

Public Health Case Studies in Diabetes Prevention and Control: Innovation, Partnerships, and Funding

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BACKGROUND In 2006, we conducted case studies of 4 North Carolina local health departments (LHDs) that scored highly on an index of diabetes prevention and control performance, to explore characteristics that may serve as barriers or facilitators of diabetes prevention and control services.

METHODS Case studies involving in-depth interviews were conducted at 4 LHDs. Sites were selected on the basis of 2 variables, known external funding for diabetes services and population size, that were associated with performance in diabetes prevention and control in a 2005 survey of all North Carolina LHDs. Fourteen interviews (individual and group) were conducted among 17 participants from the 4 LHDs. The main outcome measures were LHD characteristics that facilitate or hinder the performance of diabetes programs and services.

RESULTS Interviews revealed that all 4 high-performing LHDs had received some sort of funding from a source external to the LHD. Case study participants indicated that barriers to additional service delivery included low socioeconomic status of the population and lack of financial resources. Having a diabetes self-management education program that was recognized by the American Diabetes Association appeared to be a facilitator of diabetes services provision. Other facilitators were leadership and staff commitment, which appeared to facilitate the leveraging of partnerships and funding opportunities, leading to enhanced service delivery.

LIMITATIONS The small number of LHDs participating in the study and the cross-sectional study design were limitations.

CONCLUSION Leadership, staff commitment, partnership leveraging, and funding appear to be associated with LHD performance in diabetes prevention and control services. These factors should be further studied in future public health systems and services research.

Chronic diseases cause 70% of mortality in the United States and affect 133 million persons [1]. Diabetes is among the most important chronic conditions affecting Americans today. In North Carolina, an estimated 828,000 persons have diabetes, nearly one-third of whom do not know they have the disease [2]. In 2009, the prevalence of diagnosed diabetes was 9.6% among persons ≥ 18 years of age [3]. However, a recent survey of all 85 local health departments (LHDs) in North Carolina [4] suggested that most LHDs have limited capacity and performance in diabetes prevention and control services in communities. The survey also found that external funding and population size were characteristics associated with higher capacity and performance. These findings support the observation that chronic diseases in general are relatively neglected in public health practice [5]. These findings also support previous research demonstrating that the size of the population the LHD serves and that LHD funding affect performance [6-8]. Although survey findings described service characteristics and variation in service provision across the state, these findings did not identify factors that may serve as barriers or facilitators to performance of services or suggest strategies to increase service performance.

The purpose of this study was to conduct case studies of 4 North Carolina LHDs that scored highly on the performance survey, to further investigate LHD characteristics, particularly those that are amenable to change and that can

inform performance improvement efforts, that may serve as barriers or facilitators to performance of diabetes services. Case study methods, including those involving qualitative data collection and analysis, allow for in-depth understanding of a problem [9-11], which, in this case, involves factors that are barriers or facilitators of performance of diabetes services. The study was a collaboration among investigators at the University of North Carolina-Chapel Hill (UNC-Chapel Hill), the North Carolina Division of Public Health's (DPH's) Diabetes Prevention and Control Program, and the North Carolina Association of Local Health Directors.

Methods

Case study selection. We purposively selected 4 LHDs to participate as case study sites in this research. The 9 LHDs that scored highest on a 10-point index of diabetes prevention and control services in a 2005 survey of all 85 NC LHDs (mean score for all LHDs [$\pm$ standard deviation], 3.5 ± 1.9) [4] were placed into 4 categories that were based on the size of population served ($>100,000$ or $\leq 100,000$ individu-

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als) and the presence or absence of Diabetes Today (DT) funding (ie, funding from the state public health agency to develop local diabetes programs). These 2 variables were associated with performance in the survey [4] and were selected as the frame within which to explore variation in and barriers and facilitators to diabetes service delivery. Of the 9 eligible sites, 4 served a large population and had DT funding, 3 served a small population and had DT funding, and 2 received no DT funding, with 1 serving a large population and 1 serving a small population. Both LHDs that received no DT funding were included in the sample. Because both of these LHDs were in the eastern region of the state, we also targeted LHDs in the other cells that were geographically in the eastern part of the state. Of the initial 4 LHDs invited to participate through the health director, only 1 refused; a second LHD with matching category criteria was substituted and successfully recruited.

Case study interview guide and interviews. A structured interview guide was created that followed the original survey framework [4], which was based on the 10 Essential Public Health Services and the Local Public Health System Performance Assessment Instrument developed by the National Public Health Performance Standards Program at the Centers for Disease Control and Prevention [12]. Additional items examined the interviewee role in diabetes services at the LHD, the importance of diabetes to the community, the provision of specific types of diabetes prevention and control services, the history and changes in diabetes services in the past 5 years, and a list of barriers and facilitators to providing diabetes services, funding sources, and partners. Items were based on the expertise of the authors and expert reviewers and on previous literature on LHD performance. Questions were open ended, with the exception of the list of barriers and facilitators. Experts in diabetes and case study methods reviewed the instrument. By use of the structured interview guide, face-to-face case study interviews were conducted by 2-person teams, with one of the research team members participating in all interviews at all sites. The staff interviewed were selected by each case study site. Interviews lasted 1-2 hours and took place over 4 months in 2006. Interviews were taped and transcribed. The study protocol was approved by the institutional review boards of the DPH and UNC-Chapel Hill, and the research effort was approved and supported by the DPH and the North Carolina Association of Local Health Directors.

Case study analysis. Data from the 2005 survey (ie, scores on the performance index, number of full-time equivalent [FTE] personnel in diabetes prevention and control, and types of service provided) were included as part of the data for each case study site. These data were examined to confirm that case study LHDs provided more services overall and to investigate whether case study sites were likely to provide specific services. To examine barriers and facilitators to providing services, individual LHD case records were created from transcribed interviews. Data were coded using

both a priori and emergent coding schemes. A priori codes were used to validate barriers and facilitators to providing diabetes services. The following analyses were conducted: (1) within-case analysis for each LHD and (2) cross-case analysis to identify common themes. NVivo was used to conduct content analysis [13], to identify common response themes across interviewees and cases and for analyzing multiple case studies, as described by Miles and Huberman [14].

Results

Seventeen persons participated in interviews individually or in groups at the 4 LHDs; 7 were nurses (eg, a nurse practitioner, public health nurse, or director of nursing), 5 were nutritionists (eg, a dietician or nutrition director), 2 were health educators, and 1 each was a health promotion supervisor, program manager, and executive director for a local Healthy Carolinians (ie, health coalition) group.

Case study site survey scores on the 10-point index of diabetes prevention and control services ranged from 5.69 to 7.21, compared with the state mean of 3.5. The number of diabetes-associated FTEs ranged from 0.5 to 1.0 (mean, 0.75) for diabetes prevention services and from 0 to 1.4 (mean, 0.7) for diabetes control services. The number of certified diabetes educators (CDEs) ranged from 0 to 4 per LHD, with 3 of the LHDs having at least 1 CDE. The staff who most commonly provided diabetes prevention and control services were nurses, health educators, and nutritionists. Other staffing positions varied depending on the type of programs and services offered by the LHD.

Survey results reveal that case study LHDs were more likely to provide specific diabetes prevention and control services, compared with all LHDs in the state. Interview participants confirmed that these LHDs focus on providing the following services: (1) coordinating and providing diabetes self-management education and diabetes screening services, (2) working with local partners (described below) to strengthen and reinforce services for people with or at risk for diabetes and to link people to needed personal health services through physician referral systems, and (3) operating clinics and case management programs for persons with diabetes. Each of the 4 LHDs have referral systems for diabetes primary and/or specialty care. One LHD operates its own diabetes clinic, and another has practitioners that initiate diabetes therapy for persons with newly diagnosed diabetes who are experiencing a delay in obtaining a primary care appointment outside of the LHD. One LHD also operates a diabetes case management program for county employees. An overall description of diabetes prevention and control services identified at the case study sites is presented in Table 1.

Barriers. Interviewees were presented with the following list of potential barriers to providing diabetes services: low socioeconomic status of the population; lack of a dedicated funding stream for diabetes; small LHD size (eg, small

TABLE 1.
Diabetes-Related Activities at 4 Case Study Local Health Departments (LHDs), According to the 10 Essential Public Health Services Framework

Essential service	Case study LHD activities
1. Monitor health status to identify community health problems	Conduct community health assessments.
2. Diagnose and investigate health problems and health hazards	None of the LHDs have an epidemiologist on staff. Ways of diagnosing and investigating health problems reported by staff include the following: obtain and/or analyze data independently, seek assistance from an epidemiologist (at the state health department), and obtain assistance from a local university.
3. Inform, educate and empower people about health issues	Coordinate ADA-recognized self-management education programs. Collaborate with local health care professionals, primarily to obtain referrals from health care professionals to provide diabetes education and/or medical nutrition therapy to patients. Provide patient education outside of the LHD, either at other health care professionals' offices or in an industry setting. Conduct other awareness, education, and health promotion activities in conjunction with community partners for persons with diabetes or prediabetes/diabetes risk factors.
4. Mobilize community partnerships to identify and solve health problems	All agencies rely on local partnerships to strengthen/reinforce services provided to people with or at-risk for diabetes (see examples in the body text and in essential services 3, 4, and 7-9).
5. Develop policies/plans that support individual and/community health efforts	Two agencies described involvement in activities that influence the public health policy process in diabetes prevention and control: Issue briefs, provide public testimony, or participate on an advisory board. Provide assistance to the state in developing diabetes education curriculum.
6. Enforce laws and regulations that protect health and safety	On the basis of responses to the survey that indicated very little performance by most LHDs with regard to this essential service, this area was not probed during the interviews.
7. Link persons to needed personal health services	Create referral systems for either primary or specialist care. Operate a clinic for persons with diabetes. Provide follow-up care for patients waiting for an appointment for clinical care outside of the LHD. Implement a case management program for county employees with diabetes. Provide diabetes screening services.
8. Assure a competent public and personal health care workforce	Participate in training provided by the East Carolina University Diabetes Fellowship.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services	For LHDs with an ADA-recognized program, report required indicators to the ADA. Contract with a local university to assist with evaluation. Conduct health care professional and patient satisfaction surveys.
10. Conduct research for new insights and innovative solutions to new health problems	None of the interviewees reported involvement in diabetes-related research at their LHD.

Note. See [12] for information about the Essential Public Health Services framework. ADA, American Diabetes Association.

budget and number of FTEs); staffing challenges, including lack of training and turnover; and rural location. All 14 participants confirmed that low socioeconomic status of the population is a barrier, and >70% confirmed that lack of a dedicated diabetes-associated funding stream is a barrier (Table 2). At least one interviewee in each LHD confirmed that small LHD size, staff turnover, and rural location are barriers to providing services. Interviewees identified the following additional barriers: lack of physical space for services and, for some persons with diabetes, perceived stigma of receiving services in an LHD. Interviewees from all 4 sites described the importance of expanding diabetes-related services by increasing clinic hours and hiring more staff to overcome these barriers.

Facilitators. Of the 8 facilitators to providing diabetes services presented to interviewees (Table 3), all interviewees agreed that having a high prevalence of diabetes in the county facilitates support for services because of the raised awareness of the disease in the community and

the perceived need to address it. Other common facilitators included (1) access to data on diabetes (presumably because this can help to garner support from LHD or county leadership to develop programs or services, although this was not explored further), (2) the presence of a diabetes "champion" in the LHD, (3) a lack of other health care professionals in the county (which might have resulted in the creation of more LHD diabetes programs and services), and (4) the presence of a diabetes-related community coalition.

Additional facilitators identified by interviewees that emerged from our analyses were funding sources other than DT, having American Diabetes Association (ADA) recognition for a diabetes self-management education program, partnerships, and LHD leadership. Funding was identified as the major facilitator for providing diabetes prevention and control services. Although only 2 LHDs were known to have external funding before the interviews, it was learned that all 4 LHDs applied for and received additional funding. Funding sources included foundations, state and county

TABLE 2.
Barriers to Providing Diabetes Programs and Services
at 4 Local Health Departments (LHDs), According to 14
Interviewed LHD Staff Members

Barrier	Interviewees, no. (%) ^a	LHDs, no. (%)
County socioeconomic status	14 (100)	4 (100)
Lack of dedicated diabetes-associated funding stream	10 (71)	4 (100)
Small LHD size (budget, FTEs)	9 (64)	4 (100)
Staff issues (availability, training, turnover)	9 (64)	4 (100)
Rural location	8 (57)	4 (100)

Note. FTE, full-time equivalent.

^aNot all interviewees responded to questions because they did not know the answer or because the question was not applicable.

governments, and hospital and health care systems. These resources were used to hire and retain staff; to plan, implement, and sustain programs; to provide diabetes education through media outlets and collaborations with health care professionals; to purchase supplies, such as blood glucose test strips; and to support CDEs in providing diabetes education to county employees and in health care professionals' offices. The 2 LHDs with DT funding used those funds as seed grant money and to support communications; these LHDs also applied for additional funding from other sources.

Three LHDs have an ADA-recognized diabetes self-management program. According to interviewees, these programs bring more attention to their services and status to their program and, in some cases, bring referrals from neighboring counties. ADA-recognized programs in LHDs can bill Medicare, Medicaid, and some insurance companies for services; however, interviewees reported that correctly billing for these services has been challenging. For the LHD that does not have an ADA-recognized program, this is primarily because the neighboring hospital has one and the LHD does not wish to be perceived as being in competition.

The LHDs described relying on local partnerships to strengthen and reinforce services provided to people with or at risk for diabetes. One interviewee asserted that "We don't do anything in isolation.... [T]he reason that we are as effective as we are...is that none of us has enough resources to do it all." LHD staff described working with a variety of partners, including Healthy Carolinians groups, local health care professionals, Medicaid managed care networks, churches, hospitals, local universities and colleges, and local businesses. Most of the LHDs partner to some extent with local health care professionals, and 2 of the LHDs specifically market diabetes education and nutrition therapy services to health care professionals.

Interviewees emphasized the importance of leadership by the health director and/or staff members' direct supervisors as a facilitator to providing diabetes services. Personnel at 2 agencies indicated that the health director is a "champion" of diabetes programs and services, with one stating

that their director is "a champion in everything that needs to be taking place. I mean, he just has a lot of drive and initiative." In addition, interviewees expressed appreciation for the leadership style of the health director. Interviewees from another LHD explained that their supervisor allows them freedom in designing and implementing programs; according to one, "We are allowed to be innovative in our own approaches on how we deal with things." Content analysis revealed that supportive leadership is characterized by a health director who acts as a champion for services, serves as a resource to staff, and gives staff the autonomy to do their jobs in an innovative manner.

Discussion

To improve the public health system's ability to prevent and control chronic diseases, it is necessary to assess current public health agency practice and develop appropriate and valid strategies to improve performance. Studies have identified variation in levels of performance and pointed to characteristics that may explain some of the variation, primarily at the LHD level [6-8, 15-17]. Variables associated with overall LHD performance include number of LHD staff [8]; expenditures [6-8]; education level of the health director [8]; type of jurisdiction [7]; type of administrative relationship between state and local agencies [7, 17]; population characteristics, such as size [7, 17-19] and poverty rate [6]; and presence or characteristics of a board of health [6, 8, 17]. These studies have been quantitative in nature and typically do not provide in-depth understanding of factors that affect performance, particularly factors that are amenable to change and agency influence or that can inform LHD improvement efforts [20]. This article explores factors that affect performance in chronic disease prevention and control services, which is a relatively neglected area of public health practice [5].

TABLE 3.
Facilitators to Providing Diabetes Programs and Services
at 4 Local Health Departments (LHDs), According to 14
Interviewed LHD Staff Members

Facilitator	Interviewees, no. (%)	LHDs, no. (%)
Having a high prevalence of diabetes in the county	14 (100)	4 (100)
Having access to data on diabetes	13 (93)	4 (100)
Having a diabetes "champion" in the LHD	13 (93)	4 (100)
Lack of other health care professionals in the county	11 (79)	4 (100)
Having a diabetes-related coalition	9 (64)	4 (100)
Having received Diabetes Today training and funding	6 (43)	2 (50)
Having a self-management program that is accredited by the American Diabetes Association	3 (21)	2 (50)
Having "diabetes" or "chronic disease" in the mission statement	3 (21)	2 (50)

Case studies were conducted in 4 NC LHDs that scored highly on a diabetes prevention and control services performance index. Case study LHDs were selected specifically to include those serving small populations (and assumed to have smaller budgets) and those without known external funding for diabetes prevention and control services, since population size and DT funding were the 2 characteristics found to be associated with performance in the survey. Notably, although the LHDs with DT funding scored higher on the performance index, all 4 LHDs had multiple external funding sources, which facilitated diabetes service provision. When compared with LHDs statewide, case study LHDs had more FTEs involved in diabetes prevention and control and were much more likely to provide specific services.

Not surprisingly, barriers to providing services are primarily financial. There are few funding streams dedicated to supporting diabetes prevention and control services. Enhanced service delivery appears to happen through interconnected factors, including supportive leadership, funding from a variety of sources, and partnerships. In turn, supportive leadership appears to foster staff autonomy, innovation, and commitment. Although staff commitment was not specifically measured, LHD staff who participated in these interviews appear to have a high commitment to providing diabetes programs and services. We hypothesize that leadership and staff commitment can result in identification and attraction of funding and in creation and maintenance of community partnerships. Partnerships and funding can be related in 1 of 3 settings: when proposals are submitted collaboratively, when the LHD receives a grant that benefits other partners, and/or when a partner receives a grant that benefits the LHD. As described by interviewees, funding generally leads to more staff and an increased budget for programs and services.

The findings of this study are supported by case study research conducted among 5 diabetes prevention and control programs in state health departments [21]. Among factors that facilitate diabetes services among the state health departments were fitting programs and services to the context, building relationships, and negotiating systems through leadership, the latter 2 characteristics being very similar to this study's findings regarding partnerships and leadership. In a second study of state health departments developing new activities in diabetes prevention, in addition to partnerships and funding as identified in this work, other factors supporting development of effective interventions were planning, policies, benchmarks for progress, and data [22].

Findings from this study may be limited to LHDs with characteristics similar to those included in this study [11]. Furthermore, findings are limited to observations of the LHDs studied and do not include considerations of causation. Interview participants were selected by the LHDs and were typically frontline staff involved in implementing the programs; assessments of barriers and facilitators may have been different if health directors or medical directors were

interviewed. The study included only high-performing LHDs and therefore does not permit comparisons with average or low-performing LHDs.

In the LHDs we studied, performance of diabetes services appears to be facilitated by leadership that supports innovation and commitment, staff commitment, and enhanced funding, which are leveraged through partnerships to meet community needs. These insights enhance the literature on factors that affect LHD performance. Much of the previous literature has identified factors associated with LHD performance that are not easily amenable to change or that cannot inform LHD performance efforts, such as poverty rates or population size [6, 18-20]. Supportive leadership style, including hiring staff who are highly committed to solving community problems, partnership leveraging, and accessing funding, are teachable skills [23]. Facilitating recognition for LHD self-management education programs, as is now occurring in North Carolina through the North Carolina Diabetes Education Recognition Program, is an action step for other state health departments that is suggested by the findings of this study. Nevertheless, these insights are limited to these 4 LHDs. Future public health systems and services research should examine whether intervening on these factors can enhance the performance of diabetes prevention and control services. *NCMJ*

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