(6), 829-835 e821. doi:10.1016/j.cgh.2015.12.045

Mikocka-Walus, A. A., Turnbull, D. A., Andrews, J. M., Moulding, N. T., Wilson, I. G., Harley, H. A., . . . Holtmann, G. J. (2008). Psychological problems in gastroenterology outpatients: A South Australian experience. Psychological co-morbidity in IBD, IBS and hepatitis C. *Clin Pract Epidemiol Ment Health, 4*, 15. doi:10.1186/1745-0179-4-15

Miller, B., & Taylor, J. (2012). Racial and socioeconomic status differences in depressive symptoms among black and white youth: An examination of the mediating effects of family structure, stress and support. *Journal of youth and adolescence, 41*(4), 426-437.

Misra, R., Faiz, O., Munkholm, P., Burisch, J., & Arebi, N. (2018). Epidemiology of inflammatory bowel disease in racial and ethnic migrant groups. *World J Gastroenterol, 24*(3), 424-437. doi:10.3748/wjg.v24.i3.424

Mitchell, A. M., Crane, P. A., & Kim, Y. (2008). Perceived stress in survivors of suicide: psychometric properties of the Perceived Stress Scale. *Research in nursing & health, 31*(6), 576-585.

Mitsuyama, K., Sata, M., & Rose-John, S. (2006). Interleukin-6 trans-signaling in inflammatory bowel disease. *Cytokine & growth factor reviews, 17*(6), 451-461.

Mittermaier, C., Dejaco, C., Waldhoer, T., Oefferlbauer-Ernst, A., Miehsler, W., Beier, M., . . . Moser, G. (2004). Impact of depressive mood on relapse in patients with inflammatory bowel disease: a prospective 18-month follow-up study. *Psychosom Med, 66*(1), 79-84.

Molodecky, N. A., & Kaplan, G. G. (2010). Environmental risk factors for inflammatory bowel disease. *Gastroenterol Hepatol (N Y), 6*(5), 339-346.

Molodecky, N. A., Soon, I. S., Rabi, D. M., Ghali, W. A., Ferris, M., Chernoff, G., . . . Kaplan, G. G. (2012). Increasing incidence and prevalence of the inflammatory bowel diseases with time, based on systematic review. *Gastroenterology, 142*(1), 46-54.e42; quiz e30. doi:10.1053/j.gastro.2011.10.001

Moloney, R. D., Johnson, A. C., O'Mahony, S. M., Dinan, T. G., Greenwood-Van Meerveld, B., & Cryan, J. F. (2016). Stress and the Microbiota-Gut-Brain Axis in Visceral Pain:

Relevance to Irritable Bowel Syndrome. *CNS Neurosci Ther, 22*(2), 102-117. doi:10.1111/cns.12490

Montgomery Jr, S. R., Butler, P. D., Wirtalla, C. J., Collier, K. T., Hoffman, R. L., Aarons, C. B., . . . Kelz, R. R. (2018). Racial disparities in surgical outcomes of patients with Inflammatory Bowel Disease. *The American Journal of Surgery, 215*(6), 1046-1050.

Moody, D. L. B., Chang, Y.-F., Pantesco, E. J., Darden, T. M., Lewis, T. T., Brown, C., . . . Matthews, K. A. (2019). Everyday Discrimination Prospectively Predicts Blood Pressure Across 10 Years in Racially/Ethnically Diverse Midlife Women: Study of Women's Health Across the Nation. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine, 53*(7), 608-620. doi:10.1093/abm/kay069

Moradkhani, A., Beckman, L. J., & Tabibian, J. H. (2013). Health-related quality of life in inflammatory bowel disease: psychosocial, clinical, socioeconomic, and demographic predictors. *J Crohns Colitis, 7*(6), 467-473. doi:10.1016/j.crohns.2012.07.012

Morello-Frosch, R., Zuk, M., Jerrett, M., Shamasunder, B., & Kyle, A. D. (2011). Understanding the cumulative impacts of inequalities in environmental health: implications for policy. *Health Aff (Millwood), 30*(5), 879-887. doi:10.1377/hlthaff.2011.0153

Morgan, X. C., Tickle, T. L., Sokol, H., Gevers, D., Devaney, K. L., Ward, D. V., . . . Snapper, S. B. (2012). Dysfunction of the intestinal microbiome in inflammatory bowel disease and treatment. *Genome biology, 13*(9), R79.

Moskovitz, D. N., Maunder, R. G., Cohen, Z., McLeod, R. S., & MacRae, H. (2000). Coping behavior and social support contribute independently to quality of life after surgery for inflammatory bowel disease. *Dis Colon Rectum, 43*(4), 517-521.

Moulton, C. D., Pavlidis, P., Norton, C., Norton, S., Pariante, C., Hayee, B., & Powell, N. (2019). Depressive symptoms in inflammatory bowel disease: an extraintestinal manifestation of inflammation? *Clinical & Experimental Immunology*.

Mowat, C., Cole, A., Windsor, A., Ahmad, T., Arnott, I., Driscoll, R., . . . Younge, L. (2011). Guidelines for the management of inflammatory bowel disease in adults. *Gut, 60*(5), 571-607.

Nagalingam, N. A., & Lynch, S. V. (2012). Role of the microbiota in inflammatory bowel diseases. *Inflammatory bowel diseases, 18*(5), 968-984.

Neff. (2003). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*(2), 85-101.

Neff. (2016). The self-compassion scale is a valid and theoretically coherent measure of self-compassion. *Mindfulness, 7*(1), 264-274.

Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive psychological functioning. *Journal of research in personality, 41*(1), 139-154.

Nelson, A. (2002). Unequal treatment: confronting racial and ethnic disparities in health care. *Journal of the National Medical Association, 94*(8), 666.

Neuendorf, R., Harding, A., Stello, N., Hanes, D., & Wahbeh, H. (2016). Depression and anxiety in patients with inflammatory bowel disease: a systematic review. *Journal of psychosomatic research, 87*, 70-80.

Ng, S. C., Tang, W., Leong, R. W., Chen, M., Ko, Y., Studd, C., . . . De Silva, H. (2015). Environmental risk factors in inflammatory bowel disease: a population-based case-control study in Asia-Pacific. *Gut, 64*(7), 1063-1071.

Nguyen, G. C., Chong, C. A., & Chong, R. Y. (2014). National estimates of the burden of inflammatory bowel disease among racial and ethnic groups in the United States. *Journal of Crohn's and Colitis, 8*(4), 288-295.

Nicolai, M. P., Keller, J. J., de Vries, L., van der Meulen-de, A. E., Nicolai, J. J., Hardwick, J. C., . . . Elzevier, H. W. (2014). The impact of sexual abuse in patients undergoing colonoscopy. *PloS one, 9*(1), e85034.

NIMH. (2016). Anxiety Disorders.

Ogura, Y., Bonen, D. K., Inohara, N., Nicolae, D. L., Chen, F. F., Ramos, R., . . . Duerr, R. H. (2001). A frameshift mutation in NOD2 associated with susceptibility to Crohn's disease. *Nature, 411*(6837), 603.

Ong, A. D., Bergeman, C. S., Bisconti, T. L., & Wallace, K. A. (2006). Psychological resilience, positive emotions, and successful adaptation to stress in later life. *Journal of personality and social psychology, 91*(4), 730.

Organization, W. H. (2013). *Mental Health Action Plan 2013-2020*. Retrieved from WHO Document Production Services:

Orholm, M., Binder, V., Sorensen, T. I., Rasmussen, L. P., & Kyvik, K. O. (2000). Concordance of inflammatory bowel disease among Danish twins. Results of a nationwide study. *Scand J Gastroenterol, 35*(10), 1075-1081.

Ostir, G. V., Markides, K. S., Black, S. A., & Goodwin, J. S. (2000). Emotional well-being predicts subsequent functional independence and survival. *Journal of the American Geriatrics Society, 48*(5), 473-478.

Ostir, G. V., Markides, K. S., Peek, M. K., & Goodwin, J. S. (2001). The association between emotional well-being and the incidence of stroke in older adults. *Psychosomatic medicine, 63*(2), 210-215.

Ozbay, F., Johnson, D. C., Dimoulas, E., Morgan III, C., Charney, D., & Southwick, S. (2007). Social support and resilience to stress: from neurobiology to clinical practice. *Psychiatry (Edgmont), 4*(5), 35.

Parent, M. C. (2013). Handling item-level missing data: Simpler is just as good. *The Counseling Psychologist, 41*(4), 568-600.

Park, Naliboff, B., Shih, W., Presson, A., Videlock, E., Ju, T., . . . Chang, L. (2018). Resilience is decreased in irritable bowel syndrome and associated with symptoms and cortisol response. *Neurogastroenterology & Motility, 30*(1).

Pascoe, E. A., & Smart Richman, L. (2009). Perceived discrimination and health: a meta-analytic review. *Psychological bulletin, 135*(4), 531-554. doi:10.1037/a0016059

Persoons, P., Vermeire, S., Demyttenaere, K., Fischler, B., Vandenberghe, J., Van Oudenhove, L., . . . Noman, M. (2005). The impact of major depressive disorder on the short-and long-term outcome of Crohn's disease treatment with infliximab. *Alimentary pharmacology & therapeutics, 22*(2), 101-110.

Peterson, C. (2008). What is Positive Psychology and What Is It Not?

Peyrin-Biroulet, L., Sandborn, W., Sands, B., Reinisch, W., Bemelman, W., Bryant, R., . . . Feagan, B. (2015). Selecting therapeutic targets in inflammatory bowel disease (STRIDE): determining therapeutic goals for treat-to-target. *American Journal of Gastroenterology, 110*(9), 1324-1338.

Pinto-Meza, A., Moneta, M. V., Alonso, J., Angermeyer, M. C., Bruffaerts, R., Caldas de Almeida, J. M., . . . Haro, J. M. (2013). Social inequalities in mental health: results from

the EU contribution to the World Mental Health Surveys Initiative. *Soc Psychiatry Psychiatr Epidemiol, 48*(2), 173-181. doi:10.1007/s00127-012-0536-3

Pinto-Gouveia, J., Duarte, C., Matos, M., & Fráguas, S. (2014). The protective role of self-compassion in relation to psychopathology symptoms and quality of life in chronic and in cancer patients. *Clinical psychology & psychotherapy, 21*(4), 311-323.

Podolsky, D. K. (2002). Inflammatory bowel disease. *N Engl J Med, 347*(6), 417-429. doi:10.1056/NEJMra020831

Prefontaine, E., Sutherland, L. R., MacDonald, J. K., & Cepoiu, M. (2009). Azathioprine or 6-mercaptopurine for maintenance of remission in Crohn's disease. *Cochrane Database Syst Rev, 1*(1).

Pressman, S. D., & Cohen, S. (2005). Does positive affect influence health? *Psychological bulletin, 131*(6), 925.

Prevention, C. f. D. C. a. (2018). Prevention.

Prevention, C. f. D. C. a. (2018). What is inflammatory bowel disease (IBD)?

Prevention, O. o. D., & Promotion, H. (2000). US Department of Health and Human Services: Healthy People 2010. *http://www/health/gov/healthypeople/*.

Promotion, N. C. f. C. D. P. a. H. (2015). The Four Domains of Chronic Disease Prevention.

Purc-Stephenson, R., Bowlby, D., & Qaqish, S. (2015). "A gift wrapped in barbed wire" Positive and negative life changes after being diagnosed with inflammatory bowel disease. *Quality of Life Research, 24*(5), 1197-1205.

Raes, F. (2010). Rumination and worry as mediators of the relationship between self-compassion and depression and anxiety. *Personality and Individual Differences, 48*(6), 757-761.

Reilly, M. C. (2008). Development of the Work Productivity and Activity Impairment (WPAI) Questionnaire. *New York: Margaret Reilly associates. Retrieved from*.

Reivich, K. J., Seligman, M. E., & McBride, S. (2011). Master resilience training in the U.S. Army. *Am Psychol, 66*(1), 25-34. doi:10.1037/a0021897

Reupert, A. (2017). A socio-ecological framework for mental health and well-being. In: Taylor & Francis.

Reupert, A., Maybery, D., Cox, M., & Scott Stokes, E. (2015). Place of family in recovery models for those with a mental illness. *International journal of mental health nursing, 24*(6), 495-506.

Rhee, S. H., Pothoulakis, C., & Mayer, E. A. (2009). Principles and clinical implications of the brain-gut-enteric microbiota axis. *Nature reviews. Gastroenterology & hepatology, 6*(5), 306-314. doi:10.1038/nrgastro.2009.35

Rodriguez-Rey, R., Alonso-Tapia, J., & Hernansaiz-Garrido, H. (2016). Reliability and validity of the Brief Resilience Scale (BRS) Spanish Version. *Psychol Assess, 28*(5), e101-e110. doi:10.1037/pas0000191

Rose, A. L., & Kocovski, N. L. The Social Self-Compassion Scale (SSCS): Development, Validity, and Associations with Indices of Well-Being, Distress, and Social Anxiety.

Russo, S. J., Murrough, J. W., Han, M. H., Charney, D. S., & Nestler, E. J. (2012). Neurobiology of resilience. *Nat Neurosci, 15*(11), 1475-1484. doi:10.1038/nn.3234

Rutgeerts, P. (2006). Review article: recurrence of Crohn's disease after surgery - the need for treatment of new lesions. *Aliment Pharmacol Ther, 24 Suppl 3*, 29-32. doi:10.1111/j.1365-2036.2006.03056.x

Sajadinejad, M. S., Asgari, K., Molavi, H., Kalantari, M., & Adibi, P. (2012). Psychological issues in inflammatory bowel disease: an overview. *Gastroenterology research and practice, 2012*.

Sallis, J. F., Owen, N., & Fisher, E. (2015). Ecological models of health behavior. *Health behavior: Theory, research, and practice, 5*, 43-64.

Sandborn, W. J. (2014). Crohn's disease evaluation and treatment: clinical decision tool. *Gastroenterology, 147*(3), 702-705.

Scardillo, J., Dunn, K. S., & Piscotty, R., Jr. (2016). Exploring the Relationship Between Resilience and Ostomy Adjustment in Adults With a Permanent Ostomy. *J Wound Ostomy Continence Nurs, 43*(3), 274-279. doi:10.1097/won.0000000000000222

Schoultz, M., Atherton, I., & Watson, A. (2015). Mindfulness-based cognitive therapy for inflammatory bowel disease patients: findings from an exploratory pilot randomised controlled trial. *Trials, 16*(1), 379.

Sehgal, P., Abrahams, E., Ungaro, R. C., Dubinsky, M., & Keefer, L. (2017). Resilience is Associated with Lower Rates of Depression and Anxiety, and Higher Quality of Life in Inflammatory Bowel Disease Patients. *Gastroenterology, 152*(5), S797-S798.

Seligman. (2012). *Flourish: A visionary new understanding of happiness and well-being*: Simon and Schuster.

Seligman, M., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist, 55*(1), 5-14. doi:10.1037/0003-066X.55.1.5

Seligman, M. E. (2002). Positive psychology, positive prevention, and positive therapy. *Handbook of positive psychology, 2*(2002), 3-12.

Selinger, C. P., Ghorayeb, J., & Madill, A. (2016). What Factors Might Drive Voluntary Childlessness (VC) in Women with IBD? Does IBD-specific Pregnancy-related Knowledge Matter? *J Crohns Colitis, 10*(10), 1151-1158. doi:10.1093/ecco-jcc/jjw078

Sewell, J. L., & Velayos, F. S. (2013). Systematic review: The role of race and socioeconomic factors on IBD healthcare delivery and effectiveness. *Inflamm Bowel Dis, 19*(3), 627-643. doi:10.1002/ibd.22986

Sewitch, M. J., Abrahamowicz, M., Bitton, A., Daly, D., Wild, G. E., Cohen, A., . . . Dobkin, P. L. (2001). Psychological distress, social support, and disease activity in patients with inflammatory bowel disease. *Am J Gastroenterol, 96*(5), 1470-1479. doi:10.1111/j.1572-0241.2001.03800.x

Sexton, K. A., Targownik, L., Walker, J. R., Graff, L. A., Miller, N., Rogala, L., . . . Bernstein, C. N. (2014). Sa1201 Development of an IBD Symptom Self-Report Scale for Research and Clinical Application. *Gastroenterology, 146*(5), S-228-S-229.

Shafer, L. A., Walker, J. R., Restall, G., Chhibba, T., Ivekovic, M., Singh, H., . . . Bernstein, C. N. (2018). Association Between IBD Disability and Reduced Work Productivity (Presenteeism): A Population-Based Study in Manitoba, Canada. *Inflammatory bowel diseases*.

Shensa, A., Sidani, J. E., Lin, L. Y., Bowman, N. D., & Primack, B. A. (2016). Social Media Use and Perceived Emotional Support Among US Young Adults. *J Community Health, 41*(3), 541-549. doi:10.1007/s10900-015-0128-8

Shi, H. Y., Levy, A. N., Trivedi, H. D., Chan, F. K. L., Ng, S. C., & Ananthakrishnan, A. N. (2018). Ethnicity Influences Phenotype and Outcomes in Inflammatory Bowel Disease: A

Systematic Review and Meta-analysis of Population-based Studies. *Clin Gastroenterol Hepatol, 16*(2), 190-197.e111. doi:10.1016/j.cgh.2017.05.047

Shin, C., Lee, S.-H., Han, K.-M., Yoon, H.-K., & Han, C. (2019). Comparison of the usefulness of the PHQ-8 and PHQ-9 for screening for major depressive disorder: analysis of psychiatric outpatient data. *Psychiatry investigation, 16*(4), 300.

Sibaja, M. D., Moreno, M. C., & Hesse, B. M. (2007). Protocolized cognitive-behavioural group therapy for inflammatory bowel disease. *Revista Espanola de Enfermedades Digestivas, 99*(10), 593.

Simpson, S. M., Krishnan, L. L., Kunik, M. E., & Ruiz, P. (2007). Racial disparities in diagnosis and treatment of depression: a literature review. *Psychiatric Quarterly, 78*(1), 3-14.

Simren, M., Axelsson, J., Gillberg, R., Abrahamsson, H., Svedlund, J., & Bjornsson, E. S. (2002). Quality of life in inflammatory bowel disease in remission: the impact of IBS-like symptoms and associated psychological factors. *Am J Gastroenterol, 97*(2), 389-396. doi:10.1111/j.1572-0241.2002.05475.x

Singh, S., Graff, L. A., & Bernstein, C. N. (2009). Do NSAIDs, antibiotics, infections, or stress trigger flares in IBD? *Am J Gastroenterol, 104*(5), 1298-1313; quiz 1314. doi:10.1038/ajg.2009.15

Sirois, F. M., & Hirsch, J. K. (2017). A longitudinal study of the profiles of psychological thriving, resilience, and loss in people with inflammatory bowel disease. *British Journal of Health Psychology, 22*(4), 920-939. doi:10.1111/bjhp.12262

Sirois, F. M., Kitner, R., & Hirsch, J. K. (2015). Self-compassion, affect, and health-promoting behaviors. *Health Psychology, 34*(6), 661-669. doi:10.1037/hea0000158

10.1037/hea0000158.supp (Supplemental)

Sirois, F. M., Molnar, D. S., & Hirsch, J. K. (2015). Self-compassion, stress, and coping in the context of chronic illness. *Self and Identity, 14*(3), 334-347.

Slonim-Nevo, V., Sarid, O., Friger, M., Schwartz, D., Sergienko, R., Pereg, A., . . . Odes, S. (2018). Effect of Social Support on Psychological Distress and Disease Activity in Inflammatory Bowel Disease Patients. *Inflamm Bowel Dis, 24*(7), 1389-1400. doi:10.1093/ibd/izy041

Smarr, K. L., & Keefer, A. L. (2011). Measures of depression and depressive symptoms: Beck Depression Inventory-II (BDI-II), Center for Epidemiologic Studies Depression Scale (CES-D), Geriatric Depression Scale (GDS), Hospital Anxiety and Depression Scale (HADS), and Patient Health Questionnaire-9 (PHQ-9). *Arthritis care & research, 63*(S11).

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International journal of behavioral medicine, 15*(3), 194-200.

Soto, J. A., Dawson-Andoh, N. A., & BeLue, R. (2011). The relationship between perceived discrimination and Generalized Anxiety Disorder among African Americans, Afro Caribbeans, and non-Hispanic Whites. *J Anxiety Disord, 25*(2), 258-265. doi:10.1016/j.janxdis.2010.09.011

Spitzer, R. L., Kroenke, K., Williams, J. B., & Group, P. H. Q. P. C. S. (1999). Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. *Jama, 282*(18), 1737-1744.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of internal medicine, 166*(10), 1092-1097.

Stange, E., Travis, S., Vermeire, S., Beglinger, C., Kupcinkas, L., Geboes, K., . . . Warren, B. (2006). European evidence based consensus on the diagnosis and management of Crohn's disease: definitions and diagnosis. *Gut, 55*(suppl 1), i1-i15.

Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion, 10*(4), 282-298.

Sweeney, L., Moss-Morris, R., Czuber-Dochan, W., Meade, L., Chumbley, G., & Norton, C. (2018). Systematic review: psychosocial factors associated with pain in inflammatory bowel disease. *Alimentary pharmacology & therapeutics, 47*(6), 715-729.

Szigethy, E., Allen, J. I., Reiss, M., Cohen, W., Perera, L. P., Brillstein, L., . . . Colton, J. B. (2017). White Paper AGA: the impact of mental and psychosocial factors on the care of patients with inflammatory bowel disease. *Clinical Gastroenterology and Hepatology, 15*(7), 986-997.

Szigethy, E., Hardy, D., Craig, A. E., Low, C., & Kukic, S. (2009). Girls connect: effects of a support group for teenage girls with inflammatory bowel disease and their mothers. *Inflammatory bowel diseases, 15*(8), 1127-1128.

Szigethy, E., Youk, A. O., Benhayon, D., Fairclough, D. L., Newara, M. C., Kirshner, M. A., . . . Srinath, A. I. (2014). Depression subtypes in pediatric inflammatory bowel disease. *Journal of pediatric gastroenterology and nutrition, 58*(5), 574.

Szigethy, E., Youk, A. O., Gonzalez-Heydrich, J., Bujoreanu, S. I., Weisz, J., Fairclough, D., . . . Keljo, D. (2015). Effect of 2 psychotherapies on depression and disease activity in pediatric Crohn's disease. *Inflammatory bowel diseases, 21*(6), 1321-1328.

Taft, T. H., & Keefer, L. (2016). A systematic review of disease-related stigmatization in patients living with inflammatory bowel disease. *Clinical and experimental gastroenterology, 9*, 49.

Tanaka, Y., Kanazawa, M., Fukudo, S., & Drossman, D. A. (2011). Biopsychosocial model of irritable bowel syndrome. *Journal of neurogastroenterology and motility, 17*(2), 131.

Targownik, L. E., Sexton, K. A., Bernstein, M. T., Beatie, B., Sargent, M., Walker, J. R., & Graff, L. A. (2015). The relationship among perceived stress, symptoms, and inflammation in persons with inflammatory bowel disease. *The American journal of gastroenterology, 110*(7), 1001.

Timm, S., Svanes, C., Janson, C., Sigsgaard, T., Johannessen, A., Gislason, T., . . . Torén, K. (2014). Place of upbringing in early childhood as related to inflammatory bowel diseases in adulthood: a population-based cohort study in Northern Europe. *European journal of epidemiology, 29*(6), 429-437.

Tougas, G. (2000). The autonomic nervous system in functional bowel disorders. *Gut, 47*(suppl 4), iv78-iv80.

Trindade, I., Ferreira, C., & Pinto-Gouveia. (2015). *Self-Compassion buffers the harmful effect of anxiety on IBD patients' psychological quality of life*. Paper presented at the European Association for Behavioural and Cognitive Therapies, Jerusalem, Israel.

Tugade, M. M., Fredrickson, B. L., & Feldman Barrett, L. (2004). Psychological resilience and positive emotional granularity: Examining the benefits of positive emotions on coping and health. *Journal of personality, 72*(6), 1161-1190.

UNICEF. (2009). *Communication for Development (C4D) Capability Development Framework*. Retrieved from http://intranet.unicef.org/pd/cbsc.nsf/Site%20Pages/Page01?OpenDocument&TableRow=3.2.3#3.2.:

Van Dam, N. T., Sheppard, S. C., Forsyth, J. P., & Earleywine, M. (2011). Self-compassion is a better predictor than mindfulness of symptom severity and quality of life in mixed anxiety and depression. *Journal of anxiety disorders, 25*(1), 123-130.

Van Limbergen, J., Wilson, D. C., & Satsangi, J. (2009). The genetics of Crohn's disease. *Annu Rev Genomics Hum Genet, 10*, 89-116. doi:10.1146/annurev-genom-082908-150013

VanDussen, K. L., Liu, T.-C., Li, D., Towfic, F., Modiano, N., Winter, R., . . . Targan, S. R. (2014). Genetic variants synthesize to produce paneth cell phenotypes that define subtypes of Crohn's disease. *Gastroenterology, 146*(1), 200-209.

VanVoorhis, C. W., & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in quantitative methods for psychology, 3*(2), 43-50.

Vasic, V., & Schmidt, M. H. H. (2017). Resilience and Vulnerability to Pain and Inflammation in the Hippocampus. *Int J Mol Sci, 18*(4). doi:10.3390/ijms18040739

Vergara, M., Montserrat, A., Casellas, F., Villoria, A., Suarez, D., Maudsley, M., . . . Calvet, X. (2011). A new validation of the Spanish Work Productivity and Activity Impairment Questionnaire-Crohn's disease version. *Value Health, 14*(6), 859-861. doi:10.1016/j.jval.2011.02.1179

Vermeire, S., Schreiber, S., Sandborn, W. J., Dubois, C., & Rutgeerts, P. (2010). Correlation between the Crohn's disease activity and Harvey–Bradshaw indices in assessing Crohn's disease severity. *Clinical Gastroenterology and Hepatology, 8*(4), 357-363.

Vigano, C., Calzolari, R., Marinaccio, P. M., Bezzio, C., Furfaro, F., Ba, G., & Maconi, G. (2016). Unrevealed Depression Involves Dysfunctional Coping Strategies in Crohn's Disease Patients in Clinical Remission. *Gastroenterol Res Pract, 2016*, 7803262. doi:10.1155/2016/7803262

Voth, J., & Sirois, F. M. (2009). The role of self-blame and responsibility in adjustment to inflammatory bowel disease. *Rehabil Psychol, 54*(1), 99.

Walmsley, R. S., Ayres, R. C., Pounder, R. E., & Allan, R. N. (1998). A simple clinical colitis activity index. *Gut, 43*(1), 29-32.

Wijmenga, C. (2005). Expressing the differences between Crohn disease and ulcerative colitis. *PLoS medicine, 2*(8), e230.

Williams, D. R., Yan, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial Differences in Physical and Mental Health: Socio-economic Status, Stress and Discrimination. *J Health Psychol, 2*(3), 335-351. doi:10.1177/135910539700200305

Windle, G., Bennett, K. M., & Noyes, J. (2011). A methodological review of resilience measurement scales. *Health and quality of life outcomes, 9*(1), 8.

Yarur, A., & Kane, S. V. (2013). Update on pregnancy and breastfeeding in the era of biologics. *Dig Liver Dis, 45*(10), 787-794. doi:10.1016/j.dld.2013.02.001

Zelante, A., De, A. G., Borgoni, R., Trevisani, L., & Gallerani, M. (2014). Adherence to medical treatment in inflammatory bowel disease patients. *Minerva gastroenterologica e dietologica, 60*(4), 269-274.

Zessin, U., Dickhäuser, O., & Garbade, S. (2015). The relationship between self-compassion and well-being: A meta-analysis. *Applied Psychology: Health and Well-Being, 7*(3), 340-364.

Zimmerman, F. J., & Katon, W. (2005). Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship? *Health economics, 14*(12), 1197-1215.

Appendix A. Full Demographic Variables

Recruitment N (%)	
Clinic	63 (61.8%)
Phone	39 (38.2%)
Self-Identified Gender N (%)	
Female	62 (61.4%)
Male	37 (36.6%)
Transgender	1 (1%)
Other (fluid)	1 (1%)
Biological Sex	
Female	63 (62%)
Male	39 (38%)
Age mean (SD), median (range)	40.01 (13.61), 37.0 (20-70)
Time US mean (SD), median (range)	38.41 (14.62), 35.0 (5.0-70)
Race	
White	83 (81%)
Black/AA	6 (6%)
Asian	4 (4%)
Other	8 (8%)
Hispanic or Latinx (4)	
White from Iran (1)	
Mixed Race (1)	
Mestizo (1)	
Eastern European Jew (1)	
Ethnicity	
Hispanic or Latino/a/x	8 (8%)
Not Hispanic or Latino/a/x	86 (84%)
BMI mean (SD), median (range)	25.18 (5.95), 24.0 (17.2-52)
Country of Origin	
USA	91 (89%)
Abroad	11 (11%)
Serbia (1)	
India (2)	
Bosnia (2)	
England (1)	
Italy (1)	
Jamaica (1)	
Iran (1)	
Dominican Republic (1)	
Belarus (1)	
Relationship Status	
Partnered	58 (57%)
Married/Life partner (50)	
Cohabitating (8)	
Single	43 (42%)

Divorced (7)	
Separated (1)	
Single/never married (35)	
Income	
<$50K	40 (40%)
< 25,000 (13)	
25,001 - 50,000 (14)	
Prefer not to say (13)	59 (58%)
>$50K	
50,001 - 75,000 (14)	
75,001 - 100,000 (15)	
>100,000 (30)	
Education	
Below College	24 (24%)
Less than high school (1)	
High school or equivalent (5)	
Vocational or Technical school (1)	
Associates (6)	
Some College (11)	
College +	77 (75%)
Bachelor's Degree (33)	
Master's Degree (31)	
Doctoral level degree (13)	
Employment	
Yes	83 (81%)
Full-time employment (68)	
Part-time employment (8)	
Student (5)	
Employed but on medical/sick leave (1)	
No	18 (18%)
Unemployed/looking for work (2)	
Homemaker (7)	
Retired (4)	
Disabled/unable to work (5)	
IBD	
UC	43 (42%)
CD	59 (58%)
Age Dx mean (SD), median (range)	24.68 (11.57) 23.0 (1.0 - 65)
Disease Activity	
Active	45 (44%)
UC (10)	
CD (35)	
Remission	57 (56%)
UC (33)	
CD (24)	