



Neighborhood and social influences on blood pressure: An exploration of causation in the explanatory models of hypertension among African Americans

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Abstract

Objective: African Americans are at the highest risk of having hypertension compared to all other races and ethnicities in the United States. This disparity is compounded by lower rates of medication adherence and blood pressure control among African Americans. Divergence in African American patients' views of their hypertension from the biomedical model may be an important driver in shaping adherence behaviors and outcomes. Our study sought to identify African American explanatory models (EMs) of hypertension with a focus on disease etiology, in order to increase provider understanding of how African American patients conceptualize their hypertension and how this information can be used to foster provider-patient trust and engagement.

Methods: The study utilized 12 in-depth and semi-structured interviews with hypertensive African American patients living in Philadelphia. Interview questions solicited participants' EMs of hypertension with a focus on etiology, including what they thought caused their hypertension, environmental factors that influence blood pressure, and barriers to managing hypertension in their neighborhood and social environment. Interview transcripts were analyzed using a modified-grounded theory approach to identify emergent themes.

Results: We identified five themes from participants' EMs of hypertension: (1) stress causes high blood pressure; (2) unsafe neighborhoods lead to stress and can raise blood pressure; (3) the financial stressors of everyday living can make hypertension worse; (4) emotional distress from strained social relationships can exacerbate high blood pressure; and (5) lack of access to health care and healthy food in the community contributes to hypertension.

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Introduction

The CDC estimates that hypertension affects more than 75 million American adults, a nearly one in three prevalence [1]. Notably, hypertension disproportionately affects African Americans. While an estimated 33.9% of white men and 31.3% of white women have high blood pressure, around 43.0% and 45.7% of African American men and women, respectively, have hypertension [2]. Health disparities for African Americans with hypertension include higher rates of poorer blood pressure control compared to other races and ethnicities, with less than half having their blood pressure controlled [3]. The factors associated with poor blood pressure control in this population are numerous and include medication non-adherence, excess weight, lack of health insurance and limited healthcare access [4]. Despite ample research, the availability of effective therapies, and substantial investment in interventions to reduce or eliminate hypertension disparities, racial and ethnic disparities persist [5] and have actually widened over the past few decades [6]. Thus, reducing disparities and improving care for African Americans with hypertension, particularly those from socioeconomically disadvantaged communities, remains a national priority [7].

Researchers have investigated the role of culturally tailored, patient-centered care in addressing hypertension disparities experienced by African Americans. Previous studies have shown that when physicians demonstrate cultural competence and awareness of their patients' health beliefs, patients are more trusting and communication between clinician and patient improves [8,9]. Physician-patient relationships built on mutual trust also promote adherence and improve patients' health outcomes and satisfaction [10,11]. Thus, understanding the perspectives of African American patients regarding their hypertension is important for developing impactful interventions aimed at improving adherence, achieving blood pressure control, and reducing gaps in communication between patients and clinicians [12,13]. These perspectives and beliefs constitute patients' Explanatory Models (EMs) of illness. The EM, proposed by Kleinman and colleagues, is a patient's way of categorizing and explaining an illness in terms of its etiology, onset of symptoms, pathophysiology, course, and treatment [14]. African American EMs of hypertension do not always match the biomedical views of clinicians. A study of EMs of hypertension among black women with hypertension found that patients described two folk illness models, "high blood" and "high pertension," the former a blood disease and the latter a disease of the nerves. These culturally shaped beliefs were important influences on adherence and blood pressure control [15]. Many African American patients also believe hypertension is a symptomatic condition, describing symptoms such as faintness, headaches and sweating in their EMs of high blood pressure [16]. Thus, patients may question the necessity of taking medications daily when they perceive hypertension as acute, episodic, and symptomatic, rather than chronic and asymptomatic [17]. African Americans with these EMs may doubt the efficacy of medications or have concerns over adverse effects of medications, and choose instead to rely on alternative or home-made remedies such as tea, garlic or honey to control their blood pressure [18].

Most previous studies on African American EMs of hypertension have focused on perceptions of symptomatology, pathophysiology, course, or treatment of illness. However, patients' perceptions of the etiology of hypertension, including what causes or exacerbates high blood pressure, are also important. Particularly among inner-city, socioeconomically

disadvantaged populations, ecological stressors such as neighborhood violence, residential instability and economic frustration adversely affect hypertension [19,20]. Our study sought to understand the factors causing and exacerbating hypertension in African Americans' EMs of hypertension, with a specific exploration on perceptions of neighborhood influences on blood pressure. We conducted qualitative in-depth interviews with community-dwelling African Americans in Philadelphia. Our definition of neighborhood characteristics is broad and includes the physical environment, social environment, and access to resources [21].

Methods

Participants

Participants for this study were identified and recruited through purposive sampling. We sought adults who were at least 18 years of age, self-identified as African American, resided in Philadelphia, and had been diagnosed with hypertension for a minimum of two years. Recruitment commenced through two venues. The first was through in-person recruiting at a community-based free health clinic located in West Philadelphia. We first obtained approval from the clinic's Board of Directors to recruit patients. Patients were approached during clinic hours, given information about the study and, if interested, given screener questions. If eligible, we obtained their contact information and scheduled the interview at their convenience. The second recruitment method was by phone, via a list of participants who had taken part in a previous study, agreed to being contacted for future studies and provided their contact information. The study aims and screener questions were discussed over the phone with these contacts, and for those who were interested and eligible, an interview was scheduled.

Procedure

We conducted semi-structured and in-depth interviews with study participants between July and September of 2015. A standardized guide was developed by the study team with expertise in primary care, health disparities, and qualitative methods following a review of the literature related to explanatory models and hypertensive health disparities. Items solicited participants' EMs of hypertension with a focus on etiology, including when they were first diagnosed with hypertension, what they thought caused their hypertension, their views on factors in their environment that might negatively or positively influence their blood pressure, and barriers to managing hypertension in their neighborhood and social environment. Before interviews, informed consent was obtained from participants. All interviews were conducted in person and in English, lasted from 45-75 minutes, and were audio-recorded and transcribed for analysis. No coding software, such as NVivo, was used for transcript analysis. Additionally, each participant completed a demographic questionnaire after the interview. Interviewees were provided a \$30 incentive to compensate them for their participation. The University of Pennsylvania Institutional Review Board (IRB) provided ethical approval for all study procedures (**Table 1**).

Interview transcripts were analyzed using a modified grounded theory approach. Our approach utilized two coding schemes: an a priori set of codes used to identify the etiology components of a respondent's explanatory model, and codes that emerged from a close line-by-line review of the data. Each code was defined by the team, and decision rules for the appropriate application of each code were included in the code book.

Coding was iterative. All transcripts were double-coded by two members of the research team (KK and LL). Coding consistency was reviewed within the team for each transcript, and discrepancies were discussed and resolved through consensus.

Results

Demographic Characteristics

A total of 12 African American adults diagnosed with hypertension completed in-depth interviews. 5 participants were recruited through the community health clinic and 7 through the list of phone contacts. **Table 2** shows the demographic characteristics of the study participants. Participants were predominantly of low income, and the majority had been diagnosed with hypertension for several years.

Interview Themes

We identified five prevalent themes from participants' EMs of hypertension: (1) stress causes high blood pressure; (2) unsafe neighborhoods lead to stress and can raise blood pressure; (3) the financial stressors of everyday living can make hypertension worse; (4) emotional distress from strained social relationships can exacerbate high blood pressure; and (5) lack of access to healthcare and healthy food in the community contributes to hypertension.

Theme: Stress causes high blood pressure: Participants felt that stress can cause high blood pressure, often attributing hypertension to a state of heightened stress. As one interviewee mentioned, hypertension can be caused by "stressors... that cause neurons in your brain to go frantic and cause your blood pressure to rise." Participants suggested that high blood pressure was a physical manifestation of stress, and that stress negatively impacted their body. They shared they were often aware of when their blood pressure was high because they associated certain bodily signs or symptoms with hypertension. One interviewee, when asked what he thought causes his high blood pressure, noted:

When I get upset, or nervous, or worried about something... And you see how my attitude is. I'm more upbeat, I always look on the positive level. So when things fall off, or things get where I'm not in control of what's going on, then that can send my pressure up. I usually know when my pressure's up: My veins will pop up out of my arms, everything. I think it's more of a mental thing.

Participants felt that stress resulted from their life circumstances. Factors in their immediate surroundings, their neighborhoods and communities that they perceived as stressors could cause or exacerbate their hypertension. As one participant stated, "stress factors in the neighborhood" can make blood pressure rise. To control their high blood pressure, many participants simply tried to avoid stress, or to think with a positive outlook on life. One interviewee stated:

Me and stress, we don't have too much to say to each other. But I try to think positive. I'm a very positive person. And I have my days of stress, believe me I have mine...but, I know stress kills.

Theme: Unsafe neighborhoods lead to stress and can raise blood pressure: Participants mentioned that unsafe neighborhood conditions and violent incidents created stress and exacerbated their blood pressure. As one interviewee observed, "for us black people, for our neighborhoods that's the way it is.

You can tell when you start to get home because you start seeing the same familiar [expletive]. Drugs on the street, fightin', arguin', trash...all that gets on your nerves...it's just the environment." Many participants discussed the ways residential instability adversely affected their stress. One woman believed community violence influenced her hypertension, stating, "they started treating me for high blood...cause things happened in my life that made me stressed and I lived in a neighborhood [where] every time I turn around they're shooting bullets over your heads." Participants who lived in neighborhoods less affected by violence acknowledged the seriousness of an unsafe environment. As one interviewee noted, "my blood pressure would be out the roof [because of] so much anger and so much violence and so much drugs."

Some interviewees felt that specific events in their communities affected their blood pressure in an acute and episodic way. One participant shared his belief that a recent incident in his community directly affected his blood pressure, stating:

Across the street from my home, five people were shot. Oh, my God. And the police cars were everywhere...very stressful. My blood pressure went up, I was nervous...my stress level was slightly off, because those are the environmental impacts...community violence does play a very important role in it, because it almost affected me for that week.

Other participants acknowledged that the chronic stress caused by unsafe neighborhood conditions impacted their hypertension, and overall well-being, in the long run. One female participant, illuminating the daily stresses of living in her neighborhood, noted that she always has a Taser in her hand for protection. Another interviewee stated:

Really, I think when high blood pressure gets to you, is when you're in a neighborhood and you're a single parent, and you know...you have all these bad guys around you, you're nervous; you can't really sleep like you want to, because you are so fearful in the neighborhood. And then every time you turn around when you're coming home, somebody got killed or somebody got shot or sometimes they have yellow tape up.

Theme: The financial stressors of everyday living can make hypertension worse: Participants identified financial hardship and everyday living as factors that impacted their stress and blood pressure. When asked about the stressors in her life, one participant stated: "Family, life, death, financial...everyday living. It's a little stressful, it really is. Keeping the house, I mean... everyday things, basically." Most interviewees were of low income and mentioned the challenges of being under pressure financially or living from paycheck to paycheck. As one elderly man observed: "You lose your job; you gonna work like hell, how you gonna pay your bills? That will definitely, definitely give you headaches and stuff."

Another participant elaborated on his own experience of these challenges:

Sometimes I have no money; I gotta figure out a way to get it. When you don't have enough money to pay your bills, you get stressed out. And when you worry about when somebody wanna shut my electric, or my gas off...it can be stressful. 'Cause I just wanna be able to get the bill paid. Gonna have to worry about it.

Many interviewees believed these everyday stressors were entwined with their hypertension. A male participant acknowl-

edged that stressors are “just something you have to live with; some of us accept and know that we got hypertension, and take medicine for it.” Another interviewee explained:

I think it [high blood pressure] has to do with life stressors. Poverty can cause you to become hypertensive. If you can't afford your electric bill, you don't know how to pay it, you're a law-abiding citizen, you don't want to do anything wrong...internally, that affects you. Anything that goes on mentally affects you internally.

Paying bills was not the only life stressor for participants. The difficulties of working long hours, the instability of employment, and the challenges of balancing work with home life were common topics. One participant believed that his job as a cook at a diner makes his blood pressure worse, stating: “I stay on my feet 8-10 hours a day; I got a jerk for a boss, and he wanna yell at people like they're kids...and that really turns me off, and I do get angry; and when I get angry, then my blood pressure goes up.” A female participant shared that raising three daughters as a single mother created significant stress and adversely affected her blood pressure. She stated:

I guess it built up where I wasn't relaxing and getting enough rest at all. And then trying to worry about how I'm gonna pay all the bills. Then my children had to go to day care. So running from school to school; running from the job; trying to get them situated. That brought a lot of things—physical things—on me. But my [blood] pressure began to get out of control. So with that I ended up a couple of times in the hospital.

Participants also discussed what it was like to live in “poor neighborhoods,” and the social disadvantages of living in these communities. Many interviewees highlighted racial aspects of neighborhood living, referring to the experience of living in “black communities.” One man stated, “I think a lot more African Americans suffer from high blood pressure than the rest of the population...I think maybe it's a little...it's distress in the poor neighborhoods.”

Theme: Emotional distress from strained social relationships can exacerbate high blood pressure: Participants felt that tensions in relationships, the pressures of raising children, and events like family deaths were associated with higher blood pressure. Stress again played an important role in these narratives. One interviewee shared about his strained relationship with his brother and the arguments they had centered on his brother's drug use. He acknowledged that these family stressors could contribute to hypertension, “if it affects you to the point where you're not able to control your emotions.” Some participants viewed raising or dealing with children as a challenge that caused stress and may have contributed to their hypertension. One participant expressed disappointment that his two sons had recently come home from prison. Another participant, whose son had also been in jail, explained:

That's another thing [that] make a parent worry, and keep their blood pressure up, is their damn kids, doing that stupid stuff. Your parents, I'm sure are happy. Because they can talk about 'my child in college.' Here all I can talk about is mine's in jail. See the difference in blood pressures?

One interviewee had her children as a single mother. While explaining the stresses of raising three girls without the support of a father in the household, she stated:

When you're one single parent and the children are calling

mom all day, that just stresses me out. Now they're grown, but in the past they didn't have nobody but their mother, so I had to go to every school they was involved in. 'Cause I wanted to encourage them. So it's been a life thing, like, when am I gonna have my life? So I think that's what built the blood pressure up and all.

Participants also associated higher blood pressure with tragic incidents such as deaths of family members or friends. One interviewee noted that the death of his best friend affected him, stating: “If I take my medication, hopefully it doesn't impact it [my blood pressure] that much. But I can feel stress sometimes in my neck; I can tell when my pressure's a little up because I start to get a slight headache in my forehead.” Another participant discussed the untimely death of his son, who had been shot the previous year, describing the aftermath as a “very stressful time,” during which “my pressure was kinda up.” A middle-age woman talked about a difficult time during which she cared for her sick and aging mother, noting:

I took care of her and was working, so I was tired. It was stressful, sometimes I would leave her to go to work, 'cause I had to go to work, to take care of the bills and stuff. So I put her in hospice—she was there a week—and she just passed away. So it's like my pressure would be—my pressure was really high then, you know, with losing her and stuff.

Theme: Lack of access to healthcare and healthy food in the community contributes to hypertension: Participants felt that lack of access to healthcare, as well as healthy food in the community, were barriers to controlling their high blood pressure. They noted that access to the appropriate care, as well as being able to take their antihypertensive medications, were important for their health. As one participant stated: “I just take the pill—I'm relying on the pill, that's the way I'm thinking about it.”

Interviewees identified expensive medications, difficulties receiving or maintaining health insurance coverage, and unemployment as barriers to managing their blood pressure. Though several participants received Medicaid, they faced the possibility of becoming unqualified once they earned over a certain income. A female participant encountered this situation, stating: “I got insurance through the state and then they started saying I make too much money; so, I don't really have insurance now.” Many participants felt a similar frustration with “the system.” One interviewee shared that her temporary unemployment caused her to lose health coverage, which she did not recover even under a new job. She stated:

When I left this [old] job, what happened was, they cut it [insurance] off. But I don't have no \$380, so they don't cover you once you retire. And this [new] job that I'm on, they don't have insurance, so I had to end up getting my own...But that's still not enough, because it don't cover your medicines, and you still have to pay...the more you try to get ahead, the more the system tries to throw you back.

This participant thus could not afford her blood pressure medications. Several participants relied partially or fully on free clinics, which were the only place they could turn to for care. One man, discontinued from Medicaid because of his inability to afford premiums, stated that without insurance, “it's kind of hard for me—you know, buyin' [medications].”

Some participants expressed dissatisfaction with lower quality or accessibility of services in poorer neighborhoods. One uninsured woman, who utilized a district Health Center in Philadel-

phia for care, noted: "When you go to [the Health Center], it's like when you make an appointment, it may be months before you even get in." Another participant made the following observation about the care he received as a low-income individual:

In the poor neighborhoods, the care isn't as good as maybe a middle class neighborhood or an upper class neighborhood. Like the doctors and stuff like that... The free clinic, they have a lot of people that come down there that don't have insurance. And they [the providers] don't take a lot of time out. I mean, it's a big crowd so they wanna get you in and out. They don't like spending a lot of time with you talkin' and stuff like that.

Participants also expressed that lack of access to healthy food in their communities adversely affected their hypertension. Interviewees acknowledged that eating the "wrong foods," including excess salt, ran up their blood pressure. As one participant stated, "I think the number one concern with black people-let me talk about black people-I think the reason we have high blood pressure is because we don't eat right." One interviewee noted that healthy foods were more expensive and were scarce in nearby stores. Another participant said:

Most of the stores that sell food, in the neighborhood, use a lot of salt. You know, Chinese food, cheese steaks...it's not a lot of healthy foods, you know? I don't know where you can get a salad down there.

Even participants with more access to healthy food often could not afford it due to its higher cost relative to cheaper foods with few nutritional benefits. One participant observed:

Those foods tend to be higher [more expensive] than foods where poor people can afford. If I'm hungry, and I have \$5, I'm going to go to the Chinese store and get four chicken wings and some shrimp fried rice, as opposed to the \$9.75 salmon salad. The healthy foods are more expensive, and people opt not to buy them, because they can't afford it!

Similarly, one man stated while there may be healthy food options available, some people might not have access to "the right money; and that can affect your hypertension too."

Discussion

To our knowledge, this study was the first to describe etiological components of African American explanatory models of hypertension through exploring neighborhood factors influencing blood pressure. Participants in our study provided nuanced explanations about the advantages of controlling their blood pressure through means consistent with the traditional medical model for hypertension, such as taking medications and maintaining a healthy diet. Despite this, respondents expanded their EMs of hypertension to include the adverse effects of stress resulting from environmental factors, including unsafe neighborhood conditions, financial stressors, difficult social situations and poor healthcare and healthy food access. In patients' EMs, these stressors were perceived as causing or exacerbating high blood pressure. Below, we describe the implications of our findings for future research and practice.

Our findings are corroborated by existing literature describing associations between ecological stressors and hypertension. It has been demonstrated that stress is an important contributor to hypertension, especially among African Americans [22,23]. Specifically, participants mentioned that stressors like neighborhood violence, financial insecurity and difficult social relationships could cause stress and exacerbate their high blood

pressure. Previous studies have found that neighborhood environments have a substantial effect on adult health outcomes, influencing morbidity and mortality and contributing to social disparities in hypertension [24-26]. Neighborhood violence, residential instability and economic frustration correlate to higher rates of hypertension, while residents of neighborhoods with greater social cohesion, more food access and safer walking environments are less likely to have hypertension [27]. Additionally, environmental triggers like neighborhood violence can contribute to stress by increasing sympathetic nervous system activity, and are associated with elevated blood pressure [28].

We found that participants described social sources of illness when talking about high blood pressure and its etiology. Some respondents noted that living in socially disadvantaged, largely black communities could contribute to the higher rates of hypertension endured by African Americans compared to the rest of the population. Thus, their EMs suggested that high blood pressure is related to living conditions, and its determinants are embedded in the physical, social, economic and cultural environment [29,30]. Future research should focus on contextualizing patients' illness experiences and considering the social structures and arrangements that shape these experiences. Particularly in low-income and minority communities, chronic stress, financial challenges and insufficient access to resources make living with chronic diseases more challenging. Participants in our study emphasized that these problems could be contributing to their hypertension, highlighting the role of everyday stressors, community violence and difficult family situations. These EMs go beyond the biomedical model of hypertension to include holistic concepts relating social and psychological factors to blood pressure, and should be explored further in research.

Our findings also have important implications for health-care providers and community clinics serving African American patients. Some study participants raised concerns about the quality of care they received as low-income individuals and expressed a desire to spend more time with providers who attentively listen to their concerns. To provide meaningful care, providers must seek to understand their patients' views and perceptions regarding hypertension. As Kleinman notes, spending time connecting and engaging with patients' subjective illness experiences should be a core task in doctoring [31]. Listening to African American EMs of hypertension can bridge the gap in communication between patient and clinician and help guide meaningful conversations about management of high blood pressure. For patients who believe stress leads to high blood pressure, addressing ways to alleviate stress and cope with environmental stressors would be of benefit. Simply acknowledging and validating patients' personal illness experiences adds value to the physician-patient relationship, and has been shown to establish trust, improve patient-centered outcomes and motivate patients to take an active role managing their health [32].

Limitations

This study is limited by a small sample size and specific demographics that may not render our results generalizable to the African American population. The findings should not be interpreted as suggesting causality between the presented lived experiences of respondents and their hypertension, but can be used to develop and validate hypotheses about how low-income, urban, African American populations may contextualize their hypertension and how this information could be used to develop provider-patient trust and engagement. These factors

are not traditionally taken into consideration or acknowledged in medical education or practice, where providers focus more on disease management and less on subjective, experiential dimensions of illness.

Conclusions

Our findings provide a platform for understanding and listening to the social barriers African American patients face in managing hypertension. Healthcare providers and community-based clinics in underserved settings should seek to understand patients' explanatory models of chronic conditions including high blood pressure, which may differ from the biomedical model of disease and thus provide important insights into how patients conceptualize their illness. Eliciting these EMs provides a starting point for discussion about management of high blood pressure and can foster trust, opening a space for dialogue in the provider-patient relationship.

Funding

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Compliance with Ethical Standards

All study procedures were approved by local institutional review boards.

Informed Consent

Informed consent was obtained from all study participants.

Tables

Table 1: Semi-structured interview guide questions.

Can you remember when you were first diagnosed with hypertension, or high blood pressure?
Can you tell me what happened that day?
What do you think caused your hypertension?
Do you remember what was happening in your life at the time you were diagnosed?
In which neighborhood were you living?
Could you tell me about your neighborhood?
What has living in your neighborhood environment been like for you?
Do you think your neighborhood has an effect on your blood pressure?
If so, what things about your neighborhood do you think affect your hypertension?
Can you describe the challenges or obstacles (if any) you've faced in dealing with hypertension in your neighborhood?
What makes your blood pressure worse?
What makes your blood pressure better?
What do you normally do to manage your blood pressure?
Do you take medications for your high blood pressure?
Has it ever been difficult to take medications? If so, what made it difficult for you?

Table 2: Participant characteristics.

Characteristic	N (%)
Gender	
Male	8 (66.7)
Female	4 (33.3)
Age	
35-44	1 (8.3)
45-54	3 (25.0)
55-64	7 (58.3)

65-74	1 (8.3)
Yearly household income (\$)	
<40,000	8 (66.7)
≥40,000	2 (16.7)
Would rather not say	2 (16.7)
Years diagnosed with hypertension	
2-4	1 (8.3)
5-7	3 (25.0)
8-10	1 (8.3)
>10	7 (58.3)

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