Health departments' implementation of public health's core functions: an assessment of health impacts

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Abstract:

Objectives. The purpose of this article was to investigate the relationship between state health agencies' adherence to the recommendations of the United State's Institute of Medicine's (IOM) report, 'The Future of Public Health', and changes in their populations' health.

Study design. Data were abstracted from agencies' plans, budgets, annual reports, etc. spanning a 5-year period. A comprehensive change in population health measure over the same period was drawn from the UnitedHealth Group's annual survey.

Methods. Configurations, based on public health core functions, were established using linear regression and qualitative comparative analysis. The dependent variable was a holistic measure of change in a state population's health status.

Results. State agencies that most completely adopted a public health model emphasizing assessment, assurance and policy development also experienced significant improvements in their population health measures.

Conclusions. State agencies that more completely adopted the IOM's public health core functions had a concomitant improvement in their populations' health statuses. Further research to explore if there is a causal link between adoption of the core functions and positive health impacts is warranted.

Keywords: Public health; Health services research; Social sciences

Article:

Introduction

The 1988 Institute of Medicine (IOM) report,[1] 'The Future of Public Health', fundamentally changed the way public health was organized in the USA. In that report, the committee recommended that state-level health agencies should increase their administrative capabilities in three core functional areas—assessment, assurance and policy development. The increased attention to administrative capabilities has been accompanied by an increased interest in quantifying, tracking and improving the health impact assessment of government agencies in the USA,[2] in other developed countries[3] and throughout the world.[3,4] In the USA, the effort reached critical mass with the publication of 'Healthy People 2000'[5] and continues to grow.

Significant progress has been made in linking specific population health improvement goals (e.g. immunization and cancer screening rates) to specific administrative activities (e.g. contracting and human resources development) through programmes such as the Turning Point Performance Management Collaborative.[6] However, these programmes do not address some broader (holistic, sociological, qualitative) public health questions.[3] Specifically, does having well-developed assessment, assurance and policy development functions correlate positively with above-average improvements in population health status? Is it necessary to be proficient in all three functions, or is being capable in one or two sufficient to achieve above-average health status improvement?

The study has two purposes. The first is to comparatively measure state health agencies' adoption of the core functions promulgated by the IOM. The second is to configure state health agencies based on their public health core function capabilities, and relate the derived configurations to superior vs. inferior improvements in a population health impact assessment over 5 years. The latter analysis uses qualitative comparative analysis (QCA) to separate the more successful configuration patterns from those with less positive impact. The QCA

method is particularly well suited to the questions at hand because it allows for the exploration of the necessity, sufficiency and interactions among the three core public health functions and relates them to the outcome of interest—health impact assessments.

This research advances the study of public health in three distinct ways. First, linking population health impact assessments to the agencies charged with improving them is an important endeavour.7 In particular, assessing agencies' core management capabilities and relating them to improvements in population health status over time provides impor-ant information to policy makers on the way that departments should strive to function. Second, using content analysis to study organizational documents rather than surveys to assess the degree of compliance with IOM recommendations potentially increases the objectivity and reliability of the findings. Last, the study assesses the core functions model promulgated by the IOM and its utility in improving populations' overall health status in the USA.

Background

Public health activities have significantly improved the length and quality of life throughout the world.[8] In particular, the reduced incidence and prevalence of infectious diseases has been a major public health achievement. However, future progress will be more difficult to achieve and the health impacts of public agencies will become more difficult to assess. As Jocelyn Elders, former US Surgeon General, stated, 'public health is poorly understood—perhaps because when it is effective, nothing happens'.[9] As there are a variety of interventions and health impacts, identifying which health agency's activities are directly contributing to progress is difficult to determine and always subject to debate.[10] In the USA, a set of three core functions—assessment, assurance and policy development—has been advanced by the Federal Government's IOM.

Few studies have attempted to measure the state of public health practice in the USA as it relates to the IOM's[1] recommendations regarding all three core functions. Of eight prior studies, four focused on local health departments[11 – 13] and four took a state-level approach.[14] Scott et al.[15] were the first to conduct a complete census based on the core public health functions identified by the IOM. Scutchfield et al.[16] replicated Scott et al.'s[15] survey 7 years later and found that the number of agencies engaging in assessment and assurance activities was generally unchanged. However, the percentage of state health agencies actively engaged in policy development declined from 72 to 49% over the same period. For policy development as it pertains to specific issues, such as genetics and disease prevention,[17] states exhibited even lower levels of activity. This implies that a formal policy development function was absent in approximately half of the states, even on a self-reported basis.

In management research, configurational approaches are used to explore the relationship between organizations' strategic planning capabilities, organization structure, and decision making and performance. Further, a positive correlation between strategic planning system configurations and financial performance has been shown to exist empirically.[18–20] However, no studies to date have attempted to differentiate configurations on non-monetary measures of success—such as healthcare outcomes.

The most important feature of any configuration is determining the intended purpose of the organizations being analysed.[21,22] From a public health perspective, it is important to assess the effects of the core functions on population health status measures. Therefore, systematically linking agency planning paradigms to public health impact assessments is a natural extension of the configuration methodology.

The US Department of Health and Human Services has identified 10 leading health indicators and recommended that they be used as outcome measures because they:

> 'help everyone understand the importance of health promotion and disease prevention.... Developing strategies and action plans to address one or more of these indicators can have a profound effect on increasing the quality of life ... and eliminating health disparities.'[23]

The leading health indicators are: (1) physical activity; (2) obesity; (3) tobacco use; (4) substance abuse; (5) sexual behaviour; (6) mental health; (7) injury and violence; (8) environmental quality; (9) immunizations; and (10) access to health care. Other organizations and researchers[24] have created indices of community health status using similar measures.

For example, the UnitedHealth Group has produced annual reports ranking the general level of health in all 50 states since 1989. The report provides a comprehensive view of population health trends across the USA. The scores are designed to draw attention to key measures affecting the public's health. The US General Accounting Office has cited it as a leading composite indicator of the states' health, and has used the report to determine federal aid distributions.[25] In addition, scaling the items into a single variable allows for a holistic comparison of overall health progress with the core functions. Therefore, identifying relationships between core function configurations and population health improvement is an important addition to both management and public health research.

Consistent with the preceding discussion, three hypotheses related to configurations and health measures are stated. Public health professionals have developed a model of how agencies should be structured to improve their communities' health impact. Central to this model are the core functions of assessment, assurance and policy development. These functions are designed to be mutually reinforcing and broadly interpreted at the state level. In particular, policy development should involve 'the establishment of state-wide health objectives, delegating power to localities as appropriate and holding them accountable'.[1] Therefore, this model is examined with the following hypothesis:

Hypothesis 1. The three core functions, assessment, assurance and policy development, were significantly and positively related to improvements in health population status from 1990 to 2000 among US communities.

As many agencies were disengaging from policy development,[16] organizations may have discovered that either assessment and/or assurance were sufficient for successful improvement of population health statuses.
The question then arises, do agencies need to be engaged in all of the activities in order to have a positive effect on population health measures? Therefore, the following hypothesis is tested:

Hypothesis 2. The core functions of assessment and assurance are either individually or collectively sufficient to explain improvements in health population status from 1990 to 2000 among US communities.

The alternative hypothesis assumed under the IOM model is:

Hypothesis 3. The three core functions, assessment, assurance and policy development, were all necessary to improve health population status from 1990 to 2000 among US communities.

Linear regression and QCA are used below to test and explore critical strategic functions among state health agencies.

Methods

The present study used linear regression and configuration analysis. Linear regression was used to measure the relationship of the core function variables individually. Although linear regression applied to observational data cannot determine causality, it does provide insight into the predict-ability of variables, and serves as the basis for further investigation. QCA was used to further explore the linear regression result; this focuses on the public health core functions collectively and how they are related to above-average health improvement.

Sample

One difficulty in studying public health is that the functions reside in a variety of departments within each state's government. Therefore, a method for identifying the correct department within each state was necessary.

The criterion employed in this research was to select the cabinet-level leader that had public health in her or his agency. The sampling frame was limited to agencies from the 50 states.
The independent (core function /configuration) and dependent (changes in population health status) variables were drawn from two sources. Expert raters (possessing an MHA, MPH or similar health-related degree), using information drawn from the states themselves, scored the core functions' variables used to create the configurations. The scorers used a seven-point Likert scale to evaluate each state comparatively.

The specific queues to raters for identifying and scoring the core function variables were narrowly defined. A narrow set of queues was chosen for four reasons. First, the core function queues were defined so that only objective evidence that they were being adhered to, rather than merely claimed by the department, would receive positive scoring. Second, the definitions as described were more congruent with common strategic management variables that have demonstrated high degrees of reliability and validity. Third, the narrow definitions help to increase the level of interrater reliability (IRR). Fourth, variable definitions and examples were linked to numerical scoring queues to reduce the tendency of raters to use only a few points on the scale.

IRR was measured prior to scoring based on a sample of three randomly selected states, and a post hoc I RR was derived based on multiple scorings of every state in the sample. On the prescoring analysis, scorers achieved a Cronbach's alpha significant at $P < 0.05$. Therefore, the actual scoring was allowed to proceed. As a post hoc analysis of reliability, a Kappa statistic comparing multiple raters across every state was derived. The overall Kappa statistic was 0.865 and significant at $P < 0.001$. In descriptive terms, allowing for scoring differences of one or zero on a variable, the raters were in agreement for 92.01% of the time.

Two other potential sources of bias were considered because of the use of expert raters. The first was the phenomenon of raters using only part of the scale for some variables. Variable definitions and examples were linked to numerical scoring queues to reduce the tendency of raters to use only a few points on the scale. The second phenomenon is halo effects. Again, we believe that concise definitions help mitigate this form of bias, and the high degree of I RR seems to indicate that if the phenomenon did exist, it was at least consistent across raters.

Variables

The assessment measure included indications that the state agency was not only gathering health data, but also consulting citizens and stakeholders to evaluate and improve specific programmes in order to achieve a high score (above four on the seven-point scale).[26] With respect to assurance, raters were instructed to look for effective delegation of operating authority to county and local health departments for service delivery to at-risk populations. Similarly, evidence that state-level department leaders had the authority to adjust programmes to meet emerging needs was necessary to achieve a high score on assurance. For policy development, scorers were instructed to look for a strong decision-making authority housed at the state level. In particular, the presence of a dedicated planning office was necessary to indicate a high potential for effective policy development. The data used to score the core functions' variables are discussed next.

State agencies make large amounts of raw data relating to their organizations' activities available to the public. The items specifically requested were strategic plans, budgets, annual reports, Healthy People 2000 and 2010 goals, and organization charts. Three different attempts were made to gather relevant materials. States were deemed to have provided adequate configuration information if two reviewers agreed that all of the variables could be scored.

The UnitedHealth Group[27] report was chosen as the dependent variable source for three reasons. As the report's measures have been refined in subsequent iterations, previous reports are recalibrated to reflect the new scoring. Also, the items that compose the scale have been weighted to control for intercorrelations based on suggestions from a Delphi process. Finally, the measures were similar in nature to those recommended in Healthy People 2000 and used in other studies.[24]

Analytic approaches

The first phase of the analysis used linear regression to test the hypothesis that public health core functions are related to improvements in health status (Hypothesis 1). Two additional variables were added to the regression based on current management theory. One was resource availability and the other was adaptability. In light of the fact that many state health agencies have had significant reductions to their budgets in recent years, these two additional variables are particularly germane to assessing their health impacts and adaptive behaviours. The necessity and sufficiency of the three core functions, and two additional strategy variables, were used in the next phase of the analysis.

In order to study the correlations between the public health model and population health out-comes (Hypotheses 2 and 3), QCA was performed. QCA is a form of analysis that considers every possible variable combination and set of inter-actions. The core function measures and two additional strategy variables were dichotomized as is typical of QCA. For the independent variables, a conservative approach was taken and only organizations scoring greater than four, the mid-point of the scale, were considered to have the characteristic present. With respect to the dependent variable, the sample was divided into more and less successful halves based on the change in state health measures from 1990 to 2000.

Two other features of combinatory logic and QCA are the use of 'truth tables' and 'logical minimization'.[28] Truth tables are matrices containing every possible combination of independent variables related to the dichotomized criterion variable. The unit of analysis for tables is the row and it is possible to reduce the table using logical minimization. Rows that lack any cases (viz. states) displaying that configuration of core functional characteristics can be eliminated. Next, rows that produce similar outcomes and only differ on one independent condition are combined. This phase can have multiple iterations until no further reductions are possible and the 'prime implicants' are revealed (for a full description of the procedure, see Ragin).[29] The final step in the QCA process is to create an equation that expresses the prime implicants for the outcome of interest in a reduced form. Based on these equations, the necessity and/or sufficiency of the public health model's elements can be discerned with respect to the health impact assessment (Hypotheses 2 and 3).

Core public health functions are necessary components of above-average improvement if they must be present for the desired results to occur. A core function is sufficient if it alone can create the outcome of interest. There are several combinations of necessity and sufficiency possible. For example, it is possible for more than one function to be sufficient but not necessary and vice versa. Therefore, necessity and sufficiency need to be considered conjointly to meaningfully interpret the results of prime implicant equations28 and the veracity of the IOM's core function model.

Table 1 Regression model for changes in public health measures from 1990 to 2000.

Variable	Coefficient	SE
Model of public health core functions		
Intercept	18.217	0.633
Assessment	3.933	0.844
Assurance	4.140	0.872
Policy development	6.298	1.051
Exploratory model		
Intercept	18.217	0.587
Assessment	3.988	0.965
Assurance	4.129	0.817
Policy development	5.518	1.068
Resource availability	1.991	0.800
Adaptability/proactivity	−2.057	0.854

Dependent variable taken from the 2000 UnitedHealth Group Health Rankings. All variables significant at $P < 0.05$. Model of public health core functions $R^2 = 0.540$; adjusted $R^2 = 0.503$. Exploratory model $R^2 = 0.626$; adjusted $R^2 = 0.573$. SE, standard error.

Results

The results are based on 41 states (82%) that provided adequate information to be included in the configuration analysis. To detect any non-response bias, five demographic characteristics (age distribution, race mix, median income, poverty levels and population density) and four federal funding metrics (training grants, maternal and child health support, primary care subsidization and rural health funding) were compared. Only one measure indicated any difference between the sample and non-respondents—race mix of the population. Non-respondent states' populations had a greater proportion of white/ non -Hispanic residents.

Multiple regressions were performed to test Hypothesis 1. The model containing the three core function variables was significantly related to the dependent variable ($F = 14.497$; $P < 0.001$). All three of the independent variables' coefficients were positively related to changes in population health status from 1990 to 2000 (Table 1). Altogether, 50.3% (adjusted $R^2 = 0.503$) of the variability in the dependent variable was correlated with assessment, assurance and policy development. Therefore, Hypothesis 1 is supported.

Adding the two strategic capability variables, Hypotheses 2 and 3 are examined next. Each item was reduced to a binary variable thus yielding a truth table with 32 (2^5) possible configurations. Table 2 presents every possible combination of the variables and has 16 rows populated by state health agencies. The logical minimization algorithm delineated by Ragin[28] yielded eight configurations that are displayed in Table 3. Two of the reduced configurations are populated with states that experienced above-average and positive health impact assessment.

Table 2 Truth table for causes of 'above-average population health improvement'.

	Assess	Assure	Policy development (PD)	Resource	Adaptability	Superior progress (%)	*n*
1	Assess	Assure	~PD	Resource	Adapt	33	3
2	Assess	Assure	~PD	Resource	~Adapt		0
3	Assess	Assure	~PD	~Resource	Adapt	33	3
4	Assess	Assure	~PD	~Resource	~Adapt	50	2
5	Assess	Assure	PD	Resource	Adapt	86	7
6	Assess	Assure	PD	Resource	~Adapt	100	2
7	Assess	Assure	PD	~Resource	Adapt	100	2
8	Assess	Assure	PD	~Resource	~Adapt		0
9	Assess	~Assure	~PD	Resource	Adapt	0	1
10	Assess	~Assure	~PD	Resource	~Adapt		0
11	Assess	~Assure	~PD	~Resource	Adapt	0	1
12	Assess	~Assure	~PD	~Resource	~Adapt		0
13	Assess	~Assure	PD	Resource	Adapt		0
14	Assess	~Assure	PD	Resource	~Adapt		0
15	Assess	~Assure	PD	~Resource	Adapt	50	2
16	Assess	~Assure	PD	~Resource	~Adapt	25	4
17	~Assess	Assure	~PD	Resource	Adapt	0	1
18	~Assess	Assure	~PD	Resource	~Adapt		0
19	~Assess	Assure	~PD	~Resource	Adapt		0
20	~Assess	Assure	~PD	~Resource	~Adapt		0
21	~Assess	Assure	PD	Resource	Adapt		0
22	~Assess	Assure	PD	Resource	~Adapt		0
23	~Assess	Assure	PD	~Resource	Adapt	0	1
24	~Assess	Assure	PD	~Resource	~Adapt	33	3
25	~Assess	~Assure	~PD	Resource	Adapt		0
26	~Assess	~Assure	~PD	Resource	~Adapt		0
27	~Assess	~Assure	~PD	~Resource	Adapt		0
28	~Assess	~Assure	~PD	~Resource	~Adapt		0
29	~Assess	~Assure	PD	Resource	Adapt	50	2
30	~Assess	~Assure	PD	Resource	~Adapt	0	2
31	~Assess	~Assure	PD	~Resource	Adapt		0
32	~Assess	~Assure	PD	~Resource	~Adapt	20	5

~, not significant; superior progress, percentage of configuration members in the top half of the improvement in public health effectiveness score.

Two configurations, with above-average improvement in their populations' health statuses, were used to identify the prime implicants for success. As only one variable differed in its influence on improved health status, resource availability, the larger configuration's paradigm is considered dominant. The final reduced equation for above-average health measure improvement in Table 3 is:

Superior improvement= assessment X assurance
X policy development
X (adaptability+ resource)

Table 3 Reduced truth table sorted by superior health measure progress.

Configuration	Assessment	Assurance	PD	Resource	Adaptability	Superior progress (%)	*n*
7	Assess	Assure	PD	~Resource	Adapt	100	2
5 and 6	Assess	Assure	PD	Resource		89	9
4	Assess	Assure	~PD	~Resource	~Adapt	50	2
29	~Assess	~Assure	PD	Resource	Adapt	50	2
15, 16, 23 and 24	Assess		PD	~Resource		30	10
1, 3, 9 and 11	Assess		~PD		Adapt	25	8
30 and 32	~Assess	~Assure	PD		~Adapt	14	7
17	~Assess	Assure	~PD	Resource	Adapt	0	1

PD, policy development. States belonging to each set of reduced configurations: Cluster 7, CO, KY; Clusters 5 and 6, CT, NH, NJ, OR, TX, VA, AL, AK, WA; Cluster 4, GA, ID; Cluster 29, NY, LA; Clusters 15, 16, 23 and 24, FL, RI, MD, MO, OH, WI, ND, CA, NC, OK; Clusters 1, 3, 9 and 11, MN, AR, IN, AZ, MT, PA, NE, SC; Clusters 30 and 32, HI, NV, VT, IO, KS, NM, WY; Cluster 17, MS.

Based on the derived equation, the necessity and/or sufficiency of public health core functions can be described in terms of above-average improvement in state health measures from 1990 to 2000. The equation indicates that there are three sets of strategic capabilities that allows for such success. Assessment, assurance and policy development are all necessary conditions for above-average health improvement. Therefore, Hypothesis 2 is rejected and Hypothesis 3, that all three core functions of the public health model are necessary for success, is deemed to be true. However, the three core public health functions are not in themselves sufficient to explain superior health status improvements.

Given that a state agency is engaged in all three activities, the presence of either 'resource avail-ability' and/or 'adaptability/ proactivity' is sufficient to allow a state to achieve above-average health improvement over the period studied. Based on the Boolean expression containing the prime implicants, it is also possible to identify the combinations of strategy characteristics associated with below-average improvement in health status measures. These findings are discussed next.

Discussion

This article presents a two-step process analysing state health agencies' adherence to IOM recommendations regarding the public health core functions using qualitative and quantitative approaches. First, a set of variables serving as proxies for the public health core functions were regressed on an independent measure of population health status improvement during the 1990s. Second, a configuration based on the five variables identified in the regression was conducted using the QCA. Each of these analyses' results provides relevant information. To test if the strategic characteristic variables that approximated the public health core functions were related to improvements in population health over time, a quantitative approach was used—linear regression. All three core functions—assessment, assurance and policy development—were significantly correlated to the independent variable. These results are the first to empirically demonstrate a significant relationship for assessment, assurance and policy development to public health measures of success.

In particular, the centralization of strategy-making variable had a relatively large correlation with improvements in health. That state health agencies were disengaging from this activity during the period measured[16] indicates that the problems detected by the IOM in 1988 and re-iterated in 1996[30] are inhibiting health improvement efforts in some states. For public health leaders, the message is clear—better policy development, vis-á-vis

strategic planning, is clearly correlated with better performance and is worth pursuing while further research is conducted. For researchers, the two variables identified in the exploratory regression may hold some clues to the appropriate theoretical frameworks.

Resource availability and adaptability/ proactivity were also strongly correlated with improvements in population health measures. These variables indicate that, beyond the core public health functions model, the resource-based view of the firm may provide a valuable framework for analysing public health agencies' abilities to meet their populations' changing needs.[31] The resource-based view assumes heterogeneity within a group of organizations with respect to strategic resource availability.[32] This is most certainly the case among state health agencies. Further, the framework would be compatible with other organizational change efforts underway, such as those of the National Health Service[33] and Cochrane Collaboration[34] in the UK and The Leapfrog Group[35] in the USA.

QCA provides a means for exploring issues such as the necessity or sufficiency of strategy characteristics in an exhaustive fashion. Of the five variables identified in regression analysis, three were necessary in order for a state agency configuration to experience above-average improvement in population health measures. To summarize, it is necessary for agency leaders to assess their environment and population's health needs, provide strong policy development, and provide a significant level of assurance. However, these three elements together were not sufficient to explain above-average health status improvements. A state agency also needed to have significant organizational resources (resource availability) and/or be adaptable to the environment (adaptability/proactivity).

Looking at Table 3, resource availability and adaptability/proactivity variables are nearly equal in importance. Nine states each had one or both items present in their configuration. Seven states had positive scores for the presence of both elements. As important as this new insight is, the prime implicants equation for the states with below-average improvement is equally enlightening.

The absence of just one of the three core public health function variables was sufficient, by itself, to create below-average correlations between the improvement in health status among those configurations. Thus, state health agency configurations possessing all three core function characteristics were the only ones to have positive correlations with improved health status. The implications of these results for public health practitioners are important in two ways. First, state agency activities can be statistically demonstrated to correlate with public health outcome measures over time. Second, it is critical that state health agency leaders have the power to engage in policymaking or at least have the ability to inform policymakers in a meaningful way. Lacking this core function significantly inhibits an agency's ability to improve the health status of its community.

Future research

These findings are informative for public health administrators in two ways. First, configuration variables are related to non-monetary measures of success. Second, by combining quantitative and qualitative approaches in identifying and exploring organizational gestalts, the utilities of both approaches are increased. Therefore, future research should seek to triangulate important measures in multiple ways.

In particular, understanding the use of policy making, which is the most frequently absent characteristic among states, and changes in population health impacts is essential if policy analysis is to be of any value. Lacking this core function potentially inhibits an agency's ability to improve the health status of its community. In addition, other organizational factors, such as resource availability and organizational adaptation used herein, should also be considered when studying state agencies. Lastly, other exogenous factors that play a major role in populations' health statuses, such as national policy changes and changes in communities' socio-economic status, need to be accounted for in the statistical models.

Limitations

The model presented herein does not indicate causality and other explanatory factors undoubtedly play a role in populations' health statuses. In addition, the use of expert raters rather than objective metrics limit the utility of these results. Nevertheless, this research does provide insights into the factors that are being promulgated by US schools of public health, the IOM and practitioners.

References

1 . Institute of Medicine, The future of public health. Washing-ton: National Academy Press; 1988.

2. Wang XH. Assessing performance measurement impact. Public Perform Manage Rev 2002;26:26—43.

3. Kemm J. Can health impact assessment fulfill the expectations it raises? Public Health 2000; 114:431—3.

4. Sim F, Mackie P. Health impact assessment: a science and art for public health. Public Health 2003; 117:293—4.

5. Health and Human Services, Healthy people 2000: national health promotion and disease prevention objectives. Washington: US Department of Health and Human Services, Public Health Services; 1991. p. 696.

6. Public Health Foundation, Turning point performance management collaborative survey on performance management practices in States. Seattle: Turning Point National Program Office at the University of Washington; 2002.

7. Milner SJ, Bailey C, Deans J. Fit for purpose health impact assessment: a realistic way forward. Public Health 2003; 117:295—300.

8. Centers for Disease Control and Prevention, Ten great public health achievements—the United States 1900—1999. J Am Med Assoc 1999; 281:1481.

9. Elders J. The future of US public health. J Am Med Assoc 1995;269:2293—4.

10. Coyne JS, Hilsenrath P. The World Health Report 2000: Can health care systems be compared using a single measure of performance. Am J Public Health 2002;92:30—2.

11. Handler AS, Turnock BJ. Local health department effectiveness in addressing the core functions of public health: essential ingredients. J Public Health Policy 1996;17: 460—83.

12. Scutchfield FD, Hiltabiddle SE, Rawding N, Violante T. Compliance with the recommendations of the institute of
medicine report, The Future of Public Health: a survey of local health departments. J Public Health Policy 1997;18: 155—66.

13. Centers for Disease Control and Prevention, Public health core functions—Alabama, Maryland, Mississippi, New Jersey, South Carolina, and Wisconsin, 1993, vol. 1999. Atlanta, GA: Centers for Disease Control and Prevention; 1994.

14. Halverson PK, Miller CA, Kaluzny AD, Fried BJ, Schenck SE, Richards TB. Performing public health functions: the perceived contribution of public health and other com-munity agencies. J Health Hum Serv Admin 1996; 288—303.

15. Scott HD, Tierney J, Waters Jr W. The future of public health: a survey of the states. J Public Health Policy 1990; 11:296—304.

16. Scutchfield FD, Beversdof CA, Hiltabiddle SE, Violante T. A survey of state health department compliance with the recommendations of the institute of medicine report, The Future of Public Health. J Public Health Policy 1997;18: 13—29.

17. Piper MA, Lindenmayer JM, Lengerich EJ, Pass KA, Brown WG, Growder WB, Khoury MJ, Baker TG, Lloyd-Puryear MA, Bryan JL. The role of state public health agencies in genetics and disease prevention: results of a national survey. Public Health Rep 2001;116:22—31.

18. Miller D. Relating Porter's business strategies to environment and structure: analysis and performance implications. Acad Manage J 1988;31:280—308.

19. Veliyath R, Shortell SM. Strategic orientation: strategic planning system characteristics and performance. J Manage Stud 1993;30:359—81.

20. Zajac EJ, Shortell SM. Changing generic strategies: likelihood, direction, and performance implications. Strategic Manage J 1989; 10:413—30.

21. Law KS, Wong CS, Mobley WH. Toward a taxonomy of multidimensional constructs. Acad Manage Rev 1998;23: 741—55.

22. Fleishman EA, Quaintance MK. Taxonomies of human performance: the description of tasks. Orlando: Academic Press; 1984.
23. US Department of Health and Human Services, Healthy people 2010: understanding and improving health. Washing-ton: US Government Printing Office; 2000.
24. SutockyJW, DumbauldS, AbbottGB. Year 2000 health status indicators: a profile of California. Public Health Rep, vol. 111.; 2000. p. 521-526.
25. Scanlon WJ. Public health: a health status indictor for targeting aid to States. Washington: US General accounting office; 1996. p. 26.
26. Heller RF, Heller TD, Pattison S. Putting the public back into public health. Part II. How can public health be accountable to the public? Public Health 2003; 117:66—71.
27. UnitedHealth Group, State health ranking, 2000 ed. United Health Group, vol. 2002.; 2001.
28. Ragin CC. The comparative method: moving beyond qualitative and quantitative strategies. Berkeley: University of California Press; 1987.
29. Ragin CC. Using qualitative comparative analysis to study causal complexity. Health Serv Res 1999;34:1225—39.
30. Stoto MA, Abel C, Dievler A. Healthy communities: new partnerships for the future of public health. Medicine Io, Washington: National Academy Press; 1996.
31. Foss NJ. Research in the strategic theory of the firm: isolationism and integrationism. JManageStud1 999;36:725—55.
32. Barney JB. Firm resources and sustained competitive advantage. J Manage 1991; 17:99—120.
33. Iles V, Sutherland K. Organisational change: a review for health care managers, professionals, and researchers. London: National Health Service; 2001.
34. Anonymous, Changing, from top to bottom. Lancet 1998; 351:997.
35. Birkmeyer JD, Birkmeyer CM, Wennberg DE, Young MP. Leapfrog safety standards: potential benefits of universal adoption. Washington: The Leapfrog Group; 2000.

Appendix A

Variable names, definitions and sources

Variable name	Definition	Source
Configuration (independent) variables		
Assessment	The amount of tracking and the number of agency members engaged in scanning the environment in terms of consumer issues (epidemiology) and administrative developments.	CA
Assurance	The amount of authority for assurance of healthcare operations transferred to local health departments and state-level programme managers. Particularly departments that provide access to care.	CA
Policy development	Does the agency engage strategic planning and try to influence its environment? Is power distributed throughout the agency or centralized in top management? Is there a central planning office?	CA

(*continued on next page*)

Variable name	Definition	Source
Resource availability	The amount of available labour, materials, capital, facilities and other resources. This differs from munificence, which relates to issues outside the agency's control.	CA
Adaptability/proactivity	The amount of response by the agency to external environmental conditions, and the appropriateness and degree to which the agency attempts to shape its environment.	CA
Items used to create scale for dependent variable (item weighting)		
Change in state's health status from 1990 to 2000	This variable is calculated by taking the difference between overall health status scores from 2000 and 1990. It serves as the dependent variable in the regression analysis and to dichotomize the sample in the configuration analysis.	UHG
Prevalence of smoking (10.0)	The percentage of the population over 18 years of age that smokes tobacco* products regularly.	BRFSS
Motor vehicle deaths (5.0)	The annual number of deaths per 100 000 000 miles driven*.	NSC
Violent crime (5.0)	Violent crime measures the effect of criminal behaviour on a population's health. It represents factors such as illegal drug use* and various social ills.	UHG
Occupational fatalities (2.5)	The impact of hazardous jobs on the population.	UHG
Limited activity days (2.5)	The average number of days in the past 30 days that a person could not perform work or household tasks due to physical or mental illness*.	BRFSS
Unemployment (5.0)	The percentage of the civilian, non-institutional labour force unemployed during the year. A proxy measure of access to health insurance* and services.	UHG
Lack of health insurance (5.0)	The percentage of the population not covered by private or public health insurance*.	UHG
Adequacy of prenatal care (5.0)	The access to prenatal care* based on the modified Kessner criteria.	UHG
Risk for heart disease (5.0)	A measure of three equal criteria: obesity*, hypertension and sedentary life style*.	BRFSS
Heart disease (7.5)	A measure using a 3-year average, age- and race-adjusted death rate due to heart disease.	UHG
Cancer cases (7.5)	The number of projected cases divided by the total population of the state to determine the rate of cancer cases per 100 000 population.	ACS
Infectious disease (5.0)	The occurrence of acquired immune deficiency syndrome*, tuberculosis and hepatitis.	UHG
High school graduation (5.0)	The percentage of ninth-graders who graduate within 4 years.	NCES

(*continued on next page*)

Variable name	Definition	Source
Total mortality (10.0)	The mortality rate is age and race adjusted and is an average of the most recent 3 years of data.	UHG
Infant mortality (7.5)	Represents many factors surrounding birth, including (but not limited to) the health of the mother, prenatal care, and quality of the health services delivered to the mother and child and infant care.	UHG
Premature death (7.5)	The loss of years of productive life due to death before 75 years of age.	UHG
Support for public health care (5.0)	Total state and local expenditures for public welfare, health and hospitals divided by general expenditures of state and local units.	UHG

*, Areas explicitly cited in Healthy People 2010 measures of population health. The UnitedHealth Group compiled all of the items used in the dependent variable and weighted them, based on a Delphi process consulting public health experts. Sources: American Cancer Society. *Cancer Facts and Figures 2000.* Atlanta: ACS, 2000. *2000 BRFSS Summary Prevalence Report.* Atlanta: Centers for Disease Control and Prevention, 2000. National Center for Education Statistics. *Dropout Rates in the US 1999,* Washington: National Safety Council, 2000. *Accident Facts.* Washington: UnitedHealth Group, 2000. *State Health Rankings*—2000 edn. (Content analysis of state information by principal investigator).