Research Paper

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Family support as a pain protective factor for African American older adults: latent class analyses across 2 national longitudinal data sets

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Abstract

Family relationships dynamically affect pain outcomes. However, less is known about African American family relationships and chronic pain incidence and persistence. Using theoretically driven group characterizations of *family emotional climate* (FEC; Strained, Supportive, and Disengaged) across multiple relationship types, we conducted latent class analyses in 2 nationally representative data sets (Midlife in the United States [MIDUS]; Health Retirement Study [HRS]) aimed to identify a more ecologically valid model of family relationships and determine how the identified FEC groups, separately and concurrently, connect to chronic pain incidence and persistence for aging African Americans. For the family-only models in MIDUS and HRS, using logistic regression, Strained FEC compared with Supportive FEC increased the risk of pain incidence (odds ratio [OR] = 2.06) in MIDUS and the risk of pain persistence (OR = 2.14) in HRS. The next models extended to include parent–child relationships in HRS identified 4 FEC groups (eg, Strained Family and Parent–Child, Supportive and Strained Family and Parent–Child, Supportive Family and Parent–Child, and Disengaged Family and Parent–Child FEC). Again, using logistic regression, we identified a greater risk of pain incidence was linked to Strained Family and Parent–Child FEC (OR = 1.36) and Supportive and Strained Family and Parent–Child FEC (OR = 1.22), although not Disengaged Family and Parent–Child FEC (OR = 0.71). Strained Family and Parent–Child FEC also related to greater risk of pain persistence (OR = 1.89) compared with Supportive Family and Parent–Child FEC. These findings suggest utilization of a multidimensional modeling of family relationships to contextualize pain outcomes for aging African Americans.

Keywords: Chronic pain, Family support, Family strain, African Americans, Latent class analysis

1. Introduction

Aging African Americans experience substantial pain disparities compared with their White counterparts, including higher rates of pain intensity and pain-related disability, less participation in clinical pain maintenance, and more representation in the highest pain trajectory groups.[15,16,20,36] These inequities can partially be explained by various socioecological systems, where this population has been historically subjected to systemic stigmatization, socioeconomic disadvantage, and medical malpractice.[24] However, 1 social determinant that is rarely explored within the contact of risk and resilience is the effect of family relationships on chronic pain and high-impact chronic pain (HICP; pain interfering with daily living) trajectories.[24,38]

Seminal studies established that adults with limited or nonsupportive families experienced more pain and that family has a larger and more consistent impact on health than marital partners,[14,44] indicating both the importance of family relationship quality and family member beyond marital partners. More recent research identified chronic family-related stress as the second leading stressor linked to HICP among African Americans and Whites.[37] Though increasing evidence suggests aging African Americans may use alternative pain coping strategies in response to prevalent socioecological systems, including increased mobilization of social support networks and greater familial cohesion related to health events, this culturally specific use of family relationships is inconclusive in current chronic pain research.[24] Variability in identifying family relationships and their influence on risk or resilience for pain incidence, management, and persistence among aging African Americans has led to inconsistency in formulating cultural-specific interventions and requires further investigation.

African American families provide more support to and more frequent daily interactions with extended family members compared with their White peers.[38,39] In the context of chronic illness and aging, extended African American family members, compared with spouses, assist more with caregiving and managing health behaviors, which is different from their White peers who rely more on spousal relationship.[2,7] Thus, African

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Americans often incorporate collectivistic family relationships including extended family and kin, creating flexible boundaries in regard to who is and is not in the family and which extends to how they respond to family members' health and illness.[18] Therefore, understanding the within-group difference for African American families and pain may be particularly important for future intervention development.

Prior research leveraging data sets used in this study found supportive family relationships were linked to (1) less risk of developing chronic pain and (2) greater likelihood of chronic pain remitting.[46] Contrastingly, strained parent–child relationships coincided with greater risk of chronic pain incidence for aging African Americans.[46] However, pain research has largely investigated single indicators of family relationship quality—emphasizing *either* the positive *or* negative quality of 1 relationship. Woods et al.[46] advanced this construct to test positive *and* negative relationship quality, separately and concurrently, across several family relationships types (ie, intimate partner, parent–adult child, extended family members), whereby within-group differences (ie, type and quality of family relationships) can be used to predict pain incidence and persistence for this vulnerable population. To test a more ecologically valid model of family relationships, evaluating how individuals' differential reports of support *and* strain co-occur and connect to pain could render a more culturally relevant, acceptable model for mitigating pain disparities for aging African Americans.

2. Method

2.1. Theoretical framework

Providing theoretical framework for multidimensional modeling of family relationships, the Biobehavioral Family Model (BBFM), posits that *family emotional climate* (*FEC*)—the balance of intensity and valence (positivity or negativity) of family emotional exchange—affects disease activity (eg, chronic pain) over time.[42,43] Previous BBFM-based research has modeled FEC to include parent–child relationships experienced in childhood, family strain, and family support.[26–28,47] To our knowledge, only 1 adult health study modeled multidimensional representation of FEC, though in a primarily White midlife in the United States (MIDUS) sample.[47] This latent class analysis (LCA) indicated that group characterization of negative FEC (high family strain, low family support, and low parental affection) was tied to worse health outcomes compared with other FEC groups (eg, positive, indifferent).

Research using single indicators of family relationship quality can only suggest single interventions.[46] However, aging African Americans are nested in multiple, overlapping, concurrent, culturally specific experiences of family support and strain. Building on prior research linking single indicators of family relationships to chronic pain outcomes,[47] the aim of this study was to identify multidimensional FEC groups by incorporating positive and negative family relationship quality across multiple African American family relationships (ie, parent–child and extended family) and, secondly, determine how the identified FEC groups are linked to chronic pain outcomes 10 years later.

2.2. Samples

We use MIDUS and Health and Retirement Study (HRS), which were both developed to test aging health pathways. Each data set has unique, complementary strengths, and the capacity to adequately power the study's specific aims through epidemiological samples representative of African Americans experiencing pain. Although these 2 data sets have their strengths—MIDUS includes rich measures of pain interference and pain-related diagnoses, HRS provides more diverse assessment of different family relationship (eg, parent–adult child). They also share similar pain assessments, relationship assessment questions, and control variables allowing us to replicate and extend results across the 2 samples.

2.2.1. Midlife in the United States

Midlife in the United States is a nationally representative study of aging, beginning in 1995/1996 and spanning 20 years and 3 waves. We specifically selected African American/Black participants in the MIDUS 2 core[31] and Milwaukee[30] projects (2004-2006), as chronic pain was not assessed in the initial wave of MIDUS (ie, MIDUS 1). The MIDUS Milwaukee project was initiated at MIDUS 2 to enhance study diversity by recruiting new probability–sampled African American participants from Milwaukee, WI. In total, 755 participants at baseline completed the study's dichotomous pain status question ("Do you have chronic pain that persists beyond the time of normal healing and has lasted anywhere from a few months to many years?") and were included regardless of response. The majority of this sample (62.4%) responded again at the study's subsequent wave, MIDUS 3 core[29]/Milwaukee[30] (2013-2014).

2.2.2. Health and retirement study

Health and retirement study is a biennial, longitudinal panel study of aging, including over 37,000 American adults recruited from households with an age-eligible family member (50 years or older).[35] The nationally representative study has specifically oversampled individuals identifying as Black or African American through enhanced recruitment in geographic areas with high densities of this population.[32] Health and retirement study's age inclusion criterion (≥50 years for primary respondents) presents an opportunity to capture an older sample compared with MIDUS. To achieve replication, we selected African American participants in the 2006 wave of HRS[11] (contemporaneously aligning with MIDUS 2 as our baseline) who completed the study's dichotomous pain status question ("Are you often troubled with pain?"; N = 2585). The majority of this sample (55.8%) responded to this same item at our selected 10-year follow-up wave in 2016.[12]

2.3. Measures

2.3.1. Chronic pain

We determined pain incidence (ie, the development of new chronic pain) and pain persistence (ie, the presence of chronic pain over time) using each study's dichotomous pain status item. Participants who were pain free at baseline were considered as having developed pain if they answered "Yes" to the pain status item at follow-up, consistent with prior pain research.[22,46] Chronic pain present in both survey years was considered persistent pain. Participants who reported cancer-related pain and/or a current cancer diagnosis with ongoing cancer-related treatment were excluded to focus on nonmalignant pain.

2.3.2. Family emotional climate

Indicators of FEC were operationalized using baseline measures of family relationship (ie, family members other than parent–child and intimate partner) strain and support and parent–child

relationship strain and support. The MIDUS self-administered questionnaire (completed by both the MIDUS 2 core and Milwaukee samples) included distinct, well-supported measures of family strain and family support.[40] These exact measures are also used in HRS through the study's self-administered Leave-Behind/Participant Lifestyle Questionnaire which is administered to rotating portions of the study sample biennially (in the present sample, 80.5% of those eligible to complete the Leave-Behind Questionnaire in 2006 completed the survey; 79.3% of those eligible in 2008 completed the survey).[25] While MIDUS defines "family" as "family members not including your spouse or partner,"[31] HRS defines "family" as "other immediate family, for example, any brothers or sisters, parents, cousins, or grandchildren" who do not reside with the respondent.[25] Health and retirement study also includes similar measures of parent–child strain and parent–child support (assessing the respondent's relationship quality with their living adult child/ren).[40]

Family strain and parent–child strain measures included 4 items each that assessed how often their family/child(ren) are critical, makes too many demands, lets the respondent down, and gets on the respondent's nerves. Family support and parent–child support measures included 3 items each, assessing how much the respondent's family/child(ren) understands the way they feel, can be opened up to discuss worries (ie, can be opened up to discuss worries), and can be relied on to help with serious problems. While MIDUS researchers asked for a fourth item in their version of the family support measure, this study included only items that were equivalent across MIDUS and HRS. All items used a 4-point Likert scale ranging from 1 (*a lot*) to 4 (*not at all*), and responses on each measure were reverse coded and averaged. Higher scores indicate a greater level of strain or support. Descriptive statistics for each of these FEC indicators are presented in **Table 1**.

2.3.3. Covariates

Age, sex, and incidence of pain-related comorbidities (ie, diabetes, multiple sclerosis, and other neurological disorders, given their possible impact on the development of neuropathic pain) are included as covariates in each of the models estimating pain incidence and pain persistence.

2.4. Analytic strategy

2.4.1. Estimating family emotional climate

To determine the different clusters patterns of strain and support in FEC, we used LCA—a person-centered approach (compared with a variable centered approach). This well-established method identifies groups of participants within each sample (ie, MIDUS, HRS) who are characterized by a similar FEC (ie, high or low support and strain), is preferred over traditional cluster analyses because it used probability,[34] and has been successfully used in chronic pain studies.[23] To do so, LCA models assume that a sample's distribution on a set of predetermined categorical observed variables or indicators, is the result of distinct underlying distributions, and identifies solutions that describe unique groups of a sample's participants with similar distributions on these sets of variables. After fitting the model (ie, identifying unique groups) to a sample as a whole, LCA calculates the probability of membership in each identified group for each individual participant. This allows for the categorization of research participants into unique groups with distinct features for the analyses' predetermined set of indicators. In our study, we applied LCA analyses to identify FEC groups first with MIDUS participants and then HRS participants. We included family strain and support measures into the LCA to identify the FEC groups in MIDUS and replicated them in HRS. We also included parent–child strain and parent–child support in HRS for a second estimation of FEC groups. All variables were dichotomized at the median. We preliminarily examined the bivariate associations between dichotomized family measures and our chronic pain outcomes using χ^2 analyses (**Table 2**).

In total, we ran 3 LCA models (1 in MIDUS and 2 in HRS). First, for the MIDUS sample, we ran a single LCA with the dichotomized family strain and support variables. We then completed 2 LCAs with the HRS sample: 1 *replicating* the MIDUS model (ie, with family support and strain variables only) and a second *extending* the family-only LCA model by adding the dichotomized parent–child strain and support measures. We tested all 3 LCA models using Mplus 8.1.[21] We used model fit indicators (ie, Akaike Information Criterion [AIC], Bayesian Information Criterion [BIC]) to determine the appropriate number of homogeneous FEC

Table 1

Family emotional climate variables and demographic covariates: descriptive statistics (N = 848, midlife in the United States; N = 2586, health and retirement study).

Variables	Dataset	M	SD	Range	n of items	α
Family strain	MIDUS	2.20	0.77	1-4	4	0.774
	HRS	1.74	0.69	1-4	4	0.778
Family support	MIDUS	3.33	0.75	1-4	3	0.789
	HRS	3.10	0.82	1-4	3	0.843
Parent–child strain	HRS	1.83	0.69	1-4	4	0.722
Parent–child support	HRS	3.30	0.74	1-4	3	0.817
Age	MIDUS	52.35	12.06	28-85	—	—
	HRS	66.65	10.92	26-101	—	—
Sex*	MIDUS	1.63	0.48	0-1	—	—
	HRS	0.64	0.48	0-1	—	—
Pain-related comorbidities†	MIDUS	0.18	0.39	0-1	—	—
	HRS	0.31	0.46	0-1	—	—

* Sex: 0 = male, 1 = female.

† Pain-related comorbidities: 0 = *none reported*, 1 = *presence of comorbidities*.

HRS, health and retirement study; MIDUS, midlife in the United States.

Table 2

Bivariate χ^2 analyses for family emotional climate variables and assigned latent class with pain incidence and pain persistence.

	MIDUS		HRS	
	Incidence	Persistence	Incidence	Persistence
Family support*	**$\chi^2(1) = 5.18$, $P = 0.02$**	$\chi^2(1) = 3.76$, $P = 0.52$	$\chi^2(1) = 0.02$, $P = 0.89$	$\chi^2(1) = 3.44$, $P = 0.06$
Family strain*	$\chi^2(1) = 1.73$, $P = 0.19$	$\chi^2(1) = 1.19$, $P = 0.28$	**$\chi^2(1) = 3.91$, $P = 0.04$**	**$\chi^2(1) = 4.52$, $P = 0.03$**
Parent–child support*	—	—	$\chi^2(1) = 0.27$, $P = 0.60$	$\chi^2(1) = 0.51$, $P = 0.47$
Parent–child strain*	—	—	**$\chi^2(1) = 5.00$, $P = 0.02$**	$\chi^2(1) = 0.47$, $P = 0.49$
Family FEC groups†	**$\chi^2(1) = 6.24$, $P = 0.01$**	$\chi^2(1) = 0.00$, $P = 0.99$	$\chi^2(1) = 2.94$, $P = 0.09$	**$\chi^2(1) = 8.80$, $P = 0.003$**
Family and parent–child FEC groups‡	—	—	**$\chi^2(3) = 9.23$, $P = 0.026$**	$\chi^2(3) = 5.67$, $P = 0.13$

Dashes (—) indicate variables were not included in the data set and thus model was not estimated with the MIDUS sample. Bolded results indicate statistically significant at $P < 0.05$.
* Family emotional climate variables are dichotomized at the median, within each data set. 0 = *below the median*, 1 = *at or above the median*.
† Family FEC Groups: 1 = *Supportive Family FEC*, 2 = *Strained Family FEC*.
‡ Family & Parent–Child FEC Groups: 1 = *Strained Family FEC*, 2 = *Ambivalent Family FEC*, 3 = *Supportive Family FEC*, 5 = *Disengaged Family & Parent–Child FEC*.
FEC, family emotional climate; HRS, health and retirement study; MIDUS, midlife in the United States.

groups that best explain the data (eg, 2, 3, or 4 groups). The best fitting LCA model (ie, the most appropriate number of FEC groups) will have the lowest AIC and BIC compared with other models while also considering theoretical fit and parsimony. We also examined entropy to assess separation between groups; higher entropy (>0.80) indicates better group separation, while lower entropy indicates that there may be overlap in the determined groups (ie, participants may not fit well in the identified FEC groups; **Table 3**). After determining the best-fitting number of FEC groups using BIC and AIC scores, Mplus assigned participants to their most likely FEC group based on the highest posterior probabilities (ie, the most likely FEC group); if entropy is low, participants are still assigned to the FEC group with their *highest* posterior probability (**Table 4**). Once our identified FEC groups were assigned to individual participants, we used bivariate χ^2 tests to preliminarily examine associations with pain incidence and pain persistence (**Table 2**).

2.4.2. Hypothesis testing

We used logistic regression models in Mplus 8.1[21] to test our hypotheses that family emotional climates marked by greater strain and less support across relationships will be linked to a greater likelihood of 10-year pain incidence and pain persistence, using full information maximum likelihood as the estimator to account for missing data. We tested a total of 6 models to access FEC groups' differential associations with pain incidence and pain persistence in MIDUS (2 models) and HRS (4 models). In each model, we included the FEC group assignment (dummy-coded when more than 2 groups), and the covariates listed above. For models with more than 2 FEC groups (ie, HRS Family and Parent–Child models), we examined between-group differences using Wald χ^2 tests of parameter constraints.

While both data sets (MIDUS and HRS) target aging adults in the United States, they also include snowball sampling recruitment methods for primary participants' family member. Therefore, these data are potentially limited with the expansive age range, but given the sample power needed these complete models, we chose to include these participants but control for age.

2.4.3. Missingness

As described in prior research this study builds on,[46] older MIDUS participants were more likely missing at follow-up (ie, MIDUS 3; $t[753] = 5.523$, $P < 0.001$). Older HRS participants ($t[2584] = 21.071$, $P < 0.001$) were also more likely to be missing at our follow-up wave, as were men ($\chi^2[1] = 12.213$, $P < 0.001$) and individuals reporting comorbidities ($\chi^2[1] = 46.168$, $P < 0.001$). As such, we considered data to be missing at random in MIDUS and HRS. We thus accounted for age, sex, and comorbidities in all models to reduce bias in parameter estimates caused by patterns of missingness using full information maximum likelihood, which allowed us to use all available data[1] and to replicate covariate use across modeling in each sample.

Table 3

Information criteria for determining group numbers.

	MIDUS		
	Family only LCA N = 757		
Group #	**AIC**	**BIC**	**Entropy**
1	2074.11	2083.37	—
2	**2023.43**	**2046.58**	**0.545**
3	2029.43	2066.47	0.652
4	2035.43	2086.36	0.794
Group #	**HRS**		
	Family only LCA N = 1715		
	AIC	**BIC**	**Entropy**
1	4326.30	4337.19	—
2	**4237.57**	**4264.81**	**0.452**
3	4243.57	4287.15	0.502
4	4249.57	4309.49	0.795
Group #	**Family and parent–child LCA N = 1806**		
	AIC	**BIC**	**Entropy**
1	8389.93	8411.92	—
2	7689.00	7738.49	0.584
3	7560.09	7637.07	0.809
4	**7525.92**	**7630.40**	**0.719**
5	7535.83	7667.80	0.610
6	7545.83	7705.29	0.557

Dashes (—) indicate entropy was not estimated. Bolded results represent the best fitting number of groups in each latent class analysis.
HRS, health and retirement study; LCA, latent class analysis; MIDUS, midlife in the United States.

3. Results

3.1. Preliminary analyses

Bivariate associations between dichotomized strain and support measures at baseline and our pain outcome variables indicated that family support was linked to pain incidence in MIDUS but not in HRS; family strain was linked to pain incidence and persistence in HRS, but not in MIDUS; and parent–child strain is linked to pain incidence in HRS (**Table 2**).

3.2. Family emotional climate groups

3.2.1. Midlife in the United States

We found evidence of 2 unique groups of FEC among MIDUS participants (AIC = 2023.43, BIC = 2046.58, entropy = 0.545; **Table 3**). Specifically, our LCA testing a 2-group model demonstrated improved fit over a 1-group model, whereas the fit of 3-group and 4-group models worsened. Based on the 2-group results, we labeled groups as follows: (1) Strained FEC (n = 199; 26%) and (2) Supportive FEC (n = 555; 74%). Midlife in the United States participants with a Strained FEC were characterized by high probabilities of being at or above the median on family strain but below the median for family support (**Table 4**). Conversely, participants with a Supportive FEC had high probabilities of scoring at or above the median on family support but below the median for family strain.

Bivariate χ^2 analyses indicated these groups are linked to pain incidence but not pain persistence (**Table 2**). The logistic regression analyses affirmed the bivariate results, with the inclusion of covariates. Specifically, being in a Strained FEC compared with a Supportive FEC increased the odds of pain development by 106% (odds ratio [OR] = 2.06), while accounting for age, sex, and comorbidities (**Table 5**). Family emotional climate group was not linked to pain persistence 10 years later in MIDUS.

Table 4

Probabilities of latent class analysis group assignments.

Group assignment, n (%)	Family support	Family strain
MIDUS: Family model		
1. Supportive Family FEC Group 558 (74%)	0.76	0.27
2. Strained Family FEC Group 199 (26%)	0.03	0.68
HRS: Family model		
1. Supportive Family FEC Group 1099 (64%)	0.72	0.34
2. Strained Family FEC Group 616 (36%)	0.02	0.74

HRS: family and parent–child model Group assignment, n (%)	Family support	Family strain	Parent–child support	Parent child strain
1. Strained Family and Parent–Child FEC Group 517 (29%)	0.00	0.84	0.16	1.00
2. Ambivalent Family and Parent–Child FEC Group 279 (15%)	1.00	0.71	0.75	1.00
3. Supportive Family and Parent–Child FEC Group 577 (32%)	0.92	0.16	0.92	0.00
4. Disengaged Family and Parent–Child FEC Group 442 (24%)	0.10	0.43	0.47	0.16

FEC, family emotional climate; HRS, health and retirement study; MIDUS, midlife in the United States.

3.2.2. Health and retirement study—family

Next, we replicated MIDUS analyses with HRS data. Across the full HRS sample, the results of our LCA identified 2 unique groups of FEC (AIC = 4237.57, BIC = 4264.81, entropy = 0.452; **Table 3**). The 2-group model improved fit over a 1-group model, whereas 3-group and 4-group solutions resulted in worse fit. Based on these results, we labeled the groups similarly: (1) Strained FEC (n = 616; 36%) and (2) Supportive FEC (n = 1099; 64%). The results replicated the groups in MIDUS, such that HRS participants with a Strained FEC were characterized by high probabilities of being at or above the median on family strain but below the median for family support (**Table 4**). Conversely, participants with a Supportive FEC had high probabilities of scoring at or above the median on family support but below the median for family strain.

Unlike MIDUS, bivariate χ^2 analysis indicated that these groups are linked to pain persistence but not pain development (**Table 2**). Logistic regression analyses similarly found that a Strained FEC, compared with a Supportive FEC, was linked to a 114% increased odds of pain persistence (OR = 2.14; **Table 4**), while accounting for study covariates. Family emotional climate group—when including only family strain and support—was not linked to pain incidence in HRS.

3.2.3. Health and retirement study—family and parent–child

Finally, we extended our modeling of FEC by including parent–child relationship measures of strain and support in HRS. The LCA identified 4 groups of FEC (AIC = 7525.92, BIC = 7630.40, entropy = 0.719; **Table 3**). Based on the 4-group results, we labeled groups as follows: (1) Strained Family and Parent–Child FEC (n = 517; 29%), (2) Ambivalent Family and Parent–Child FEC (n = 279; 15%), (3) Supportive Family and Parent–Child FEC (n = 577; 32%), and (4) Disengaged Family and Parent–Child FEC (n = 442; 24%). Health and retirement study participants with a Strained Family and Parent–Child FEC were characterized by high probabilities of being at or above the median on both family and parent–child strain but below the median for both family and parent–child support (**Table 4**). The Ambivalent Family and Parent–Child FEC group was characterized by high probabilities of being at or above the median on all 4 strain and support variables. Health and retirement study participants with a Supportive Family and Parent–Child FEC had high probabilities of scoring at or above the median on both family and parent–child support but below the median for both family and parent–child strain. Finally, HRS participants who were classified as having a Disengaged Family and Parent–Child FEC were characterized as having higher probability of scoring *below* the median on all strain and support variables.

Unlike the earlier family-only groups of FEC in HRS, bivariate χ^2 analyses indicated that these family and parent–child groups of FEC are significantly linked to pain incidence but not pain persistence (**Table 2**). Logistic regression and subsequent Wald χ^2 analyses affirmed that membership in the Strained Family and Parent–Child FEC class (OR = 1.36) as well as the Ambivalent Family and Parent–Child FEC group (OR = 1.22) were each linked to significantly greater odds of pain incidence 10 years later compared with those in the Disengaged Family and Parent–Child FEC group (OR = 0.71; **Table 5**). The pain persistence modeling, with the inclusion of study covariates, identified that the Strained

Table 5

Logistic regression models for family emotional climate group assignment with pain incidence and pain persistence in midlife in the United States and health and retirement study samples.

	MIDUS: family models			
	Pain incidence (n = 334)		Pain persistence (n = 135)	
	B (SE)	OR	B (SE)	OR
Strained FEC group†	0.72 (0.29)*	2.06	−0.08 (0.39)	0.92
Age	0.001 (0.01)	1.00	−0.02 (0.02)	0.98
Sex	−0.26 (0.27)	0.77	0.39 (0.38)	1.48
Comorbidities	0.10 (0.35)	1.11	0.60 (0.42)	1.82
	HRS: family models			
	Pain incidence (n = 740)		Pain persistence (n = 334)	
	B (SE)	OR	B (SE)	OR
Strained FEC group†	0.29 (0.17)	1.34	0.76 (0.27)*	2.14
Age	0.01 (0.01)	1.001	−0.006 (0.02)	0.99
Sex	0.48 (0.18)**	1.61	−0.33 (0.32)	0.72
Comorbidities	0.36 (0.19)	1.44	0.68 (0.28)*	1.98
	HRS: family and parent–child models			
	Pain incidence (n = 770)		Pain persistence (n = 353)	
	B (SE)	OR	B (SE)	OR
1. Strained Family and Parent–Child FEC Group‡	0.31 (0.20)	1.36	0.63 (0.32)*	1.89
2. Ambivalent Family and Parent–Child FEC Group‡	0.20 (0.25)	1.22	0.05 (0.35)	1.05
4. Disengaged Family and Parent–Child FEC Group‡	−0.34 (0.23)	0.71	0.39 (0.33)	1.48
Age	0.001 (0.01)	1.001	−0.006 (0.01)	0.99
Sex	0.43 (0.18)*	1.54	−0.38 (0.31)	0.68
Comorbidities	0.29 (0.18)	1.35	0.64 (0.26)*	1.91
Group	**HRS family and parent–child models Between-group differences**			
	Pain incidence		Pain persistence	
1 vs 2	Wald $\chi^2(1) = 0.18$, $P = 0.67$		Wald $\chi^2(1) = 2.79$, $P = 0.09$	
1 vs 4	**Wald $\chi^2(1) = 1.66$, $P = 0.005$**		Wald $\chi^2(1) = 0.51$, $P = 0.47$	
2 vs 4	**Wald $\chi^2(1) = 3.88$, $P = 0.04$**		Wald $\chi^2(1) = 0.89$, $P = 0.34$	

For the Wald χ^2 tests of between group differences, bolded results indicate significant between-group differences in associations to pain incidence.

*$P < 0.05$, **$P < 0.01$.

† Reference group is Supportive Family FEC.

‡ Reference group is Supportive Family and Parent–Child FEC group.

FEC, family emotional climate; HRS, health and retirement study; LCA, latent class analysis; MIDUS, midlife in the United States; OR, odds ratio.

Family and Parent–Child FEC group was significantly linked to an 89% increased odds of pain persistence 10 years later, compared with a Supportive Family and Parent–Child FEC (OR = 1.89). Wald χ^2 tests did not reveal additional between-group differences among FEC groups' links to pain persistence.

4. Discussion

This study is the first to leverage LCA to identify underlying multidimensional structures of FEC (eg, family strain and support) before modeling links to chronic pain outcomes for aging African Americans with 2 samples. We first summarize and explain our findings, and secondly, we theorize how and why these relationships differ in African American adults.

First, our findings indicate that the *absence* of family support may be critical for determining worse pain outcomes, more so than the presence of family strain. While seemingly counterintuitive, our models examining extended family FEC groups found that high strain and low support increased the risk of (1) developing chronic pain (MIDUS) and (2) chronic pain persisting (HRS). Similarly, when modeling relationship quality with extended family *and* adult children (HRS), greater strain and less support in *both* types of relationships were more likely to report chronic pain persistence than those with greater support and less strain in these same relationships. However, FEC groups with high strain *and* support in family *and* parent–child relationships (HRS) were *not* significantly linked to pain persistence, despite similar relationship strain as the Strained Family and Parent–Child FEC Group (**Table 4**). Meaning if relationship strain was the quality that made the difference, we would expect a significant link to persistent chronic pain in both FEC Groups. This suggests the *absence* of support may predict particularly worse pain persistence outcomes, while the presence of support may promote pain remission. These conclusions extend prior research that greater support from multiple types of family relationships on average protected against the development of chronic pain among aging African American MIDUS participants.[46]

The disengaged FEC group's (moderate strain and support) links to pain incidence (HRS) provided additional nuance regarding this family support. Notably, the decreased risk of pain incidence tied to a disengaged FEC significantly differed from the greater risk of pain incidence linked to both high-strain groups. In total, perhaps FECs marked by low parent–child strain and moderate or high parent–child support are especially protective against the development of chronic pain. Alternatively, older African Americans experiencing a disengaged FEC may locate closeness and support from extrafamilial relationships that could offer protection against pain and thus result in our unexpected findings. Indeed, subjective isolation from both family *and* friends is a stronger predictor of pain for African Americans than isolation from family alone.[3] Extended family (eg, "sister-cousins") and fictive kin are culturally significant relationships and serve as health-related resources for those experiencing more disconnected immediate family relationships.[18,39] Traditionally, African American culture has leveraged the "village" model whereby family extends beyond immediate and extended members and into friends, neighbors, and their faith community. Broadening future pain research to incorporate assessments of extrafamilial relationships could spotlight culturally significant characteristics for within-group chronic pain analyses.[5]

Second, our study—guided by the BBFM—emphasized assessing relationship strain and support across multiple relationship types, including extended family and parent–child. The BBFM posits that an FEC with a balance of positivity and negativity leads to improving health outcomes; therefore, a strain-free FEC should not be the goal.[43] Indeed, despite the consistency of FEC groups in structure and

proportion across the 2 data sets, we observed diverging but complementary findings regarding how FEC groups are linked to pain outcomes when incorporating parent–child relationship quality (HRS). Studies limiting focus on a single relationship, single measure of relationship quality, or assessing the often-used but broad concepts of "social support" or "perceived support" could hamper identifying *how* aging African Americans' experiences of pain are tied to their closest relationships.[45] Our findings, affirmed by theory and previous empirical work,[6,19] suggest that attending to parent–child strain, plus family and parent–child support, may promote improved pain outcomes.

Our results across the 2 data sets indicate substantive variation in how support and strain in different relationships co-occur. For pain-free aging African Americans, reducing parent–child strain may be helpful to protect against future chronic pain, though it is more likely that achieving a FEC with greater support *and* less strain is tied to the least risk of developing pain. Prior research suggests older African American parents may be less likely to experience social network shrinking, report more frequent contact with their adult children than White peers, and are protected from worse health outcomes when coresiding with their children.[17,38] However, the presence of adult children may not be sufficiently pain protective, particularly if those relationships are unstable, critical, or demanding, where the centrality of parent–child relationships has been subject to dynamic structural influences over time.[9]

A historical perspective offers more clarity as African Americans had to adapt to adverse and strained relationships and life circumstances over generations (eg, slavery and forced separation and isolation from family, segregation)[10]; therefore, support may have a stronger biological and emotional effect and importance on pain. In other words, historically, to survive oppressive systems (eg, Jim-Crow Era laws in the United States), African Americans have responded to violent systemic structures by adapting to more permeable family support networks to maintain cultural resilience and family cohesion.[41] Meaning African Americans, during and after slavery, worked hard to preserve their families and build lasting kinship networks to survive cruelty and hardship of historically racist policies.

For example, policy determining family structure such as current welfare laws devaluing legal marital relationships or historical marital laws and practices in the United States In her book, *Bound in Wedlock: Slave and Free Black Marriage in the 19th Century*, Tera W. Hunter states that because of these historical marital policies, "African Americans were not attached to a family structure, they were attached to a family sensibility" (p. 206).[13] One study with older African American adults found that marital status did not significantly predict pain; however, living alone was associated with greater pain intensity. This suggests marriage alone may not offer protection against pain, but perhaps that egalitarian family structures and connections are important social factors.[8] Therefore, given the historical context affecting family formation, relationships with adult children as interconnected units, compared with other family or kinship relationship, may be more salient to aging African American's pain experiences.

Furthermore, this study advances the literature to suggest that optimizing supportive family relationships (eg, providing emotional safety, empathic validation, and offering help in the face of serious concerns) may promote healing from chronic pain. African Americans' lived experiences of pain in the context of family relationships appears to be complex, whereby participants reporting needing support (eg, comfort, concern) from family but instead described lacking support (eg, invalidation, limited understanding).[6] The authors emphasize that FEC characterization in the context of chronic pain does *not* reflect a lack of love and caring but perhaps limited pain knowledge and inadequate structural resources resulting in hindered pain control. Despite growing pain research highlighting importance of African Americans' close relationships for pain outcomes, family-based interventions for pain remain underdeveloped. Indeed, there is a striking lack of family science in the field of pain, and the effect of family-based interventions for African Americans has yet to be studied. The more recent "whole health for pain" care paradigm explicitly includes family and friend relationships as part of personal pain management.[33] Using this approach, we suggest that family-centered interventions (1) center values such as collectivism, spirituality/faith, resilience, and social justice; (2) be designed flexibly to include multiple family structures; and (3) engage caregivers. These interventions may be designed as dyadic or group-based and include family counseling, cognitive behavioral therapy, and pain science education. Complementing cultural preference for familial support in managing pain among older African American adults,[6,19] providers should promote family-focused education help reduce prevalent pain disparities.[4]

4.1. Strengths and limitations

This study's substantial contributions should be understood through typical study limitations of secondary data use. First, this is not a clinical sample of people with verified chronic pain diagnoses; participants self-reported chronic pain. Second, some entropy scores are lower than expected. Entropy measures the accuracy of group assignment but should not be used as a model selection criterion. A low entropy score may indicate that some participants could be classified into more than 1 group but were assigned to their most likely group. Because LCA structures are sample dependent, no conclusion should be drawn about use with this specific population.

Also, there are many other classifications of family relationships and shared connections beyond "extended family" and "parent-child relationships." Future prospective studies may consider examining extrafamilial relationships, while also capturing greater fluidity in family dynamics that our use of secondary data prevents. Future research should also identify possible tipping points of family strain or support to identify individuals at risk of worse pain outcomes, and how the quality of these relationships change over the life course to inform family-based pain intervention. Finally, many studies have included marital/intimate relationships with mixed results[8] and we have focused on the need to explore expanded and more culturally salient types of relationships. Nevertheless, the inclusion of romantic relationships will continue to advance research in finding avenues to effectively mitigate pain disparities experienced by African Americans.

Conflict of interest statement

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