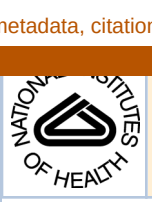

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Improving the Effectiveness of Health Care Innovation Implementation: Middle Managers as Change Agents

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Abstract

The rate of successful health care innovation implementation is dismal. Middle managers have a potentially important yet poorly understood role in health care innovation implementation. This study used self-administered surveys and interviews of middle managers in health centers that implemented an innovation to reduce health disparities to address the questions: Does middle managers' commitment to health care innovation implementation influence implementation effectiveness? If so, in what ways does their commitment influence implementation effectiveness? Although quantitative survey data analysis results suggest a weak relationship, qualitative interview data analysis results indicate that middle managers' commitment influences implementation effectiveness when middle managers are proactive. Scholars should account for middle managers' influence in implementation research, and health care executives may promote implementation effectiveness by hiring proactive middle managers and creating climates in which proactivity is rewarded, supported, and expected.

Keywords

middle managers; implementation effectiveness; innovation; quality improvement; health centers

Introduction

Implementation is the period during which employees ideally become proficient and consistent in their use of an innovation (Klein & Sorra, 1996). Implementing even seemingly simple health care innovations has proven to be challenging. The rate of successfully implemented quality improvement initiatives, for example, is less than 50% (Alexander, 2008). Poor implementation rates may be due to the substantial organizational changes

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The Chronic Care Model identifies the essential elements of a health care system that encourage high-quality chronic disease care. These elements are the community, the health system, self-management support, delivery system design, decision support, and clinical information systems (Wagner et al., 2001).

required for the initiatives (Alexander, 2008). Indeed, implementing innovations is demanding of employees and organizations—cognitively, emotionally, physically, and spiritually. When attempting to implement innovations, organizations face challenges such as misaligned incentives, professional barriers, competing priorities, and inertia (Shortell, Bennett, & Byck, 1998). Middle managers—employees who are supervised by an organization's executives and who supervise frontline employees—may play a role in overcoming these challenges (Birken, Lee, & Weiner, 2012).

Extant research on health care innovation implementation has focused on the roles of executives and physicians (e.g., Blumenthal & Kilo, 1998; Levinson et al., 2002; Weiner, Shortell, & Alexander, 1997); middle managers are largely overlooked (Noble, 1999). We fill a gap in the literature by addressing the following questions: Does middle managers' commitment to health care innovation implementation influence implementation effectiveness? If so, in what ways does their commitment influence implementation effectiveness?

New Contribution

As team work designs have become popular in health care organizations, middle managers' potential to influence the implementation process has grown (Blancett & Flarey, 1995; Bourne & Walker, 2005). Nevertheless, research on middle managers' influence on innovation implementation is scant. To the best of our knowledge, our study is the first to empirically assess middle managers' influence on health care innovation implementation. Study findings encourage health services researchers to account for middle managers' influence in implementation research and suggest that health care executives may promote implementation effectiveness by hiring proactive middle managers and creating climates in which proactivity is rewarded, supported, and expected.

Conceptual Framework

Middle managers' commitment to innovation implementation is a behavioral manifestation of their emotional attachment to, identification with, and involvement in innovation implementation (Randall, Fedor, & Longenecker, 1990). The theory of middle managers' role in health care innovation implementation has been described elsewhere (Birken et al., 2012). Briefly, to effectively implement health care innovations, employees must have information regarding what to do, how and when to do it, and why they must do it (Ackerman & Kyllonen, 1991; Kanfer & Ackerman, 1989). Gaps in this information make it challenging for employees to achieve a shared sense of efficacy to implement innovations.

Because of their strategic location between executives and frontline employees, middle managers bridge informational gaps when they commit to innovation implementation. Middle managers may express commitment to innovation implementation by giving employees information regarding innovation implementation, making it relevant to them, giving them the tools necessary to implement the innovation, and encouraging them to use those tools. These expressions of commitment contribute to employees' shared perceptions of the extent to which innovation implementation is rewarded, supported, and expected. In theory, these positive shared perceptions promote *implementation effectiveness*—high-quality and consistent use of the innovation (Klein & Sorra, 1996).

Method

Research Design and Sample

The study capitalized on an evaluation of the Health Disparities Collaboratives (HDC), a 10-year initiative that began in 1998 and was designed to reduce health disparities in

community health centers (HCs; Chin, 2010; Landon et al., 2007). Quality improvement targets were evidence-based clinical performance measures. Measures included processes of care (e.g., glycosylated hemoglobin measurement for patients with diabetes) and outcomes (e.g., glycosylated hemoglobin levels). In 1998, the Health Resources and Services Administration's Bureau of Primary Health Care (HRSA's BPHC) invited HCs to participate in the HDC. Beginning in 1999, participating HCs were expected to form quality improvement teams; attend one national and three regional learning sessions, where teams learned about the Chronic Care Model (Wagner et al., 2001)[1] and Plan–Do–Study–Act cycles using the Breakthrough Series process; attend conference calls; and submit monthly progress reports to regional HDC coordinators.

We used a mixed-method sequential design to address the research questions. Mixed methods have received increasing attention in health services research (Creswell, Klassen, Plano Clark, & Smith, 2011). When combined, quantitative and qualitative data offer a more nuanced understanding of the complexity of health care innovation implementation that neither quantitative nor qualitative data alone are sufficient to capture (Tashakkori & Teddlie, 1998). Specifically, qualitative analysis allowed us to assess nuances of middle managers' commitment and implementation effectiveness that would have been too circumscribed had we analyzed quantitative data alone. We first conducted a quantitative analysis of data collected in an HDC survey to assess the relationship between middle managers' commitment and implementation effectiveness. We then conducted semistructured interviews with HDC middle managers and qualitatively analyzed the data to explore ways in which their commitment influenced implementation effectiveness (Palinkas et al., 2011).

The Health Disparities Collaboratives Survey

Between March and December 2004, the National Opinion Research Center, the University of Chicago, and the MidWest Clinicians' Network, a nonprofit corporation that provides research opportunities, mentoring programs, and education opportunities for its members, conducted a survey to assess HDC implementation. The survey was sent to HCs in 21 Midwestern and West Central states that (1) had participated in the HDC for at least 1 year by March 2004 and (2) identified a chief executive officer (CEO), a medical director, and an HDC team leader. One hundred forty-nine HCs met these criteria. The survey collected information regarding HDC implementation effectiveness, middle managers' commitment, and organizational attributes of HCs during the 2003–2004 calendar year.

In this study, HDC team leaders were considered middle managers because they supervised their HCs' team members in implementing the HDC and were supervised by HC executives. The 120 middle managers responding to the survey were included in our analysis (81% response rate; one middle manager per HC). A total of 103 CEOs from those middle managers' HCs also responded to the survey (69% response rate). When available, we used CEOs' responses regarding organizational size and location in lieu of middle managers' responses because CEOs were more likely to have specific information regarding these measures.

Variables in the Quantitative Analysis

The intended outcome of the HDC was chronic disease management improvement using the Chronic Care Model. As such, *implementation effectiveness* was operationalized as middle managers' assessments of how effectively their HCs used the six interrelated components of the Chronic Care Model in the Assessment of Chronic Illness Care (community resources, self-management support, delivery system redesign, clinical information systems, decision support, and health care organization; specific items are available on request from the first

author; Bonomi, Wagner, Glasgow, & VonKorff, 2002). To verify that these items had high internal consistency, a factor analysis was performed. Results indicated that items for three components (developing linkages with community resources, promoting patient self-management, and optimizing delivery systems) were loaded on common factors and had high internal reliability (Cronbach's alphas equaled .78, .74, and .77, respectively). The other components (developing high-quality clinical information systems, incorporating decision support into daily practice, and supporting improvement throughout the health care organization) showed low internal consistency and were excluded. Thus, our analysis included three dependent variables, measured as middle managers' assessments of their HCs' development of linkages with community resources, promotion of patient self-management, and optimization of care delivery systems.

Commitment is a multidimensional construct (Randall et al., 1990). We focused on behavioral manifestations of the affective dimension. Behavioral manifestations of *middle managers' affective commitment to innovation implementation* may include engaging in activities that go beyond fulfilling HDC job requirements (i.e., leading quality improvement teams, attending learning sessions and conference calls, and submitting monthly progress reports to regional HDC coordinators; Porter & Smith, 1970). To operationalize commitment to HDC implementation, we used middle managers' responses to survey items regarding how regularly they used three online HDC tools—listserv, virtual classroom, and webpage. These online HDC tools represent a small subset of many extra-role behaviors that middle managers may have intended to promote HDC implementation; however, using online HDC tools exemplifies the key ways in which middle managers may express commitment to innovation implementation. The HDC listserv offered middle managers the opportunity to find information to solve HDC implementation-related problems and adapt the information for use among employees in their HCs; the HDC virtual classroom offered middle managers the opportunity to learn about specific tasks required for HDC implementation and make it relevant to employees charged with carrying out those tasks; and middle managers could use the HDC webpage to encourage employees to effectively and consistently carry out HDC-related tasks (Birken et al., 2012). Furthermore, these indicators represent the frequency with which middle managers engaged in extra-role behaviors. Perseverance in engaging in extra-role behaviors is an indicator of commitment (Pazy & Ganzach, 2010). A factor analysis verified that the three survey items were loaded on the same factor. Thus, we used the average of the responses as the measure of commitment to innovation implementation. The Cronbach's alpha was .75, indicating good internal reliability.

Several attributes of HCs and middle managers were included as controls in the analysis. *Implementation policies and practices* (IP&Ps)—that is, incentives, performance reviews, access to financial resources, access to human resources, access to training resources, local social network involvement, and executive support—were included because HCs offering IP&Ps may also have the infrastructure necessary to effectively implement HDC components (Solberg et al., 2000). The variable *years of HDC experience* was included because, over time, HCs should become more familiar with the HDC and more effective in implementing it. *HC size* was an indicator of patient load; HCs with smaller patient loads may find it more challenging to implement the HDC to improve care quality because of lack of infrastructure and support staff (Landon & Normand, 2008). *Turnover* may limit HCs' ability to integrate HDC components because of staffing uncertainty and loss of knowledge and expertise. HCs located in *rural* areas may have difficulty finding partnerships with community organizations. *Middle managers' organizational tenure* (time in the HC) may be related to their knowledge of the HC and their ability to contribute to integrating HDC components into HC practices. *Middle managers' job tenure* (time in the middle manager position) may be indicative of their professional experience and managerial skills, which

may enhance their ability to effectively perform their role. We controlled for *middle managers' occupation* because middle managers who were patient care providers may have the requisite clinical knowledge to integrate HDC components into the clinical practices of a HC. Factor analysis was performed to verify internal consistency of control variables constructed using multiple items from the HDC survey.

Data were missing for three variables (1% for executive support, 22% for access to financial resources, and 37% for access to human resources). Little's (1988) test indicated that data were missing at random. Relative to other methods, multiple imputation produces unbiased estimates and standard errors that reflect the uncertainty associated with imputed values (McPherson, Barbosa-Leiker, Burns, Howell, & Roll, 2012; Schafer & Graham, 2002). Complete case analysis yields correct standard errors and test statistics but is inefficient because observations are discarded (Demissie, LaValley, Horton, Glynn, & Cupples, 2003), and maximum likelihood is efficient but requires a large sample for reliable estimation (Schafer & Graham, 2002). Studies with high rates of missing data have demonstrated multiple imputation's consistency and efficiency (e.g., Delaney et al., 2009; Kayem et al., 2011). These benefits were particularly important given our sample size. Multiple imputation involved the following steps: (1) Missing values were predicted using existing values from other variables; (2) predicted values were substituted for missing values, creating an imputed data set; (3) steps 1 and 2 were repeated 19 times, resulting in a total of 20 imputed data sets; (4) regression analysis was conducted with each of the 20 imputed data sets; and (5) estimates were averaged to construct a single set of results.

Quantitative Analysis

We used ordinary least squares (OLS) regression to test our hypothesis. Middle managers were the units of analysis. Using middle managers' responses to construct both dependent and independent variables may introduce unmeasured variance to OLS models. To control for this bias, we included in OLS models self-reported attitude survey items that were theoretically unrelated to implementation effectiveness or middle managers' commitment and were minimally correlated with implementation effectiveness (Lindell & Whitney, 2001).

To achieve adequate statistical power with our sample, the OLS models included only independent variables that were significantly correlated ($p < .1$) with dependent variables. Shapiro–Francia, skewness and kurtosis tests indicated approximate normality. We adjusted for heteroskedasticity. No variables in the data were critically collinear ($r < .6$). Variance inflation factors were all less than 2.2 (Kennedy, 1998). Analyses were conducted using Stata 10 (Stata Corp., College Station, TX).

Semistructured Interviews

Middle managers were asked to describe the activities outside their job description, in which they engaged and that they felt to be the most influential in promoting HDC implementation. To maximize potential variation in responses, of the 57 middle managers who completed the HDC survey and consented to be interviewed, 16 in the top and bottom 25th percentile of responses to middle managers' commitment and implementation effectiveness HDC survey items were selected to participate.

The first author conducted 1- to 2-hour interviews via telephone in January and February 2010. Middle managers were asked to respond to interview questions based on their experience with the HDC at the time of the survey. To minimize recall bias, prior to discussing their commitment to HDC implementation, middle managers were asked to discuss the HDC for several minutes. Many middle managers described the HDC as very

memorable: Although some middle managers may have engaged in quality improvement initiatives before the HDC, the HDC was a distinct, major initiative that employed strategies that were unfamiliar to middle managers (Chin et al., 2004). Interviews were recorded and transcribed verbatim to enhance data reliability. The consent and interview guide (available on request from the first author) were approved by the institutional review board at the University of North Carolina at Chapel Hill.

Qualitative Analysis

We employed template analysis, combining content analysis with grounded theory (King, 1998). Template analysis allowed us to identify some a priori themes regarding the ways in which middle managers' commitment to HDC implementation influenced implementation effectiveness (Birken et al., 2012). It also allowed additional themes to emerge as the analysis proceeded. The analysis focused on the degree to which constructs emerged in the data (strength) and the degree to which constructs affected responses (valence). Atlas.ti 5.0, a multifunctional qualitative data analysis software program, was used to code the interview data and identify emergent themes. The text units were coded using a coding manual, with definitions, decision rules, and examples, to ensure consistency of data analysis and increase internal validity. The first author and a researcher familiar with qualitative analysis, each independently coded 20% of the interview transcripts, compared coding, and reconciled disagreements until consensus was reached. In most cases, the reason for the discrepancy was obvious (e.g., misapplication of inclusion/exclusion criteria for a code, lapse of attention). Remaining discrepancies were resolved by collaboratively refining code definitions. The first author independently coded the remaining 80% of the interview transcripts.

Results

Survey

Table 1 displays descriptive statistics. Middle managers consistently reported that HDC implementation was moderate: Fewer than five middle managers rated linkages with community resources as fully developed, patient self-management as optimally promoted, or care delivery systems as fully optimized. With little variation, middle managers reported that their commitment to HDC implementation was moderate. Less than 12% of middle managers "agreed" or "strongly agreed" that they regularly used online HDC tools.

OLS regression analysis results are displayed in Table 2. Results provided weak support for the hypothesis that middle managers' commitment is positively related to implementation effectiveness: The relationship was not statistically significant for promoting patient self-management or optimizing care delivery systems. It was marginally significant for developing linkages with community resources. Developing linkages with community resources also had marginally significant relationships with the following IP&Ps: performance reviews, access to financial resources, access to human resources, access to training resources, and executive support.

Interviews

Qualitative analysis provided nuanced results regarding the ways in which middle managers expressed their commitment to HDC implementation, attitudinal differences among middle managers toward engaging in extra-role HDC activities, and how attitudinal differences may contribute to variation in HDC implementation effectiveness. Consistent with the theory of middle managers' role in health care innovation implementation (Birken et al., 2012), HDC middle managers intended to influence implementation by giving employees information regarding HDC implementation, making it relevant to them, giving them the tools necessary

to implement the HDC, and encouraging them to use those tools. In addition to using online HDC tools, middle managers identified the following extra-role behaviors as particularly influential for promoting HDC implementation: changing HCs' operations; soliciting grant funding; developing and maintaining high-quality, timely patient data registries; and selling innovation implementation.

Middle managers indicated that they viewed themselves as information brokers. The HDC listserv, virtual classroom, and webpage were sources of information that middle managers drew upon to solicit ideas for effectively implementing the HDC. One middle manager recalled,

> [The listserv] was wonderful because all you had to do was go in and pose a question, like, 'How do you get the people who work nights investing?' And then four or five clinics would come back with, 'We did this. We did that. We did this, we did that.' And then you go … in our little collaborative group and we'll say, 'This is what these people did. How do we want to do it? Or what do we want to do?' (059)

Information itself had little use unless it was made relevant to employees. To make information regarding HDC implementation relevant for employees in their HCs, middle managers made substantial changes to their HCs' operations. To effectively implement the HDC, receptionists had to understand a new scheduling system that involved more preventive visits, appointment reminder calls, and letters; medical assistants had to ensure that new patient flow sheets were included in patients' health records; providers had to change the way that they cared for patients, including engaging patients more actively in self-management; and lab technicians had to keep up with increased demands for more regular testing. Middle managers indicated that they attempted to promote these changes by translating the broad strategy of HDC implementation into actionable tasks. One middle manager recounted her attempt to ensure that patient data were entered into the registry: She asked medical assistants to place flow sheets on the front of patient health records. The visible flow sheets reminded front desk staff to route records for data entry.

To effectively use the Chronic Care Model, HC employees required tools to promote self-management support and useful clinical information systems. Middle managers gave their HCs' employees these tools. Many middle managers reported that soliciting grant funding was an important tool for promoting self-management support. A substantial amount of self-management support tools were funded by HRSA's BPHC. However, middle managers indicated that effectively promoting self-management often required resources that neither HRSA's BPHC nor their HC could fund. For example, one middle manager found that the HDC encouraged patients with diabetes to test their blood sugar; however, glucometer test strips were often prohibitively expensive. To ensure that patients could engage in self-management, the middle manager applied for a grant for glucometer test strips.

Middle managers also reported that patient data registries were important tools for developing useful clinical information systems. Registries of patients with the chronic disease of interest (i.e., asthma, cancer, cardiovascular disease, diabetes, or depression) were central to the HDC's core Plan–Do–Study–Act cycle methodology. Patient data were used to track changes in patient outcomes subsequent to changes in approaches to care for patients with chronic diseases. Developing and maintaining patient data registries involved a substantial change to existing HC systems, which often used paper health records and unsystematic patient data documentation. Middle managers described going to great lengths to ensure data quality and timeliness. One middle manager said that she derived satisfaction from ensuring that patient data were of high quality and were timely. High-quality, timely data, she explained, meant that HC employees were confident in her calls to redouble their

efforts to improve care for patients whose quality metrics, such as hemoglobin A1c control, did not meet goals. Another middle manager recalled,

> We had to enter [patient data] in the computer, and then we pretty much had to [generate the reports] all by hand … All the calculations … because I remember printing out all the spreadsheets, taping them altogether … Just to figure out my average hemoglobin A1C … [But] the fact that it was measured and that we could report back and say look we're not doing our foot exams … [was] something very powerful…[But] that was on top of me seeing twenty people a day, and I was salaried, and I didn't get overtime. I was there until eight, nine, ten o'clock at night generating these reports. (095)

To sustain the implementation effort and overcome resistance, middle managers had to justify HDC implementation, encouraging employees to effectively and consistently use the HDC (Birken et al., 2012). Many middle managers reported trying to sell HDC implementation to resistant employees. One middle manager who had a particularly good relationship with a resistant physician remembered selling HDC implementation to her:

> [I said to her,] "You read all the time … even at home you read all these medical journals and everything. Don't you see things changing? There's always a new medicine, a new technique, a new procedure. Well, that's what this [the HDC] is basically saying. There's something new, it's been proven to work better, so we just got to do the best we can do."

Middle managers reported that selling innovation implementation also involved self-monitoring. In some respects, this involved stifling their emotions for frontline employees' sake. For example, one middle manager recalled being upset about her experience at a national HDC meeting. She anticipated that her negative feelings might adversely affect HDC team members' willingness to implement the innovation, so she monitored herself:

> [E]verybody would ask how'd it go and … I'd realize that by my short statements, I was making a negative effect, and I tried to hold off on that. I really did. Because I didn't want to bring negativity into it because we're working hard enough, we don't need to be beating our heads against a wall with negative thoughts and not get the job done. (059)

Engaging in self-monitoring allowed middle managers to promote innovation implementation by allowing other employees to maintain a positive view of HDC implementation.

There were few differences between low- and high-commitment middle managers with respect to the number and type of extra-role behaviors in which they engaged to promote HDC implementation. However, low- and high-commitment middle managers differed with respect to their attitudes toward engaging in these extra-role behaviors. Whereas low-commitment middle managers talked about their frustration with barriers to HDC implementation, high-commitment middle managers talked about their creative, effective approaches to addressing barriers to HDC implementation. These differences may have contributed to variation in HDC implementation effectiveness. For example, developing linkages for patients with diabetes with community resources, such as companies that offered discounted orthotic shoes, allowed one high-commitment middle manager to overcome poor access to financial resources. The middle manager explained,

> I've always felt that [if] it's something that's working and there's something good there, we've got to find a way to do it. And because we're community centers, and we're always poor, and there's never enough staff, and we're always under-staffed,

> over-worked, and under-paid, that was nothing new. So, I figured, "I'm sure I can come up with something." (097)

In contrast, several low-commitment middle managers reported that poor access to financial resources limited their ability to influence HDC implementation. Little attempt was made to overcome the limitation. One low-commitment middle manager said, "When you look at the patient population versus our staffing ability … your hands are somewhat tied" (156). Another low-commitment middle manager complained that, as a result of poor access to human resources, "things [related to HDC implementation] just didn't get done" (61).

Discussion

This study addressed the questions: Does middle managers' commitment influence implementation effectiveness? If so, in what ways does their commitment influence implementation effectiveness? Quantitative results suggested a weak relationship between middle managers' commitment and one indicator of implementation effectiveness. Qualitative results offered a more nuanced understanding of the relationship: Middle managers' commitment influenced implementation effectiveness when middle managers engaged in extra-role behaviors with a positive attitude. A positive attitude meant the difference between a behavior *intended to* promote implementation effectiveness and a behavior that *did* promote implementation effectiveness. In contrast to low-commitment middle managers, high-commitment middle managers persevered in extra-role behaviors until they achieved desired results (Crant, 2000).

We found that high- and low-commitment managers differed in their attitude toward engaging in extra-role behaviors but not in the strategies that they used to implement the HDC. In contrast, Hysong, Best, and Pugh (2007) found that high- and low-performing Veterans Affairs Medical Centers (VAMCs) differed in the strategies that they used to implement clinical practice guidelines. Like our study, however, what distinguished high-performing VAMCs from low-performing VAMCs was *pro-activity*—the initiative to solve problems (Crant, 2000). This proactivity promoted creative, effective solutions to problems that frustrated low-performers (Kim, Hon, & Crant, 2009).

Proactivity may have made middle managers particularly adept at developing linkages with community resources. Middle managers' influence on developing linkages with community resources may be related to their ability to span organizational boundaries (Pappas & Wooldridge, 2007). Indeed, middle managers acted as liaisons between their HCs and external organizations. Developing patient registries, for example, involved generating reports to be submitted to HRSA's BPHC. Middle managers who were proactive in ensuring patient data quality and timeliness may have been particularly effective in their role as liaisons between HRSA's BPHC and their HCs.

Our findings suggest that health care executives may promote implementation effectiveness by predisposing middle managers to proactivity. Executives may encourage proactivity among middle managers by creating climates in which proactivity is rewarded, supported, and expected. Evidence regarding strategies to promote proactivity among middle managers is scant. The ARC (availability, responsiveness, and continuity) organizational intervention model suggests that middle managers may be more proactive when executives communicate a clear vision and share specific information regarding an innovation (Glisson, 2008). Self-determination theory suggests that executive–middle manager exchange is associated with greater energy, and in turn, involvement in work (Quinn, Spreitzer, & Lam, 2012). One study found that open, regular, and informal communication between health care executives and middle managers may promote proactivity in innovation implementation (Birken, 2011). This suggests that executives should assess how regularly and openly they express support

for innovation implementation and the ways in which they express support for innovation implementation: Do they clearly, emphatically, and frequently communicate support? Do they do so in a variety of ways that are apparent to middle managers?

In addition to middle managers' commitment, we found that many IP&Ps had marginally significant relationships with developing linkages with community resources. In contrast, few variables had statistically significant relationships with promoting patient self-management or optimizing care delivery systems. Future research should assess the relationship between implementation climate and developing linkages with community resources. Are employees more inclined to perceive a strong climate for developing linkages with community resources than climates for other indicators of implementation effectiveness? Or are there specific combinations of IP&Ps to which developing linkages with community resources is sensitive? Results may equip executives to promote strong climates for developing linkages with community resources. Future research should also identify factors that influence other indicators of implementation effectiveness, such as promoting patient self-management and optimizing care delivery systems. Such research would support comprehensive implementation effectiveness improvement.

Our study has several limitations. First, the cross-sectional study design limited our ability to identify causal relationships. There is a possibility that middle managers may be more committed in health care organizations with greater implementation effectiveness, not vice versa. Second, the survey and interview responses in our study may be subject to social desirability bias and recall bias. We used middle managers' responses to operationalize key constructs. Ideally, we would have used more objective measures. Third, results of the qualitative analysis clearly indicated that the items used to measure middle managers' commitment in the survey represented a subset of extra-role behaviors that middle managers may engage in, during the implementation of the HDC innovation. We were also unable to measure all dimensions of implementation effectiveness in quantitative analyses (Linnan & Steckler, 2002). As such, our ability to detect relationships between middle managers' commitment and implementation effectiveness in quantitative analyses may have been limited. This measurement bias emphasizes the need to develop measures of implementation-related constructs (Eccles et al., 2009). Validated measures will promote strong research in a rapidly developing field. Fourth, we were unable to include other determinants of implementation effectiveness, such as implementation climate and innovation-values fit (Klein & Sorra, 1996), in the quantitative analysis because of data limitations. Fifth, the sample size limited the statistical power of our analysis. This limitation was further complicated by missing data.

Despite these limitations, our results suggest that middle managers' role in health care innovation implementation warrants additional research. Future research should verify the extent to which our results reflect data idiosyncrasies or measurement error. Research should also assess the conditions under which middle managers' commitment to health care innovation implementation positively influences implementation effectiveness. Specifically, what kinds of health care organizations elicit a positive influence from middle managers? The mission of HCs to provide care to the underserved may encourage middle managers to commit to innovation implementation; the mission of for-profit health care organizations, such as nursing homes, may not inspire middle managers' commitment to innovation implementation to the same degree.

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Table 1

Descriptive Statistics of Middle Managers and Health Centers Implementing the Health Disparities Collaboratives

Variable	Mean	*SD*	Min	Max
1. Developing linkages with community resources[a]	7.10	2.12	2	11
2. Promoting patient self-management[a]	6.26	2.20	0	11
3. Optimizing care delivery systems[a]	5.37	2.41	1	11
4. Middle managers' commitment to innovation implementation	2.67	0.89	1	4
5. Incentives	2.75	0.89	1	5
6. Performance reviews	2.94	1.15	1	5
7. Access to financial resources	2.25	0.99	1	5
8. Access to administrative human resources	3.74	0.75	2	5
9. Access to clinical human resources	3.91	0.74	2	5
10. Access to health system training resources	3.73	0.74	2	5
11. Access to provider training resources	3.74	0.93	2	5
12. Local social network involvement	3.54	3.26	1	17
13. Executive support for an environment that encourages innovation implementation	2.85	1.24	1	5
14. Executive support in the form of technology	2.70	1.08	1	5
15. Year in which health center began the HDC	3.56	1.11	1	5
16. Organizational size (number of patients)	14129.01	10932.93	500	58000
17. Organizational turnover	1.80	1.72	1	18
18. Organizational location (urban/rural)	0.50	0.50	0	1
19. Organizational tenure (years)	7.22	5.58	1	26
20. Job tenure (years)	2.68	1.43	0	6
21. Provider	22.50	0.50	0	1
22. Other clinical employee	52.50	0.50	0	1
23. Administrative employee	50.00	0.50	0	1
24. Board of directors involvement[b]	3.36	0.97	1	5
25. Learning session HDC team motivation[b]	3.98	1.01	1	5

Note: $n = 120$. *SD* = standard deviation; HDC = Health Disparities Collaboratives. Detailed information regarding variables and scales are available on request from the first author.

[a] Based on the Assessment of Chronic Illness Care (Bonomi et al., 2002).

[b] Marker variable.

Table 2

Predictors of Health Disparities Collaboratives Implementation Effectiveness: Ordinary Least Squares Regression Results

	Community Resource		Self-Management		Delivery System	
Variable	**β**	***SE***	**β**	***SE***	**β**	***SE***
Middle manager commitment to innovation implementation	0.44*	(0.21)	0.15	(0.23)	0.14	(0.37)
Incentives	0.17	(0.20)	0.29	(0.20)	NA	NA
Performance reviews	0.26*	(0.18)	0.28	(0.18)	0.35	(0.27)
Access to financial resources	0.36*	(0.20)	0.27	(0.22)	NA	NA
Access to administrative human resources	0.67*	(0.37)	0.80*	(0.39)	0.51	(0.58)
Access to clinical human resources	−0.18	(0.35)	−0.13	(0.45)	0.35	(0.59)
Access to health system training resources	0.58*	(0.24)	NA	NA	NA	NA
Access to provider training resources	−0.53*	(0.19)	NA	NA	−0.34	(0.29)
Executive support for an environment that encourages innovation implementation	0.40*	(0.24)	0.49*	(0.27)	0.23	(0.38)
Executive support in the form of technology	−0.27	(0.26)	0.03	(0.26)	0.01	(0.37)
Organizational location	NA	NA	NA	NA	−1.08*	(0.53)
Occupation: Provider	−0.98*	(0.41)	NA	NA	NA	NA
Board of directors' involvement[a]	−0.09	(0.21)	−0.19	(0.22)	−0.19	(0.22)
Learning session HDC team motivation[a]	NA	NA	NA	NA	0.21	(0.30)

Note: $n = 120$; *SE* = standard error; HDC = Health Disparities Collaboratives; NA = not applicable. Detailed information regarding variables and scales are available on request from the first author.

[a]Marker variable.

*$p < .10$.